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DRAFT

European Vertical Reference Network (EUVN)

Final Documentation

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The Concept of the European Vertical GPS Reference Network (EUVN)

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The Concept of the European Vertical GPS Reference Network (EUVN)

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Abstract

The European Vertical GPS Reference Network (EUVN) is designed to contribute to the unification of different height systems in Europe. The most important practical and scientific aspects are

- contribution to a unique European height datum
- connection of European tide gauge benchmarks as contribution to monitoring absolute sea level variations
- establishing of fiducial points for the European geoid determination
- preparation of a European Vertical Kinematic Network.

The EUVN includes 195 points all over Europe, 79 EUREF points, 53 nodal points of the Levelling Networks of Eastern and Western Europe and 63 tide gauges. At every EUVN point three-dimensional coordinates in ETRS89 and levelling heights primary in the system of the United European Levelling Network (UELN) have to be derived. In the period of May 21 to 29, 1997, GPS observations at all EUVN stations were carried out simultaneously. The results of the GPS computations are presented at the EUREF Symposium in Bad Neuenahr-Ahrweiler. Some connection levellings still have to be finalized. At the tide gauge stations of EUVN additional sea level observations have to be included.

1. Foundations

The EUVN project was prepared since 1994 by the Technical Working Group (TWG) of the IAG Subcommission for Europe (EUREF). As a result of TWG meetings at the EUREF Symposia three project related resolutions were adopted:

- the Resolution No 3 of the EUREF Symposium in Warsaw, 8-11 June 1994,
- the Resolution No 2 of the EUREF Symposium in Helsinki, 4-6 May 1995,
- the Resolution No 3 of the EUREF Symposium in Ankara, 22-25 May 1996.

A small working group was set up during the EUREF TWG Meeting in Paris, 9-10 October, 1995, to take over the coordination of the project and the measurement campaigns. The authors of the paper are the members of the EUVN Working Group.

At the end of February 1996 the proposal of the EUVN project with a description of the project, a preliminary list of proposed EUVN sites, technical requirements and guidelines for the GPS campaign, a questionnaire and a mailing list was sent to the representatives of 36 European countries in order to inform on these plans and to ask for support of such a campaign.

Most of the countries were able to support EUVN in their national area with own receivers, with own staff and on their own costs. The information obtained frame the returned questionnaires is summarized in Figure 1 and 2 and compile show the present status of national height systems to different tide gauges and the kind of heights.

2. Project Objectives

The initial practical objective of the EUVN project is to unify different European height datums within few centimeter. In addition to the United European Levelling Network (UELN 73) for West and North Europe and the United Precise Levelling Network 1982 (UPLN 82) for Central and Eastern European countries national height systems exist with different kinds of heights and different zero levels. The zero level for the UELN is the tide gauge Amsterdam and for the UPLN it is the tide gauge Kronstadt. The level difference is about $h_{Amsterdam} - h_{Kronstadt} = 0{,}15\text{m}$.

At all EUVN points *P* three-dimensional coordinates in the ETRS89 $(X_p, Y_p, Z_p)_{ETRS}$ and geopotential numbers c_p will be derived. The geopotential number $c_p = W_{o\ UELN} - W_p$ is the difference between the potential of the earth gravity field of the reference tide gauge of the UELN (W_{oUELN}) and of the gravity potential in the EUVN points (W_p). Finally the EUVN is representing a geometrical-physical reference frame. In addition to the geopotential numbers c_p normal heights $h_n = c_p / \bar{\gamma}$ will be provided ($\bar{\gamma}$ is the mean normal gravity value between the ellipsoid and the telluroid.).

Figure 1:

Reference Tide Gauges of National Height Systems in Europe

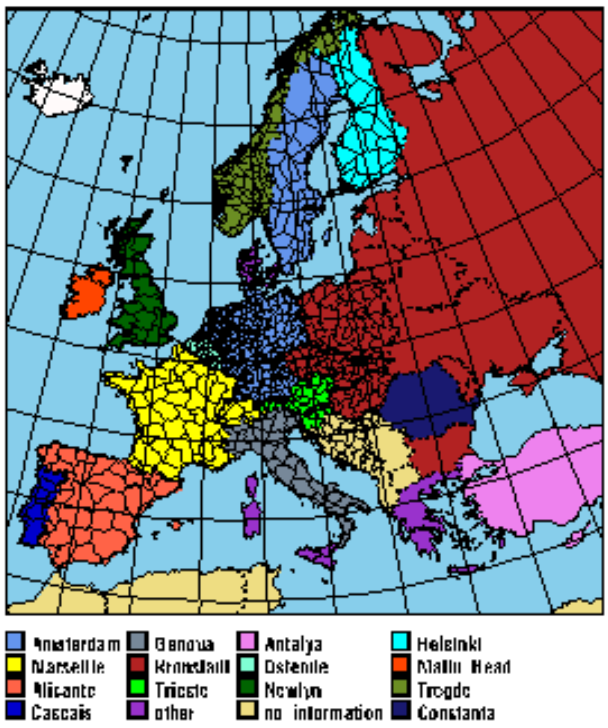


Figure 2:

Kind of Heights of National Height Systems in Europe

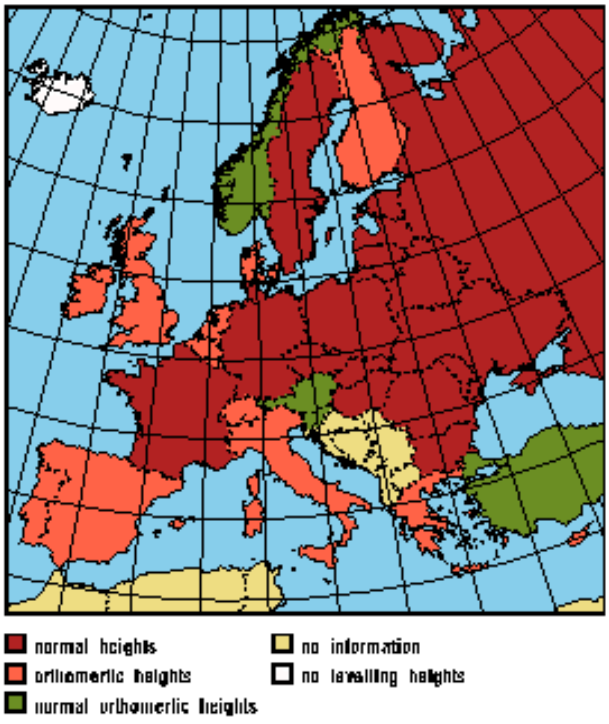


Figure 3:
Present Status of the United European Levelling Network (UELN 95)

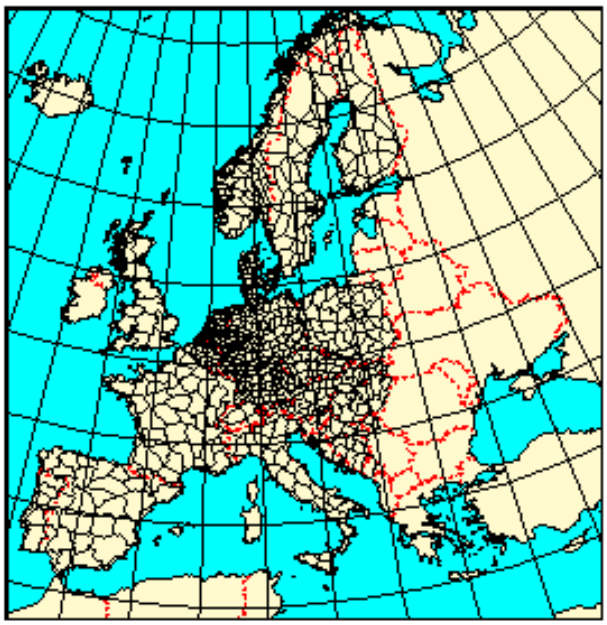
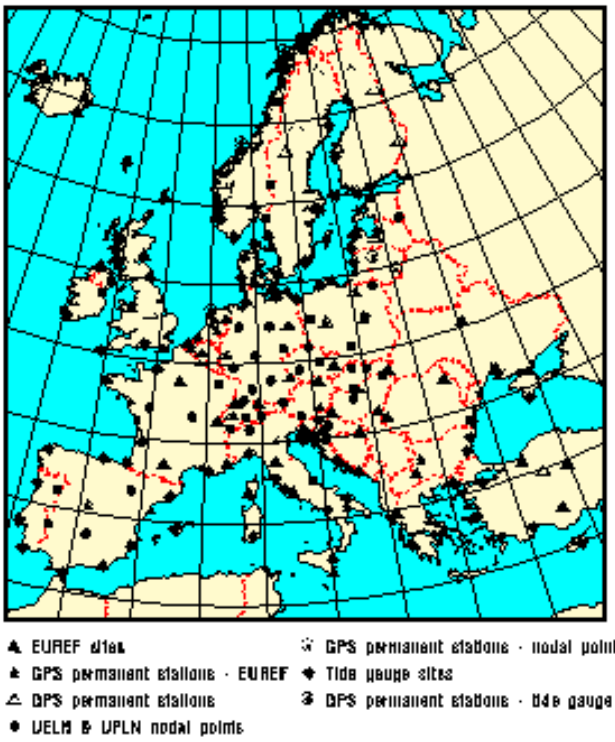


Figure 4:
Destribution of EUVN Points



The application of the GPS technique for practical levelling would dramatically extend if the geoid would be known precisely enough in relation to the concerned GPS reference system and the levelling reference system. To derive such a geoid, a European reference geoid is required in the reference system ETRS89 and the reference system of UELN. Up to now there is no precise geoid available for Europe with an accuracy of a few centimeters which fulfils the requirement for the practical applications. This proposal points out a possibility to derive a geoid tailored for the GPS-levelling methods by combining the existing reference network EUREF/ETRS89 with the UELN95.

Independent of a uniform height level for the maritime countries the knowledge of the sea level and, under special conditions, of the variations of the adjacent oceans is vitally important. Tide gauges provide access to a local information which generally results from a combination of sea level changes and vertical movements of the earth crust at the tide gauge site. Therefore, global sea level studies based on tide gauge data require to monitor the vertical crustal velocities at the tide gauge sites with respect to a geocentric reference frame, in order to recover a global geocentric assessment of the sea level variations. In this scope the use of GPS has been recommended by an international group of experts at two occasions (Carter et al., 1989 and Carter, 1994).

Following recommendations by Carter (et al., 1989) several institutions around Europe have carried out regional tide gauge GPS surveys. At least three common points between two networks are needed for a rigorous combination of the coordinates and for the subsequent description of the regional campaign results in a common geocentric reference frame (Boucher et al., 1994). The information provided by the tide gauges has been taken into account in the design of the EUVN network.

The EUVN project contributes to the realization of an European vertical datum and to connect different sea levels of European oceans with respect to the work PSMSL (Permanent Service Mean Sea Level) and of anticipated accelerated sea level rise due to global warning. The project provides a contribution to the determination of an absolute world height system as shown by Balasubramania, 1994.

EUVN is a step to establish a fundamental network for a further geokinematic height reference system such as UELN 2000 under the special consideration of the Fennoscandian uplift and the uplift in the Carpathian-Balkan region (Augath, 1996).

3. EUVN Design

EUVN connects several kinds of heights and will incorporate the vertical references of the European Reference Systems EUREF, UELN, national height networks and tide gauge sites as well as the European Geoid. The EUVN is designed under consideration of the already existing parts of EUREF and UELN as well as of the planned network of European permanent GPS stations.

EUREF is the realization of the ETRS89 frame for precise applications of GPS techniques in Europe for positioning with an accuracy about 1 cm. The height components refer to the reference ellipsoid GRS80.

The UELN provides gravity-related heights with respect to the tide gauge of Amsterdam. According to Resolution No. 3 of the EUREF Symposium 1994 in Warsaw, it is the objective to create a uniform height datum for Europe on the basis of UELN73 (Ehrensberger, Kok 1986) which includes also the extension to the Central and Eastern European countries as well as the data of such network blocks which already are part of UELN73 but include more and new measurements. The 1998 status of UELN95 is given in figure 3 (Sacher et al., 1998).

In the Central and Eastern European countries there exists already a United Precise Levelling Network (UPLN) consisting of first order levelling lines through Bulgaria, East Germany, Czech Republic, Slovakia, Poland, Romania, Russia, Georgia, Estonia, Latvia, Lithuania, Belorussia, Hungary, Ukraine and Moldavia. The UPLN was observed in the 50ies and remeasured in the 70ies. The readjustment was completed in 1982. It comprises more than 350 nodal points. The lengths of lines varies between 70 km in the western part and 200 km in the eastern part. The reference tide gauge is Kronstadt/Russia. The 1982 adjustment was carried out in normal heights.

Tide gauge sites are essential to estimate a possible secular sea level rise. The tide gauge sites will provide all the information for the combination of ellipsoidal heights and physical heights along coast lines. These results will be of great importance for the proposed campaign covering whole Europe.

The Fennoscandian uplift and the crustal deformation in the Carpathian-Balkan region are geodynamic effects of European dimensions. Therefore the project will consider these aspects in relation to the density and distribution of the EUVN sites and permanent GPS stations.

In total the EUVN consists of about 196 sites: 66 EUREF- and 13 national permanent sites, 54 UELN and UPLN stations and 63 tide gauges (Figure 4). The northernmost EUVN station is situated at Ny Alesund (78.9°, 12.0°) on Spitzbergen, the southernmost point is the tide gauge Larnaka (34,9°, 33,6°) on Cyprus. The westernmost point Reykjavik (64,15°, -22,0°) is situated in the North Atlantic, the easternmost point Yozgat (39,8°, 34,8°) in Turkey.

Three kinds of observation groups are necessary:

- GPS measurements for the determination of the ellipsoidal heights of all defined EUVN points,
- levellings between the EUVN sites and the UELN nodal points for the determination of the physical height of all defined EUVN points,
- observations of sea level at tide gauge stations.

4. GPS Frame

The EUVN97 GPS Campaign is a collaboration of most of the European countries. Many surveyors were involved and each of them will contribute to the success of the campaign.

The Baltic Sea Level GPS campaign 1997 and other local GPS activities were performed simultaneously to the EUVN97 GPS campaign. For the observations at the EUVN and BSL stations 200 field parties were employed whereby it should be considered that at several stations collocations between different receivers were performed.

The GPS observations for the EUVN were carried out in the period from May 21 (18:00 UT) to May 29 (06:00 UT), 1997. Three types of receiver were used: 35 Turbo Rogue Receivers, 134 Trimble SSI or SSE and 51 Ashtech Z12. The time interval was set to 30 s, the elevation mask is 5°. The campaign was running very smoothly and everybody who participated in the campaign supported the action successfully.

At 18 sites two or three types of receivers were collocated. The Turbo Rogue which provide data to the International GPS Service for Geodynamics (IGS) for orbit determination are spread all over the whole network. The Ashtech receivers were mainly used in Scandinavia, in Lithuania and in France. Several spare receivers were held in reserve at the BKG to replace receivers in case of system failures. It has to be pointed out, that no spare receiver was requested during the period of observations, which demonstrates that GPS receivers are very reliable today.

The data preprocessing after the EUVN campaign performed by 9 EUVN Preprocessing Centers (PPC) is mainly a check concerning completeness and consistency of the data and the auxiliary informations. The PPCs were requested to prepare complete access informations and/or data flow guidelines for the observing agencies before the start of the campaign (Luthardt et al., 1998).

The EUVN Data Center (DC) is established at the Bundesamt für Kartographie und Geodäsie in Leipzig, with the main tasks:

- to collect all data and information from the Preprocessing Centers (PPC)
- to make these data available for the Analysis Centers (AC)
- to collect the solutions of the ACs (SINEX files)
- to provide additional informations.

The task of the EUVN GPS Analysis Center (AC) is to process the data of a special subnetwork. A subdivision of the whole EUVN Network was done under the aspect of receiver type and regions. 10 European institutions were ready to contribute as Analysis Centers. On the Analysis Center Workshop in September 1997 in Leipzig the subdivision of EUVN was discussed and decided (see Figure 5) Ineichen et al., 1998. The AC of Croatia was responsible for the analysis of the collocation points

and the investigation of the biases introduced by using different antenna types within one GPS network. Simultaneously with the EUVN 97 Campaign the Baltic Sea Level GPS campaign was performed. The BSL 97 GPS campaign was processed by the Finnish Geodetic Institute.

The Astronomical Institute of the University of Bern and the Bundesamt für Kartographie und Geodäsie were responsible for the computation of the final GPS solution of EUVN (Ineichen et al., 1998).

5. Connection Levellings to UELN95 and Sea Level Observations

In order to fulfil future requests it is necessary to connect the EUVN stations by levellings with nodal points of relevant levelling networks. So it is possible to use levelling observations to update the gravity related EUVN heights in contest with new adjustment of UELN.

For all countries which are members of the UELN project it should be clear to connect the EUVN stations to the nearest UELN nodal points. All other countries should connect the EUVN stations to such levelling points which will be in future stations of their national UELN part.

With respect to the objectives of EUVN, each EUVN marker has to be connected at least to one nodal point of one of the three height references system:

1. The United European Levelling Network (UELN) 1995 for all countries which have access to the UELN (for about 80 % of the EUVN points).

2. The United Precise Levelling Network (UPLN) 1982 for all countries which have access to the UPLN (for about 10 % of the EUVN points).

3. National height systems for all countries or parts of countries which have not access to UELN or UPLN or which are not connected with the European continent.

The connections between the EUVN marker and the nodal points or the tide gauge bench mark should be given in geopotential number differences. The levelling accuracy should be equal to the requirements of a first order levelling (better than 1mm per km).

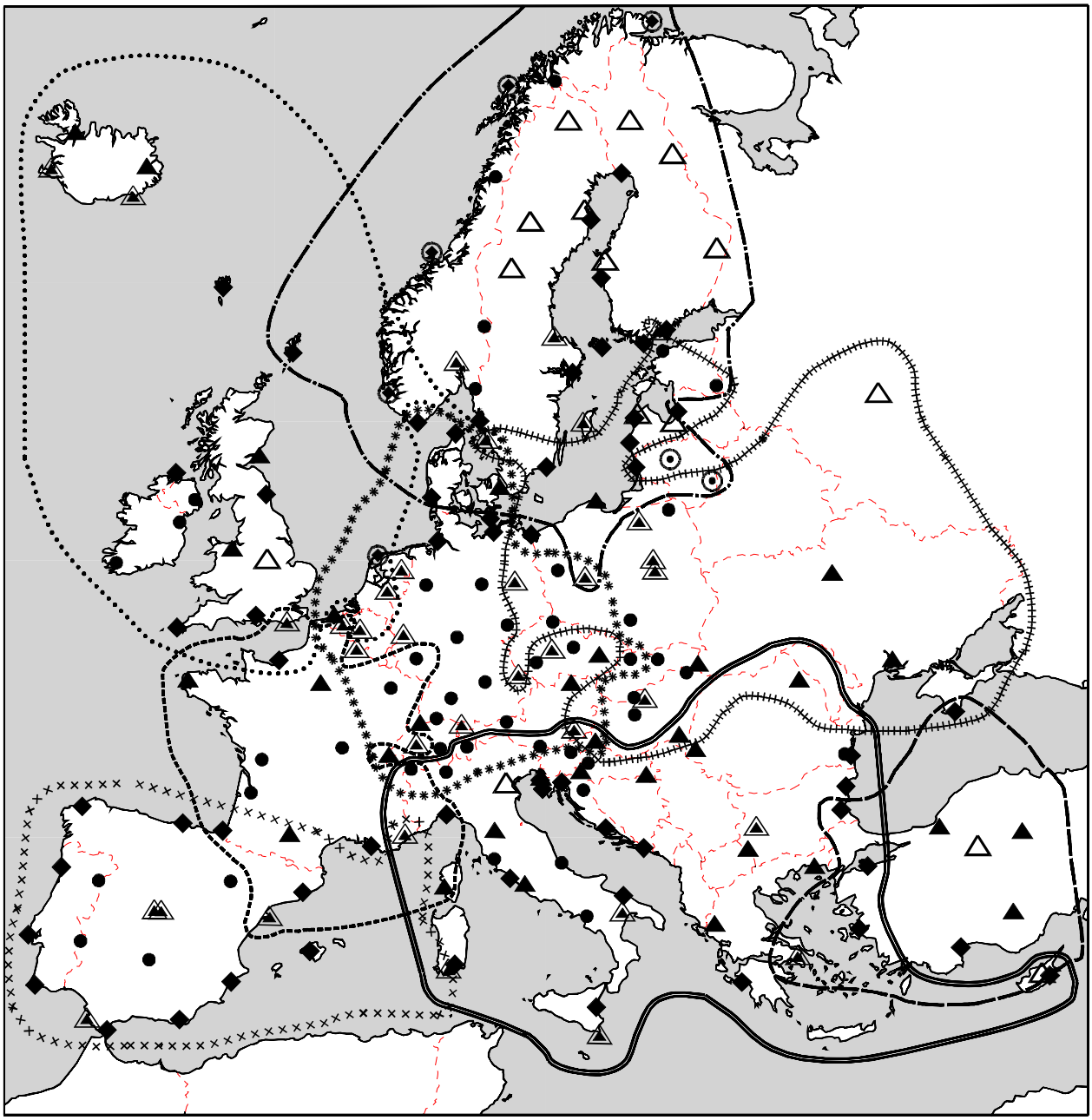


Figure 5: EUVN Analysis Center Subnetworks

▲ EUREF sites
⛰ GPS permanent stations - EUREF
△ GPS permanent stations
● UELN & UPLN nodal points
⊙ GPS permanent stations - nodal points
◆ Tide gauge sites
⊚ GPS permanent stations - tide gauge

Analysis Centers:

Austria
Belgium
Czech Republic
France
Germany
Poland
Sweden
Turkey

Depending on the variation of gravity and topography along the levelling lines the gravity values have to be measured at distances from 0.5 to 3.0 km and with an accuracy between 1 to 3 mgal. In general it should be sufficient to provide gravity values in distances of about 1 km with an accuracy of 1 mgal to guarantee a gravity correction of better than 0.1 mm.

This above summarized information has already been asked for in the levelling/gravity form sent out by the EUVN Working Group last year. However, we suppose that it was not clear enough. The corresponding letters were mailed directly to the agencies February 1998 in order to receive the necessary levelling and gravity information in time. Deadline for having all the levelling information in the data base was May 1998, in order be able to continue the evaluation of EUVN after all GPS results are available.

The levellings between the EUVN GPS marker and the nodal point marker respectively between the EUVN-GPS marker and the tide gauge bench mark and between the corresponding nodal point and the tide gauge have not been received completely, up to now. At present only about 75 per cent of the levellings connections are available at the EUVN data center. So we again ask you kindly to provide these informations quickly.

As the EUVN is a static height network it is necessary to know the value of the mean sea level in relation to the tide gauge bench mark at the epoch of EUVN GPS campaign 1997.5. However for future tasks it is useful to have available the monthly mean values over a period of some years. The Permanent Service for Mean Sea Level (PSMSL), as member of the Federation of the Astronomical and Geophysical Data Analysis Service (FAGS), is in principle in charge of the data collection. Independently from EUVN the PSMSL collects tide gauge data from about 1700 worldwide stations. The informations which are sent to the PSMSL databank in general should also be made available for the EUVN project. Needed are the following data: tide gauge (TG) station name, tide gauge authority, contact name (if any), type of tide gauge, date of tide gauge observations, Tide Gauge Bench Mark (TGBM), height of TGBM above the datum, date of spirit levelling observations, latest data year sent to PSMSL.

EUVN tide gauge stations which are not processed by the PSMSL the responsible national surveying agencies in kindly asked to organize the data collection.

6. Further steps

If the levelling information for the EUVN points will be available within a reasonable time the gravity related heights of the EUVN points in the system of the UELN 95 solution (Sacher et al., 1998) could be finally processed end of 1998.

In spite of the effort of EUVN it should not be forgotten that the time differences between GPS campaign and the latest levelling are mostly more than 10 years. So we have to use other information to be able to correct the levelling height to the GPS epoch especially in Scandinavian and Carpathian-Balkan region.

As soon as the gravity related heights in UELN95 and sea level heights at the tide gauges are available it will be possible to compute the GPS/levelling geoidal heights and sea surface topography values along the European coastlines as well as the transformation parameter of height systems in Europe into the system of UELN 95.

Based on the present static consideration in the future the EUVN project will be continued and converted to a kinematic stage in sense of UELN/EVS 2000.

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EUVN97 Combined GPS Solution

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EUVN 97 Combined GPS Solution

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Abstract

The European Vertical Reference Network 97 (EUVN 97) GPS campaign was performed from May 21 to May 29, 1997. For the data processing the network was divided into eight subnetworks. Ten different analysis centers were involved in the distributed network analysis. The Bundesamt für Kartographie und Geodäsie (BKG) at Leipzig and the Center for Orbit Determination in Europe (CODE), located at the Astronomical Institute of the University of Berne, were responsible for the combination of the subnetwork solutions into an official EUVN 97 solution.

All the observed GPS data, collected and checked by various preprocessing centers, have been made available to the analysis centers by the EUVN data center located at BKG in Leipzig. The entire network consists of 217 GPS sites, out of which 37 sites have known ITRF 96 coordinates.

In order to examine different processing strategies, solutions with different elevation cut-off angles, with introduction of elevation-dependent weighting, and with introduction of satellite-specific weighting were generated. For the final solution the strategy using a 15-degree elevation cut-off angle without introduction of elevation-dependent weighting was chosen. For the realization of the Terrestial Reference Frame the network was fixed to ITRF 96 coordinates (epoch 1997.4).

The following final products were generated: two coordinate files containing geocentric coordinates (ITRF 96 and ETRF 96 at epoch 1997.4) and a file in the Solution-INdependent EXchange (SINEX) format [6], containing in addition to the coordinates the variance-covariance information of the EUVN 97 GPS network. These products will be available at the EUREF data information system at IGN Paris and at the EUVN data center at BKG in Leipzig.

1. Introduction

During the EUVN Analysis Center Workshop at the Bundesamt für Kartographie und Geodäsie (BKG) in Leipzig (September 17–18, 1997) it was decided that BKG and CODE (Center for Orbit Determination in Europe) should contribute to the EUVN combined solution. Further activities of BKG to the realization of EUVN were the operation of the EUVN Data Center and the analysis of a subnetwork in Central Europe.

CODE is located at the Astronomical Institute of the University of Berne (AIUB). In addition to its main function — to operate as an IGS Global Analysis Center — CODE is also involved in the processing of the European permanent GPS network (as Local Network Associated Analysis Center (LNAAC) and combination center).

The official observation period of the EUVN 97 GPS campaign started on May 21, 1997 at 18:00 UTC (Day of the year 141) and ended on May 29, 1997 at 6:00 UTC (DOY 149). For the final solution only data of the seven full days (DOY 142 to 148), were used, i.e. six hours of data were dropped from the first and last day each.

Three EUVN Analysis Center Workshops were held at Leipzig (September 17–18, 1997), Berne (February 5–6, 1998), and Wettzell (April 2–3, 1998) to discuss data exchange, processing strategies, detected problems, preliminary results, and the selection of the final solution.

The combination of the various subnetwork solutions into one final network solution was done at CODE with the latest version of the Bernese GPS Software [1], which is running on a VMS Alpha cluster and at BKG Leipzig with the Bernese GPS Software, Version 4.0 on the basis of a CONVEX workstation with operating system SPP-UX 1.0.

2. General Remarks on the Combined Solution

2.1 The EUVN 97 GPS Network

The EUVN 97 GPS network consists of 217 processed sites: 37 sites with known ITRF 96 coordinates (used for fixing the network) and 180 sites with new determined coordinates. A map of these 180 new sites can be seen in Figure 1. Not shown on the Map are the sites `NYAL` (Ny-Alesund, Spitsbergen) and `KIT3` (Kitab, Uzbekistan). The following kind of points are part of the EUVN 97 GPS network:

- EUREF permanent GPS stations
- EUREF sites
- Permanent GPS stations
- United European Levelling Network (UELN) and United Precise Levelling Network (UPLN) nodal points
- Tide gauge sites

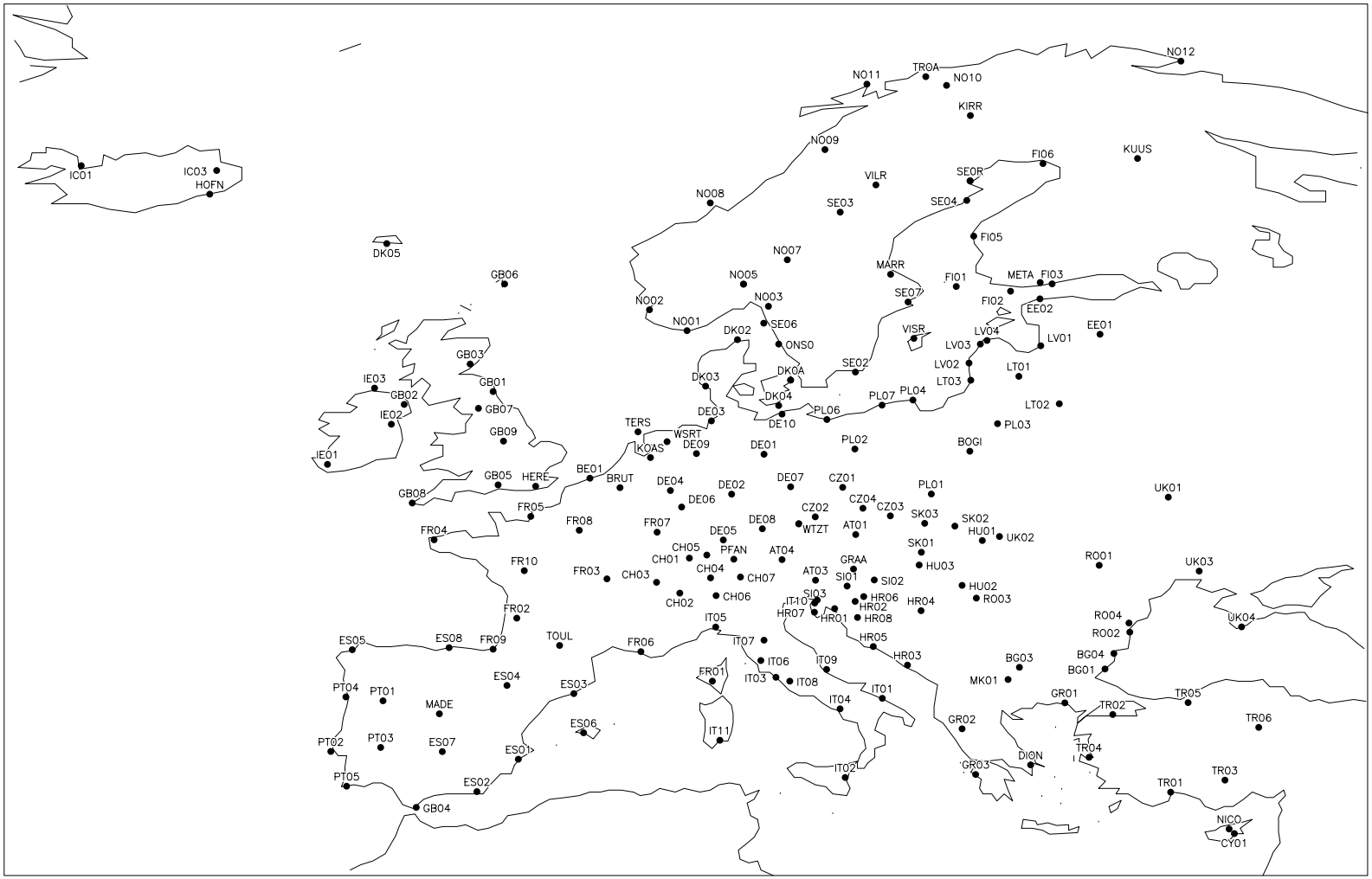

Figure 1: Map of the new points within the EUVN 97 GPS network

2.2 Contributing Analysis Centers

The EUVN 97 GPS network was divided into eight different subnetworks, and the approach of a distributed processing was selected. The eight Analysis Centers (ACs) involved in the processing of the subnetworks are listed in Table 1. In addition the Table contains short statistics of the total number of processed subnetwork sites, the number of sites with known ITRF 96 coordinates, and the number of redundant sites (sites which are part of at least two subnetworks but not used as fiducials).

The daily subnetwork solutions were combined by the ACs to one subnetwok solution for the entire campaign period. All these subnetwork campaign-solutions were combined by the combination centers BKG and CODE to one official EUVN 97 solution.

Table 1: Contributing analysis centers

	Total processed sites	ITRF 96 sites	Redundant sites
AC Austria	48	8	10
AC Belgium	24	5	4
AC Czech Republic	22	5	2
AC Germany	54	11	12
AC France	20	5	9
AC Poland	39	12	12
AC Sweden	53	12	10
AC Turkey	15	4	5

As additional analysis centers AC Croatia and AC Finland were involved in the analysis of EUVN 97 GPS data as follows:

AC Croatia This Center was responsible for the analysis of the collocation points and the investigation of the biases introduced by using different antenna types within one GPS network. Results are presented in [3].

AC Finland Simultaneously with the EUVN 97 campaign a Baltic Sea Level (BSL) GPS campaign was performed. There are some points which are part of both networks. Therefore, the two networks could not only be connected by constraining them to the same reference frame (ITRF 96), but also by a common computation of both networks. The BSL campaign was processed by the Finnish Geodetic Institute. Solutions were also delivered to the EUVN Data Center at Leipzig. A combination was done for testing and checking purposes, only. Some inconsistencies in the naming conventions between EUVN 97 and the BSL campaign were detected and removed. So it is possible to connect both networks without any inconsistencies.

2.3 Problem Areas

During the combination of the subnetwork solutions the following kind of problems occurred:

- For a few sites different antenna names were introduced into the subnetwork solutions and therefore unequal antenna phase center eccentricities were used. If this was the case, the analysis center agreed on the correct antenna names and introduced them into the computations.
- Inconsistencies in the site names were removed.
- A few sites were not usable for EUVN 97 due to very poor data quality or very few available data. They were excluded by the analysis centers themselves from the subnetwork solutions (see analysis center reports). All sites contained in the final subnetwork solutions were used for the combined solution.

3. Investigated Solution Types

The analysis centers produced different solution types in order to investigate the influence of the processing strategy on the results. Mainly the following three types of solutions were looked at:

15 degrees without weighting: The 'standard' solution with the highest priority. Data down to an elevation cut-off angle of 15 degrees were used for generating this solution type. All observations were introduced with the same weight into the parameter estimation process. This solution type corresponds to the processing strategy used for the permanent EUREF network at the time of the EUVN campaign.

5 degrees with elevation-dependent weighting: Measurements down to an elevation cut-off angle of 5 degrees were used for this solution type. In addition, the observations were weighted with $w = \cos^2(z)$, where z is the zenith angle of the observed satellite.

Satellite-specific weighting: The IGS precise orbit files (in SP3 format) contain accuracy codes for each satellite. These accuracy codes can be used by the Bernese GPS Software to weight the corresponding observations. Solutions of this type were not delivered by all analysis centers, and therefore no combined solution was generated. It was the goal of this solution type to get experienced with the influence of such a satellite-specific weighting on the site coordinate repeatability. Furthermore, the EUVN 97 campaign was a good opportunity to test different weighting schemes and their impact on the estimated coordinates. Results are presented in the analysis center reports.

The processing options applied to *all* of the above mentioned solution types were described in [2]. Let us just summarize here the most important ones:

- Data sampling rate of processing: 180 sec
- Ambiguity resolution with Quasi Ionosphere-Free (QIF) strategy [1]

- Estimation of one troposphere parameter per 2 hours, absolute and relative a priori standard deviations of 10 m (i. e., virtually no constraints)
- Use of IGS final orbits and earth orientation parameters
- Introduction of correct inter-baseline correlations

4. Quality Checks

4.1 Daily Repeatabilities

An interesting quality parameter to look at is the repeatability of the daily solutions. Such a comparison of the daily solutions could only be done for the individual subnetwork solutions, because no daily combined solutions were generated.

Different repeatability values were obtained by the individual analysis centers (depending on the subnetwork geometry and the quality of the subnetwork sites). On the average the values amount to 4–5 mm for the height and 1-2 mm for north and east component. More detailed results may be found in the analysis center reports.

4.2 Comparison of Redundant Sites

To gain further insight into the quality of the solutions, the redundant sites within the EUVN 97 GPS network were investigated. A redundant site is a site which is part of at least two different subnetworks and which is not used as fiducial to fix the network to ITRF 96.

When combining the eight different subnetworks, the program ADDNEQ, the normal equation stacking program of the Bernese Software, automatically computes the residuals of all redundant points with respect to the final coordinates.

An RMS of each coordinate component was calculated as follows:

$$m_C = \sqrt{\frac{\sum_{k=1}^{N_r} r_{k,C}^2}{N_r - N_p}} \quad , \tag{1}$$

where

m_C is the estimated RMS for the north (m_N), east (m_E) and height (m_H) component,
$r_{k,C}$ is the residual of component C (N, E or H) of the individual solution with respect to the combined solution,
N_p is the total number of redundant points,
N_r is the total number of residuals per component.

For the computation of the residuals $r_{k,C}$ the combined solution was fixed to ITRF 96 coordinates. The estimated RMS values are shown in Table 2.

Table 2: RMS of redundant sites in [mm]

	m_N	m_E	m_H
15 degrees, no weighting	1.3	1.8	3.7
5 degrees, elevation-dependent weighting	1.6	1.2	4.2

The values above should not be mistaken as a measure of the absolute accuracy of the determined coordinates. They only show the differences in the site coordinates when a station is computed by two or more analysis centers. The most important reasons for the occurrence of such differences are:

- Redundant points are computed within two different subnetworks and as such connected with different sites, involving different observations.
- The subnetworks are constrained to different ITRF 96 sites. That means that errors in the ITRF 96 coordinates can add to the difference between two subnetwork solutions.

4.3 Residuals of Helmert Transformations with Respect to ITRF 96

To verify the agreement of the EUVN 97 network with the ITRF 96 coordinates (at epoch 1997.4) Helmert transformations of the unweighted 15-degree solution and the weighted 5-degree solution to ITRF 96 coordinates were performed. Results are summarized in Table 3. Within the EUVN 97 campaign special emphasis was put on the height component: For the unweighted 15-degree solution the height residuals of the Helmert transformation were below 10 mm for all sites except `VILL` (10.6 mm). The estimated height RMS was of the same quality (5.1 mm) for both investigated solution types.

This RMS value agrees well with the repeatability values of the height component seen within the EUREF permanent GPS network. The comparison of several weekly EUREF solutions gives a value of the same order (4-5 mm). This means that the height residuals of the Helmert transformation are about as good as the weekly repeatabilities of the permanent GPS network itself. EUVN 97 therefore agrees well with ITRF 96 and no systematic effects seem to be introduced by defining the terrestrial reference frame for EUVN 97 through ITRF 96. Two problematic sites were detected by means of the Helmert transformation (these two stations are not listed in Table 3):

- `TOUL`: The ITRF 96 coordinates of site `TOUL` are of very poor quality (the permanent GPS site did not yet contribute to the ITRF 96 solution). The differences between the ITRF 96 coordinates and the EUVN 97 solution were 75 mm in the north, 99 mm in the east, and 41 mm in height, respectively. Therefore `TOUL` was not used as fiducial site.

Table 3: Residuals after performing a seven-parameter Helmert transformation of the unweighted 15-degree solution and the weighted 5-degree solution to the ITRF 96 coordinates

Solution type		15 degrees, unweighted			5 degrees, weighted		
Station name		Residuals [mm]			Residuals [mm]		
		North	East	Up	North	East	Up
GRAS	10002M006	-0.9	-4.2	3.2	-1.0	-4.5	1.7
REYK	10202M001	-7.9	-1.7	1.0	-4.5	-3.1	2.4
NYAL	10317M001	-1.2	-7.5	8.0	-3.4	-6.3	13.5
ONSA	10402M004	-0.3	-2.4	9.8	0.8	-2.0	8.0
MAR6	10405M002	0.5	5.3	5.0	-0.6	5.0	-6.1
KIRO	10422M001	-2.6	4.0	-7.6	-4.4	4.5	-5.1
VISO	10423M001	-2.1	3.3	-1.5	-1.6	3.0	-7.2
VILO	10424M001	-1.1	5.3	0.4	-4.0	5.3	-7.9
METS	10503S011	-0.4	-1.2	4.0	0.3	-1.6	1.7
VAAS	10511M001	1.1	6.5	0.9	-0.6	5.5	-3.3
JOEN	10512M001	4.5	4.7	6.4	2.6	3.4	4.2
SODA	10513M001	3.6	1.6	1.1	0.4	1.2	1.7
GRAZ	11001M002	0.9	-1.7	6.4	0.7	-1.7	7.0
PENC	11206M006	3.0	-1.8	-2.0	3.1	-1.0	0.9
GOPE	11502M002	2.0	-1.6	-5.8	2.9	-2.0	-5.5
JOZE	12204M001	2.3	-1.9	-4.7	3.3	-0.7	-7.7
BOR1	12205M002	-0.2	-2.0	1.1	0.6	-2.0	-1.7
LAMA	12209M001	0.8	-1.0	-2.9	1.9	-0.3	1.2
RIGA	12302M002	0.6	5.8	-2.2	1.7	5.6	-3.4
ZWEN	12330M001	0.6	-3.4	-4.9	3.4	-1.0	-0.5
MEDI	12711M003	-0.8	4.3	-7.8	-1.3	3.9	-5.9
NOTO	12717M003	-3.8	-1.7	7.9	-4.5	-1.3	8.0
CAGL	12725M003	2.9	3.4	-0.5	3.0	3.3	-3.6
MATE	12734M008	-0.8	-3.2	5.2	-1.5	-2.4	9.2
UPAD	12750M002	-0.5	1.6	2.0	0.4	1.9	1.4
BRUS	13101M004	-1.2	-1.8	-2.8	-0.1	-2.8	0.6
DENT	13112M001	-0.8	-1.3	-6.2	-0.2	-3.0	1.2
DOUR	13113M001	-0.7	-0.3	-8.0	0.1	-1.7	-3.1
HERS	13212M007	0.3	0.5	-6.6	0.7	-1.1	-0.3
SFER	13402M004	4.9	-6.6	-1.5	3.7	-6.5	-2.9
VILL	13406M001	-2.3	-2.6	10.6	-1.2	-1.3	2.0
EBRE	13410M001	-4.6	4.0	1.0	-5.0	3.8	-2.1
KOSG	13504M003	-1.2	0.7	-2.0	-1.1	-0.6	4.5
ZIMM	14001M004	2.0	-0.9	-1.8	1.4	0.5	-6.8
POTS	14106M003	0.4	-1.8	-6.0	1.2	-1.8	-2.2
WTZR	14201M010	0.9	0.4	-2.6	1.2	0.1	2.1
ANKR	20805M002	1.8	-0.8	3.9	1.6	1.6	3.9
RMS per component		2.5	3.4	5.1	2.4	3.2	5.1
RMS of transformation			3.9			3.8	

- MADR: Site MADR showed severe problems in the EUREF permanent network solutions during the time period of the EUVN 97 campaign (jumps in the north component of about −20 mm and in the east component of about 40 mm). Therefore MADR was judged to be unreliable and was not used for EUVN 97 at all. The nearby IGS/EUREF site VILL (Villafranca) was used as fiducial, instead.

4.4 Comparison of the Unweighted 15-Degree and the Weighted 5-Degree Solution

The unconstrained unweighted 15-degree solution was compared with the unconstrained weighted 5-degree solution in order to get an overview of the influence of the chosen processing strategy. The comparison was done with a seven-parameter Helmert transformation. A total of 217 points were compared. All points were used for the determination of the transformation parameters except point KIT3 (which is located rather far from the actual EUVN 97 area). The overall RMS was 1.7 mm in the north, 1.1 mm in the east, and 5.4 mm in height, respectively. Table 4 shows all points with a height residual larger than 10 mm and Table 5 shows all points with a residual larger than 5 mm for the north or east component.

Large residuals in this comparison indicate that the obtained coordinates of these points are sensitive to the applied processing model. Therefore Table 4 indicates that the height values in particular of sites IT06 (Montepescali) and FR06 (Marseille) may be biased by systematic influences and should be treated with caution.

Table 4: Comparison of the unweighted 15-degree solution and the weighted 5-degree solution: Points with Helmert-residuals larger than 10 mm in height

		Residuals in [mm]		
Station name		N	E	H
META	METSAEHOVI A	1.9	2.1	10.2
IE03	MALIN HEAD	-3.1	2.3	-10.5
SE0R	SKELLEFTEAA R	4.4	1.1	10.7
DK03	ESBJERG	-0.5	-1.7	11.1
MAR6	MAARTSBO	2.0	0.7	11.4
IE01	KENMARE	-1.7	2.1	-11.4
FI01	DEGERBY	1.9	1.4	11.5
SE05	SKELLEFTEAA	4.6	1.2	11.7
HR05	SPLIT	-1.0	1.4	14.9
IT06	MONTEPESCALI	-3.1	0.2	23.6
FR06	MARSEILLE	-2.5	-1.7	27.0

Table 5: Comparison of the unweighted 15-degree solution and the weighted 5-degree solution: Points with Helmert-residuals larger than 5 mm in north or east

		Residuals in [mm]		
Station name		N	E	H
NO11	ANDENES	5.2	0.0	3.6
IC01	ENNISHOEFDI	-6.2	1.7	-7.4

5. Final Solution

5.1 Selection of the Solution Type

The question which solution to choose as the official EUVN 97 solution (the unweighted 15-degree solution or the weighted 5-degree solution), was discussed during the Analysis Center Workshop at Wettzell (April 2–3, 1998): The unweighted 15-degree solution was selected as the official one [5].

The following aspects had to be taken into account:

- The comparison of the height component of redundant points in both solution types showed a slightly better repeatability for the unweighted 15-degree solution (See section 4.2).
- The Helmert transformation of the two different solution types to ITRF 96 led to almost identical results, in particular for the height component (see section 4.3).
- Daily repeatability tests within the subnetworks did not really prove a better quality of the weighted 5-degree solution. Different results were obtained by the different analysis centers (depending on the subnetwork structure, see also analysis center Reports).
- Not all sites within EUVN 97 were tracking satellites below 15 degrees with the same quality and quantity. For some sites the number of observations is hardly increasing when changing to the lower cut-off angle, whereas for others the number of observations increased by up to 20% (See e.g. [4]). Therefore the site coordinates within the EUVN 97 GPS network could be more inhomogeneous in the 5-degree solution.
- The elevation-dependent antenna phase center variations are not yet well known below 10 degrees. Introduction of poorly defined corrections could lead to additional systematic errors.
- We do not yet have enough experiences with the performance of the tropospheric mapping functions at very low elevations.

- The ITRF 96 coordinates of the European reference sites are strongly influenced by the EUREF permanent GPS network. Computations of this network are done using an elevation cut-off angle of 15 degrees. Selecting the same cut-off angle for the EUVN 97 final solution decreases the probability of introducing systematic effects through different processing options for the new network and the reference frame.

5.2 Selection of the Fiducials

A map of all the sites used for the definition of the reference frame is shown in Figure 2, except `NYAL` (Ny-Alesund, Spitsbergen).

The final solution is constrained to ITRF 96 coordinates (epoch 1997.4) with an a priori standard deviation of 0.01 mm for each coordinate component. As a consequence of these tight constraints the resulting coordinates of the reference points are virtually identical with the ITRF 96 values.

The file containing the ITRF 96 coordinates used for the constraints was prepared by CODE and made available at the Data Center Leipzig. All sites common to the EUVN 97 network, except `MADR` (Madrid) and `TOUL` (Toulouse), were used.

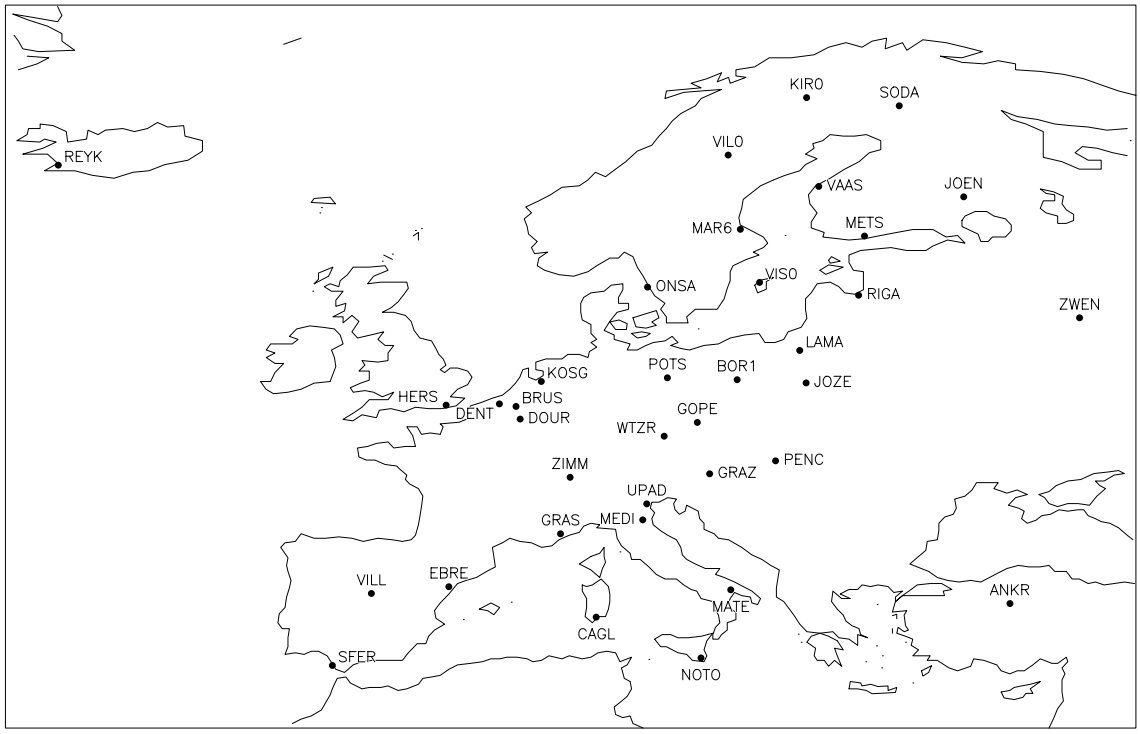

Figure 2: Map of the fiducials used to define the reference frame

5.3 Combination of the EUVN 97 and the ITRF 96 Solution

At the EUREF-Symposium 1998 at Bad Neuenahr–Ahrweiler the idea arised to combine the EUVN 97 solution with the ITRF 96 solution, taking into account the full variance–covariance information of both solutions. The task of this combination was to investigate the influence of the tight constraints of the fiducials on the height component of the newly determined points.

The ITRF 96 solution was introduced using the SINEX file `ITRF96_EUROPE.SNX` [7], containing full variance–covariance information. The rescaling factors between the two solutions were selected in a way, that the residuals of the ITRF sites with long-time series of coordinates obtained reasonably small values ($0 - 2\,mm$, with respect to the original ITRF 96 solution). ITRF 96 velocities were used to relate both solutions to the same epoch (1997.4). For the combined solutions all a priori constraints were removed and free network conditions were set up.

The resulting coordinates of this combination were compared with the ones of the fixed EUVN 97 solution: the differences in the height component were below 2 mm for all sites with unknown ITRF coordinates. All ITRF sites showed corrections in height lower than 4 mm with one exception: site JOEN (7.5 mm).

Therefore it can be stated, that the tight constraining of the EUVN 97 solution to ITRF 96 (what was done for the final solution) is not deteriorating the homogeneity of the EUVN 97 network.

5.4 EUVN 97 Final Coordinates (ITRF 96, Epoch 1997.4)

A comparison of the combined solutions of BKG and CODE showed that these two solutions were identical. Therefore no further combination had to be done. The final coordinate values of all EUVN 97 sites are summarized in Appendix A. For this final solution the EUVN 97 GPS network was fixed to ITRF 96 coordinates (epoch 1997.4). The last column in the table of Appendix A indicates whether the point was fixed (F) or whether it is a newly determined point (N).

At six sites two different receivers (Ashtech and Rogue) were connected to the same antenna (Dorne Margolin). All these sites (`KIRR`, `MARR`, `ONSO`, `SEOR`, `VILR` and `VISR`) were part of the subnetwork processed by AC Sweden. The coordinates of these sites are listed in Appendix C together with the solution of the corresponding 'official' receiver. The differences in the coordinates are caused by the fixing of the 'official' solutions to ITRF 96 coordinates and are *not* due to the different receiver types. In [3] it is shown that the differences generated by the usage of different receiver types is below 1 mm for each coordinate component (this can also be seen in the unconstrained combined EUVN 97 solution).

5.5 Transformation to ETRS 89 (ETRF 96, Epoch 1997.4)

For many practical purposes it is useful to have the ETRS 89 coordinates available (see Appendix B). To get conformity with other projects, the general relations between ITRS and ETRS should be used. The following formula transforms coordinates from ITRF 96 to ETRF 96 [8]:

$$\vec{X}_{ETRF\,96,t_c} = \vec{X}_{ITRF\,96,t_c} + \begin{pmatrix} T_1 \\ T_2 \\ T_3 \end{pmatrix} + \begin{pmatrix} 0 & -\dot{R}_3 & \dot{R}_2 \\ \dot{R}_3 & 0 & -\dot{R}_1 \\ -\dot{R}_2 & \dot{R}_1 & 0 \end{pmatrix} \vec{X}_{ITRF\,96,t_c}\ (t_c - 1989.0)$$

with

$\vec{X}_{ETRF\,96,t_c}$	X, Y, Z coordinates in ETRF 96, epoch 1997.4
$\vec{X}_{ITRF\,96,t_c}$	X, Y, Z coordinates in ITRF 96, epoch 1997.4
t_c	observation epoch 1997.4
T_i	translation parameters from ITRF 96 to ITRF 89, $T_1 = 4.1\,cm,\ T_2 = 4.1\,cm,\ T_3 = -4.9\,cm$
$\dot{R}_i$	rotation parameters due to the motion of the European plate with the motion model NNR-NUVEL1A in 0.001"/y, $\dot{R}_1 = 0.20,\ \dot{R}_2 = 0.50,\ \dot{R}_3 = -0.65$

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[7] LAREG, 1998, *ITRF 96 solutions*, `http://lareg.ensg.ign.fr/ITRF/itrf96.html`

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`ftp://lareg.ensg.ign.fr/pub/euref/info/guidelines`

Appendix A: EUVN 97 Coordinates (ITRF 96 epoch 1997.4)

Station name		Domes no.	X [m]	Y [m]	Z [m]	F/N
ANKR	ANKARA	20805M002	4121948.599	2652187.957	4069023.674	F
BOR1	BOROWIEC	12205M002	3738358.605	1148173.598	5021815.700	F
BRUS	BRUSSELS/UCCLE	13101M004	4027893.862	307045.706	4919475.035	F
CAGL	CAGLIARI	12725M003	4893378.945	772649.638	4004182.057	F
DENT	DENTERGEM	13112M001	4020711.602	238850.995	4928949.570	F
DOUR	DOURBES	13113M001	4086778.272	328451.865	4869782.550	F
EBRE	EBRE	13410M001	4833520.253	41536.958	4147461.448	F
GOPE	PENCY	11502M002	3979316.270	1050312.358	4857067.017	F
GRAS	GRASSE	10002M006	4581691.018	556114.698	4389360.690	F
GRAZ	GRAZ	11001M002	4194423.962	1162702.566	4647245.318	F
HERS	HERSTMONCEUX	13212M007	4033470.232	23672.768	4924301.230	F
JOEN	JOENSUU	10512M001	2564139.232	1486149.666	5628951.352	F
JOZE	JOZEFOSLAW	12204M001	3664940.325	1409153.758	5009571.319	F
KIR0	KIRUNA	10422M001	2248123.327	865686.599	5886425.682	F
KOSG	KOOTWIJK	13504M003	3899225.254	396731.825	5015078.349	F
LAMA	LAMKOWKO	12209M001	3524523.081	1329693.533	5129846.286	F
MAR6	MAARTSBO	10405M002	2998189.533	931451.670	5533398.573	F
MATE	MATERA	12734M008	4641949.710	1393045.289	4133287.338	F
MEDI	MEDICINA	12711M003	4461400.905	919593.439	4449504.680	F
METS	METSAEHOVI	10503S011	2892570.928	1311843.344	5512634.052	F
NOTO	NOTO	12717M003	4934528.661	1321262.241	3806479.516	F
NYAL	NY AALESUND	10317M001	1202430.646	252626.658	6237767.516	F
ONSA	ONSALA	10402M004	3370658.668	711877.038	5349786.868	F
PENC	PENC	11206M006	4052449.634	1417681.005	4701407.030	F
POTS	POTSDAM	14106M003	3800689.777	882077.276	5028791.245	F
REYK	REYKJAVIK	10202M001	2587384.492	−1043033.498	5716563.978	F
RIGA	RIGA	12302M002	3183899.351	1421478.386	5322810.727	F
SFER	SAN FERNANDO	13402M004	5105519.095	−555145.990	3769803.257	F
SODA	SODANKYLAE	10513M001	2200146.815	1091638.262	5866870.686	F
UPAD	PADOVA	12750M002	4389531.294	923253.657	4519256.345	F
VAAS	VAASA	10511M001	2699864.454	1078263.900	5658064.766	F
VIL0	VILHELMINA	10424M001	2620258.716	779138.054	5743799.369	F
VILL	VILLAFRANCA	13406M001	4849833.796	−335049.170	4116014.836	F
VIS0	VISBY	10423M001	3246470.386	1077900.403	5365278.016	F
WTZR	WETTZELL	14201M010	4075580.691	931853.676	4801568.047	F
ZIMM	ZIMMERWALD	14001M004	4331297.197	567555.747	4633133.848	F
ZWEN	ZWENIGOROD	12330M001	2886325.547	2155998.412	5245816.138	F
AT01	HUTBIEGL	-	4066170.635	1135173.269	4765611.941	N
AT03	THOERL-MAGLERN	-	4269552.617	1039497.462	4608324.749	N
AT04	WOERGL	-	4221962.730	903799.911	4679665.615	N
BE01	OSTENDE	-	3996496.547	204372.974	4949994.020	N
BG01	BURGAS	-	4179321.474	2173955.760	4285392.059	N
BG03	SOFIA	-	4319372.239	1868687.653	4292063.867	N
BG04	VARNA	-	4115657.708	2179981.707	4343159.466	N

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Station name		Domes no.	X [m]	Y [m]	Z [m]	F/N
BOGI	BOROWA GORA I	-	3633815.477	1397454.013	5035280.890	N
BRUT	BRUSSELS/UCCLE	13101M003	4027828.599	307014.186	4919540.135	N
CH01	CHRISCHONA	-	4273147.790	575368.401	4684903.763	N
CH02	BOURG ST. PIERRE	-	4407673.511	557562.090	4563260.462	N
CH03	LA GIVRINE	-	4377795.365	468008.744	4601077.398	N
CH04	OBERALP	-	4336578.153	661303.193	4617410.165	N
CH05	SIBLINGEN	-	4252539.308	635461.695	4695882.685	N
CH06	STABIO	-	4396411.594	691631.222	4554070.695	N
CH07	ZERNEZ	-	4315304.078	768728.777	4620021.393	N
CY01	LARNAKA	-	4358072.147	2900454.019	3631353.954	N
CZ01	CHRASTAVA	-	3900991.588	1043027.975	4920986.997	N
CZ02	KOTOUN	-	4036220.113	981441.714	4824567.909	N
CZ03	PREDNI PRICKA	-	3963414.835	1230404.443	4827514.664	N
CZ04	KOSTELEC	-	3961862.444	1131198.939	4852979.340	N
DE01	FLECHTINGEN	-	3830805.799	760508.839	5025824.777	N
DE02	BRONNZELL	-	4006695.120	683568.761	4899211.859	N
DE03	CUXHAVEN	-	3725573.539	571226.438	5128135.694	N
DE04	EUSKIRCHEN	-	4022131.883	476874.377	4910797.762	N
DE05	HONAU	-	4187473.321	684501.324	4747104.616	N
DE06	NIEDERWEILER	-	4082139.263	522626.226	4857094.624	N
DE07	MEERANE	-	3940501.872	872686.013	4922647.102	N
DE08	SCHERNFELD	-	4120602.692	811533.473	4784977.464	N
DE09	WALLENHORST	-	3864996.090	543689.236	5027735.606	N
DE10	WARNEMUENDE	-	3658231.710	783518.322	5148404.355	N
DION	DIONYSOS	-	4595216.457	2039452.965	3912626.814	N
DK01	KOBENHAVN	-	3513649.457	778954.648	5248201.892	N
DK02	HIRTSHALS	-	3374587.817	592744.596	5361737.945	N
DK03	ESBJERG	-	3585285.365	531974.654	5230633.593	N
DK04	GEDSER	-	3625568.098	765648.944	5173951.478	N
DK05	THORSHAVN	-	2980913.283	−353401.285	5608798.706	N
DK0A	KOBENHAVN A	-	3513655.743	778946.882	5248197.376	N
EE01	OTSA	-	3025358.186	1558080.882	5376502.680	N
EE02	SUURUPI	-	2959056.482	1341058.317	5470427.175	N
ES01	ALICANTE	-	5009051.290	−42072.344	3935057.626	N
ES02	ALMERIA	-	5105223.243	−219258.125	3804380.023	N
ES03	BARCELONA	-	4791585.155	180506.313	4191802.007	N
ES04	CASETAS	-	4767076.783	−85259.666	4222749.104	N
ES05	LA CORUNA	-	4594489.827	−678367.957	4357066.048	N
ES06	PALMA DE MALLORCA	-	4919369.038	225504.810	4039845.443	N
ES07	PUERTOLLANO	-	4972908.206	−357377.581	3965709.881	N
ES08	SANTANDER	-	4626748.303	−306451.266	4364891.077	N
FI01	DEGERBY	-	2994064.936	1112559.057	5502241.376	N
FI02	HANKO	-	2959210.971	1254679.120	5490594.441	N
FI03	HELSINKI	-	2885137.391	1342710.230	5509039.119	N
FI05	KASKINEN	-	2767237.370	1074245.461	5626366.818	N

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Station name		Domes no.	X [m]	Y [m]	Z [m]	F/N
FI06	KEMI	-	2397071.577	1093330.313	5789108.447	N
FR01	AJACCIO	100077M003	4696992.023	724001.528	4239671.532	N
FR02	BORDEAUX	100013M001	4531872.731	−44441.098	4472878.316	N
FR03	BOURBON-LANCY	100086M001	4379327.828	285906.691	4613052.035	N
FR04	BREST	-	4228877.074	−333104.161	4747180.953	N
FR05	LE HAVRE	-	4151867.832	7683.105	4825589.462	N
FR06	MARSEILLE	100073M008	4630532.862	433946.189	4350142.617	N
FR07	FROUARD	100087M001	4188395.145	449710.790	4773391.475	N
FR08	PARIS	100001M011	4201791.919	177941.900	4779287.032	N
FR09	ST. JEAN DE LUZ	100088M001	4639942.656	−136229.890	4359542.439	N
FR10	THOUARS	100089M001	4358530.067	−15169.620	4641136.997	N
GB01	MORPETH	13299S001	3645667.940	−107277.344	5215053.427	N
GB02	BELFAST	-	3681235.841	−381979.326	5177205.094	N
GB03	BUDDON	13296M002	3526416.342	−171421.093	5294098.797	N
GB04	GIBRALTAR	-	5134911.043	−481396.405	3740038.373	N
GB05	SOUTHAMPTON	-	4026784.288	−101977.401	4928770.608	N
GB06	LERWICK	-	3182200.930	−63351.954	5508804.048	N
GB07	KIRKBY STEPHEN	-	3713868.520	−154772.517	5166095.569	N
GB08	NEWLYN	-	4079955.844	−395940.497	4870185.427	N
GB09	NOTTINGHAM	-	3851174.353	−80151.748	5066647.145	N
GR01	ASKITES	-	4353444.709	2082666.472	4156506.738	N
GR02	KARITSA	-	4596042.482	1733476.898	4055720.962	N
GR03	KATAKOLO	-	4710606.630	1838512.779	3874257.578	N
GRAA	GRAZ A	11001M003	4194422.497	1162703.106	4647248.924	N
HERE	HERSTMONCEUX E	-	4033459.067	23626.422	4924303.213	N
HOFN	HOEFN	-	2679690.007	−727951.322	5722789.127	N
HR01	BAKAR	-	4352648.017	1132636.916	4507507.137	N
HR02	BRUSNIK	-	4307965.917	1200393.305	4532778.852	N
HR03	DUBROVNIK	-	4466353.862	1456445.353	4299660.951	N
HR04	VELIKO GRADISTE	-	4267436.778	1445417.813	4499533.591	N
HR05	SPLIT	-	4444024.133	1311189.648	4368530.000	N
HR06	ZAGREB	-	4281822.772	1226066.042	4550373.198	N
HR07	ROVINJ	-	4383992.410	1062976.879	4493984.520	N
HR08	PLITVICE LAKES	-	4361672.107	1224335.342	4475663.239	N
HU01	BAKSIPART	-	3945622.823	1564760.587	4744941.629	N
HU02	CSANADALBERTI	-	4128720.498	1557707.458	4589954.373	N
HU03	NADAP	-	4110020.223	1384712.143	4661277.043	N
IC01	ENNISHOEFDI	-	2463207.122	−961488.265	5785116.333	N
IC03	HOFTEIGUR	-	2577684.129	−684377.793	5774580.235	N
IE01	KENMARE	-	3891188.512	−656960.577	4994036.575	N
IE02	SLANE	-	3758592.174	−430971.721	5117918.092	N
IE03	MALIN HEAD	-	3602912.067	−464038.531	5225072.685	N
IT01	BARI	-	4604015.864	1395990.074	4173523.319	N
IT02	CATANIA	-	4891562.414	1319356.307	3861697.449	N
IT03	CIVITAVECCHIA	-	4639918.274	968326.578	4253578.588	N

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Station name		Domes no.	X [m]	Y [m]	Z [m]	F/N
IT04	BATTIPAGLIA	-	4684234.747	1242032.056	4133027.453	N
IT05	GENOVA	-	4508320.965	708053.248	4440951.252	N
IT06	MONTEPESCALI	-	4594522.474	899334.145	4317112.434	N
IT07	IROE	-	4522401.668	898001.896	4392484.999	N
IT08	MTE MARIO	-	4641092.968	1024874.238	4239336.989	N
IT09	PESCARA	-	4568085.491	1157024.054	4283890.612	N
IT10	TRIESTE	-	4338306.976	1062332.457	4537962.636	N
IT11	CAGLIARI HABOUR	-	4886140.583	783960.863	4010490.869	N
KIT3	KITAB	-	1944945.345	4556652.208	4004325.987	N
KOAS	KOOTWIJK A	-	3899208.442	396761.221	5015079.483	N
KUUS	KUUSAMO	-	2282711.599	1267071.785	5800215.760	N
LT01	SIAULIAI	-	3288941.450	1421306.222	5259190.391	N
LT02	VILNIUS	-	3343600.780	1580417.639	5179337.220	N
LT03	MOLAS	-	3358793.381	1294907.415	5247584.401	N
LV01	SKULTE	-	3143836.710	1426775.085	5345000.663	N
LV02	LIEPAJA	-	3292890.347	1264082.170	5296320.898	N
LV03	VENTSPILS	-	3204401.451	1264700.422	5349808.017	N
LV04	IRBENE	-	3183612.160	1276706.561	5359310.754	N
MADE	MADRID/ROBLEDO T	-	4849333.094	−360298.570	4114740.685	N
META	METSAEHOVI A	-	2892569.977	1311843.544	5512634.445	N
MK01	BOROVA CUKA	-	4374796.464	1844718.410	4246577.097	N
NICO	NICOSIA	14302M001	4359415.862	2874116.998	3650777.714	N
NO01	TREGDE	-	3358069.041	445365.533	5386157.864	N
NO02	STAVANGER	-	3280059.938	331383.677	5441785.450	N
NO03	HALDEN	-	3215956.722	650882.039	5451251.620	N
NO04	HOENEFOSS	-	3132538.951	566401.815	5508609.933	N
NO05	HOENEFOSS A	-	3132535.604	566401.572	5508611.866	N
NO07	NYBERGSUND	-	3003947.595	656925.446	5569744.277	N
NO08	MAUSUNDVAER	-	2784637.209	424345.537	5703313.863	N
NO09	RANA	-	2491540.525	627261.072	5818227.650	N
NO10	STORFJORD	-	2129342.509	771959.751	5942490.095	N
NO11	ANDENES	-	2169937.750	627585.718	5944784.548	N
NO12	VARDOE	-	1839606.903	1109535.953	5985335.527	N
PFAN	PFAENDER	11005S002	4253560.190	733544.846	4681452.911	N
PL01	BRUDZONICE	-	3838174.546	1336729.834	4899501.280	N
PL02	CHELMSKO	-	3741888.376	1041415.396	5042252.151	N
PL03	PROSTKI	-	3496922.753	1438440.899	5119413.621	N
PL04	ROZEWIE	-	3495579.445	1157845.614	5190403.715	N
PL06	SWINOUJSCIE	-	3648326.517	924984.031	5132035.272	N
PL07	USTKA	-	3545014.330	1073939.772	5174949.947	N
PT01	BARCA D'ALVA	-	4783826.252	−582394.696	4164421.717	N
PT02	CASCAIS	-	4917648.195	−816414.998	3965563.234	N
PT03	ELVAS	-	4934349.106	−610382.404	3982001.653	N
PT04	LEIXOES	-	4750917.478	−727587.685	4178903.290	N
PT05	LAGOS	-	5035163.397	−767677.173	3826286.768	N

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Station name		Domes no.	X [m]	Y [m]	Z [m]	F/N
RO01	SIRCA (IASI)	-	3858208.700	1983192.110	4660288.089	N
RO02	CONSTANTA	-	4021069.258	2197733.193	4421574.217	N
RO03	TIMISOARA	-	4153382.405	1623173.034	4545098.726	N
RO04	HEIGHT ZERO POINT	-	3993862.319	2179699.539	4454979.882	N
SE02	KUNGSHOLMSFORT	-	3434083.464	958104.771	5270952.915	N
SE03	OESTERSUND	-	2763885.341	733247.413	5682653.440	N
SE04	RATAN	-	2620558.097	1000461.598	5709038.717	N
SE05	SKELLEFTEAA	-	2534031.014	975174.477	5752078.427	N
SE06	SMOEGEN	-	3290543.656	652615.122	5406535.487	N
SE07	STOCKHOLM	-	3101008.862	1013021.037	5462373.383	N
SI01	VELIKA PIRESICA	-	4261425.029	1156639.401	4587549.392	N
SI02	LENDAVSKE GORICE	-	4212714.595	1246016.076	4608998.534	N
SI03	MALIJA	-	4351694.601	1056274.829	4526994.713	N
SK01	KAMENICA	-	4062233.230	1377316.178	4704896.603	N
SK02	GANOVCE	-	3929172.868	1455278.749	4793644.518	N
SK03	STRECNO	-	3953831.753	1352503.882	4802958.956	N
TERS	TERSCHELLING	13534M001	3798580.716	346993.932	5094780.943	N
TOUL	TOULOUSE	10003M004	4627846.135	119629.193	4372999.719	N
TR01	ANTALYA	-	4399214.737	2602657.535	3802195.030	N
TR02	ERDEK	-	4301483.867	2272242.446	4111129.587	N
TR03	MELENGICLIK	20803M001	4247620.359	2778639.035	3851607.632	N
TR04	MENTES	-	4469012.223	2249388.236	3942689.280	N
TR05	YIGILCA	20804M001	4117361.810	2517076.974	4157679.152	N
TR06	YOZGAT	20802M001	4029730.516	2802093.271	4062068.138	N
TROA	TROMSOE A	-	2102928.623	721619.382	5958196.189	N
UK01	KIEV	-	3512887.371	2068982.507	4888901.366	N
UK02	UZHGORAD	-	3908590.563	1615205.770	4758733.187	N
UK03	MYKOLAIV	-	3698609.553	2308760.851	4639662.124	N
UK04	SIMEIZ	-	3783746.477	2551362.664	4441445.118	N
WSRT	WESTERBORK	13506M005	3828735.996	443304.842	5064884.630	N
WTZA	WETTZELL A	-	4075601.902	931826.557	4801547.784	N
WTZT	WETTZELL T	14201M011	4075577.621	931855.298	4801570.206	N

Appendix B: EUVN 97 Coordinates (ETRF 96 epoch 1997.4)

Station name		Domes no.	X [m]	Y [m]	Z [m]	F/N
ANKR	ANKARA	20805M002	4121948.793	2652187.856	4069023.563	F
BOR1	BOROWIEC	12205M002	3738358.778	1148173.499	5021815.584	F
BRUS	BRUSSELS/UCCLE	13101M004	4027894.012	307045.600	4919474.907	F
CAGL	CAGLIARI	12725M003	4893379.088	772649.517	4004181.915	F
DENT	DENTERGEM	13112M001	4020711.749	238850.889	4928949.441	F
DOUR	DOURBES	13113M001	4086778.421	328451.758	4869782.420	F
EBRE	EBRE	13410M001	4833520.380	41536.837	4147461.301	F
GOPE	PENCY	11502M002	3979316.437	1050312.254	4857066.895	F
GRAS	GRASSE	10002M006	4581691.163	556114.582	4389360.552	F
GRAZ	GRAZ	11001M002	4194424.128	1162702.459	4647245.193	F
HERS	HERSTMONCEUX	13212M007	4033470.374	23672.663	4924301.099	F
JOEN	JOENSUU	10512M001	2564139.427	1486149.593	5628951.263	F
JOZE	JOZEFOSLAW	12204M001	3664940.506	1409153.661	5009571.207	F
KIR0	KIRUNA	10422M001	2248123.511	865686.532	5886425.595	F
KOSG	KOOTWIJK	13504M003	3899225.408	396731.722	5015078.224	F
LAMA	LAMKOWKO	12209M001	3524523.261	1329693.439	5129846.176	F
MAR6	MAARTSBO	10405M002	2998189.712	931451.587	5533398.470	F
MATE	MATERA	12734M008	4641949.872	1393045.174	4133287.206	F
MEDI	MEDICINA	12711M003	4461401.061	919593.325	4449504.547	F
METS	METSAEHOVI	10503S011	2892571.116	1311843.264	5512633.954	F
NOTO	NOTO	12717M003	4934528.814	1321262.120	3806479.378	F
NYAL	NY AALESUND	10317M001	1202430.821	252626.617	6237767.444	F
ONSA	ONSALA	10402M004	3370658.837	711876.946	5349786.756	F
PENC	PENC	11206M006	4052449.808	1417680.901	4701406.910	F
POTS	POTSDAM	14106M003	3800689.944	882077.176	5028791.125	F
REYK	REYKJAVIK	10202M001	2587384.622	−1043033.572	5716563.868	F
RIGA	RIGA	12302M002	3183899.538	1421478.299	5322810.625	F
SFER	SAN FERNANDO	13402M004	5105519.198	−555146.114	3769803.100	F
SODA	SODANKYLAE	10513M001	2200147.005	1091638.197	5866870.601	F
UPAD	PADOVA	12750M002	4389531.451	923253.545	4519256.214	F
VAAS	VAASA	10511M001	2699864.639	1078263.824	5658064.671	F
VIL0	VILHELMINA	10424M001	2620258.894	779137.979	5743799.273	F
VILL	VILLAFRANCA	13406M001	4849833.912	−335049.291	4116014.685	F
VIS0	VISBY	10423M001	3246470.565	1077900.314	5365277.910	F
WTZR	WETTZELL	14201M010	4075580.854	931853.571	4801567.923	F
ZIMM	ZIMMERWALD	14001M004	4331297.347	567555.635	4633133.715	F
ZWEN	ZWENIGOROD	12330M001	2886325.752	2155998.333	5245816.047	F
AT01	HUTBIEGL	-	4066170.803	1135173.163	4765611.818	N
AT03	THOERL-MAGLERN	-	4269552.780	1039497.353	4608324.622	N
AT04	WOERGL	-	4221962.890	903799.802	4679665.487	N
BE01	OSTENDE	-	3996496.694	204372.869	4949993.891	N
BG01	BURGAS	-	4179321.660	2173955.655	4285391.943	N
BG03	SOFIA	-	4319372.417	1868687.544	4292063.745	N
BG04	VARNA	-	4115657.895	2179981.604	4343159.351	N

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Station name		Domes no.	X [m]	Y [m]	Z [m]	F/N
BOGI	BOROWA GORA I	-	3633815.657	1397453.917	5035280.779	N
BRUT	BRUSSELS/UCCLE	13101M003	4027828.748	307014.080	4919540.007	N
CH01	CHRISCHONA	-	4273147.942	575368.291	4684903.632	N
CH02	BOURG ST. PIERRE	-	4407673.660	557561.977	4563260.328	N
CH03	LA GIVRINE	-	4377795.512	468008.632	4601077.264	N
CH04	OBERALP	-	4336578.305	661303.082	4617410.033	N
CH05	SIBLINGEN	-	4252539.462	635461.585	4695882.555	N
CH06	STABIO	-	4396411.746	691631.110	4554070.562	N
CH07	ZERNEZ	-	4315304.233	768728.666	4620021.262	N
CY01	LARNAKA	-	4358072.339	2900453.915	3631353.840	N
CZ01	CHRASTAVA	-	3900991.757	1043027.873	4920986.877	N
CZ02	KOTOUN	-	4036220.278	981441.609	4824567.786	N
CZ03	PREDNI PRICKA	-	3963415.007	1230404.339	4827514.545	N
CZ04	KOSTELEC	-	3961862.614	1131198.835	4852979.219	N
DE01	FLECHTINGEN	-	3830805.962	760508.738	5025824.656	N
DE02	BRONNZELL	-	4006695.278	683568.656	4899211.734	N
DE03	CUXHAVEN	-	3725573.700	571226.339	5128135.574	N
DE04	EUSKIRCHEN	-	4022132.037	476874.271	4910797.635	N
DE05	HONAU	-	4187473.476	684501.215	4747104.487	N
DE06	NIEDERWEILER	-	4082139.416	522626.119	4857094.496	N
DE07	MEERANE	-	3940502.037	872685.910	4922646.980	N
DE08	SCHERNFELD	-	4120602.852	811533.366	4784977.338	N
DE09	WALLENHORST	-	3864996.248	543689.134	5027735.482	N
DE10	WARNEMUENDE	-	3658231.877	783518.224	5148404.237	N
DION	DIONYSOS	-	4595216.632	2039452.852	3912626.688	N
DK01	KOBENHAVN	-	3513649.625	778954.553	5248201.778	N
DK02	HIRTSHALS	-	3374587.983	592744.504	5361737.832	N
DK03	ESBJERG	-	3585285.527	531974.557	5230633.475	N
DK04	GEDSER	-	3625568.265	765648.847	5173951.362	N
DK05	THORSHAVN	-	2980913.429	−353401.369	5608798.593	N
DK0A	KOBENHAVN A	-	3513655.911	778946.787	5248197.262	N
EE01	OTSA	-	3025358.378	1558080.799	5376502.582	N
EE02	SUURUPI	-	2959056.670	1341058.235	5470427.077	N
ES01	ALICANTE	-	5009051.410	−42072.467	3935057.475	N
ES02	ALMERIA	-	5105223.356	−219258.250	3804379.868	N
ES03	BARCELONA	-	4791585.286	180506.193	4191801.862	N
ES04	CASETAS	-	4767076.908	−85259.785	4222748.957	N
ES05	LA CORUNA	-	4594489.939	−678368.073	4357065.900	N
ES06	PALMA DE MALLORCA	-	4919369.167	225504.688	4039845.295	N
ES07	PUERTOLLANO	-	4972908.318	−357377.704	3965709.728	N
ES08	SANTANDER	-	4626748.424	−306451.383	4364890.931	N
FI01	DEGERBY	-	2994065.119	1112558.974	5502241.275	N
FI02	HANKO	-	2959211.157	1254679.038	5490594.342	N
FI03	HELSINKI	-	2885137.580	1342710.149	5509039.022	N
FI05	KASKINEN	-	2767237.554	1074245.383	5626366.721	N

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Station name		Domes no.	X [m]	Y [m]	Z [m]	F/N
FI06	KEMI	-	2397071.765	1093330.243	5789108.359	N
FR01	AJACCIO	100077M003	4696992.170	724001.410	4239671.394	N
FR02	BORDEAUX	100013M001	4531872.862	−44441.213	4472878.174	N
FR03	BOURBON-LANCY	100086M001	4379327.970	285906.579	4613051.899	N
FR04	BREST	-	4228877.203	−333104.271	4747180.815	N
FR05	LE HAVRE	-	4151867.971	7682.996	4825589.328	N
FR06	MARSEILLE	100073M008	4630533.003	433946.072	4350142.477	N
FR07	FROUARD	100087M001	4188395.295	449710.681	4773391.345	N
FR08	PARIS	100001M011	4201792.062	177941.790	4779286.899	N
FR09	ST. JEAN DE LUZ	100088M001	4639942.782	−136230.007	4359542.295	N
FR10	THOUARS	100089M001	4358530.203	−15169.732	4641136.859	N
GB01	MORPETH	13299S001	3645668.085	−107277.442	5215053.303	N
GB02	BELFAST	-	3681235.977	−381979.425	5177204.967	N
GB03	BUDDON	13296M002	3526416.486	−171421.189	5294098.675	N
GB04	GIBRALTAR	-	5134911.148	−481396.531	3740038.215	N
GB05	SOUTHAMPTON	-	4026784.426	−101977.507	4928770.476	N
GB06	LERWICK	-	3182201.081	−63352.042	5508803.934	N
GB07	KIRKBY STEPHEN	-	3713868.662	−154772.617	5166095.444	N
GB08	NEWLYN	-	4079955.974	−395940.604	4870185.292	N
GB09	NOTTINGHAM	-	3851174.495	−80151.850	5066647.017	N
GR01	ASKITES	-	4353444.889	2082666.364	4156506.618	N
GR02	KARITSA	-	4596042.651	1733476.784	4055720.834	N
GR03	KATAKOLO	-	4710606.799	1838512.663	3874257.448	N
GRAA	GRAZ A	11001M003	4194422.664	1162702.998	4647248.799	N
HERE	HERSTMONCEUX E	-	4033459.208	23626.316	4924303.082	N
HOFN	HOEFN	-	2679690.145	−727951.398	5722789.017	N
HR01	BAKAR	-	4352648.180	1132636.805	4507507.009	N
HR02	BRUSNIK	-	4307966.082	1200393.195	4532778.725	N
HR03	DUBROVNIK	-	4466354.029	1456445.241	4299660.823	N
HR04	VELIKO GRADISTE	-	4267436.949	1445417.704	4499533.467	N
HR05	SPLIT	-	4444024.297	1311189.535	4368529.871	N
HR06	ZAGREB	-	4281822.938	1226065.933	4550373.072	N
HR07	ROVINJ	-	4383992.571	1062976.767	4493984.390	N
HR08	PLITVICE LAKES	-	4361672.272	1224335.231	4475663.112	N
HU01	BAKSIPART	-	3945623.002	1564760.485	4744941.513	N
HU02	CSANADALBERTI	-	4128720.673	1557707.352	4589954.252	N
HU03	NADAP	-	4110020.396	1384712.037	4661276.921	N
IC01	ENNISHOEFDI	-	2463207.256	−961488.337	5785116.226	N
IC03	HOFTEIGUR	-	2577684.270	−684377.867	5774580.128	N
IE01	KENMARE	-	3891188.638	−656960.680	4994036.441	N
IE02	SLANE	-	3758592.308	−430971.821	5117917.963	N
IE03	MALIN HEAD	-	3602912.202	−464038.628	5225072.558	N
IT01	BARI	-	4604016.027	1395989.959	4173523.188	N
IT02	CATANIA	-	4891562.569	1319356.187	3861697.311	N
IT03	CIVITAVECCHIA	-	4639918.427	968326.462	4253578.452	N

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Station name		Domes no.	X [m]	Y [m]	Z [m]	F/N
IT04	BATTIPAGLIA	-	4684234.905	1242031.940	4133027.319	N
IT05	GENOVA	-	4508321.116	708053.133	4440951.116	N
IT06	MONTEPESCALI	-	4594522.627	899334.030	4317112.299	N
IT07	IROE	-	4522401.822	898001.781	4392484.865	N
IT08	MTE MARIO	-	4641093.123	1024874.122	4239336.853	N
IT09	PESCARA	-	4568085.650	1157023.939	4283890.480	N
IT10	TRIESTE	-	4338307.138	1062332.346	4537962.507	N
IT11	CAGLIARI HABOUR	-	4886140.726	783960.742	4010490.727	N
KIT3	KITAB	-	1944945.588	4556652.165	4004325.936	N
KOAS	KOOTWIJK A	-	3899208.596	396761.118	5015079.358	N
KUUS	KUUSAMO	-	2282711.792	1267071.718	5800215.675	N
LT01	SIAULIAI	-	3288941.635	1421306.133	5259190.286	N
LT02	VILNIUS	-	3343600.968	1580417.549	5179337.116	N
LT03	MOLAS	-	3358793.563	1294907.325	5247584.294	N
LV01	SKULTE	-	3143836.897	1426774.999	5345000.562	N
LV02	LIEPAJA	-	3292890.529	1264082.081	5296320.792	N
LV03	VENTSPILS	-	3204401.634	1264700.335	5349807.913	N
LV04	IRBENE	-	3183612.344	1276706.474	5359310.651	N
MADE	MADRID/ROBLEDO T	-	4849333.209	−360298.691	4114740.535	N
META	METSAEHOVI A	-	2892570.165	1311843.463	5512634.348	N
MK01	BOROVA CUKA	-	4374796.640	1844718.301	4246576.974	N
NICO	NICOSIA	14302M001	4359416.053	2874116.894	3650777.599	N
NO01	TREGDE	-	3358069.204	445365.441	5386157.750	N
NO02	STAVANGER	-	3280060.098	331383.587	5441785.336	N
NO03	HALDEN	-	3215956.891	650881.951	5451251.510	N
NO04	HOENEFOSS	-	3132539.120	566401.729	5508609.825	N
NO05	HOENEFOSS A	-	3132535.772	566401.485	5508611.757	N
NO07	NYBERGSUND	-	3003947.767	656925.362	5569744.172	N
NO08	MAUSUNDVAER	-	2784637.377	424345.457	5703313.761	N
NO09	RANA	-	2491540.701	627261.000	5818227.555	N
NO10	STORFJORD	-	2129342.692	771959.687	5942490.009	N
NO11	ANDENES	-	2169937.929	627585.653	5944784.460	N
NO12	VARDOE	-	1839607.095	1109535.896	5985335.449	N
PFAN	PFAENDER	11005S002	4253560.346	733544.737	4681452.782	N
PL01	BRUDZONICE	-	3838174.722	1336729.734	4899501.163	N
PL02	CHELMSKO	-	3741888.547	1041415.297	5042252.034	N
PL03	PROSTKI	-	3496922.936	1438440.806	5119413.512	N
PL04	ROZEWIE	-	3495579.623	1157845.520	5190403.604	N
PL06	SWINOUJSCIE	-	3648326.687	924983.934	5132035.156	N
PL07	USTKA	-	3545014.505	1073939.677	5174949.834	N
PT01	BARCA D'ALVA	-	4783826.362	−582394.815	4164421.566	N
PT02	CASCAIS	-	4917648.295	−816415.119	3965563.078	N
PT03	ELVAS	-	4934349.212	−610382.526	3982001.498	N
PT04	LEIXOES	-	4750917.584	−727587.803	4178903.138	N
PT05	LAGOS	-	5035163.496	−767677.296	3826286.610	N

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Station name		Domes no.	X [m]	Y [m]	Z [m]	F/N
RO01	SIRCA (IASI)	-	3858208.888	1983192.011	4660287.978	N
RO02	CONSTANTA	-	4021069.447	2197733.092	4421574.104	N
RO03	TIMISOARA	-	4153382.581	1623172.928	4545098.606	N
RO04	HEIGHT ZERO POINT	-	3993862.509	2179699.438	4454979.769	N
SE02	KUNGSHOLMSFORT	-	3434083.638	958104.678	5270952.803	N
SE03	OESTERSUND	-	2763885.517	733247.335	5682653.340	N
SE04	RATAN	-	2620558.280	1000461.523	5709038.623	N
SE05	SKELLEFTEAA	-	2534031.198	975174.404	5752078.335	N
SE06	SMOEGEN	-	3290543.825	652615.032	5406535.377	N
SE07	STOCKHOLM	-	3101009.041	1013020.952	5462373.279	N
SI01	VELIKA PIRESICA	-	4261425.194	1156639.292	4587549.265	N
SI02	LENDAVSKE GORICE	-	4212714.763	1246015.968	4608998.410	N
SI03	MALIJA	-	4351694.762	1056274.718	4526994.584	N
SK01	KAMENICA	-	4062233.403	1377316.074	4704896.483	N
SK02	GANOVCE	-	3929173.045	1455278.647	4793644.401	N
SK03	STRECNO	-	3953831.927	1352503.780	4802958.838	N
TERS	TERSCHELLING	13534M001	3798580.870	346993.831	5094780.819	N
TOUL	TOULOUSE	10003M004	4627846.269	119629.076	4372999.577	N
TR01	ANTALYA	-	4399214.925	2602657.428	3802194.912	N
TR02	ERDEK	-	4301484.051	2272242.339	4111129.469	N
TR03	MELENGICLIK	20803M001	4247620.552	2778638.932	3851607.519	N
TR04	MENTES	-	4469012.404	2249388.127	3942689.158	N
TR05	YIGILCA	20804M001	4117362.003	2517076.872	4157679.040	N
TR06	YOZGAT	20802M001	4029730.714	2802093.173	4062068.030	N
TROA	TROMSOE A	-	2102928.805	721619.319	5958196.103	N
UK01	KIEV	-	3512887.566	2068982.415	4888901.262	N
UK02	UZHGORAD	-	3908590.743	1615205.669	4758733.071	N
UK03	MYKOLAIV	-	3698609.749	2308760.756	4639662.019	N
UK04	SIMEIZ	-	3783746.676	2551362.568	4441445.012	N
WSRT	WESTERBORK	13506M005	3828736.152	443304.741	5064884.507	N
WTZA	WETTZELL A	-	4075602.065	931826.451	4801547.660	N
WTZT	WETTZELL T	14201M011	4075577.785	931855.192	4801570.081	N

Appendix C: EUVN 97 Coordinates of sites with a second receiver connected to the same antenna (ITRF 96 epoch 1997.4)

Station name		X [m]	Y [m]	Z [m]	F/N
KIRR	KIRUNA R	2248123.325	865686.601	5886425.678	N
KIR0	KIRUNA	2248123.327	865686.599	5886425.682	F
MARR	MAARTSBO R	2998189.536	931451.674	5533398.578	N
MAR6	MAARTSBO	2998189.533	931451.670	5533398.573	F
ONS0	ONSALA 0	3370658.675	711877.036	5349786.877	N
ONSA	ONSALA	3370658.668	711877.038	5349786.868	F
SE0R	SKELLEFTEAA R	2534031.014	975174.477	5752078.427	N
SE05	SKELLEFTEAA	2534031.014	975174.477	5752078.427	N
VILR	VILHELMINA R	2620258.717	779138.058	5743799.370	N
VIL0	VILHELMINA	2620258.716	779138.054	5743799.369	F
VISR	VISBY R	3246470.389	1077900.405	5365278.016	N
VIS0	VISBY	3246470.386	1077900.403	5365278.016	F

Report on the GPS Preprocessing and EUVN Data Center

(Reprint from EUREF-Publication Nr. 7/II in Mitteilungen des Bundesamtes für Kartographie und Geodäsie, Band 7, pp. 47-51)

Report on the GPS Preprocessing and EUVN Data Center

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Abstract

After the EUVN campaign the observed data were processed by 9 Preprocessing Centers. The resulting RINEX files and the EUVN Forms were collected at the EUVN Data Center.
The observations are available at the EUVN Data Center in a Data Base for computation of the GPS network through the EUVN Analysis Centers. The results of the Analysis Centers were also stored at the EUVN Data Center.

GPS Data Preprocessing

The GPS measurements for the EUVN campaign were performed from May 21, 1997 to May 29, 1997. In total the EUVN network consists of about 220 stations in 32 European countries. From the observed data the preprocessing up to the RINEX file level had to be carried out. The RINEX files were stored finally at the EUVN Data Center, which is established at Bundesamt für Kartographie und Geodäsie in Leipzig. In the Data Center the files for the GPS data analysis of the EUVN network are available.

Because of the great number of stations the preprocessing of the EUVN GPS data were divided to a number of Preprocessing Centers. To have a manageable size 9 Preprocessing Centers were established.

The 9 Preprocessing Centers (PPC) were responsible for the EUVN stations in the following countries (number of stations in brackets):

- PPC Austria: Austria (6), Bulgaria (3), Croatia (8), Italy (16), Switzerland (8)
- PPC Czech Republic: Czech Republic (5), Denmark (6), Hungary (4), Slovakia (3), Slovenia (3)
- PPC Finland: Estonia (2), Finland (12), Lithuania (3)
- PPC Germany: Cyprus (2), FYRO Macedonia (1), Germany (14), Greece (4), Iceland (4), Ireland (3), Latvia (5), Romania (4), Spain (13), Ukraine (4)
- PPC Netherlands: Belgium (5), France (12), Netherlands (4), Portugal (5)
- PPC Norway: Sweden (17)
- PPC Poland: Poland (12), United Kingdom (11)
- PPC Sweden: Norway (13)
- PPC Turkey: Turkey (7)

In the annex of the EUVN Circular Letter No. 3 from March 97 "Technical Requirements and Guidelines for the EUVN Campaign" (Schlüter et.al., 1997) the recommendations for the preprocessing were given.

After the end of the campaign the Preprocessing Centers have collected the raw or always converted RINEX data from the observing agencies. Besides this the Preprocessing Centers had to collect the specially for EUVN designed GPS Occupation Forms, GPS Site Information Forms and Levelling/Gravity Forms as well as auxiliary information. These files and forms had to be checked for completeness.

In the first step the existing raw data were converted to RINEX files. At this step the correct header of the RINEX files were established. In the EUVN forms the relevant information for the header like receiver and antenna type and antenna height to antenna reference point could be found. If RINEX files were available, these information was checked. As a result RINEX files, which correspond with the RINEX standard, were created.
The file names had to be consistent with the EUVN site code and the covered data span. For stations, where the measurements were interrupted during the day, the RINEX files were merged to create one file a day. But if the antenna height changed between the original sessions, it was necessary to create two files for one day with different antenna heights. To have an idea about the quality, so called quality check summary files were created by the UNAVCO Quality Check program.

After finishing the preprocessing the Preprocessing Centers supplied the RINEX observation data, all forms, additional data and quality check summary files to the EUVN Data Center. At end of September 1997 the RINEX data, with some smaller exceptions, were available at the Data Center and could be used for data analysis of the EUVN network.

EUVN Data Center

For collection, archiving and delivery of the EUVN data and information the EUVN Data Center was established at Bundesamt für Kartographie und Geodäsie (BKG) in Leipzig. The Data Center contains a Data Base on a computer platform and an archive of the paper forms. The Data Center has to collect all data and information from Preprocessing Centers like

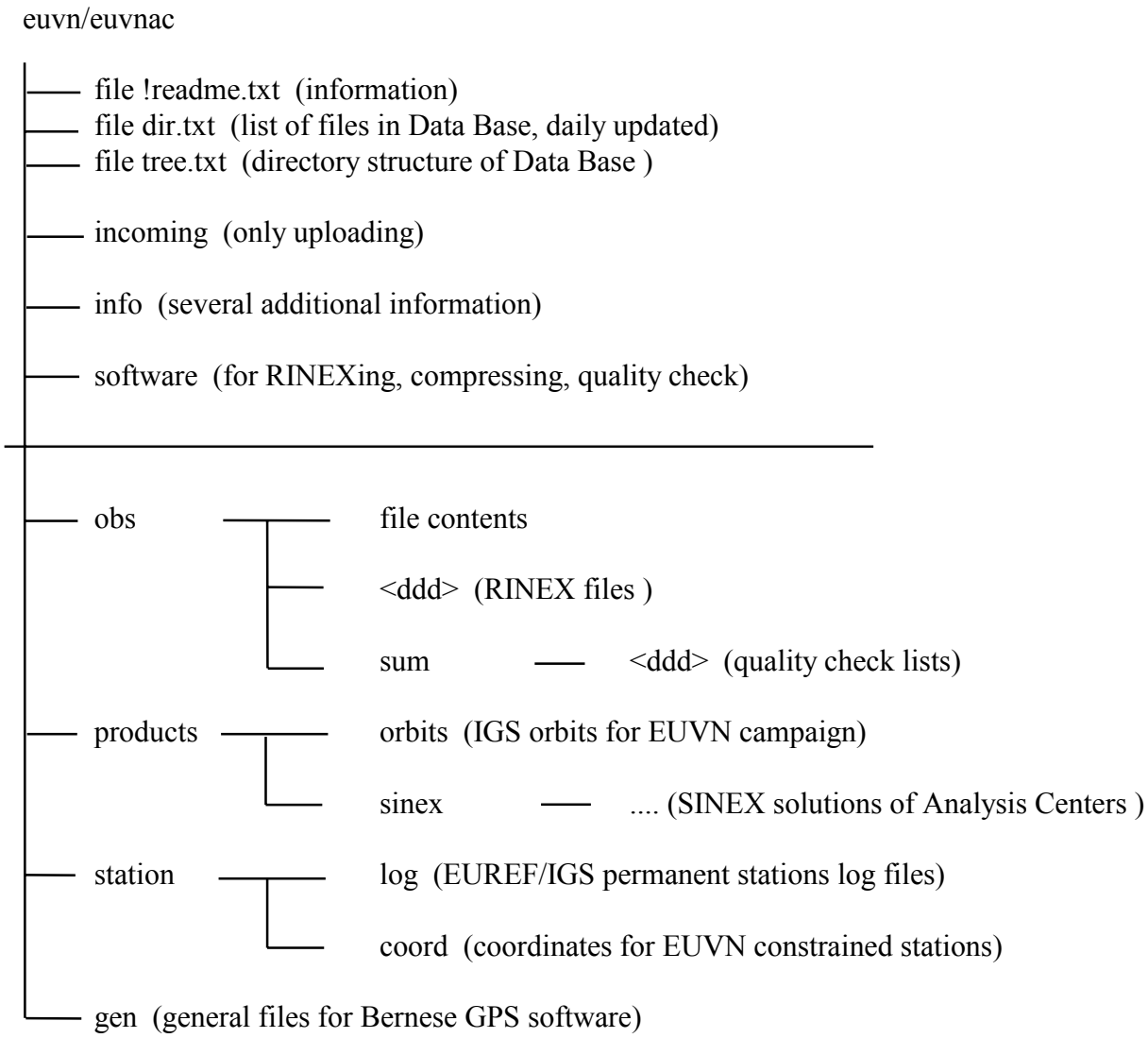
- RINEX data
- quality check lists
- observation sheets
- site documentations
- other information.

The EUVN Data Base is available via anonymous FTP-Account at BKG in Leipzig. For security reasons the Data Base works inside the FTP-Account with a subuser and password. In an incoming directory all data can be uploaded from Preprocessing Centers and EUVN Analysis Centers.

Access to EUVN Data Base

• access:	ftp access:	Anonymous FTP Account at BKG, Branch Leipzig
	login:	anonymous
	password:	<your e-mail address>
	in addition type	user euvn / euvnac password: <password>
• contact address:	e-mail: euvnop@leipzig.ifag.de Bundesamt für Kartographie und Geodäsie *) Außenstelle Leipzig Karl-Rothe-Str. 10-14 04105 Leipzig GERMANY *) formerly Institut für Angewandte Geodäsie	
• computer / operating system	HP / UNIX	
• uploads	only possible in the directory /incoming	
• content	see file dir.txt (daily updated)	
• information	see file !readme.txt	
• directory structure	see file tree.txt	

The data were stored in a special directory structure. In this manner the RINEX data and all other additional information are available for the EUVN users. The structure is similar to the structure of other Data Bases like the International Service for Geodynamics (IGS) and is divided in two parts (see Figure 1). Part one contains special information and software for preprocessing. In the second part the RINEX observation files and the files for the computation of the EUVN network are available (orbits, coordinate files etc.).



ddd ... day of year

Figure 1: Structure of EUVN Data Base

The EUVN Data Center makes data available for the Analysis Centers, which have to compute the GPS network including a table of observation availability. There is available also a summary list with receiver type, antenna type, antenna height for all EUVN stations of the present RINEX data in the Data Center and an official list of EUVN sites. Important is also a list of the history of changes in the headers of the RINEX files and in the official list of EUVN sites. Some IGS/EUREF-Permanent stations were not included in the data flow from the Preprocessing Centers and were prepared by the EUVN Data Center for use in EUVN GPS network.
Furthermore the Data Center provides additional and auxiliary information which were created by the Data Center itself or were delivered from other institutions

- official list of EUVN sites as postscript file
- station translation table for unique form of site names in solution files of Analysis Centers
- software for RINEX conversion, compressing and quality check
- technical requirements
- EUVN GPS Occupation Form, EUVN GPS Site Information Form and EUVN Levelling/Gravity Form as postscript files
- EUVN mailing list and contact persons for the Analysis Centers
- antenna pseudo graphics, antenna phase center offset file and list of receiver and antenna names
- precise orbits, pole information, file for bad satellites during the campaign and the coordinates for constrained sites in ITRF96.

After the computation of the GPS data by the Analysis Centers the Data Center collected the solutions in SINEX format and made them available for the combined solution of EUVN network.

During the collection of the data from the Preprocessing Centers and also in the process of data analysis a large number of contacts primarily by e-mail had to be made by the EUVN Data Center to Preprocessing Centers, Analysis Centers and responsible persons in the countries, which took part in EUVN. These contacts were necessary to clear actual problems, to ask for information but also to give answers or provide with information.

The work of the EUVN Data Center will be continued after the computation of the GPS network. In the next steps the EUVN Data Center will be concentrated to the collection and storage of the data of levelling, gravity and tide gauge measurements.

References:

Schlüter W., Adam J., Gurtner W., Harrson B., Ihde J., Wöppelmann G.: EUVN97 Circular Letter No. 3, March 1997

EUVN Height Solution

Reprint from EUREF Publication No. 9 in Veröffentlichungen der Bayerischen Kommission für die internationale Erdmessung der Bayerischen Akademie der Wissenschaften, Astronomisch-Geodätische Arbeiten, Heft Nr. 61, pp. 132-145

The Height Solution of the European Vertical Reference Network (EUVN)

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W. SCHLÜTER[6], G. WÖPPELMANN[7],

Abstract

For the EUVN stations the final height solution is given. The heights are related to the solution of the United European Levelling Network 1995/1998 (UELN95/98) which was distributed in January 1999 to the participating countries. The vertical datum of the UELN95/98 is related to the Normaal Amsterdams Peil (NAP), the heights are computed as geopotential numbers and given as normal heights. The height accuracy is within 5 cm level. For islands and countries which are not connected with the UELN, the heights are given to local tide gauges/vertical datums. For all stations GPS/levelling height anomalies by using ETRS89/97.4 heights are given and compared with the European quasigeoid EGG97.

1. The EUVN height concept

The initial practical objective of the EUVN project is to unify different European vertical datums within few centimeters. In addition to the United European Levelling Network 1973 (UELN 73) for Western and Northern Europe and the United Precise Levelling Network 1982 (UPLN 82) for Central and Eastern European countries national height systems exist with vertical datums and different kinds of heights. The vertical datum for the UELN is given by the tide gauge Amsterdam and for the UPLN it is the tide gauge Kronstadt. The level difference is about $h_{Amsterdam} - h_{Kronstadt} = 0{,}15\text{m}$.

The application of the GPS technique for practical levelling would dramatically extend if the geoid would be known precisely enough in relation to the concerned GPS reference system and the levelling reference system. To derive such a geoid, a European reference geoid is required in the reference system ETRS89 and the reference system of UELN. Up to now there is no precise geoid available for Europe with an accuracy of a few centimeters which fulfils the requirement for the practical applications. This project contributes to a geoid tailored for the GPS-levelling methods by combining the existing reference network EUREF/ETRS89 with the UELN95.

Independently of an uniform height level for the maritime countries the knowledge of the sea level and, under special conditions, of the variations of the adjacent oceans is vitally important. Tide gauges provide access to a local information which generally results from a combination of sea level changes and vertical movements of the earth crust at the tide gauge site. Therefore, global sea level studies based on tide gauge data require to monitor the vertical crustal velocities at the tide gauge sites with respect to a geocentric reference frame, in order to recover a global geocentric assessment of the sea level variations.

Following recommendations by Carter (et al., 1989) several institutions around Europe have carried out regional tide gauge GPS surveys.

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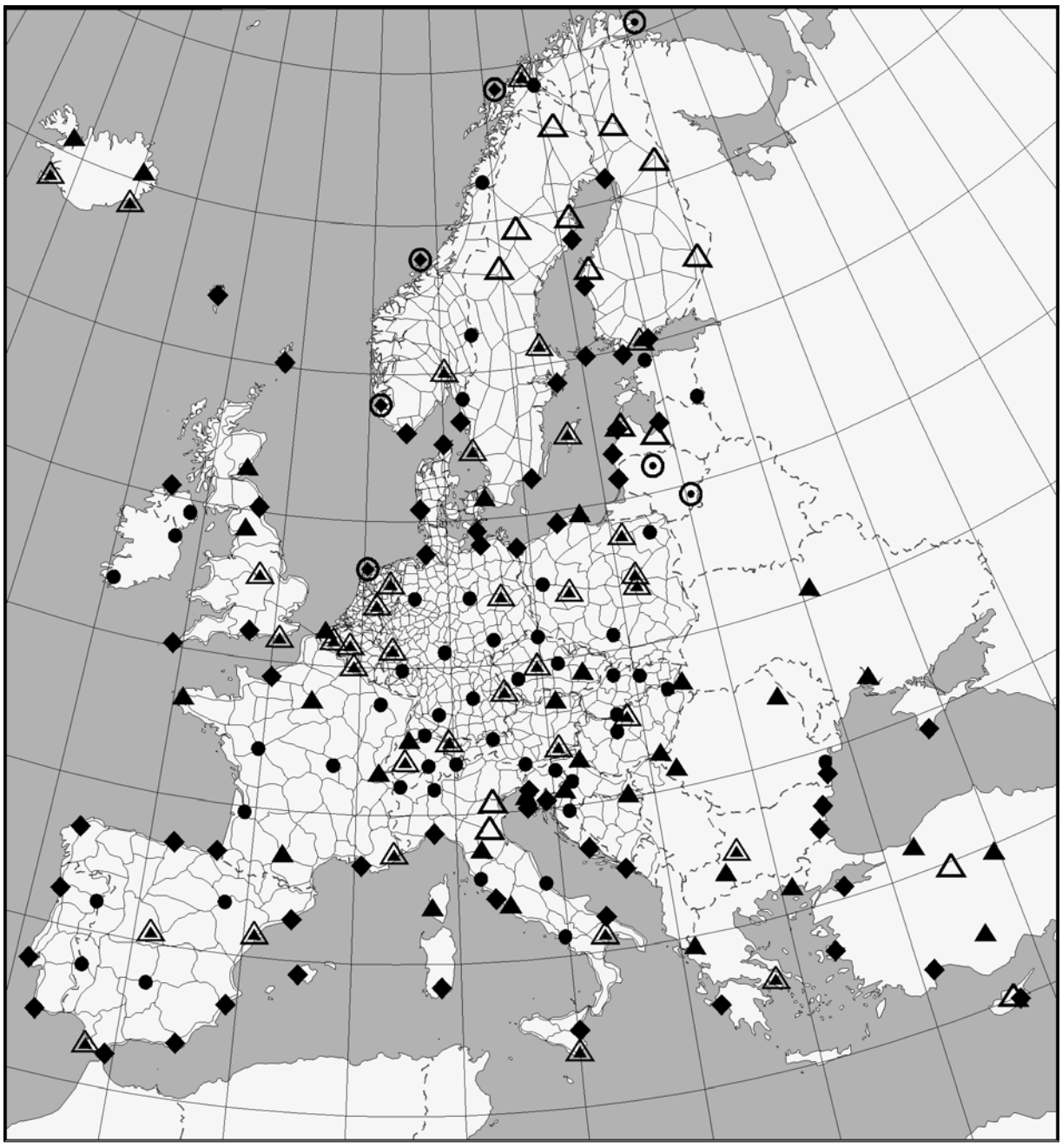

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Figure 1 EUROPEAN VERTICAL REFERENCE NETWORK (EUVN)

▲ EUREF sites
⛰ GPS permanent stations - EUREF
△ GPS permanent stations
• UELN & UPLN nodal points
⊙ GPS permanent stations - nodal points
◆ Tide gauge sites
⊛ GPS permanent stations - tide gauge
/\/ UELN lines

At least three common points between two networks are needed for a rigorous combination of the coordinates and for the subsequent description of the regional campaign results in a common geocentric reference frame (Boucher et al., 1994). The information provided by the tide gauges has been taken into account in the design of the EUVN network.
The EUVN project contributes to the realization of an European vertical datum and to connect different sea levels of European oceans with respect to the work of PSMSL (Permanent Service Mean Sea Level) and of anticipated accelerated sea level rise due to global warming. The project provides a contribution to the determination of an absolute world height system as shown by Balasubramania, 1994.

At all EUVN points P three-dimensional coordinates in the ETRS89 $(X_p, Y_p, Z_p)_{ETRS}$ and geopotential numbers c_p are to be derived. The geopotential number $c_p = W_{o\ UELN} - W_p$ is the difference between the potential of the earth gravity field
of the reference tide gauge of the UELN (W_{oUELN}) and of the gravity potential in the EUVN points (W_p). Finally the EUVN is representing a geometrical-physical reference frame (Figure 1). In addition to the geopotential numbers c_p normal heights $h_n = c_p / \bar{\gamma}$ are to be provided ($\bar{\gamma}$ is the mean normal gravity value between the ellipsoid and the telluroid.).

The EUVN is a step to establish a fundamental network for a further geokinematic height reference system such as EVS 2000 under the special consideration of the Fennoscandian uplift and the uplift in the Carpathian-Balkan region (Augath, 1996).

2. EUVN heights in the UELN 95/98 solution

In order to fulfil future requests of the EUVN project it was necessary to connect the EUVN stations by levellings with nodal points of relevant levelling networks. So it will be also in the future possible to use levelling observations to update the gravity related EUVN heights in connection with new adjustments of UELN.

All countries which are members of the UELN project connected their EUVN stations to the nearest UELN nodal points. All other countries connected the EUVN stations to such levelling points which will be stations of their national UELN part in the future.
This information had been requested in the levelling/gravity form (see Annex 2). In 1998 the working group sent in connection with the EUVN Circular Letter No 6 individual letters directly to the national agencies in order to request the necessary levelling and gravity information.

In order to support the correct completion of the levelling/gravity forms, the following general hints were given:

(1) With respect to the objectives of EUVN, each EUVN marker has to be connected to at least one nodal point of one of the three height reference systems:
   a) United European Levelling Network (UELN) 1995 for all countries which are members of the UELN (for about 80 % of the EUVN points).
   b) United Precise Levelling Network (UPLN) 1982 for all countries which are members of the UPLN (for about 10 % of the EUVN points).
   c) National height systems for all countries or parts of countries which are not members of UELN and UPLN or which are not connected with the European continent.

(2) For the identification of the UELN95 nodal points the following illustrations were made available to the responsible agencies:
   a) Relevant national part of the UELN95 with the respective point numbers.
   b) Map with the local situation around the EUVN point and the corresponding UELN95 points.
   c) Lists of the UELN95 nodal points with UELN point numbers, national point numbers, coordinates and geopotential numbers.

(3) The connection levelling between the EUVN marker and the nodal points or the tide gauge bench mark had to be given in geopotential numbers. The levelling accuracy had to be equal to the requirements of a first order levelling (better than 1 mm per km). The geopotential number difference Δc of a line had to be calculated by

$$\Delta c = \sum_{i=1}^{n} \Delta h_i \cdot g_i \qquad [\mathrm{m}^2 \cdot \mathrm{s}^{-2}]$$

Δh_i are the levelled height differences between the intermediate points in a distance of about 1 km along the levelling lines, g_i is the mean gravity value in IGSN71 derived from the gravity values in the vicinity of the intermediate points S and E along the line

$$g_i = \frac{g_S + g_E}{2}$$

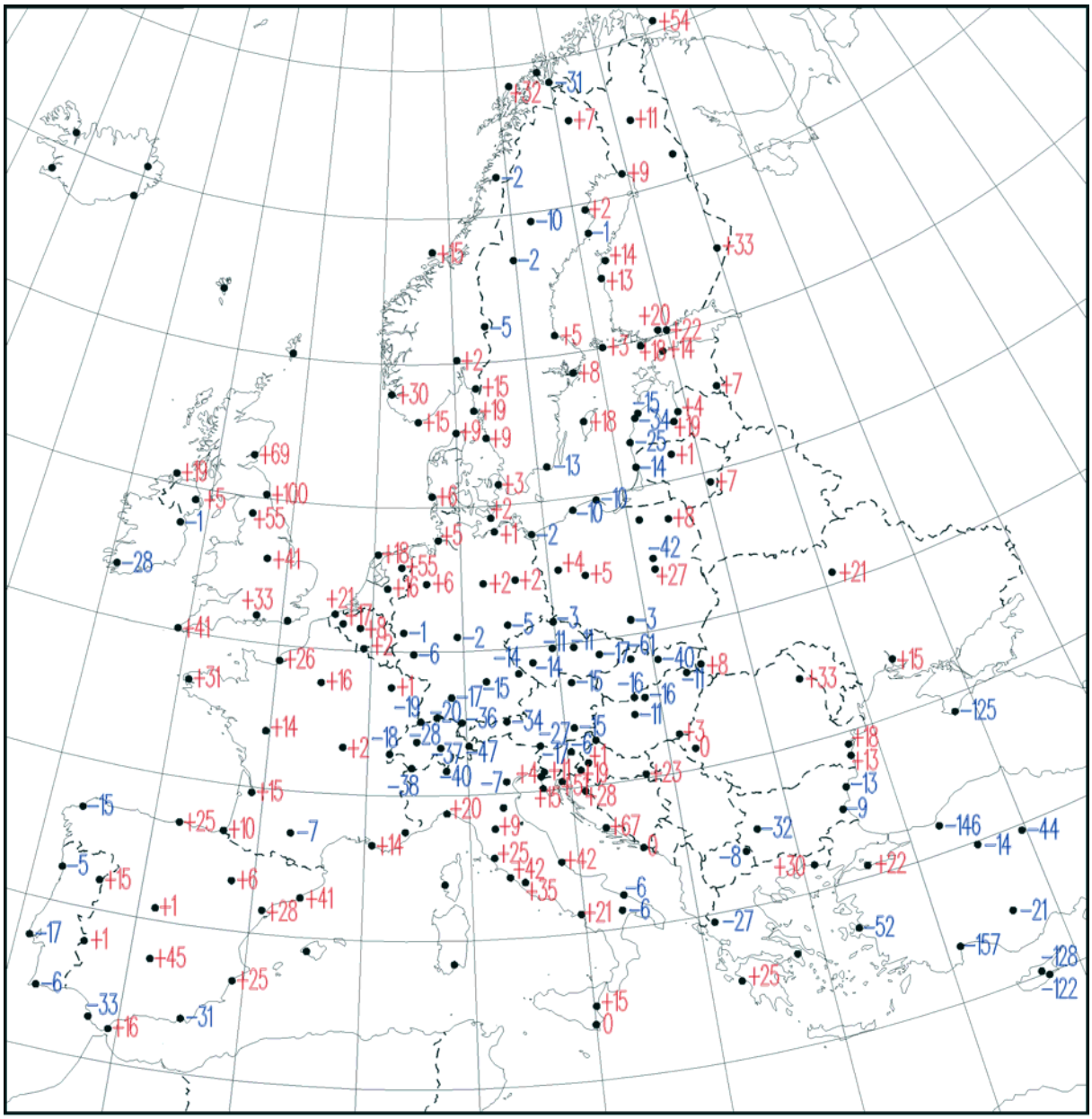

Figure 2 Differences between EUVN GPS/levelling geoid and EGG97 geoid (in cm)

(4) Gravity values for reduction of the levelling measurements to geopotential numbers had to be given in the intermediate points *S, E* in a distance of about 1 km along the levelling lines with an accuracy of about 1 mgal. For connection levellings shorter than 0.5 km the gravity value was only necessary in one of the considered points: EUVN GPS marker, UELN nodal point or tide gauge bench mark.

(5) The connections between the EUVN marker and the levelling networks Δc could be carried out principally in three ways (see Annex 3):

a) With a levelling line or a levelling loop respectively to a nodal point (Annex 3, Sketch 1).
b) With a connection levelling to a line point LP between 2 nodal points. In addition to Δc the geopotential number differences between the nodal points and the line point LP Δc_1 and Δc_2 had to be given (Annex 3, Sketch 2).
c) With a local height network (the national height network can be used) which is connected at least to 2 UELN or UPLN nodal points (Annex 3, Sketch 3). In that case the geopotential number differences of a local network had to be given as observations.

The available information and measurements for the single EUVN stations were used to compute normal heights in the UELN-95/98 system. Countries which are not members of UELN have made directly available the heights in their national height system. Table 1 in Annex 1 shows the final height solution for the EUVN stations in connection with the GPS solution.

3. Contribution to the European geoid

To get an integrated European spatial reference system a tailored geoid solution is necessary. At present the European gravimetric quasigeoid EGG87 is available for practical use (Denker, Torge, 1997). For further developments of combined geoid solutions with gravity and GPS/levelling data the EUVN gives a Europe-wide basis. Figure 2 and Table 2 in Annex 2 contain the differences between the EGG97 quasigeoid and the GPS/levelling quasigeoidal height anomalies of the EUVN stations.

The heights of the Scandinavian EUVN stations in Finland, Norway, Sweden were reduced from the epoch 1960 to the epoch of the GPS measurement (1997) by the values of the land uplift which were delivered from the countries for the adjustment version UELN-73/86. For the countries which are not members of the UELN and which have a national height system in relation to the tide gauge Kronstadt, the heights were reduced to the UELN level by + 15 cm. These are Bulgaria and Ukraine.

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Annex 1

Table 1: The EUVN Height Solution

Station Name		Ellipsoidal Coordinates in ETRS89 (ETRF96, Epoch 1997.4)			Normal Heights in UELN-95/98
		Latitude φ in ° ´ ˝	Longitude λ in ° ´ ˝	Height h in m	in m
GRAZ	11001M002	47 4 1.65744	15 29 36.51428	538.290	490.925
GRAA	11001M003	47 4 1.76700	15 29 36.55742	540.068	
AT01	HUTBIEGL	48 39 16.38501	15 35 54.25296	457.606	411.123
PFAN	11005S002	47 30 55.17219	9 47 4.77756	1090.310	1043.183
AT03	THOERL-MA	46 33 15.11686	13 41 .37626	687.372	638.588
AT04	WOERGL	47 29 45.77751	12 4 58.77923	630.059	582.508
BRUS	13101M004	50 47 52.13436	4 21 33.17660	149.668	104.437
BRUT	13101M003	50 47 55.15784	4 21 31.82508	157.470	
DENT	13112M001	50 56 1.33118	3 23 58.80359	63.894	19.518
DOUR	13113M001	50 5 41.54594	4 35 41.81538	282.695	236.643
BE01	OOSTENDE	51 14 5.77503	2 55 38.79050	54.461	10.213
BG01	BURGAS	42 29 .62331	27 28 55.47220	41.743	2.836 (1)
BG03	SOFIA	42 33 21.93149	23 23 41.02232	1119.557	1074.357 (1)
BG04	VARNA	43 11 33.68566	27 54 33.38345	38.243	1.922 (1)
HR01	BAKAR	45 15 19.60331	14 35 9.26800	182.398	137.380
HR02	BRUSNIK	45 34 42.89927	15 34 12.82566	268.988	223.239
HR03	DUBROVNIK	42 39 28.38641	18 3 38.76129	46.673	5.347
HR04	VELIKO_GR	45 9 14.21431	18 42 42.06173	146.095	101.613
HR05	SPLIT	43 30 23.91399	16 26 18.45382	47.627	5.186
HR06	ZAGREB	45 48 22.31105	15 58 43.11745	160.909	115.025
HR07	ROVINJ	45 5 2.48873	13 37 45.65525	53.589	9.385
HR08	PLITVICE_	44 50 42.37874	15 40 46.55741	713.172	667.464
CY01	LARNAKA	34 55 41.39614	33 38 42.69724	31.203	5.887 (9)
NICO	14302M001	35 8 27.54140	33 23 47.19228	190.040	162.277 (9)
CZ01	CHRASTAVA	50 49 2.06015	14 58 9.49211	338.631	295.744
CZ02	KOTOUN	49 27 45.23280	13 40 .21868	547.358	500.770
CZ03	PREDNI_PR	49 30 21.27087	17 14 47.24416	303.702	260.283
CZ04	KOSTELEC	49 51 30.33739	15 56 6.75002	427.682	383.124
GOPE	11502M002	49 54 49.32651	14 47 8.22569	592.594	547.696
DK01	KOBENHAVN	55 44 19.91747	12 29 59.84248	87.938	51.840
DK0A	KOBENHAVN	55 44 19.71618	12 29 59.32996	86.715	50.616
DK02	HIRTSHALS	57 35 42.13692	9 57 44.44644	42.208	4.040
DK03	ESBJERG	55 27 36.55347	8 26 23.31363	43.303	2.519
DK04	GEDSER	54 34 19.65630	11 55 28.33467	40.619	2.643
DK05	THORSHAVN	62 0 15.97013	-6 45 40.05651	58.073	
EE01	OTSA	57 50 32.39263	27 14 55.62698	107.504	88.162
EE02	SUURUPI	59 27 48.87862	24 22 48.91655	84.272	65.993
FI01	DEGERBY	60 1 52.84863	20 23 4.08149	21.647	2.913
FI02	HANKO	59 49 21.63882	22 58 35.43499	24.858	5.251
FI03	HELSINKI	60 9 13.23464	24 57 24.23468	24.177	6.566
JOEN	10512M001	62 23 28.21581	30 5 46.14856	113.676	96.532
FI05	KASKINEN	62 20 33.67633	21 12 58.60787	25.273	5.957
FI06	KEMI	65 40 27.69623	24 31 5.66259	26.114	7.092
KUUS	KUUSAMO	65 54 36.88749	29 2 .50245	378.951	
METS	10503S011	60 13 2.89058	24 23 43.13359	94.568	75.875
META	METSAEHOV	60 13 2.91888	24 23 43.17087	94.520	
SODA	10513M001	67 25 15.08483	26 23 20.56346	299.730	279.063
VAAS	10511M001	62 57 40.28637	21 46 14.27088	58.042	40.090

FR01	100077M00	41 55 38.59292	8 45 45.69211	96.797	49.069 (2)
GRAS	10002M006	43 45 17.04528	6 55 14.05096	1319.310	
FR02	100013M00	44 48 56.40426	-0 33 42.64376	53.915	7.380
FR03	100086M00	46 37 12.57573	3 44 7.01632	257.485	209.154
FR04	BREST	48 24 28.31549	-4 30 13.78707	104.411	53.301
FR05	LE_HAVRE	49 28 54.80772	0 6 21.69082	53.632	8.131
FR06	100073M00	43 16 43.56059	5 21 13.62263	61.797	12.394
FR07	100087M00	48 45 45.97069	6 7 42.26196	241.724	194.365
FR08	100001M01	48 50 40.00410	2 25 29.89673	126.148	81.867
TOUL	10003M004	43 33 38.77295	1 28 50.72467	207.106	157.740
FR09	100088M00	43 23 42.56047	-1 40 54.25268	54.264	5.010
FR10	100089M00	46 59 25.55485	-0 11 57.89549	133.433	86.065
DE01	FLECHTING	52 20 7.94007	11 13 43.03066	153.490	110.580
DE02	BRONNZELL	50 30 30.56765	9 40 54.55663	334.877	287.133
DE03	CUXHAVEN	53 52 5.06677	8 43 1.31452	45.021	5.653
DE04	EUSKIRCHE	50 40 25.75319	6 45 41.65039	217.982	170.947
DE05	HONAU	48 24 .66761	9 17 1.28705	760.506	711.848
DE06	NIEDERWEI	49 54 53.25543	7 17 44.68828	526.493	477.835
DE07	MEERANE	50 50 27.28046	12 29 14.97670	334.308	288.907
DE08	SCHERNFEL	48 55 2.61945	11 8 29.55923	597.626	550.771
POTS	14106M003	52 22 45.46023	13 3 57.91424	144.420	104.216
DE09	WALLENHOR	52 21 50.17271	8 0 26.13160	128.934	85.191
DE10	WARNEMUEN	54 10 40.77808	12 5 20.17587	49.546	11.251
WTZR	14201M010	49 8 39.10400	12 52 44.06095	666.026	619.339
WTZA	WETTZELL_	49 8 38.31674	12 52 42.52335	660.272	613.594
WTZT	14201M011	49 8 39.21409	12 52 44.17266	665.937	619.249
GR01	ASKITES	40 55 40.86988	25 33 58.39334	182.585	141.838 (6)
DION	DIONYSOS	38 4 42.71911	23 55 57.52273	514.553	
GR02	KARITSA	39 44 3.30089	20 39 53.39835	598.607	566.089 (6)
GR03	KATAKOLO	37 38 38.79058	21 19 13.11326	26.885	3.424 (6)
HU01	BAKSIPART	48 22 37.26767	21 37 56.47244	155.772	116.021
HU02	CSANADALB	46 19 10.43654	20 40 14.78981	142.470	100.000
HU03	NADAP	47 15 20.47693	18 37 9.29651	234.628	190.670
PENC	11206M006	47 47 22.56111	19 16 53.48804	291.748	248.387
IC01	ENNISHOEF	65 34 53.03124	-21 19 21.68671	339.469	
HOFN	HOEFN	64 16 2.24107	-15 11 52.52345	82.533	
IC03	HOFTEIGUR	65 21 22.76964	-14 52 8.57196	211.624	
REYK	10202M001	64 8 19.61165	-21 57 19.74353	93.017	
IE01	KENMARE	51 52 17.34783	-9 34 58.94911	62.621	4.464 (3)
IE02	SLANE	53 42 41.63763	-6 32 28.11949	135.615	79.140 (3)
IE03	MALIN_HEA	55 22 17.91376	-7 20 20.51504	82.705	25.617 (3)
IT01	BARI	41 7 55.46062	16 52 4.43851	63.116	17.251
CAGL	12725M003	39 8 9.27209	8 58 21.89643	238.378	
IT02	CATANIA	37 30 4.15287	15 5 40.79122	51.971	10.502
IT03	CIVITAVEC	42 5 46.37802	11 47 17.27499	57.488	9.050
IT04	BATTIPAGL	40 38 58.25648	14 51 1.21613	86.635	39.101
IT05	GENOVA	44 24 43.57613	8 55 32.38364	49.339	4.014
IT06	MONTEPESC	42 52 18.07072	11 4 30.27040	68.406	19.904
IT07	IROE	43 48 13.70271	11 13 51.55821	144.673	99.295
MATE	12734M008	40 38 56.86283	16 42 16.03975	535.657	490.042
MEDI	12711M003	44 31 11.83515	11 38 48.51928	50.057	
IT08	MTE_MARIO	41 55 20.95976	12 27 9.19168	201.931	153.528
NOTO	12717M003	36 52 33.98539	14 59 23.30331	126.244	84.441
UPAD	12750M002	45 24 24.17549	11 52 40.54568	84.043	39.582
IT09	PESCARA	42 27 53.85037	14 12 47.54993	68.747	24.921
IT10	TRIESTE	45 38 49.96956	13 45 33.88255	56.199	11.075
IT11	CAGLIARI_	39 12 37.86174	9 6 54.64764	60.143	14.681 (4)
LV01	LV01	57 18 57.21329	24 24 36.30856	26.406	6.760
LV02	LV02	56 30 53.78643	21 0 3.26669	36.258	12.184
LV03	LV03	57 23 45.22477	21 32 16.65063	27.941	6.633
LV04	LV04	57 33 15.89707	21 51 7.17656	40.611	19.645
RIGA	RIGA	56 56 55.02145	24 3 31.56681	34.702	14.017

LT01	SIAULIAI	55 54 48.78221	23 22 17.18426	164.821	141.381
LT02	VILNIUS	54 39 11.30512	25 17 55.19023	240.831	215.798
LT03	MOLAS	55 43 47.23801	21 4 58.88451	29.329	4.638
MK01	BOROVA_CU	42 0 5.54874	22 51 49.20842	1264.161	1219.003 (5)
KOSG	13504M003	52 10 42.32572	5 48 34.70529	96.846	53.589
KOAS	KOOTWIJK_	52 10 42.69962	5 48 36.33394	89.310	
TERS	13534M001	53 21 45.84905	5 13 9.78733	56.091	14.718
WSRT	13506M005	52 54 52.58902	6 36 16.20621	82.275	40.747
NO01	TREGDE	58 0 23.35472	7 33 17.24195	43.822	2.804
NO02	STAVANGER	58 57 42.66581	5 46 8.40796	45.534	1.879
NO03	HALDEN	59 7 32.21886	11 26 29.82401	141.486	104.895
NO04	HOENEFOSS	60 8 36.73503	10 14 56.58109	177.613	137.358
NO05	HOENEFOSS	60 8 36.85964	10 14 56.60413	177.626	
NO07	NYBERGSUN	61 15 37.29707	12 20 8.38071	449.165	413.484
NO08	MAUSUNDVA	63 52 6.18561	8 39 52.31812	50.941	9.204
NYAL	10317M001	78 55 46.49585	11 51 54.28638	78.394	
NO09	RANA	66 18 57.57724	14 7 51.28332	40.308	7.039
NO10	STORFJORD	69 15 49.03195	19 55 38.33703	44.638	14.424
NO11	ANDENES	69 19 18.90135	16 7 51.00300	39.236	3.755
TROA	TROMSOE_A	69 39 45.77566	18 56 22.70580	138.034	
NO12	VARDOE	70 22 39.15821	31 5 44.70425	21.132	2.968
BOGI	BOROWA_GO	52 28 29.96065	21 2 6.75757	139.882	108.760
BOR1	12205M002	52 16 37.03435	17 4 24.42748	124.366	89.027
PL01	BRUDZOWIC	50 30 44.02523	19 12 6.51250	367.231	327.338
PL02	CHELMSKO	52 34 42.27685	15 33 9.22722	101.438	65.098
JOZE	12204M001	52 5 50.17993	21 1 53.52337	141.447	110.244
LAMA	12209M001	53 53 32.63080	20 40 11.77451	187.031	
PL03	PROSTKI	53 44 2.55374	22 21 34.40648	154.602	126.367
PL04	ROZEWIE	54 49 39.01581	18 19 35.35935	70.796	41.668
PL06	SWINOUJSC	53 55 39.24781	14 13 36.44709	42.205	6.655
PL07	USTKA	54 35 15.67906	16 51 13.86726	33.861	1.603
PT01	BARCA_D'A	41 1 19.59645	-6 56 28.21817	221.752	165.953
PT02	CASCAIS	38 41 24.33179	-9 25 34.04221	65.808	12.147
PT03	ELVAS	38 52 43.91112	-7 3 6.14307	229.935	174.931
PT04	LEIXOES	41 11 46.91513	-8 42 25.25164	70.070	14.866
PT05	LAGOS	37 6 .11198	-8 40 7.47344	55.347	2.597
RO01	SIRCA_(IA	47 14 33.71258	27 12 14.46214	222.944	190.136
RO02	CONSTANTA	44 10 6.94908	28 39 32.41187	37.216	3.561
RO03	TIMISOARA	45 44 18.08291	21 20 45.34545	140.156	96.980
RO04	HEIGHT_ZE	44 35 17.36028	28 37 26.56572	156.390	122.777
SK01	KAMENICA	47 50 11.87136	18 43 45.94329	261.732	218.047
SK02	GANOVCE	49 2 4.60560	20 19 24.64845	743.178	701.273
SK02	STRECNO	49 9 57.33752	18 53 4.17326	415.054	372.356
SI01	VELIKA_PI	46 17 10.92746	15 11 7.51470	342.172	295.255
SI02	LENDAVSKE	46 33 57.18228	16 28 36.85146	385.191	339.820
SI03	MALIJA	45 30 13.62833	13 38 36.19974	323.127	278.186
ES01	ALICANTE	38 20 20.10263	-0 28 52.43684	60.347	9.998
ES02	ALMERIA	36 51 8.88805	-2 27 33.18463	125.048	74.251
ES03	BARCELONA	41 21 3.30031	2 9 26.63153	67.660	18.170
ES04	CASETAS	41 43 17.56091	-1 1 28.67937	269.634	219.285
EBRE	13410M001	40 49 15.18643	0 29 32.49211	107.810	57.708
ES05	LA_CORUNA	43 21 51.76943	-8 23 56.16992	66.957	12.123
MADE	MADRID/RO	40 25 38.02687	-4 14 57.08054	815.088	762.103
ES06	PALMA_DE_	39 33 9.34372	2 37 28.59801	59.085	10.083
ES07	PUERTOLLA	38 41 12.31361	-4 6 37.76599	763.213	709.871
ES08	SANTANDER	43 27 41.04807	-3 47 21.96555	59.281	8.968
SFER	13402M004	36 27 51.63250	-6 12 20.33325	84.180	38.939
VILL	13406M001	40 26 36.92482	-3 57 7.13580	647.362	

KIR0	10422M001	67 52 39.26356	21 3 36.84326	497.968	469.314
KIRR	KIRUNA_R	67 52 39.26352	21 3 36.84356	497.963	
SE02	KUNGSHOLM	56 6 15.25902	15 35 20.50882	35.189	2.415
MAR6	10405M002	60 35 42.50804	17 15 30.67770	75.372	50.485
MARR	MAARTSBO_	60 35 42.50803	17 15 30.67783	75.379	
ONSA	10402M004	57 23 43.06581	11 55 31.84758	45.547	9.099
ONS0	10402M004	57 23 43.06579	11 55 31.84738	45.558	
SE03	OESTERSUN	63 26 34.04833	14 51 29.03092	490.008	458.334
SE04	RATAN	63 59 8.11785	20 53 44.03682	31.320	9.993
SE05	SKELLEFTE	64 52 45.10123	21 2 53.82525	81.189	58.850
SE0R	SKELLEFTE	64 52 45.10122	21 2 53.82525	81.188	
SE06	SMOEGEN	58 21 12.46157	11 13 4.52608	45.196	9.035
SE07	STOCKHOLM	59 19 20.39806	18 5 27.24415	35.084	11.954
VIS0	10423M001	57 39 13.92220	18 22 2.32435	79.787	54.846
VISR	VISBY_R	57 39 13.92211	18 22 2.32441	79.788	
VIL0	10424M001	64 41 52.24148	16 33 35.73380	449.934	420.092
VILR	VILHELMIN	64 41 52.24144	16 33 35.73407	449.936	
CH01	CHRISCHON	47 34 1.38501	7 40 6.98289	504.933	455.773
CH02	BOURG_ST.	45 57 30.98020	7 12 34.23705	1683.443	1629.321
CH03	LA_GIVRIN	46 27 14.68981	6 6 7.32564	1258.258	1207.278
CH04	OBERALP	46 39 35.12553	8 40 13.71807	2094.219	2042.489
CH05	SIBLINGEN	47 42 46.86246	8 29 55.98166	563.324	514.832
CH06	STABIO	45 51 5.21055	8 56 25.21413	429.707	382.128
CH07	ZERNEZ	46 41 54.87577	10 6 2.59009	1612.690	1560.915
ZIMM	14001M004	46 52 37.54033	7 27 54.98332	956.342	906.877
ANKR	20805M002	39 53 14.52729	32 45 30.48374	976.056	939.301 (7)
TR01	ANTALYA	36 49 42.59595	30 36 33.65628	31.554	4.926 (7)
TR02	ERDEK	40 23 25.67861	27 50 42.29168	40.005	1.656 (7)
TR03	20803M001	37 22 39.58212	33 11 28.50994	1357.758	1323.541 (7)
TR04	MENTES	38 25 35.88762	26 43 2.94563	58.650	20.348 (7)
TR05	20804M001	40 56 13.17999	31 26 19.66877	822.685	785.624 (7)
TR06	20802M001	39 48 1.90002	34 48 46.84053	1677.058	1641.991 (7)
UK01	KIEV	50 21 51.01571	30 29 48.38253	224.877	199.370 (1)
UK02	UZHGORAD	48 33 46.35914	22 27 9.42239	273.801	235.264 (1)
UK03	MYKOLAIV	46 58 17.46768	31 58 24.23034	78.244	52.518 (1)
UK04	SIMEIZ	44 24 55.27519	33 59 29.76881	386.480	361.964 (1)
GB01	13299S001	55 12 46.03424	-1 41 7.79798	144.401	95.483
GB02	BELFAST	54 37 20.04452	-5 55 26.52005	67.897	11.813 (6)
GB03	13296M002	56 28 42.58493	-2 46 58.76766	57.779	6.810
GB04	GIBRALTAR	36 7 54.40412	-5 21 20.91484	45.469	2.456
GB05	SOUTHAMPT	50 55 50.75915	-1 27 2.49852	98.586	52.185
GB06	LERWICK	60 8 53.92142	-1 8 25.82813	96.130	46.853 (8)
HERS	13212M007	50 52 2.31861	0 20 10.56577	76.489	
HERE	HERSTMONC	50 52 2.64621	0 20 8.19909	70.809	
GB07	KIRKBY_ST	54 26 47.74472	-2 23 10.95587	356.112	304.233
GB08	NEWLYN	50 6 10.58834	-5 32 34.54661	57.507	4.495
GB09	NOTTINGHA	52 56 26.47639	-1 11 32.22810	98.465	49.923
ZWEN	12330M001	55 41 57.41151	36 45 31.04174	204.993	
KIT3	12334M001	39 8 5.15694	66 53 7.58466	622.534	

(1) normal Heights /Kronstadt
(2) normal Heights /Ajaccio
(3) orthom. Heights /Malin Head
(4) normal Heights /Cagliari
(5) normal-orth. Heights /Trieste
(6) height system and/or tide gauge unknown
(7) normal-orth. Heights /Antalya
(8) orthom. Heights /Lerwick
(9) orthom. Heights /Larnaka

Table 2: The EUVN GPS/Levelling Quasi-Geoid

Station Name		Ellipsoidal coordinates in ETRS89			Normal Height H in UELN-95/98	h-H	EGG97 Geoid	EGG97 -(h-H)
		Latitude φ in ° ′ ″	Longitude λ in ° ′ ″	Height h in m	in m	in m	in m	in cm
GRAZ	11001M002	47 4 2	15 29 37	538.290	490.925	47.365	47.213	-15
GRAA	11001M003	47 4 2	15 29 37	540.068			47.213	
AT01	HUTBIEGL	48 39 16	15 35 54	457.606	411.123	46.483	46.335	-15
PFAN	11005S002	47 30 55	9 47 5	1090.310	1043.183	47.127	46.763	-36
AT03	THOERL-MA	46 33 15	13 41 0	687.372	638.588	48.784	48.517	-27
AT04	WOERGL	47 29 46	12 4 59	630.059	582.508	47.551	47.209	-34
BRUS	13101M004	50 47 52	4 21 33	149.668	104.437	45.231	45.311	+ 8
BRUT	13101M003	50 47 55	4 21 32	157.470			45.310	
DENT	13112M001	50 56 1	3 23 59	63.894	19.518	44.376	44.547	+17
DOUR	13113M001	50 5 42	4 35 42	282.695	236.643	46.052	46.069	+ 2
BE01	OOSTENDE	51 14 6	2 55 39	54.461	10.213	44.248	44.454	+21
BG01	BURGAS	42 29 1	27 28 55	41.743	2.986 (1)	38.757	38.667	-9
BG03	SOFIA	42 33 22	23 23 41	1119.557	1074.507 (1)	45.050	44.725	-33
BG04	VARNA	43 11 34	27 54 33	38.243	2.072 (1)	36.171	36.045	-13
HR01	BAKAR	45 15 20	14 35 9	182.398	137.380	45.018	45.531	+51
HR02	BRUSNIK	45 34 43	15 34 13	268.988	223.239	45.749	45.939	+19
HR03	DUBROVNIK	42 39 28	18 3 39	46.673	5.347	41.326	41.322	+ 0
HR04	VELIKO_GR	45 9 14	18 42 42	146.095	101.613	44.482	44.714	+23
HR05	SPLIT	43 30 24	16 26 18	47.627	5.186	42.441	43.113	+67
HR06	ZAGREB	45 48 22	15 58 43	160.909	115.025	45.884	45.894	+ 1
HR07	ROVINJ	45 5 2	13 37 46	53.589	9.385	44.204	44.355	+15
HR08	PLITVICE_	44 50 42	15 40 47	713.172	667.464	45.708	45.983	+28
CY01	LARNAKA	34 55 41	33 38 43	31.203	5.887 (9)	25.316	24.096	-122
NICO	14302M001	35 8 28	33 23 47	190.040	162.277 (9)	27.763	26.481	-128
CZ01	CHRASTAVA	50 49 2	14 58 9	338.631	295.744	42.887	42.861	- 3
CZ02	KOTOUN	49 27 45	13 40 0	547.358	500.770	46.588	46.444	-14
CZ03	PREDNI_PR	49 30 21	17 14 47	303.702	260.283	43.419	43.251	-17
CZ04	KOSTELEC	49 51 30	15 56 7	427.682	383.124	44.558	44.447	-11
GOPE	11502M002	49 54 49	14 47 8	592.594	547.696	44.898	44.784	-11
DK01	KOBENHAVN	55 44 20	12 29 60	87.938	51.840	36.098	36.127	+ 3
DK0A	KOBENHAVN	55 44 20	12 29 59	86.715	50.616	36.099	36.127	+ 3
DK02	HIRTSHALS	57 35 42	9 57 44	42.208	4.040	38.168	38.253	+ 9
DK03	ESBJERG	55 27 37	8 26 23	43.303	2.519	40.784	40.842	+ 6
DK04	GEDSER	54 34 20	11 55 28	40.619	2.643	37.976	37.993	+ 2
DK05	THORSHAVN	62 0 16	-6 45 40	58.073			56.193	
EE01	OTSA	57 50 32	27 14 56	107.504	88.162	19.342	19.408	+ 7
EE02	SUURUPI	59 27 49	24 22 49	84.272	65.993	18.279	18.416	+14
FI01	DEGERBY	60 1 53	20 23 4	21.647	2.913	18.734	18.766	+ 3
FI02	HANKO	59 49 22	22 58 35	24.858	5.376	19.482	19.666	+18
FI03	HELSINKI	60 9 13	24 57 24	24.177	6.662	17.515	17.733	+22
JOEN	10512M001	62 23 28	30 5 46	113.676	96.694	16.982	17.313	+33
FI05	KASKINEN	62 20 34	21 12 59	25.273	6.223	19.050	19.178	+13
FI06	KEMI	65 40 28	24 31 6	26.114	7.384	18.730	18.818	+ 9
KUUS	KUUSAMO	65 54 37	29 2 1	378.951			17.935	
METS	10503S011	60 13 3	24 23 43	94.568	75.986	18.582	18.778	+20
META	METSAEHOV	60 13 3	24 23 43	94.520			18.778	
SODA	10513M001	67 25 15	26 23 21	299.730	279.309	20.421	20.531	+11
VAAS	10511M001	62 57 40	21 46 14	58.042	40.382	17.660	17.802	+14

FR01	100077M00	41 55 39	8 45 46	96.797	49.069 (2)	47.728	49.234	+151
GRAS	10002M006	43 45 17	6 55 14	1319.310			51.182	
FR02	100013M00	44 48 56	-0 33 43	53.915	7.380	46.535	46.683	+15
FR03	100086M00	46 37 13	3 44 7	257.485	209.154	48.331	48.348	+ 2
FR04	BREST	48 24 28	-4 30 14	104.411	53.301	51.110	51.419	+31
FR05	LE_HAVRE	49 28 55	0 6 22	53.632	8.131	45.501	45.763	+26
FR06	100073M00	43 16 44	5 21 14	61.797	12.394	49.403	49.547	+14
FR07	100087M00	48 45 46	6 7 42	241.724	194.365	47.359	47.365	+ 1
FR08	100001M01	48 50 40	2 25 30	126.148	81.867	44.281	44.438	+16
TOUL	10003M004	43 33 39	1 28 51	207.106	157.740	49.366	49.301	- 7
FR09	100088M00	43 23 43	-1 40 54	54.264	5.010	49.254	49.350	+10
FR10	100089M00	46 59 26	-0 11 58	133.433	86.065	47.368	47.507	+14
DE01	FLECHTING	52 20 8	11 13 43	153.490	110.580	42.910	42.929	+ 2
DE02	BRONNZELL	50 30 31	9 40 55	334.877	287.133	47.744	47.723	- 2
DE03	CUXHAVEN	53 52 5	8 43 1	45.021	5.653	39.368	39.416	+ 5
DE04	EUSKIRCHE	50 40 26	6 45 42	217.982	170.947	47.035	47.022	- 1
DE05	HONAU	48 24 1	9 17 1	760.506	711.848	48.658	48.492	-17
DE06	NIEDERWEI	49 54 53	7 17 45	526.493	477.835	48.658	48.596	- 6
DE07	MEERANE	50 50 27	12 29 15	334.308	288.907	45.401	45.355	- 5
DE08	SCHERNFEL	48 55 3	11 8 30	597.626	550.771	46.855	46.706	-15
POTS	14106M003	52 22 45	13 3 58	144.420	104.216	40.204	40.219	+ 2
DE09	WALLENHOR	52 21 50	8 0 26	128.934	85.191	43.743	43.800	+ 6
DE10	WARNEMUEN	54 10 41	12 5 20	49.546	11.251	38.295	38.304	+ 1
WTZR	14201M010	49 8 39	12 52 44	666.026	619.339	46.687	46.548	-14
WTZA	WETTZELL_	49 8 38	12 52 43	660.272	613.594	46.678	46.547	-13
WTZT	14201M011	49 8 39	12 52 44	665.937	619.249	46.688	46.548	-14
GR01	ASKITES	40 55 41	25 33 58	182.585	141.838 (6)	40.747	41.051	+30
DION	DIONYSOS	38 4 43	23 55 58	514.553			38.349	
GR02	KARITSA	39 44 3	20 39 53	598.607	566.089 (6)	32.518	32.251	-27
GR03	KATAKOLO	37 38 39	21 19 13	26.885	3.424 (6)	23.461	23.707	+25
HU01	BAKSIPART	48 22 37	21 37 56	155.772	116.021	39.751	39.638	-11
HU02	CSANADALB	46 19 10	20 40 15	142.470	100.000	42.470	42.498	+ 3
HU03	NADAP	47 15 20	18 37 9	234.628	190.670	43.958	43.849	-11
PENC	11206M006	47 47 23	19 16 53	291.748	248.387	43.361	43.200	-16
IC01	ENNISHOEF	65 34 53	-21 19 22	339.469			65.725	
HOFN	HOEFN	64 16 2	-15 11 53	82.533			65.150	
IC03	HOFTEIGUR	65 21 23	-14 52 9	211.624			65.629	
REYK	10202M001	64 8 20	-21 57 20	93.017			66.446	
IE01	KENMARE	51 52 17	-9 34 59	62.621	4.464 (3)	58.157	57.874	-28
IE02	SLANE	53 42 42	-6 32 28	135.615	79.140 (3)	56.475	56.464	- 1
IE03	MALIN_HEAD	55 22 18	-7 20 21	82.705	25.617 (3)	57.088	57.281	+19
IT01	BARI	41 7 55	16 52 4	63.116	17.251	45.865	45.810	- 6
CAGL	12725M003	39 8 9	8 58 22	238.378			46.552	
IT02	CATANIA	37 30 4	15 5 41	51.971	10.502	41.469	41.623	+15
IT03	CIVITAVEC	42 5 46	11 47 17	57.488	9.050	48.438	48.856	+42
IT04	BATTIPAGL	40 38 58	14 51 1	86.635	39.101	47.534	47.742	+21
IT05	GENOVA	44 24 44	8 55 32	49.339	4.014	45.325	45.529	+20
IT06	MONTEPESC	42 52 18	11 4 30	68.406	19.904	48.502	48.749	+25
IT07	IROE	43 48 14	11 13 52	144.673	99.295	45.378	45.471	+ 9
MATE	12734M008	40 38 57	16 42 16	535.657	490.042	45.615	45.559	- 6
MEDI	12711M003	44 31 12	11 38 49	50.057			39.725	
IT08	MTE_MARIO	41 55 21	12 27 9	201.931	153.528	48.403	48.752	+35
NOTO	12717M003	36 52 34	14 59 23	126.244	84.441	41.803	41.800	- 0
UPAD	12750M002	45 24 24	11 52 41	84.043	39.582	44.461	44.391	- 7
IT09	PESCARA	42 27 54	14 12 48	68.747	24.921	43.826	44.241	+42
IT10	TRIESTE	45 38 50	13 45 34	56.199	11.075	45.124	45.161	+ 4
IT11	CAGLIARI_	39 12 38	9 6 55	60.143	14.681 (4)	45.462	46.358	+90
LV01	SKULTE	57 18 57	24 24 36	26.406	6.760	19.646	19.685	+ 4
LV02	LIEPAJA	56 30 54	21 0 3	36.258	12.184	24.074	23.825	-25
LV03	VENTSPILS	57 23 45	21 32 17	27.941	6.633	21.308	20.967	-34
LV04	IRBENE	57 33 16	21 51 7	40.611	19.645	20.966	20.766	-20
RIGA	12302M002	56 56 55	24 3 32	34.702	14.017	20.685	20.873	+19

LT01	SIAULIAI	55 54 49	23 22 17	164.821	141.381	23.440	23.446	+ 1
LT02	VILNIUS	54 39 11	25 17 55	240.831	215.798	25.033	25.102	+ 7
LT03	MOLAS	55 43 47	21 4 59	29.329	4.638	24.691	24.552	- 14
MK01	BOROVA_CU	42 0 6	22 51 49	1264.161	1219.003 (5)	45.158	45.078	- 8
KOSG	13504M003	52 10 42	5 48 35	96.846	53.589	43.257	43.418	+16
KOAS	KOOTWIJK_	52 10 43	5 48 36	89.310			43.418	
TERS	13534M001	53 21 46	5 13 10	56.091	14.718	41.373	41.554	+18
WSRT	13506M005	52 54 53	6 36 16	82.275	40.747	41.528	41.703	+18
NO01	TREGDE	58 0 23	7 33 17	43.822	2.804	41.018	41.164	+15
NO02	STAVANGER	58 57 43	5 46 8	45.534	1.886	43.648	43.968	+32
NO03	HALDEN	59 7 32	11 26 30	141.486	105.021	36.465	36.618	+15
NO04	HOENEFOSS	60 8 37	10 14 57	177.613	137.495	40.118	40.136	+ 2
NO05	HOENEFOSS	60 8 37	10 14 57	177.626			40.136	
NO07	NYBERGSUN	61 15 37	12 20 8	449.165	413.706	35.459	35.406	- 5
NO08	MAUSUNDVA	63 52 6	8 39 52	50.941	9.278	41.663	41.816	+15
NYAL	10317M001	78 55 46	11 51 54	78.394				
NO09	RANA	66 18 58	14 7 51	40.308	7.176	33.132	33.115	- 2
NO10	STORFJORD	69 15 49	19 55 38	44.638	14.528	30.110	29.785	-32
NO11	ANDENES	69 19 19	16 7 51	39.236	3.828	35.408	35.735	+32
TROA	TROMSOE_A	69 39 46	18 56 23	138.034			30.672	
NO12	VARDOE	70 22 39	31 5 45	21.132	3.042	18.090	18.629	+54
BOGI	BOROWA_GO	52 28 30	21 2 7	139.882	108.760	31.122	30.706	-42
BOR1	12205M002	52 16 37	17 4 24	124.366	89.027	35.339	35.385	+ 5
PL01	BRUDZOWIC	50 30 44	19 12 7	367.231	327.338	39.893	39.863	- 3
PL02	CHELMSKO	52 34 42	15 33 9	101.438	65.098	36.340	36.375	+ 4
JOZE	12204M001	52 5 50	21 1 54	141.447	110.244	31.203	31.470	+27
LAMA	12209M001	53 53 33	20 40 12	187.031			29.255	
PL03	PROSTKI	53 44 3	22 21 34	154.602	126.367	28.235	28.310	+ 8
PL04	ROZEWIE	54 49 39	18 19 35	70.796	41.668	29.128	29.027	-10
PL06	SWINOUJSC	53 55 39	14 13 36	42.205	6.655	35.550	35.531	- 2
PL07	USTKA	54 35 16	16 51 14	33.861	1.603	32.258	32.158	-10
PT01	BARCA_D'A	41 1 20	-6 56 28	221.752	165.953	55.799	55.949	+15
PT02	CASCAIS	38 41 24	-9 25 34	65.808	12.147	53.661	53.496	-17
PT03	ELVAS	38 52 44	-7 3 6	229.935	174.931	55.004	55.017	+ 1
PT04	LEIXOES	41 11 47	-8 42 25	70.070	14.866	55.204	55.157	- 5
PT05	LAGOS	37 6 0	-8 40 7	55.347	2.597	52.750	52.693	- 6
RO01	SIRCA_(IA	47 14 34	27 12 14	222.944	190.136	32.808	33.137	+33
RO02	CONSTANTA	44 10 7	28 39 32	37.216	3.561	33.655	33.781	+13
RO03	TIMISOARA	45 44 18	21 20 45	140.156	96.980	43.176	43.178	+ 0
RO04	HEIGHT_ZE	44 35 17	28 37 27	156.390	122.777	33.613	33.792	+18
SK01	KAMENICA	47 50 12	18 43 46	261.732	218.047	43.685	43.523	-16
SK02	GANOVCE	49 2 5	20 19 25	743.178	701.273	41.905	41.506	-40
SK03	STRECNO	49 9 57	18 53 4	415.054	372.356	42.698	42.085	-61
SI01	VELIKA_PI	46 17 11	15 11 8	342.172	295.255	46.917	46.751	-17
SI02	LENDAVSKE	46 33 57	16 28 37	385.191	339.820	45.371	45.308	-6
SI03	MALIJA	45 30 14	13 38 36	323.127	278.186	44.941	45.047	+11
ES01	ALICANTE	38 20 20	-0 28 52	60.347	9.998	50.349	50.598	+25
ES02	ALMERIA	36 51 9	-2 27 33	125.048	74.251	50.797	50.489	-31
ES03	BARCELONA	41 21 3	2 9 27	67.660	18.170	49.490	49.903	+41
ES04	CASETAS	41 43 18	-1 1 29	269.634	219.285	50.349	50.412	+ 6
EBRE	13410M001	40 49 15	0 29 32	107.810	57.708	50.102	50.379	+28
ES05	LA_CORUNA	43 21 52	-8 23 56	66.957	12.123	54.834	54.685	-15
MADE	MADRID/RO	40 25 38	-4 14 57	815.088	762.103	52.985	52.992	+ 1
ES06	PALMA_DE_	39 33 9	2 37 29	59.085	10.083	49.002	50.090	+109
ES07	PUERTOLLA	38 41 12	-4 6 38	763.213	709.871	53.342	53.796	+45
ES08	SANTANDER	43 27 41	-3 47 22	59.281	8.968	50.313	50.564	+25
SFER	13402M004	36 27 52	-6 12 20	84.180	38.939	45.241	44.914	-33
VILL	13406M001	40 26 37	-3 57 7	647.362			51.859	

KIR0	10422M001	67 52 39	21 3 37	497.968	469.536	28.432	28.505	+ 7
KIRR	KIRUNA_R	67 52 39	21 3 37	497.963			28.505	
SE02	KUNGSHOLM	56 6 15	15 35 21	35.189	2.430	32.759	32.630	-13
MAR6	10405M002	60 35 43	17 15 31	75.372	50.728	24.644	24.697	+ 5
MARR	MAARTSBO_	60 35 43	17 15 31	75.379			24.697	
ONSA	10402M004	57 23 43	11 55 32	45.547	9.129	36.418	36.508	+ 9
ONS0	10402M004	57 23 43	11 55 32	45.558			36.508	
SE03	OESTERSUN	63 26 34	14 51 29	490.008	458.645	31.363	31.339	- 2
SE04	RATAN	63 59 8	20 53 44	31.320	10.310	21.010	20.997	- 1
SE05	SKELLEFTE	64 52 45	21 2 54	81.189	59.179	22.010	22.029	+ 2
SE0R	SKELLEFTE	64 52 45	21 2 54	81.188			22.029	
SE06	SMOEGEN	58 21 12	11 13 5	45.196	9.098	36.098	36.285	+19
SE07	STOCKHOLM	59 19 20	18 5 27	35.084	12.103	22.981	23.060	+ 8
VIS0	10423M001	57 39 14	18 22 2	79.787	54.846	24.941	25.121	+18
VISR	VISBY_R	57 39 14	18 22 2	79.788			25.121	
VIL0	10424M001	64 41 52	16 33 36	449.934	420.321	29.613	29.510	-10
VILR	VILHELMIN	64 41 52	16 33 36	449.936			29.510	
CH01	CHRISCHON	47 34 1	7 40 7	504.933	455.773	49.160	48.971	-19
CH02	BOURG_ST.	45 57 31	7 12 34	1683.443	1629.321	54.122	53.747	-38
CH03	LA_GIVRIN	46 27 15	6 6 7	1258.258	1207.278	50.980	50.798	-18
CH04	OBERALP	46 39 35	8 40 14	2094.219	2042.489	51.730	51.357	-37
CH05	SIBLINGEN	47 42 47	8 29 56	563.324	514.832	48.492	48.294	-20
CH06	STABIO	45 51 5	8 56 25	429.707	382.128	47.579	47.175	-40
CH07	ZERNEZ	46 41 55	10 6 3	1612.690	1560.915	51.775	51.306	-47
ZIMM	14001M004	46 52 38	7 27 55	956.342	906.877	49.465	49.188	-28
ANKR	20805M002	39 53 15	32 45 30	976.056	939.301 (7)	36.755	36.612	-14
TR01	ANTALYA	36 49 43	30 36 34	31.554	4.926 (7)	26.628	25.057	-157
TR02	ERDEK	40 23 26	27 50 42	40.005	1.656 (7)	38.349	38.573	+22
TR03	20803M001	37 22 40	33 11 29	1357.758	1323.541 (7)	34.217	34.007	-21
TR04	MENTES	38 25 36	26 43 3	58.650	20.348 (7)	38.302	37.784	-52
TR05	20804M001	40 56 13	31 26 20	822.685	785.624 (7)	37.061	35.601	-146
TR06	20802M001	39 48 2	34 48 47	1677.058	1641.991 (7)	35.067	34.629	-44
UK01	KIEV	50 21 51	30 29 48	224.877	199.520 (1)	25.357	25.564	+21
UK02	UZHGORAD	48 33 46	22 27 9	273.801	235.414 (1)	38.387	38.465	+ 8
UK03	MYKOLAIV	46 58 17	31 58 24	78.244	52.668 (1)	25.576	25.726	+15
UK04	SIMEIZ	44 24 55	33 59 30	386.480	362.114 (1)	24.366	23.121	-125
GB01	13299S001	55 12 46	-1 41 8	144.401	95.483	48.918	49.913	+100
GB02	BELFAST	54 37 20	-5 55 27	67.897	11.813 (6)	56.084	56.136	+ 5
GB03	13296M002	56 28 43	-2 46 59	57.779	6.810	50.969	51.661	+69
GB04	GIBRALTAR	36 7 54	-5 21 21	45.469	2.456	43.013	43.171	+16
GB05	SOUTHAMPT	50 55 51	-1 27 2	98.586	52.185	46.401	46.732	+33
GB06	LERWICK	60 8 54	-1 8 26	96.130	46.853 (8)	49.277	49.838	+56
HERS	13212M007	50 52 2	0 20 11	76.489			45.026	
HERE	HERSTMONC	50 52 3	0 20 8	70.809			45.026	
GB07	KIRKBY_ST	54 26 48	-2 23 11	356.112	304.233	51.879	52.428	+55
GB08	NEWLYN	50 6 11	-5 32 35	57.507	4.495	53.012	53.419	+41
GB09	NOTTINGHA	52 56 26	-1 11 32	98.465	49.923	48.542	48.955	+41
ZWEN	12330M001	55 41 57	36 45 31	204.993			15.203	
KIT3	12334M001	39 8 5	66 53 8	622.534			-36.686	

Remarks

(1) normal Heights transformed from tide gauge Kronstadt to tide gauge Amsterdam by +15cm
(2) normal Heights /Ajaccio
(3) orthom. Heights /Malin Head
(4) normal Heights /Cagliari
(5) normal-orth. Heights /Trieste
(6) height system and/or tide gauge unknown
(7) normal-orth. Heights /Antalya
(8) orthom. Heights /Lerwick
(9) orthom. Heights /Larnaka

The normal heights of Finland, Norway and Sweden were reduced from the epoch 1960 to the epoch of the GPS measurement (1997) by the values of the land uplift (see paragraph 3.).

Technical Working Group EUREF | **EUVN** | Levelling/Gravity Form Page 1 of 2

EUVN Working Group

Levelling/Gravity Form

EUVN ID CODE_____ Version 1.1 Date_____

This Form is valid for height difference measurements between GPS Marker and next Levelling Nodal Point. Please use for height differences between GPS Marker and Tide Gauge Bench Mark as well as Levelling Nodal Point and Tide Gauge Bench Mark the same form. Then change the designation of I and II.

Information should be compatible with marker information in the GPS Site Information Form and GPS Occupation Form.

Station Name: _____ 4-Char. EUVN ID: _____ National site number: _____
Location: _____ City/Area: _____ Country: _____
Responsible Agency (Full Adress): _____

Reported by: _____ Telephone: _____

I EUVN GPS Marker: _____ Official No. of other networks (EUREF):_____

GPS Mark Inscription: _____
GPS Mark Identifier: _____
Marker type, monumentation type, foundation: _____

Ellipsoidal coordinates in ETRS89
Latitude: ° ′ ″ _____
Longitude: ° ′ ″ _____

Gravity value in m/s^2: _____
(For reduction of geopotential number)
Gravity system: _____
Approximate accuracy of gravity in 10^{-5} ms^{-2} (mGal): _____

II Nodal Point Marker: _____ Official No.: _____

Mark Inscription: _____
Mark Identifier: _____
Marker type, monumentation type, foundation: _____

of UELN ☐ of UPLN ☐

or of other networks ☐ _____

Ellipsoidal coordinates in ETRS89
Latitude: ° ′ ″ _____
Longitude: ° ′ ″ _____

Gravity value in m/s^2: _____
(For reduction of geopotential number)
Gravity system: _____
Approximate accuracy of gravity in 10^{-5} ms^{-2} (mGal):
Geopotential number in $m^2 \cdot s^{-2}$: _____

EUVN Working Group

Levelling/Gravity Form

EUVN ID CODE_____ Version 1.1 Date_____

still II

or

Levelling height in m: _____

kind of height :

normal ☐ orthometric ☐

normalorthometric ☐ or other ☐ _____

Kind of height system: _____

_____

Related to which tide gauge: _____

Difference of geopotential number between **I-II** in $m^2 \cdot s^{-2}$ (measured value): _____

Precision of geoptential number difference in $m^2 \cdot s^{-2}$: _____

Distance between point I and II in km: _____

or

Height **difference** between **I-II** in m (measured value): _____

Precision of height difference in m: _____

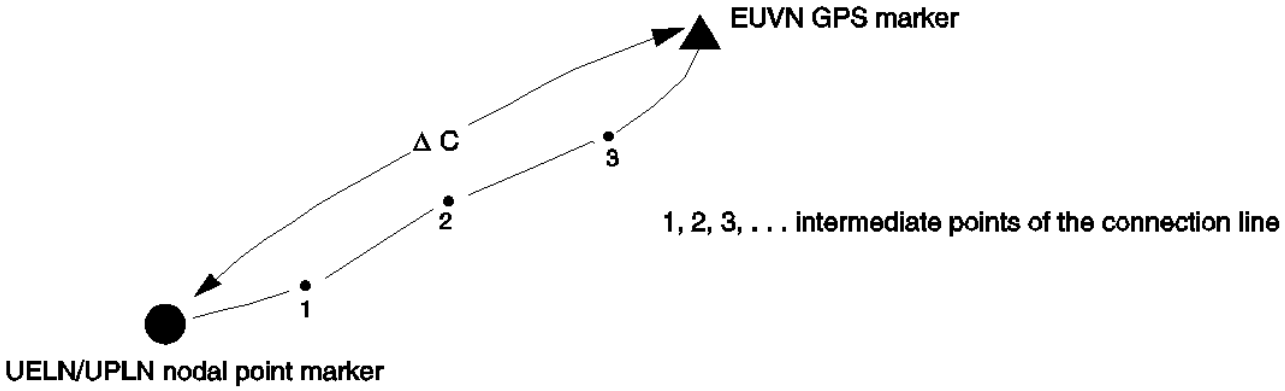
Distance between point I and II in km: _____

Kind of height difference

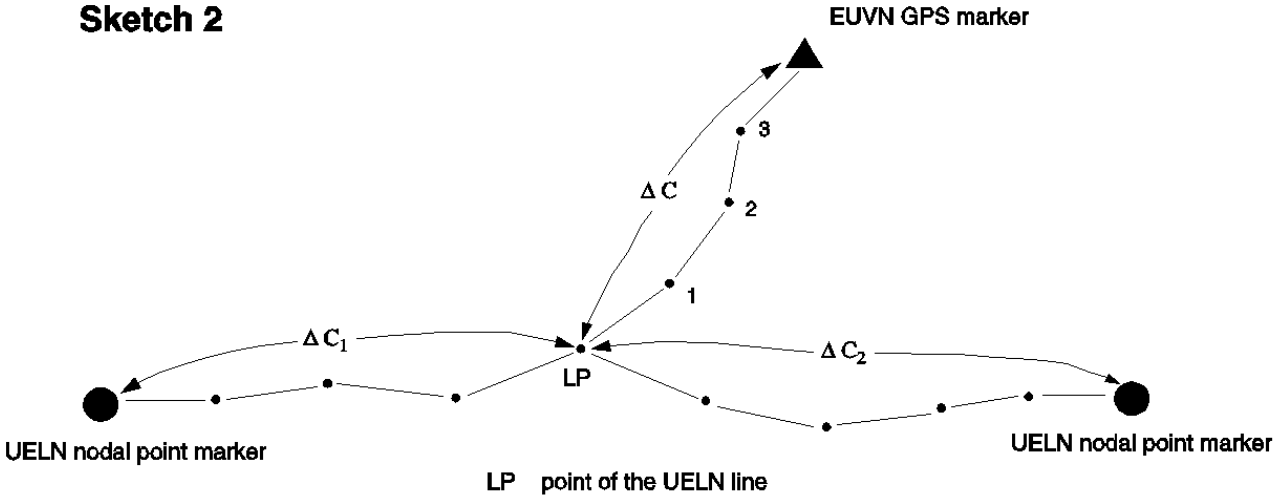
normal ☐ orthometric ☐

normalorthometric ☐ or other ☐ _____

Sketch 1

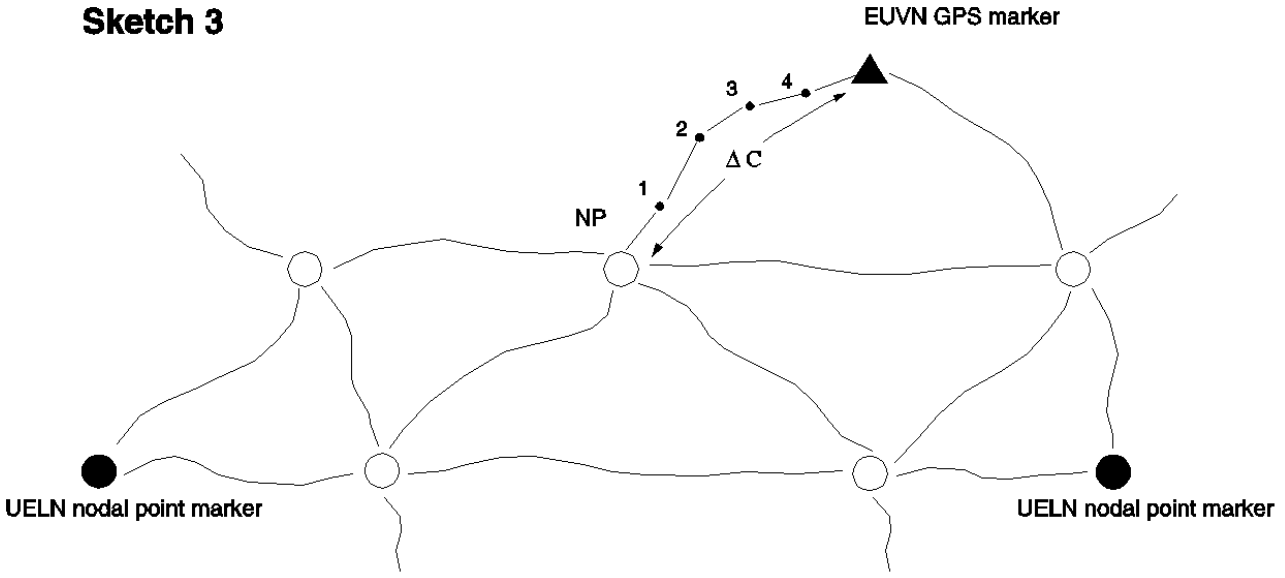


Sketch 2



LP point of the UELN line

Sketch 3



NP Network point of the national height network

EUVN Tide Gauge Solution

Reprint from EUREF Publication No. 9 in Veröffentlichungen der Bayerischen Kommission für die internationale Erdmessung der Bayerischen Akademie der Wissenschaften, Astronomisch-Geodätische Arbeiten, Heft Nr. 61, pp. 146-153, completed by Annex 2: Mean Sea Level Estimation (status March 2002)

Status Report on sea-level data collection and analysis within the EUVN Project

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1 Introduction

1.1. Basic principles on tide gauges

Whatever the technology (acoustic, pressure or floating devices), the basic quantity provided by a tide gauge is an instantaneous height difference between the level of the sea surface and the level of a fixed point on the adjacent land. Tide gauge datum (or reference) can be seen as a conventional local horizontal plane, which is materialized by a set of physical markers. Usually, one of them is arbitrarily called the tide gauge benchmark (TGBM). Sometimes it is the "most" stable, sometimes the most secure, or simply the closest, although all of them are representative of the datum.

The TGBM is extremely important as it serves to build useful long-term sea level time series. Even if parts of the time series were obtained from different gauges and/or with respect to different benchmarks, the measurements may be reduced to a common reference all along the observation period if these benchmarks are geodetically connected. Tide gauge benchmarks are the only guarantee of the long-term coherence of the measurements. It is therefore common sense to preserve the datum by installing and connecting a set of 5 to 10 benchmarks within a few hundred meters of the tide gauge.

Tide gauges not only record ocean tides but also a large variety of sea level signals caused by variations in atmospheric pressure, density, currents or continental ice melt, as well as by vertical motions of the land upon which the measurement instrument is located, due to tectonic changes, isostatic adjustments, volcanism inflation, sediment consolidation, pier subsidence, etc. Therefore, the records of these devices are indicative of so-called "relative" sea level changes.

1.2. Tide gauge and GPS synergy

Periodic or continuous GPS observations may provide the necessary complementary information to separate both long term signals within 10-20 years [Carter et al 1989 and 1994, Neilan et al 1998]. But even one single height determination of the TGBM in the ETRS89 or ITRS may benefit to some applications like for instance the unification of hydrographic chart datums as recommended by the International Hydrographic Organisation. Conversely, tide gauge data may contribute to height system definitions or quality control of levelling results, as most national height systems rely on mean sea level determined over a specific period at one or several sites.

Emphasis has been placed in the 7th EUVN circular letter on collecting all the tide gauge information needed for the complete success of the manifold EUVN objectives. We would like to recall two of them, items (7) and (8) in the initial proposal of EUVN [Ihde et al, 1996] :

7. to provide data to separate the land and sea level components of relative sea level variations, as measured by tide gauges;
8. to provide the basis to express the results of the regional European tide gauge GPS surveys in the EUREF reference system (ETRS89).

2 Tide gauge records : collection and analysis

2.1. EUVN tide gauge selection

The EUVN tide gauge selection was based on the following criteria. We proposed to include :

- tide gauges which were used for the establishment of the national height systems. These tide gauges may no longer be operational. The essential point

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is that a related TGBM still exists and available sea level data can be expressed to this TGBM.

- tide gauges which contribute to the global sea level observing program GLOSS [IOC, 1997].
- and tide gauges which were known for their long term records or for their participation in former GPS campaigns. We also tried to get an homogenous geographical distribution.

The selection led to an initial proposal of about 60 tide gauges. Then after adjustment by the national delegates and participants we came up with the final tide gauge network. This led to a larger number, up to 79 tide gauges. The map in figure 1 shows the distribution of the 79 sites which were observed during the EUVN'97 GPS campaign.

2.2. Collection of tide gauge data

A recent check (June 2000) shows that 57 of the 79 tide gauges have data available in the Permanent Service for Mean Sea Level. The PSMSL is an international service, member of the Federation of Astronomical and Geophysical Data Analysis Services, whose mission is the collection, publication, analysis and interpretation of monthly and annual mean sea level values from any tide gauge in the world. In consequence, the EUVN group agreed to request tide gauge data from its contacts only for stations whose data is not at PSMSL. A sea level form was established for this purpose. It was distributed with recommandations and guidelines through the 7th EUVN Circular Letter in January 1999.

The map in figure 1 summarises the status of the mean sea level data collection. Two types of datasets are available at the PSMSL. The first is called "Metric" and contains data as provided by the organisms. The second is called "RLR" and provides data which has passed through some quality control checks to spot inconsistent or erroneous values. Full TGBM datum history is theoretically available for RLR stations. This information is used to reduce the data to a common local datum, the Revised Local Reference (RLR). Thus, the RLR dataset is the most convenient for long term sea level analysis.

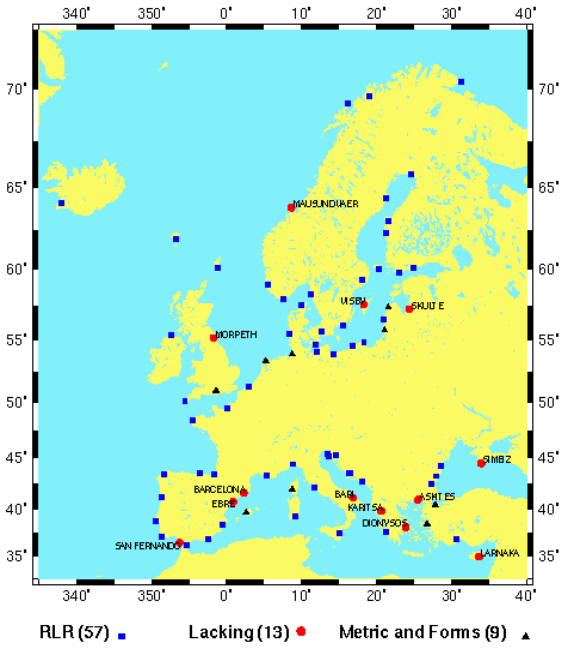

Figure 1: Sea level data collection for the EUVN'97 observed tide gauge sites.

2.3. First analysis of tide gauge data

A few basic data analysis have been performed on the currently available tide gauge data set. In particular, members of the EUVN Working Group expressed their interest in mean sea level values during 1997 which is when the GPS campaign took place, as well as estimations of the mean sea level data precision and the linear trend.

The table in Annex 1 summarises the results for the whole 66 tide gauges for which data is available through EUVN (as of June 2000). The first and third columns are station identification codes, EUVN and PSMSL. The name of the tide gauge station is given in the second column. The fourth column indicates wether the data are of "RLR" (R) or "Metric" (M) type, the number of annual mean sea level values, and the corresponding time span. The trend and standard deviation of the trend are given in the fifth column. These were obtained from the linear regression analysis. Column six shows either the "observed" 1997 annual mean sea level value, or the inter-extrapolated value if no enough observations were available to compute the annual value (11 months at least). Column seven gives the standard deviation of the detrended mean sea level values. The last column informs wether the TGBM connection to the EUVN GPS marker was performed and wether no ambiguity remains concerning the TGBM actually used to perform the link (see section 3).

Figure 2 illustrates the large variety of cases. The trends are quite different from place to place, ranging from few millimetres per year "relative" sea level fall to few millimetres per year "relative" sea level rise. No

clear regional pattern emerges from the long tide gauge records, except for the Baltic Sea, where post-glacial rebound dominates the tide gauge signals. This wide range in observed sea level trends is mainly attributed to uplift or subsidence of the land upon which the tide gauges are settled [Woodworth 1993, Pirazzoli 1996].

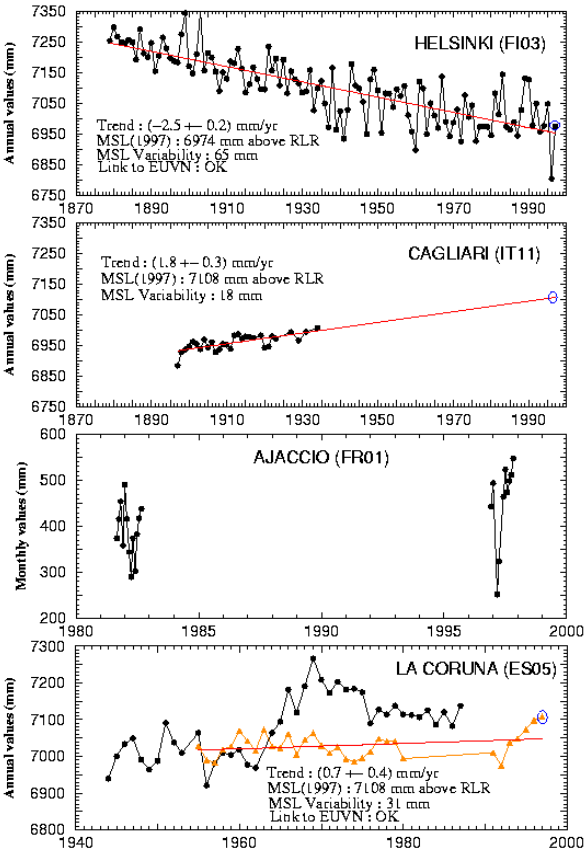

Figure 2: Annual mean sea level time series of some European tide gauge sites and results of the preliminary data analysis.

Tide gauge records also contain a considerable amount of interannual variability, which can affect the determination of long term trends. Atmospheric and oceanographic processes account for a large fraction of the interannual variability : changes in the local surface heating, currents, density, atmospheric pressure, ocean circulation, wind forcing, upwelling processes, etc. This interannual variability is roughly estimated in column seven (Annex 1) by the standard deviation of the detrended annual sea level values. Here again, values are quite different from place to place depending on the physical factors that affect each site and their amplitude. The annual variability is typically less than 10 centimeters whereas monthly variability is higher : 10-20 cm.

Figure 2 shows that an "observed" annual mean sea level value could not be computed for 1997 at every site. A linear regression value is then estimated if enough data is available, although in some cases a filter would be more convenient to approach the real state of the sea. But some stations do not have enough data and no value could be estimated or computed according to the standard and common sense rules of PSMSL. In some places, several gauges are or were operational. Their time series are not always coherent, see Alicante in figure 2 for instance.

2.4. Tide gauges and vertical references

This first analysis also gives an idea of what can be expected from tide gauge data for the definition of the European height system or for the control of the levelling references. Tide gauge data has been used historically - and is still used - for the definition and realisation of vertical reference systems on land and on sea. The belief, about a century ago, that the average level of the sea was constant over long periods of time led to define the concept of geoid and, subsequently, to establish the origin of the levelling networks on "mean sea level". Typically, countries chose one tide gauge station to compute this quantity over an arbitrary time period : in France, for example, the datum was determined at Marseille from continuous tide gauge records performed during the period 1885-1897 ; in Britain, the Ordnance Datum was determined at Newlyn from records extending from May 1915 to April 1921. However, mean sea level varies from place to place and at one specific place over time. Today, the mean sea level at Marseille is about 10 cm above the local 1885-1897 datum, whereas it is about 15 cm above the Ordnance Datum at Newlyn (see figure 3). Thus, the datums no longer represent the "real" average of the sea level at these sites.

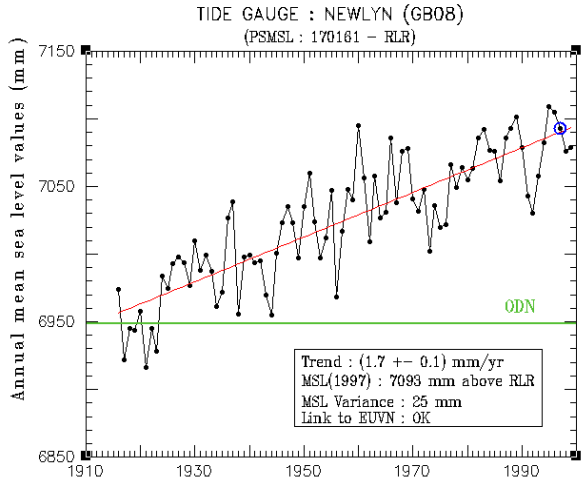

Figure 3: Newlyn tide gauge time series of annual mean sea level values (RLR reference).

3 Sea-level connection to EUVN

As explained previously, tide gauge readings {g} are reduced to a common local datum, for instance the PSMSL's Revised Local Reference. The reduction is usually achieved through some calibration constants like {D} and $\{C_M\}$ in figure 4, leading to a coherent time series of "relative" sea level values {m}.

To express sea level data into the European geocentric reference frame, the EUVN working group has to gather the intermediate data indicated in figure 4. This figure shows the main quantities involved in the geodetic tide gauge connection process.

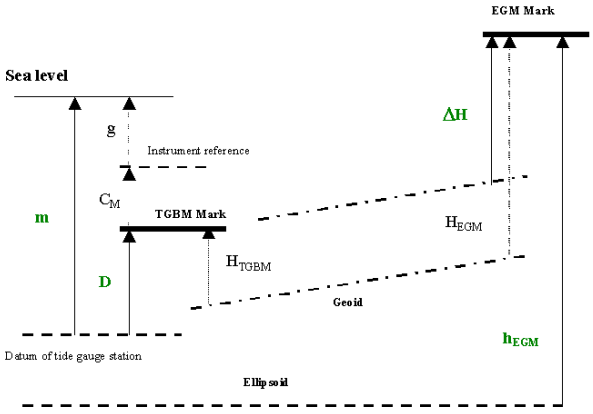

Figure 4: Schematic description of the main quantities involved in the geodetic tide gauge connection process to a geocentric reference frame

- The ellipsoidal height of the EUVN GPS mark {h_{EGM}} near the tide gauge station is already provided by the combined solution [Ineichen et al 1998].
- The height difference between the EGM and the TGBM marks {Δ H}, as well as the mark identifiers, are partly obtained through the levelling forms. 20 levelling forms are still missing.
- The sea level values {m} and the tide gauge datum definition, {D} and TGBM description, are partly collected, either from PSMSL databank, or from the Sea level Forms that we requested in EUVN Circular Letter Nr. 7.

Figure 5 summarises the present situation : 27 tide gauges - out of the 66 for which we have sea level data (see section 2) - can actually be connected to the EUVN solution. For the others, some piece of information is lacking to succeed :

- for 13 tide gauges, we do not have any sea level data (see figure 1) ;
- for 20 tide gauges, the levelling forms have not been received yet ;
- for 19, the TGBM description is ambiguous. The only way to join the sea level data collected at the PSMSL databank to the data provided by the levelling forms is the TGBM mark identifier. When we crosscheck this item, it appears that very few TGBM descriptions are consistent and clearly identified as the same mark in both data sources.

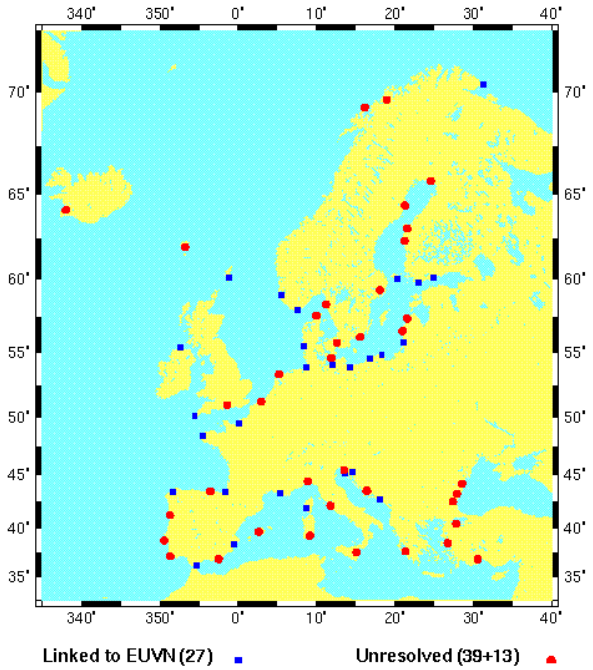

Figure 5: Geodetic connection of tide gauge data into EUVN.

4 Outlooks

As of today this analysis has been carried on over a set of 66 tide gauge time series and the geodetic connection problem has been solved for 27 out of the 79 tide gauges which were actually observed during the EUVN'97 GPS campaign.

For the complete success of the manifold EUVN objectives, sea level data of 13 tide gauges and levelling forms of 20 tide gauges are highly requested. Ambiguities in the TGBM descriptions have also been identified in 19 sites. To solve these problems, the EUVN working group has agreed to individually contact the related national representatives.

Acknowledgements

Thanks are due to the Permanent Service for Mean Sea Level (PSMSL), specially to its Director P. Woodworth. We also thank the EUVN participants, who have already provided the requested information, we hope to thank all of them in the next status report.

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Annex 1

Tide gauge data analysis for the EUVN stations and TGBM link (June 20, 2000)

EUVN Code	TIDE GAUGE STATION	PSMSL Code	DATA	TREND (mm/yr)	MSL (1997) (mm)	Variability (mm)	LINK
BE01	OOSTENDE	160021	R 57:1937-1999	1.38 +- 0.20	7018	25	
BG01	BURGAS	295021	R 50:1929-1995	1.51 +- 0.40	7047 (E)	58	
BG04	VARNA	295051	R 58:1929-1996	1.46 +- 0.40	7068 (E)	59	
HR01	BAKAR	280011	R 55:1930-1997	0.64 +- 0.27	7091	37	SOLVED
HR03	DUBROVNIK	280081	R 40:1956-1997	0.15 +- 0.37	7095	27	SOLVED
HR05	SPLIT_HARBOUR	280031	R 43:1955-1997	-0.52 +- 0.34	7082	27	
HR05	SPLIT_RT_MARJANA	280021	R 43:1953-1997	-0.06 +- 0.37	7032	30	
HR07	ROVINJ	280006	R 41:1956-1997	-0.08 +- 0.35	7087	27	SOLVED
CY01	LARNAKA	---	---	---	---	---	
DK01	KOBENHAVN	130021	R 106:1889-1996	0.27 +- 0.11	6995 (E)	35	
DK02	HIRTSHALS	130101	R 94:1892-1997	-0.36 +- 0.15	7061	41	
DK03	ESBJERG	130121	R 105:1890-1997	1.02 +- 0.15	7062	47	OK
DK04	GEDSER	130001	R 97:1898-1996	0.94 +-0.12	6997 (E)	32	
DK05	THORSHAVN	015011	R 27:1957-1997	1.59 +- 0.36	7023	23	
FI01	DEGERBY	060281	R 66:1924-1997	-3.89 +- 0.35	6862	62	SOLVED
FI02	HANKO/HANGO	060331	R 91:1889-1997	-2.74 +- 0.21	6927	62	OK
FI03	HELSINKI	060351	R 119:1879-1997	-2.49 +- 0.17	6974	65	OK
FI05	KASKINEN/KASKO	060071	R 65:1927-1997	-6.84 +- 0.42	6805	69	
FI06	KEMI	060001	R 69:1920-1997	-7.28 +- 0.39	6719	71	
VAAS	VAASA/VASA	060051	R 102:1884-1997	-7.30 +- 0.17	6766	57	
FR01	AJACCIO	---	Few months	---	---	---	SOLVED
FR04	BREST	190091	R 168:1807-1997	0.97 +- 0.05	7113	36	OK
FR05	LE_HAVRE	190051	R 23:1959-1998	2.19 +- 0.60	7031	34	SOLVED
FR06	MARSEILLE	230051	R 106:1885-1996	1.23 +- 0.08	6985 (E)	26	SOLVED
FR09	SOCOA/ST_JEAN_DE_LUZ	190141	29:1966-1996	1.58 +- 0.61	6995 (E)	29	SOLVED
DE03	CUXHAVEN_2	140012	M 156:1843-1998	2.37 +- 0.09	73	50	SOLVED
DE10	WARNEMUNDE_2	120012	R 136:1856-1991	1.17 +- 0.08	7078 (E)	34	SOLVED
GR01	ASKITES	---	---	---	---	---	
DION	DIONYSOS	---	---	---	---	---	
GR02	KARITSA	---	---	---	---	---	
GR03	KATAKOLON	290017	R 25:1969-1999	1.33 +- 0.73	7139	34	
REYK	REYKJAVIK	010001	R 39:1957-1997	2.66 +- 0.59	7085	44	
IE03	MALIN_HEAD	175011	R 36:1959-1997	-0.29 +- 0.50	7129	34	OK

IT01	BARI	---	---	---	---	---	
IT02	CATANIA	260031	R 12:1960-1971	1.21 +- 1.60	7052 (E)	15	
IT03	CIVITAVECCHIA	250031	R 23:1897-1921	0.70 +- 0.62	7105 (E)	20	
IT05	GENOVA	250011	R 85:1884-1996	1.22 +- 0.07	7019 (E)	23	
IT10	TRIESTE	270061	R 89:1905-1999	1.13 +- 0.13	7044	34	
IT11	CAGLIARI	240011	R 30:1897-1934	1.75 +- 0.33	7108 (E)	18	
LV01	SKULTE	---	---	---	---	---	
LV02	LIEPAJA	080151	R 63:1865-1936	0.85 +- 0.36	7076 (E)	61	
LV03	VENTSPILS	080121	M 54:1873-1936	1.09 +- 0.37	146 (E)	50	
LT03	MOLAS	---	Few months	---	---	---	SOLVED
TERS	WEST-TERSCHELLING	150011	M 79:1921-1999	0.80 +- 0.19	-49	38	
NO01	TREGDE	040301	R 61:1935-1999	-0.04 +- 0.19	6990	26	OK
NO02	STAVANGER	040261	R 62:1882-1999	0.22 +- 0.14	6973	29	OK
NO08	MAUSUNDVAER	---	---	---	---	---	
NYAL	NY-ALESUND	025021	R 15:1977-1999	-2.48 +- 0.79	6940	23	
NO11	ANDENES	040041	R 29:1938-1999	1.68+-0.41	7169	48	
TROM	TROMSO	040031	R 47:1953-1999	0.05 +- 0.57	6957	52	
NO12	VARDO	040001	R 25:1948-1998	-0.92 +- 0.41	6949	35	OK
PL04	WLADYSLAWOWO	110047	R 47:1951-1997	2.28 +- 0.65	7015	59	SOLVED
PL06	SWINOUJSCIE	110092	R 168:1811-1997	0.82 +- 0.06	6964	44	SOLVED
PL07	USTKA	110057	R 47:1951-1997	1.63 +- 0.59	7002	54	SOLVED
PT02	CASCAIS	210021	R 99:1882-1991	1.19 +- 0.10	7003 (E)	31	
PT04	LEIXOES	210012	R 31:1956-1995	0.47 +- 1.16	7060 (E)	60	
PT05	LAGOS	210031	R 71:1909-1992	1.40 +- 0.15	7094 (E)	29	
RO02	CONSTANTA	297021	R 59:1933-1996	1.19 +- 0.49	6999	67	
ES01	ALICANTE_I	220051	R 28:1952-1996				OK
ES01	ALICANTE_II	220052	R 35:1960-1995	-0.81 +- 0.24	7048 (E)	14	OK
ES02	ALMERIA	220041	R 18:1978-1997	0.30 +- 0.91	7094	21	
ES03	BARCELONA	---	---	---	---	---	
EBRE	EBRE	---	---	---	---	---	
ES05	LA CORUNA_I	200030	R 42:1944-1987				OK
ES05	LA CORUNA_II	200031	R 33:1955-1997	0.73 +- 0.43	7108 7048 (E)	31	OK
ES06	PALMA	225001	M 3:1964-1966	---	---	---	
ES08	SANTANDER_I	200011	R 37:1944-1987	-0.25 +- 0.61	7006 (E)	50	
SFER	SAN FERNANDO	---	---	---	---	---	
SE02	KUNGHOLMSFORT	050081	R 113:1887-1999	-0.09 +- 0.14	7022	48	
SE04	RATAN	050191	R 107:1892-1999	-7.83 +- 0.20	6678	65	
SE06	SMOGEN	050011	R 89:1911-1999	-2.19 +- 0.17	7003	41	
SE07	STOCKHOLM	050141	R 111:1889-1999	-3.89 +- 0.17	6845	57	
VIS0	VISBY	---	---	---	---	---	
TR01	ANTALYA_II	310052	R 9:1986-1997	-1.16 +- 5.44	7084	48	

TR02	ERDEK	310038	M 14:1984-1998	38.60 +- 7.61	1862	106	
TR04	MENTES/IZMIR	310042	M 12:1986-1998	10.86 +- 7.75	1737	85	
UK04	SIMEIZ	---	---	---	---	---	
GB01	MORPETH	---	---	---	---	---	
GB04	GIBRALTAR	215001	R 20:1962-1989	-0.70 +- 0.75	6963	27	SOLVED
GB05	SOUTHAMPTON	170141	M 16:1924-1966	0.32 +- 2.05	2407 (E)	28	
GB06	LERWICK	170001	R 40:1957-1999	-0.81 +- 0.35	7017	27	SOLVED
GB08	NEWLYN	170161	R 84:1916-1999	1.65 +- 0.11	7093	25	SOLVED

Annex 2: **Mean Sea Level Estimation**

ID	TIDE GAUGE	MSL -1997,000	DATUM	TGBM	H (TGBM)	DH	h(EGM)	h(MSL) -1997,000	H(EGM)	h(EGM)-H(EGM)	H(MSL) -1997,000
BE01	OOSTENDE	7,018	RLR(1974)	DH4-II	11,400	5,849	54,473	44,242	10,213	44,260	-0,018
HR01	BAKAR	7,091	RLR(1964)	BV15663	9,725	135,040	182,398	44,724	137,380	45,018	-0,294
HR03	DUBROVNIK	7,095	RLR(1964)	A496	10,756	2,024	46,669	40,984	5,347	41,322	-0,338
HR07	ROVINJ	7,087	RLR(1964)	BP82	11,901	4,867	53,589	43,908	9,385	44,204	-0,296
DK01	KOBENHAVN	6,995	RLR(1964)	GI 2000	8,841	49,932	87,952	36,174	51,840	36,112	0,062
DK02	HIRTSHALS	7,061	RLR(1964)	54-05-9059	15,709	-4,548	42,225	38,125	4,040	38,185	-0,060
DK03	ESBJERG	7,062	RLR(1964)	GM 879	22,000	-12,472	43,317	40,851	2,519	40,798	0,053
DK04	GEDSER	6,997	RLR(1964)	GI 1622	7,902	1,661	40,630	38,064	2,643	37,987	0,077
DK05	TORSHAVN	7,023	RLR(1964)	K-87-9030	9,300	0,373	58,100	55,450			
FI01	DEGERBY	6,862	RLR(1964)	73125	8,533	1,127	21,664	18,866	2,913	18,751	0,115
FI02	HANKO/HANGO	6,927	RLR(1964)	BM 126	9,700	2,294	24,873	19,806	5,376	19,497	0,309
FI03	HELSINKI	6,974	RLR(1964)	BM 7HB	9,600	3,760	24,193	17,807	6,662	17,531	0,276
FR04	BREST	7,113	RLR(1964)	NO-47	12,500	47,882	104,423	51,154	53,301	51,122	0,032
FR06	MARSEILLE	6,985	RLR(1963)	Mac-O-VIII	8,500	11,222	61,799	49,062	12,394	49,405	-0,343
DE03	CUXHAVEN	7,073	RLR(2000)	2118-9-108	10,749	1,921	45,033	39,436	5,653	39,380	0,056
DE10	WARNEMUNDE_2	7,078	RLR(1991)	4061 13 105 1	7,300	10,980	49,558	38,356	11,251	38,307	0,049
IE03	MALIN_HEAD	7,129	RLR(1976)	FBM	30,400	2,331	82,726	57,124	25,617	57,109	0,015
NO01	TREGDE	6,990	RLR(1964)	BM D40N53	8,700	1,172	43,840	40,958	2,804	41,036	-0,078
NO02	STAVANGER	6,973	RLR(1964)	BM B38N16	9,900	-0,966	45,554	43,593	1,886	43,668	-0,075
NO11	ANDENES	7,169	RLR(1955)	L7N42	10,463	0,540	39,264	35,430	3,828	35,436	-0,006
NO12	VARDO	6,949	RLR(1964)	BM 03N9	8,900	1,100	21,160	18,109	3,042	18,118	-0,009
PT02	CASCAIS	7,003	RLR(1964)	BM Ob1	11,200	8,162	65,814	53,455	12,147	53,667	-0,212
PT04	LEIXOES	7,060	RLR(1984)	TGBM	11,100	10,959	70,077	55,078	14,866	55,211	-0,133
PT05	LAGOS	7,094	RLR(1974)	BM OP	10,000	-0,179	55,350	52,623	2,597	52,753	-0,130
ES01	ALICANTE_II	7,048	RLR(1964)	NP 1	10,400	7,081	60,345	49,912	9,998	50,347	-0,435
ES03	BARCELONA	7,048	RLR(1993)	NGP-791	9,215	14,509	67,662	50,986	18,170	49,492	**1,494**
ES05	LA_CORUNA_II	7,108	RLR(1964)	NP-615	11,800	7,562	66,965	54,711	12,123	54,842	-0,131
ES08	SANTANDER_I	7,006	RLR(1962)	NGU-84	10,506	-3,362	59,288	59,150	8,968	50,320	**8,830**
SE02	KUNGHOLMSFORT	7,022	RLR(1964)	BM 404M	8,000	1,379	35,203	32,846	2,430	32,773	0,073
SE04	RATAN	6,678	RLR(1964)	BM 1992	9,900	6,843	31,341	21,276	10,310	21,031	0,245
SE07	STOCKHOLM	6,845	RLR(1964)	BM "M"	9,900	8,872	35,100	23,173	12,103	22,997	0,176
TR01	ANTALYA_II	7,084	RLR(1995)	M85-2	7,908	4,081	31,538	26,633	4,926	26,612	0,021
TR02	ERDEK	7,862	RLR(1995)	ERD-R-1	8,606	0,601	39,996	38,651	1,656	38,340	0,311
TR04	MENTES/IZMIR	7,737	RLR(1995)	131-35	11,134	16,949	58,638	38,292	20,348	38,290	0,002
GB04	GIBRALTAR	6,963	RLR(1964)	BM BoltAP	9,700	-0,013	45,468	42,744	2,456	43,012	-0,268
GB06	LERWICK	7,017	RLR(1987)	HU4783 4129	10,300	43,503	96,153	49,367	46,853	49,300	0,067
GB08	NEWLYN	7,093	RLR(1964)	SW4676 2855	11,700	-0,225	57,522	53,140	4,495	53,027	0,113

First and second column give the EUVN station identification code and tide gauge name. The second column shows either the "observed" or the estimated 1997 annual mean sea level value. This value is given in the local tide gauge datum, which description appears in the fourth column. Column five indicates which TGBM is used, its height above the local datum is given in column six. Column seven is the height difference between EGM and TGBM. Column eight shows the EGM ellipsoidal height derived from the EUVN97-Combined GPS solution [Ineichen et al, 1998], in **ITRF96, epoch 1997.4 - GRS80 ellipsoid**. The last column gives the resulting 1997 geocentric mean sea level value :

$h(MSL)_{1997} = h(EGM) - DH - h(TGBM) + MSL(1997)$

Column ten contains the normal height H(EGN) of the GPS site. Column eleven gives the GPS/Levelling quasi geoid as difference h(EGM)-H(EGM). The last column is the height of the mean sea level above the quasi geoid:

$H(MSL) = h(MSL)_{1997} - h(EGM) + H(EGM)$

Compilation of the Numerical Results

Compilation of the Numerical Results																
Name		Ellipsoidal coordinates in ITRF96 Epoch 1997.4							Normal Height	Re-	h-H	EGG97	EGG97 -	Tide Gauge	h(MSL)	H(MSL)
		Latitude φ			Longitude λ			Height h	H in UELN-95/98	mark		Geoid	(h-H)		1997	1997
		°	′	″	°	′	″	in m	in m		in m	in m	in cm		in m	in cm
	Austria															
GRAZ	11001M002	47	4	1,66331	15	29	36,52128	538,293	490,925		47,368	47,213	-15			
GRAA	11001M003	47	4	1,77288	15	29	36,56444	540,069				47,213				
AT01	HUTBIEGL	48	39	16,39089	15	35	54,26015	457,611	411,123		46,488	46,335	-15			
PFAN	11005S002	47	30	55,17824	9	47	4,78398	1090,314	1043,183		47,131	46,763	-37			
AT03	THOERL-MA	46	33	15,12280	13	41	0,38304	687,373	638,588		48,785	48,517	-27			
AT04	WOERGL	47	29	45,78351	12	4	58,78592	630,062	582,508		47,554	47,209	-34			
	Belgium															
BRUS	13101M004	50	47	52,14052	4	21	33,18257	149,678	104,437		45,241	45,311	7			
BRUT	13101M003	50	47	55,16400	4	21	31,83105	157,481				45,310				
DENT	13112M001	50	56	1,33735	3	23	58,80944	63,906	19,518		44,388	44,547	16			
DOUR	13113M001	50	5	41,55211	4	35	41,82136	282,704	236,643		46,061	46,069	1			
BE01	OSTEND	51	14	5,78122	2	55	38,79631	54,473	10,213		44,260	44,454	19	OSTEND	44,242	-2
	Bulgaria															
BG01	BURGAS	42	29	0,62864	27	28	55,48001	41,735	2,986	(1)	38,749	38,667	-8			
BG03	SOFIA	42	33	21,93703	23	23	41,02978	1119,551	1074,507	(1)	45,044	44,725	-32			
BG04	VARNA	43	11	33,69097	27	54	33,39137	38,236	2,072	(1)	36,164	36,045	-12			
	Croatia															
HR01	BAKAR	45	15	19,60921	14	35	9,27483	182,398	137,380		45,018	45,531	51	BAKAR	44,724	-29
HR02	BRUSNIK	45	34	42,90515	15	34	12,83257	268,988	223,239		45,749	45,939	19			
HR03	DUBROVNIK	42	39	28,39218	18	3	38,76823	46,669	5,347		41,322	41,322	0	DUBROVNIK	40,984	-34
HR04	VELIKO_GR	45	9	14,22005	18	42	42,06897	146,094	101,613		44,481	44,714	23			
HR05	SPLIT	43	30	23,91982	16	26	18,46069	47,624	5,186		42,438	43,113	67			
HR06	ZAGREB	45	48	22,31691	15	58	43,12444	160,909	115,025		45,884	45,894	1			
HR07	ROVINJ	45	5	2,49468	13	37	45,66193	53,589	9,385		44,204	44,355	15	ROVINJ	43,908	-30
HR08	PLITVICE_	44	50	42,38460	15	40	46,56432	713,170	667,464		45,706	45,983	28			
	Cyprus															
CY01	LARNAKA	34	55	41,40106	33	38	42,70484	31,185	5,887	(9)	25,298	24,096	-120			
NICO	14302M001	35	8	27,54635	33	23	47,19986	190,023	162,277	(9)	27,746	26,481	-127			
	Czech Republic															
CZ01	CHRASTAVA	50	49	2,06603	14	58	9,49939	338,637	295,744		42,893	42,861	-3			
CZ02	KOTOUN	49	27	45,23874	13	40	0,22570	547,363	500,770		46,593	46,444	-15			
CZ03	PREDNI_PR	49	30	21,27665	17	14	47,25161	303,706	260,283		43,423	43,251	-17			
CZ04	KOSTELEC	49	51	30,34324	15	56	6,75735	427,687	383,124		44,563	44,447	-12			
GOPE	11502M002	49	54	49,33239	14	47	8,23288	592,600	547,696		44,904	44,784	-12			

Compilation of the Numerical Results

Name		Ellipsoidal coordinates in ITRF96 Epoch 1997.4							Normal Height	Re-	h-H	EGG97	EGG97 -	Tide Gauge	h(MSL)	H(MSL)
		Latitude φ			Longitude λ			Height h	H in UELN-95/98	mark		Geoid	(h-H)		1997	1997
		°	′	″	°	′	″	in m	in m		in m	in m	in cm		in m	in cm
	Denmark															
DK01	KOBENHAVN	55	44	19,92340	12	29	59,84989	87,952	51,840		36,112	36,127	2	KOBENHAVN	36,174	6
DK0A	KOBENHAVN	55	44	19,72209	12	29	59,33735	86,728	50,616		36,112	36,127	2			
DK02	HIRTSHALS	57	35	42,14289	9	57	44,45359	42,225	4,040		38,185	38,253	7	HIRTSHALS	38,125	-6
DK03	ESBJERG	55	27	36,55950	8	26	23,32044	43,317	2,519		40,798	40,842	4	ESBJERG	40,851	5
DK04	GEDSER	54	34	19,66226	11	55	28,34188	40,630	2,643		37,987	37,993	1	GEDSER	38,064	8
DK05	THORSHAVN	62	0	15,97625	-6	45	40,05197	58,100				56,193		TORSHAVN	55,450	
	Estonia															
EE01	OTSA	57	50	32,39796	27	14	55,63677	107,516	88,162		19,354	19,408	5			
EE02	SUURUPI	59	27	48,88404	24	22	48,92622	84,286	65,993		18,293	18,416	12			
	Finland															
FI01	DEGERBY	60	1	52,85424	20	23	4,09064	21,664	2,913		18,751	18,766	1	DEGERBY	18,866	11
FI02	HANKO	59	49	21,64432	22	58	35,44449	24,873	5,376		19,497	19,666	17	HANKO	19,806	31
FI03	HELSINKI	60	9	13,24004	24	57	24,24459	24,193	6,662		17,531	17,733	20	HELSINKI	17,807	28
JOEN	10512M001	62	23	28,22091	30	5	46,15973	113,694	96,694		17,000	17,313	31			
FI05	KASKINEN	62	20	33,68187	21	12	58,61757	25,292	6,223		19,069	19,178	11			
FI06	KEMI	65	40	27,70158	24	31	5,67368	26,137	7,384		18,753	18,818	7			
KUUS	KUUSAMO	65	54	36,89262	29	2	0,51445	378,973				17,935				
METS	10503S011	60	13	2,89602	24	23	43,14337	94,584	75,986		18,598	18,778	18			
META	METSAEHOV	60	13	2,92430	24	23	43,18069	94,536				18,778				
SODA	10513M001	67	25	15,09008	26	23	20,57544	299,754	279,309		20,445	20,531	9			
VAAS	10511M001	62	57	40,29188	21	46	14,28075	58,061	40,382		17,679	17,802	12			
	France															
FR01	100077M00	41	55	38,59900	8	45	45,69815	96,794	49,069	(2)	47,725	49,234	151			
GRAS	10002M006	43	45	17,05141	6	55	14,05690	1319,311				51,182				
FR02	100013M00	44	48	56,41053	0	33	42,63856	53,922	7,380		46,542	46,683	14			
FR03	100086M00	46	37	12,58193	3	44	7,02201	257,491	209,154		48,337	48,348	1			
FR04	BREST	48	24	28,32176	-4	30	13,78225	104,423	53,301		51,122	51,419	30	BREST	51,154	3
FR05	LE_HAVRE	49	28	54,81396	0	6	21,69622	53,643	8,131		45,512	45,763	25			
FR06	100073M00	43	16	43,56677	5	21	13,62837	61,799	12,394		49,405	49,547	14	MARSEILLE	49,062	-34
FR07	100087M00	48	45	45,97683	6	7	42,26804	241,731	194,365		47,366	47,365	0			
FR08	100001M01	48	50	40,01031	2	25	29,90240	126,158	81,867		44,291	44,438	15			
TOUL	10003M004	43	33	38,77920	1	28	50,73002	207,109	157,740		49,369	49,301	-7			
FR09	100088M00	43	23	42,56674	-1	40	54,24764	54,269	5,010		49,259	49,350	9			
FR10	100089M00	46	59	25,56112	0	11	57,89021	133,442	86,065		47,377	47,507	13			

Compilation of the Numerical Results																
Name		Ellipsoidal coordinates in ITRF96 Epoch 1997.4							Normal Height	Re-	h-H	EGG97	EGG97 -	Tide Gauge	h(MSL)	H(MSL)
		Latitude φ			Longitude λ			Height h	H in UELN-95/98	mark		Geoid	(h-H)		1997	1997
		°	′	″	°	′	″	in m	in m		in m	in m	in cm		in m	in cm
	Germany															
DE01	FLECHTING	52	20	7,94605	11	13	43,03759	153,500	110,580		42,920	42,929	1			
DE02	BRONNZELL	50	30	30,57368	9	40	54,56325	334,885	287,133		47,752	47,723	-3			
DE03	CUXHAVEN	53	52	5,07282	8	43	1,32123	45,033	5,653		39,380	39,416	4	CUXHAVEN	39,436	6
DE04	EUSKIRCHE	50	40	25,75931	6	45	41,65666	217,992	170,947		47,045	47,022	-2			
DE05	HONAU	48	24	0,67368	9	17	1,29347	760,512	711,848		48,664	48,492	-17			
DE06	NIEDERWEI	49	54	53,26153	7	17	44,69458	526,502	477,835		48,667	48,596	-7			
DE07	MEERANE	50	50	27,28642	12	29	14,98366	334,315	288,907		45,408	45,355	-5			
DE08	SCHERNFEL	48	55	2,62545	11	8	29,56592	597,631	550,771		46,860	46,706	-15			
POTS	14106M003	52	22	45,46617	13	3	57,92138	144,430	104,216		40,214	40,219	0			
DE09	WALLENHOR	52	21	50,17878	8	0	26,13810	128,945	85,191		43,754	43,800	5			
DE10	WARNEMUEN	54	10	40,78405	12	5	20,18308	49,558	11,251		38,307	38,304	0	WARNEMUNDE_2	38,356	5
WTZR	14201M010	49	8	39,10995	12	52	44,06782	666,031	619,339		46,692	46,548	-14			
WTZA	WETTZELL_	49	8	38,32270	12	52	42,53023	660,277	613,594		46,683	46,547	-14			
WTZT	14201M011	49	8	39,22006	12	52	44,17958	665,943	619,249		46,694	46,548	-15			
	Greece															
GR01	ASKITES	40	55	40,87529	25	33	58,40083	182,576	141,838	(6)	40,738	41,051	31			
DION	DIONYSOS	38	4	42,72462	23	55	57,52986	514,541				38,349				
GR02	KARITSA	39	44	3,30653	20	39	53,40534	598,598	566,089	(6)	32,509	32,251	-26			
GR03	KATAKOLO	37	38	38,79622	21	19	13,12015	26,873	3,424	(6)	23,449	23,707	26			
	Hungary															
HU01	BAKSIPART	48	22	37,27329	21	37	56,48027	155,773	116,021		39,752	39,638	-11			
HU02	CSANADALB	46	19	10,44221	20	40	14,79733	142,470	100,000		42,470	42,498	3			
HU03	NADAP	47	15	20,48270	18	37	9,30390	234,629	190,670		43,959	43,849	-11			
PENC	11206M006	47	47	22,56682	19	16	53,49554	291,750	248,387		43,363	43,200	-16			
	Iceland															
IC01	ENNISHOEF	65	34	53,03710	-21	19	21,68530	339,504				65,725				
HOFN	HOEFN	64	16	2,24707	-15	11	52,52066	82,565				65,150				
IC03	HOFTEIGUR	65	21	22,77563	-14	52	8,56923	211,656				65,629				
REYK	10202M001	64	8	19,61750	-21	57	19,74201	93,051				66,446				
	Ireland															
IE01	KENMARE	51	52	17,35409	-9	34	58,94489	62,640	4,464	(3)	58,176	57,874	-30			
IE02	SLANE	53	42	41,64386	-6	32	28,11492	135,634	79,140	(3)	56,494	56,464	-3			
IE03	MALIN_HEA	55	22	17,91996	-7	20	20,51058	82,726	25,617	(3)	57,109	57,281	17	MALIN_HEAD	57,124	2
	Italy															

Compilation of the Numerical Results																
Name		Ellipsoidal coordinates in ITRF96 Epoch 1997.4							Normal Height	Re-	h-H	EGG97	EGG97 -	Tide Gauge	h(MSL)	H(MSL)
		Latitude φ			Longitude λ			Height h	H in UELN-95/98	mark		Geoid	(h-H)		1997	1997
		°	′	″	°	′	″	in m	in m		in m	in m	in cm		in m	in cm
IT01	BARI	41	7	55,46645	16	52	4,44525	63,110	17,251		45,859	45,810	-5			
CAGL	12725M003	39	8	9,27817	8	58	21,90233	238,372				46,552				
IT02	CATANIA	37	30	4,15876	15	5	40,79759	51,961	10,502		41,459	41,623	16			
IT03	CIVITAVEC	42	5	46,38402	11	47	17,28131	57,486	9,050		48,436	48,856	42			
IT04	BATTIPAGL	40	38	58,26239	14	51	1,22265	86,629	39,101		47,528	47,742	21			
IT05	GENOVA	44	24	43,58223	8	55	32,38983	49,340	4,014		45,326	45,529	20			
IT06	MONTEPESC	42	52	18,07675	11	4	30,27669	68,404	19,904		48,500	48,749	25			
IT07	IROE	43	48	13,70873	11	13	51,56458	144,672	99,295		45,377	45,471	9			
MATE	12734M008	40	38	56,86866	16	42	16,04643	535,650	490,042		45,608	45,559	-5			
MEDI	12711M003	44	31	11,84117	11	38	48,52574	50,058				39,725				
IT08	MTE_MARIO	41	55	20,96576	12	27	9,19805	201,928	153,528		48,400	48,752	35			
NOTO	12717M003	36	52	33,99127	14	59	23,30962	126,233	84,441		41,792	41,800	1			
UPAD	12750M002	45	24	24,18148	11	52	40,55221	84,044	39,582		44,462	44,391	-7			
IT09	PESCARA	42	27	53,85629	14	12	47,55653	68,743	24,921		43,822	44,241	42			
IT10	TRIESTE	45	38	49,97551	13	45	33,88929	56,199	11,075		45,124	45,161	4			
IT11	CAGLIARI_	39	12	37,86781	9	6	54,65357	60,138	14,681	(4)	45,457	46,358	90			
	Latvia															
LV01	SKULTE	57	18	57,21873	24	24	36,31786	26,418	6,760		19,658	19,685	3			
LV02	LIEPAJA	56	30	53,79204	21	0	3,27538	36,271	12,184		24,087	23,825	-26			
LV03	VENTSPILS	57	23	45,23034	21	32	16,65951	27,954	6,633		21,321	20,967	-35			
LV04	IRBENE	57	33	15,90265	21	51	7,18552	40,624	19,645		20,979	20,766	-21			
RIGA	12302M002	56	56	55,02693	24	3	31,57600	34,714	14,017		20,697	20,873	18			
	Lithuania															
LT01	SIAULIAI	55	54	48,78772	23	22	17,19320	164,832	141,381		23,451	23,446	0			
LT02	VILNIUS	54	39	11,31054	25	17	55,19924	240,840	215,798		25,042	25,102	6			
LT03	MOLAS	55	43	47,24363	21	4	58,89308	29,339	4,638		24,701	24,552	-15			
	Macedonia															
MK01	BOROVA_CU	42	0	5,55428	22	51	49,21577	1264,154	1219,003	(5)	45,151	45,078	-7			
	Netherlands															
KOSG	13504M003	52	10	42,33184	5	48	34,71152	96,857	53,589		43,268	43,418	15			
KOAS	KOOTWIJK_	52	10	42,70575	5	48	36,34013	89,321	46,048		43,273	43,418	15			
TERS	13534M001	53	21	45,85518	5	13	9,79356	56,104	14,718		41,386	41,554	17			
WSRT	13506M005	52	54	52,59513	6	36	16,21257	82,287	40,747		41,540	41,703	16			
	Norway															
NO01	TREGDE	58	0	23,36076	7	33	17,24881	43,840	2,804		41,036	41,164	13	TREDGE	40,958	-8

Compilation of the Numerical Results																
Name		Ellipsoidal coordinates in ITRF96 Epoch 1997.4						Normal Height	Re-	h-H	EGG97	EGG97 -	Tide Gauge	h(MSL)	H(MSL)
		Latitude φ			Longitude λ			Height h	H in UELN-95/98	mark		Geoid	(h-H)		1997	1997
		°	′	″	°	′	″	in m	in m		in m	in m	in cm		in m	in cm
NO02	STAVANGER	58	57	42,67187	5	46	8,41460	45,554	1,886		43,668	43,968	30	STAVANGER	43,593	-7
NO03	HALDEN	59	7	32,22479	11	26	29,83156	141,504	105,021		36,483	36,618	14			
NO04	HOENEFOSS	60	8	36,74099	10	14	56,58854	177,632	137,495		40,137	40,136	0			
NO05	HOENEFOSS	60	8	36,86559	10	14	56,61161	177,646				40,136				
NO07	NYBERGSUN	61	15	37,30294	12	20	8,38868	449,185	413,706		35,479	35,406	-7			
NO08	MAUSUNDVA	63	52	6,19153	8	39	52,32573	50,964	9,278		41,686	41,816	13			
NYAL	10317M001	78	55	46,50144	11	51	54,29922	78,434								
NO09	RANA	66	18	57,58298	14	7	51,29237	40,333	7,176		33,157	33,115	-4			
NO10	STORFJORD	69	15	49,03745	19	55	38,34820	44,665	14,528		30,137	29,785	-35			
NO11	ANDENES	69	19	18,90699	16	7	51,01321	39,264	3,828		35,436	35,735	30	ANDENES	35,430	-1
TROA	TROMSOE_A	69	39	45,78122	18	56	22,71679	138,062				30,672				
NO12	VARDOE	70	22	39,16316	31	5	44,71845	21,160	3,042		18,118	18,629	51	VARDO	18,109	-1
	Poland															
BOGI	BOROWA_GO	52	28	29,96628	21	2	6,76573	139,889	108,760		31,129	30,706	-42			
BOR1	12205M002	52	16	37,04014	17	4	24,43515	124,374	89,027		35,347	35,385	4			
PL01	BRUDZOWIC	50	30	44,03097	19	12	6,52026	367,236	327,338		39,898	39,863	-3			
PL02	CHELMSKO	52	34	42,28270	15	33	9,23474	101,447	65,098		36,349	36,375	3			
JOZE	12204M001	52	5	50,18558	21	1	53,53151	141,453	110,244		31,209	31,470	26			
LAMA	12209M001	53	53	32,63644	20	40	11,78284	187,040				29,255				
PL03	PROSTKI	53	44	2,55932	22	21	34,41498	154,611	126,367		28,244	28,310	7			
PL04	ROZEWIE	54	49	39,02155	18	19	35,36746	70,806	41,668		29,138	29,027	-11			
PL06	SWINOUJSC	53	55	39,25370	14	13	36,45455	42,216	6,655		35,561	35,531	-3			
PL07	USTKA	54	35	15,68487	16	51	13,87512	33,871	1,603		32,268	32,158	-11			
	Portugal															
PT01	BARCA_D'A	41	1	19,60277	-6	56	28,21367	221,758	165,953		55,805	55,949	14			
PT02	CASCAIS	38	41	24,33815	-9	25	34,03793	65,814	12,147		53,667	53,496	-17	CASCAIS	53,455	-21
PT03	ELVAS	38	52	43,91747	-7	3	6,13859	229,938	174,931		55,007	55,017	1			
PT04	LEIXOES	41	11	46,92145	-8	42	25,24731	70,077	14,866		55,211	55,157	-5	LEIXOES	55,078	-13
PT05	LAGOS	37	6	0,11833	-8	40	7,46911	55,350	2,597		52,753	52,693	-6	LAGOS	52,623	-13
	Romania															
RO01	SIRCA_(IA	47	14	33,71793	27	12	14,47042	222,943	190,136		32,807	33,137	33			
RO02	CONSTANTA	44	10	6,95436	28	39	32,41995	37,210	3,561		33,649	33,781	13			
RO03	TIMISOARA	45	44	18,08854	21	20	45,35298	140,154	96,980		43,174	43,178	0			
RO04	HEIGHT_ZE	44	35	17,36557	28	37	26,57386	156,385	122,777		33,608	33,792	18			
	Slovakia															

Compilation of the Numerical Results

Name		Ellipsoidal coordinates in ITRF96 Epoch 1997.4							Normal Height	Re-	h-H	EGG97	EGG97 -	Tide Gauge	h(MSL)	H(MSL)
		Latitude φ			Longitude λ			Height h	H in UELN-95/98	mark		Geoid	(h-H)		1997	1997
		°	′	″	°	′	″	in m	in m		in m	in m	in cm		in m	in cm
SK01	KAMENICA	47	50	11,87710	18	43	45,95072	261,734	218,047		43,687	43,523	-16			
SK02	GANOVCE	49	2	4,61129	20	19	24,65621	743,181	701,273		41,908	41,506	-40			
SK03	STRECNO	49	9	57,34325	18	53	4,18082	415,057	372,356		42,701	42,085	-62			
	Slovenia															
SI01	VELIKA_PI	46	17	10,93335	15	11	7,52165	342,174	295,255		46,919	46,751	-17			
SI02	LENDAVSKE	46	33	57,18812	16	28	36,85857	385,192	339,820		45,372	45,308	-6			
SI03	MALIJA	45	30	13,63428	13	38	36,20645	323,128	278,186		44,942	45,047	10			
	Spain															
ES01	ALICANTE	38	20	20,10890	0	28	52,43181	60,345	9,998		50,347	50,598	25	ALICANTE_II	49,912	-44
ES02	ALMERIA	36	51	8,89437	-2	27	33,17980	125,046	74,251		50,795	50,489	-31			
ES03	BARCELONA	41	21	3,30654	2	9	26,63692	67,662	18,170		49,492	49,903	41			
ES04	CASETAS	41	43	17,56720	-1	1	28,67431	269,637	219,285		50,352	50,412	6			
EBRE	13410M001	40	49	15,19270	0	29	32,49730	107,811	57,708		50,103	50,379	28			
ES05	LA_CORUNA	43	21	51,77577	-8	23	56,16555	66,965	12,123		54,842	54,685	-16	LA_CORUNA_II	54,711	-13
MADE	MADRID/RO	40	25	38,03319	-4	14	57,07578	815,091	762,103		52,988	52,992	0			
ES06	PALMA_DE_	39	33	9,34996	2	37	28,60337	59,084	10,083		49,001	50,090	109			
ES07	PUERTOLLA	38	41	12,31993	-4	6	37,76123	763,215	709,871		53,344	53,796	45			
ES08	SANTANDER	43	27	41,05438	-3	47	21,96072	59,288	8,968		50,320	50,564	24			
SFER	13402M004	36	27	51,63884	-6	12	20,32873	84,180	38,939		45,241	44,914	-33			
VILL	13406M001	40	26	36,93115	-3	57	7,13101	647,365				51,859				
	Sweden															
KIR0	10422M001	67	52	39,26904	21	3	36,85427	497,993	469,536		28,457	28,505	5			
KIRR	KIRUNA_R	67	52	39,26901	21	3	36,85452	497,989				28,505				
SE02	KUNGSHOLM	56	6	15,26486	15	35	20,51671	35,203	2,430		32,773	32,630	-14	KUNGSHOLMSFORT	32,846	7
MAR6	10405M002	60	35	42,51377	17	15	30,68640	75,389	50,728		24,661	24,697	4			
MARR	MAARTSBO_	60	35	42,51376	17	15	30,68658	75,396				24,697				
ONSA	10402M004	57	23	43,07174	11	55	31,85504	45,563	9,129		36,434	36,508	7			
ONS0	10402M004	57	23	43,07172	11	55	31,85485	45,573				36,508				
SE03	OESTERSUN	63	26	34,05410	14	51	29,03963	490,030	458,645		31,385	31,339	-5			
SE04	RATAN	63	59	8,12337	20	53	44,04680	31,341	10,310		21,031	20,997	-3	RATAN	21,276	25
SE05	SKELLEFTE	64	52	45,10674	21	2	53,83547	81,211	59,179		22,032	22,029	0			
SE0R	SKELLEFTE	64	52	45,10675	21	2	53,83544	81,211				22,029				
SE06	SMOEGEN	58	21	12,46751	11	13	4,53352	45,212	9,098		36,114	36,285	17			
SE07	STOCKHOLM	59	19	20,40376	18	5	27,25280	35,100	12,103		22,997	23,060	6	STOCKHOLM	23,173	18
VIS0	10423M001	57	39	13,92791	18	22	2,33283	79,801	54,846		24,955	25,121	17			

Compilation of the Numerical Results																
Name		Ellipsoidal coordinates in ITRF96 Epoch 1997.4							Normal Height	Re-	h-H	EGG97	EGG97 -	Tide Gauge	h(MSL)	H(MSL)
		Latitude φ			Longitude λ			Height h	H in UELN-95/98	mark		Geoid	(h-H)		1997	1997
		°	′	″	°	′	″	in m	in m		in m	in m	in cm		in m	in cm
VISR	VISBY_R	57	39	13,92782	18	22	2,33289	79,803				25,121				
VIL0	10424M001	64	41	52,24717	16	33	35,74309	449,957	420,321		29,636	29,510	-13			
VILR	VILHELMIN	64	41	52,24713	16	33	35,74333	449,958				29,510				
	Switzerland															
CH01	CHRISCHON	47	34	1,39113	7	40	6,98909	504,939	455,773		49,166	48,971	-20			
CH02	BOURG_ST.	45	57	30,98633	7	12	34,24312	1683,447	1629,321		54,126	53,747	-38			
CH03	LA_GIVRIN	46	27	14,69594	6	6	7,33159	1258,263	1207,278		50,985	50,798	-19			
CH04	OBERALP	46	39	35,13162	8	40	13,72432	2094,224	2042,489		51,735	51,357	-38			
CH05	SIBLINGEN	47	42	46,86855	8	29	55,98795	563,329	514,832		48,497	48,294	-20			
CH06	STABIO	45	51	5,21663	8	56	25,22036	429,710	382,128		47,582	47,175	-41			
CH07	ZERNEZ	46	41	54,88182	10	6	2,59650	1612,694	1560,915		51,779	51,306	-47			
ZIMM	14001M004	46	52	37,54645	7	27	54,98947	956,347	906,877		49,470	49,188	-28			
	Turkey															
ANKR	20805M002	39	53	14,53231	32	45	30,49172	976,044	939,301	(7)	36,743	36,612	-13			
TR01	ANTALYA	36	49	42,60108	30	36	33,66384	31,538	4,926	(7)	26,612	25,057	-156	ANTALYA_II	26,633	2
TR02	ERDEK	40	23	25,68390	27	50	42,29932	39,996	1,656	(7)	38,340	38,573	23	ERDEK	38,651	31
TR03	20803M001	37	22	39,58710	33	11	28,51771	1357,743	1323,541	(7)	34,202	34,007	-20			
TR04	MENTES	38	25	35,89299	26	43	2,95300	58,638	20,348	(7)	38,290	37,784	-51	MENTES/IZMIR	38,292	0
TR05	20804M001	40	56	13,18510	31	26	19,67678	822,674	785,624	(7)	37,050	35,601	-145			
TR06	20802M001	39	48	1,90492	34	48	46,84868	1677,045	1641,991	(7)	35,054	34,629	-43			
	Ukraine															
UK01	KIEV	50	21	51,02088	30	29	48,39156	224,880	199,520	(1)	25,360	25,564	20			
UK02	UZHGORAD	48	33	46,36473	22	27	9,43030	273,803	235,414	(1)	38,389	38,465	8			
UK03	MYKOLAIV	46	58	17,47276	31	58	24,23905	78,242	52,668	(1)	25,574	25,726	15			
UK04	SIMEIZ	44	24	55,28016	33	59	29,77742	386,475	362,114	(1)	24,361	23,121	-124			
	United Kingdom															
GB01	13299S001	55	12	46,04045	-1	41	7,79269	144,419	95,483		48,936	49,913	98			
GB02	BELFAST	54	37	20,05074	-5	55	26,51534	67,916	11,813	(6)	56,103	56,136	3			
GB03	13296M002	56	28	42,59111	-2	46	58,76247	57,799	6,810		50,989	51,661	67			
GB04	GIBRALTAR	36	7	54,41047	-5	21	20,91023	45,468	2,456		43,012	43,171	16	GIBRALTAR	42,744	-27
GB05	SOUTHAMPT	50	55	50,76538	-1	27	2,49327	98,599	52,185		46,414	46,732	32			
GB06	LERWICK	60	8	53,92755	-1	8	25,82262	96,153	46,853	(8)	49,300	49,838	54	LERWICK	49,367	7
HERS	13212M007	50	52	2,32485	0	20	10,57121	76,501				45,026				
HERE	HERSTMONC	50	52	2,65241	0	20	8,20454	70,821				45,026				
GB07	KIRKBY_ST	54	26	47,75093	-2	23	10,95067	356,129	304,233		51,896	52,428	53			

Compilation of the Numerical Results																
Name		Ellipsoidal coordinates in ITRF96 Epoch 1997.4							Normal Height	Re-	h-H	EGG97	EGG97 -	Tide Gauge	h(MSL)	H(MSL)
		Latitude φ			Longitude λ			Height h	H in UELN-95/98	mark		Geoid	(h-H)		1997	1997
		°	´	˝	°	´	˝	in m	in m		in m	in m	in cm		in m	in cm
GB08	NEWLYN	50	6	10,59460	-5	32	34,54190	57,522	4,495		53,027	53,419	39	NEWLYN	53,140	11
GB09	NOTTINGHA	52	56	26,48262	-1	11	32,22278	98,480	49,923		48,557	48,955	40			
	Russia															
ZWEN	12330M001	55	41	57,41629	36	45	31,05237	205,002				15,203				
KIT3	12334M001	39	8	5,15936	66	53	7,59466	622,524				-36,686				

Remarks

(1) normal Heights transformed from tide gauge Kronstadt to tide gauge Amsterdam by +15cm
(2) normal Heights /Ajaccio
(3) orthom. Heights /Malin Head
(4) normal Heights /Cagliari
(5) normal-orth. Heights /Trieste
(6) height system and/or tide gauge unknown
(7) normal-orth. Heights /Antalya
(8) orthom. Heights /Lerwick
(9) orthom. Heights /Larnaka

The UELN heights of the EUVN stations in Finland, Norway and Sweden were reduced from the epoch 1960 to the epoch of the GPS measurement (1997) by the values of the land uplift.

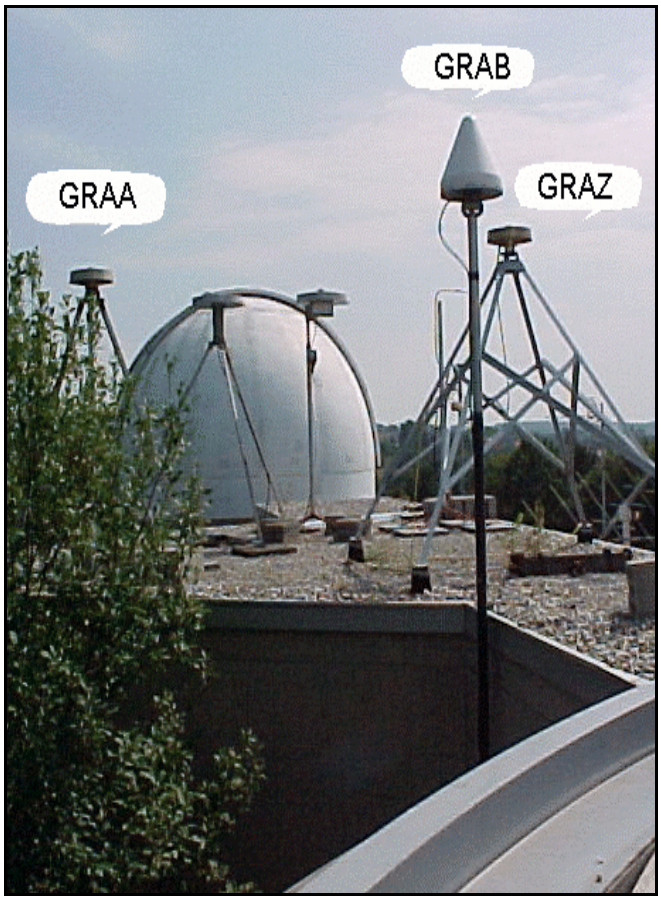
Station Documentation

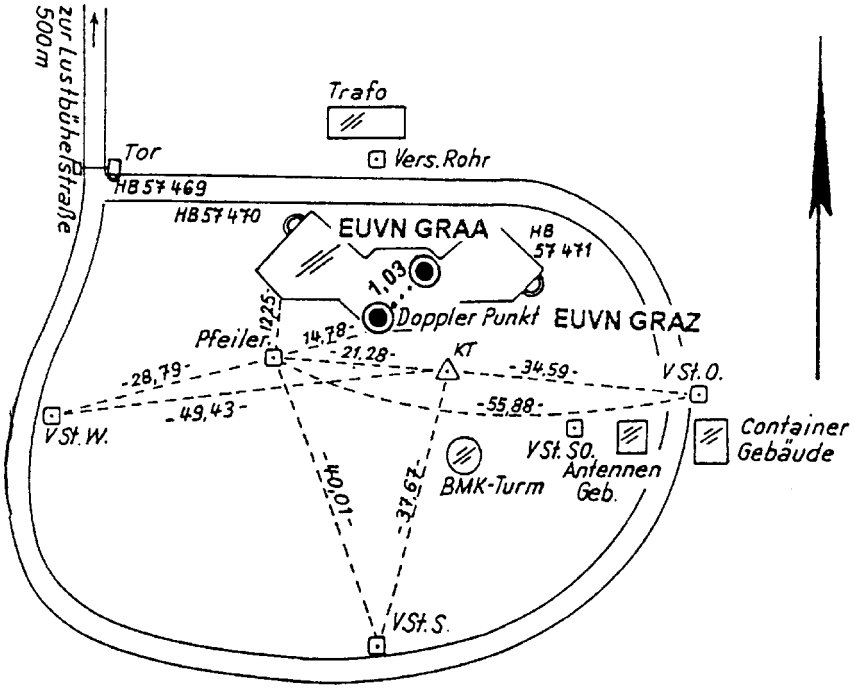
European Vertical GPS Reference Network (EUVN)

Station Graz

Site Identification of the GPS Monument	
4-Char. EUVN ID	GRAZ
DOMES Number	11001 M 002
Monument Inscription/National Site Number	Central reference marker T306-164B1
Marker Type, Monumentation Type, Foundation	
Mark dot of coordinates	

Site Location Information	
City or Town	Graz
State or Province	Steiermark
Country	Austria
Responsible Agency (Full Address)	Institute for Space Research Lustbuehelstr. 46 A-8042 Graz Austria
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4194424.128 m Y = 1162702.459 m Z = 4647245.193 m
Height in UELN-95/98	490.925 m
Gravity in ISGN71	980 695.80 mgal



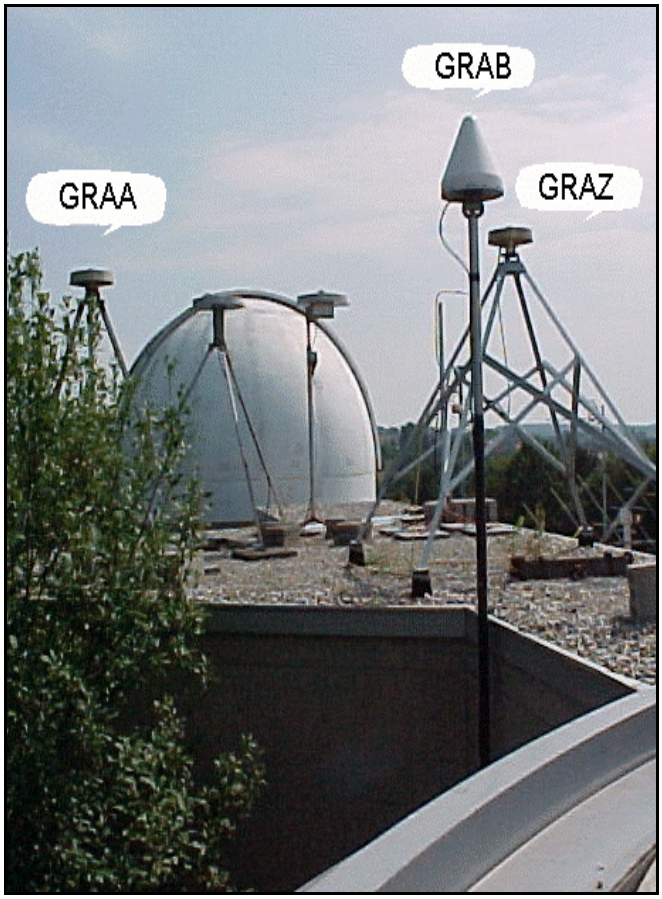


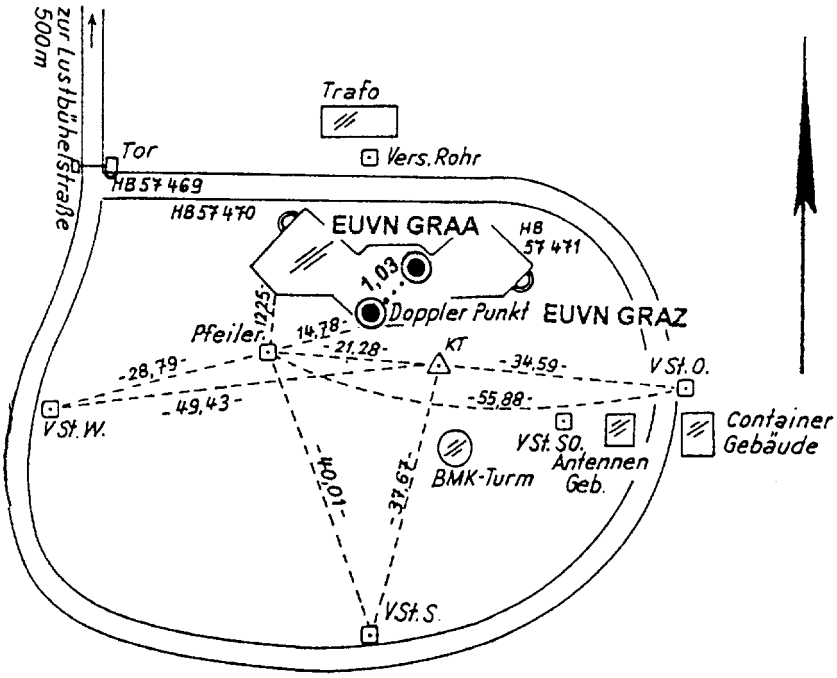
European Vertical GPS Reference Network (EUVN)

Station Graz A

Site Identification of the GPS Monument	
4-Char. EUVN ID	GRAA
DOMES Number	11001 M 003
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	
Mark dot of coordinates	

Site Location Information	
City or Town	Graz
State or Province	Steiermark
Country	Austria
Responsible Agency (Full Address)	Institute for Space Research Lustbuehelstr. 46 A-8042 Graz Austria
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4194422.664 m Y = 1162702.998 m Z = 4647248.799 m
Height in UELN-95/98	
Gravity in ISGN71	



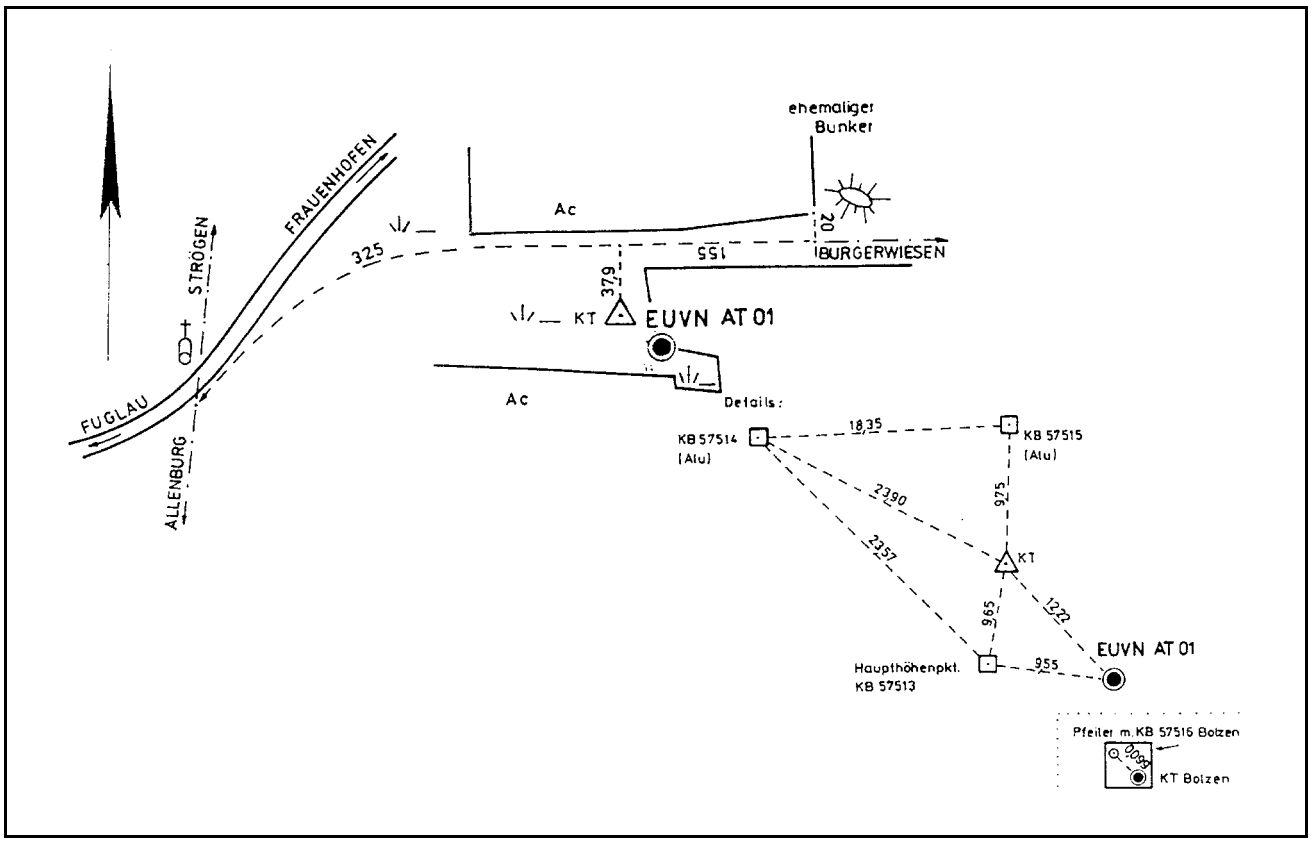


European Vertical GPS Reference Network (EUVN)

Station Hutbiegl

Site Identification of the GPS Monument	
4-Char. EUVN ID	AT01
DOMES Number	
Monument Inscription/National Site Number	KT T73-21B0
Marker Type, Monumentation Type, Foundation	Granite pillar with bolt (KT) and forced centring device
Mark dot of coordinates	Centre and top of the GPS marker thread inserted into the pillar

Site Location Information	
City or Town	Horn
State or Province	Niederösterreich
Country	Austria
Responsible Agency (Full Address)	Federal Office of Metrology and Surveying Schiffamtsgasse 1-3 A-1025 Wien Austria
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4066170.803 m Y = 1135173.163 m Z = 4765611.818 m
Height in UELN-95/98	411.123 m
Gravity in ISGN71	980 863.98 mgal

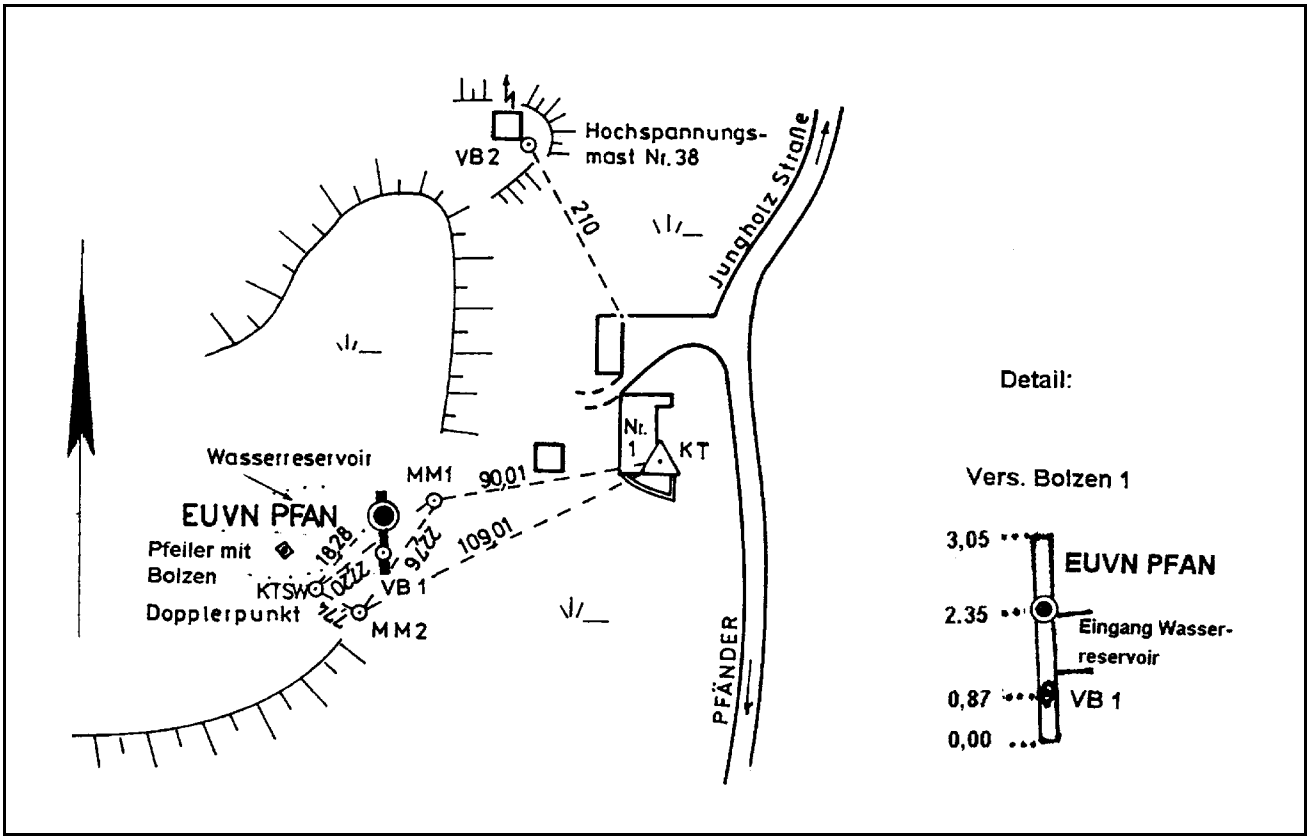


European Vertical GPS Reference Network (EUVN)

Station Pfaender

Site Identification of the GPS Monument	
4-Char. EUVN ID	PFAN
DOMES Number	11005 S 002
Monument Inscription/National Site Number	T39-82B1
Marker Type, Monumentation Type, Foundation	Pillar on fresh bedrock with cladding tube
Mark dot of coordinates	Centre and top of the thread insert into the pillar

Site Location Information	
City or Town	Bregenz
State or Province	Vorarlberg
Country	Austria
Responsible Agency (Full Address)	Institute for Space Research Lustbuehelstr. 46 A-8042 Graz Austria in cooperation with BKG, Germany
Contact Agency Information	Institute for Space Research Lustbuehelstr. 46 A-8042 Graz Austria in cooperation with BKG, Germany
Coordinates in ETRS89, Epoch 97.4	X = 4253560.346 m Y = 733544.737 m Z = 4681452.782 m
Height in UELN-95/98	1043.183 m
Gravity in ISGN71	980 518.53 mgal

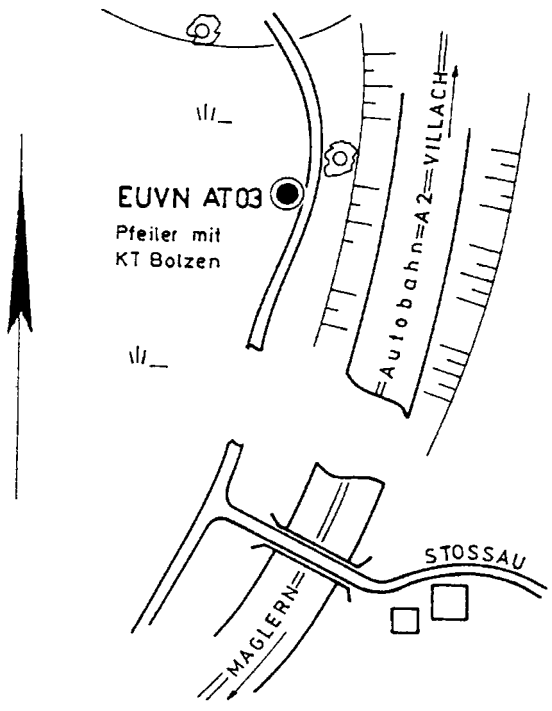


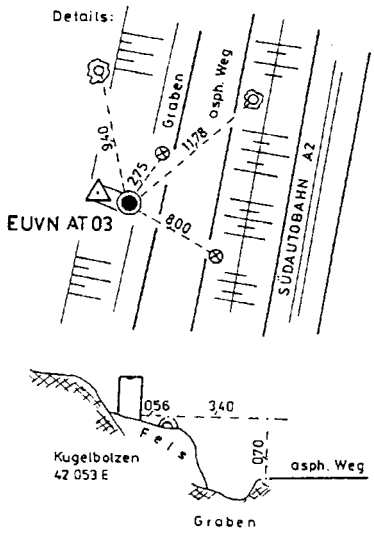
European Vertical GPS Reference Network (EUVN)

Station Thoerl-Maglern

Site Identification of the GPS Monument	
4-Char. EUVN ID	AT03
DOMES Number	
Monument Inscription/National Site Number	KT 397-200B0
Marker Type, Monumentation Type, Foundation	Pillar with bolt (KT) and forced centring device, set in bedrock
Mark dot of coordinates	Centre and top of the GPS marker thread inserted into the pillar

Site Location Information	
City or Town	Arnoldstein
State or Province	
Country	Austria
Responsible Agency (Full Address)	Federal Office of Metrology and Surveying Schiffamtsgasse 1-3 A-1025 Wien Austria
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4269552.780 m Y = 1039497.353 m Z = 4608324.622 m
Height in UELN-95/98	638.588 m
Gravity in ISGN71	980 553.69 mgal



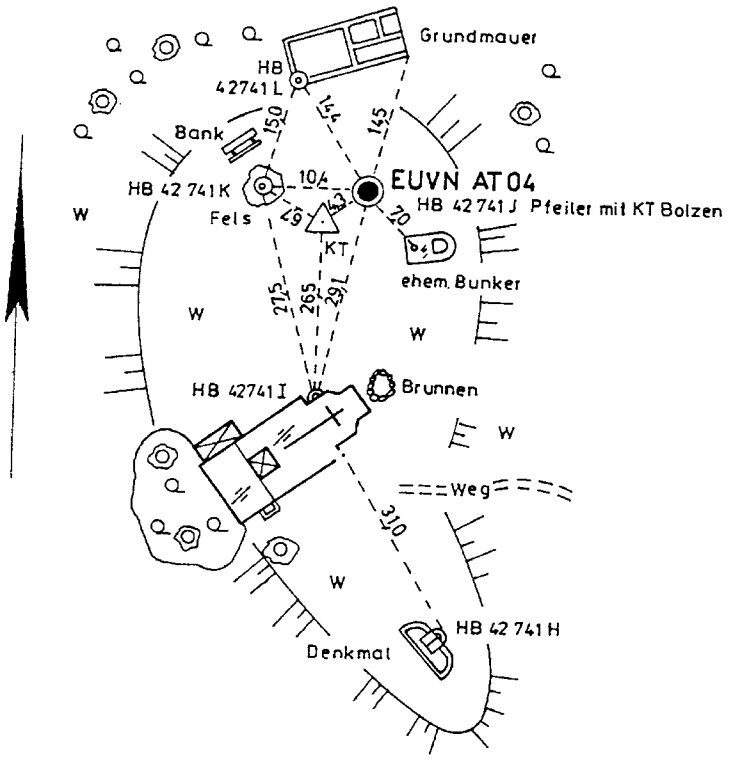


European Vertical GPS Reference Network (EUVN)

Station Woergl

Site Identification of the GPS Monument	
4-Char. EUVN ID	AT04
DOMES Number	
Monument Inscription/National Site Number	KT T89-121B0
Marker Type, Monumentation Type, Foundation	Pillar with bolt (KT) and forced centring device
Mark dot of coordinates	Centre and top of the GPS marker thread inserted into the pillar

Site Location Information	
City or Town	Woergl
State or Province	Tirol
Country	Austria
Responsible Agency (Full Address)	Federal Office of Metrology and Surveying Schiffamtsgasse 1-3 A-1025 Wien Austria
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4221962.890 m Y = 903799.802 m Z = 4679665.487 m
Height in UELN-95/98	582.508 m
Gravity in ISGN71	980 614.18 mgal

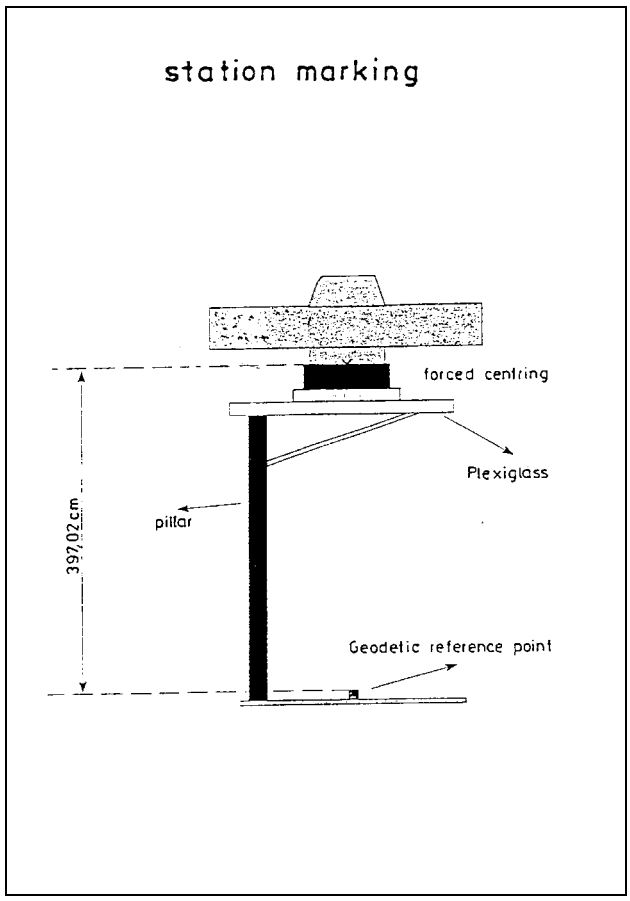


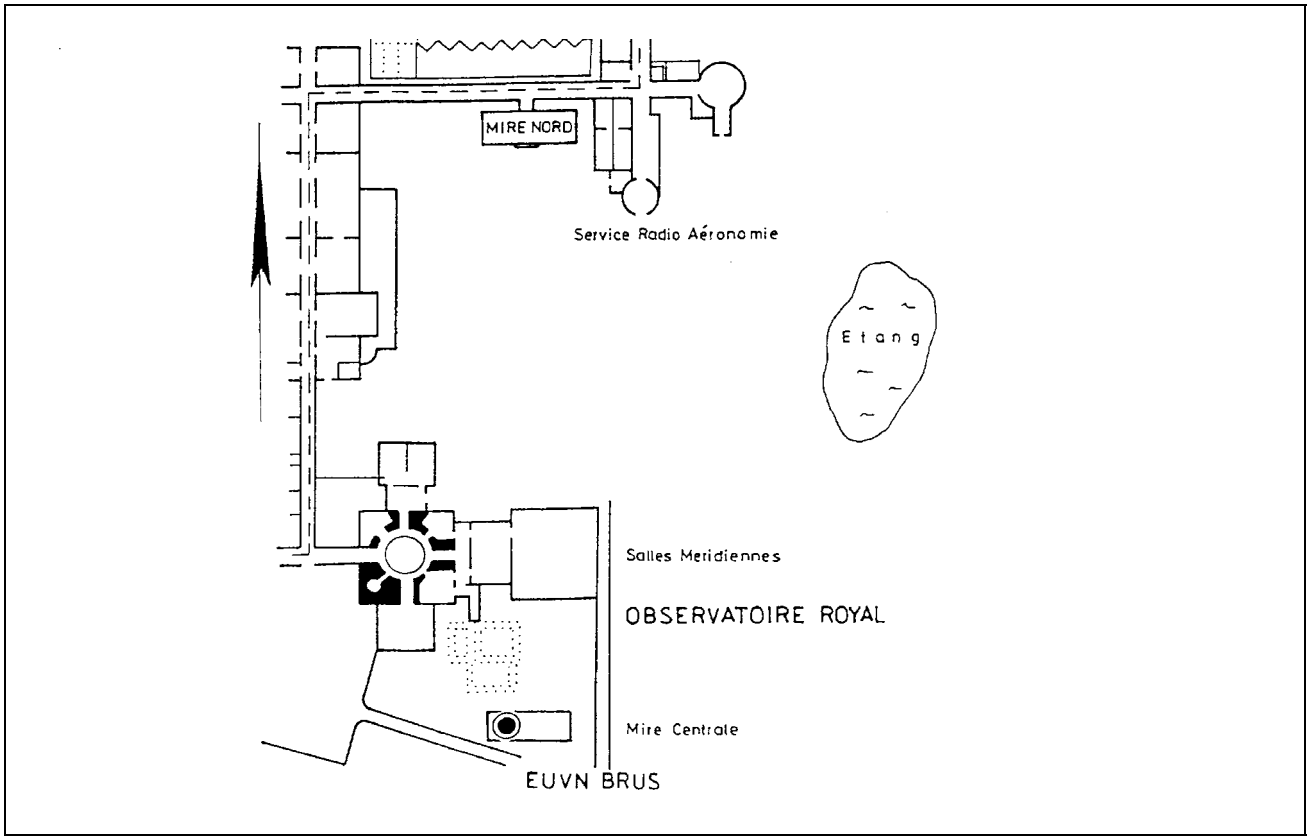
European Vertical GPS Reference Network (EUVN)

Station Brussels/Uccle

Site Identification of the GPS Monument	
4-Char. EUVN ID	BRUS
DOMES Number	13101 M 004
Monument Inscription/National Site Number	31G03C3
Marker Type, Monumentation Type, Foundation	Special pillar with acrylic glass plate over bolt in base plate
Mark dot of coordinates	Centre and top of the bolt

Site Location Information	
City or Town	Brussels
State or Province	Brabant
Country	Belgium
Responsible Agency (Full Address)	Royal Observatory of Belgium Av. Circulaire No. 3 B-1180 Bruxelles Belgium
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4027894.012 m Y = 307045.600 m Z = 4919474.907 m
Height in UELN-95/98	104.437 m
Gravity in ISGN71	981 115.112 mgal



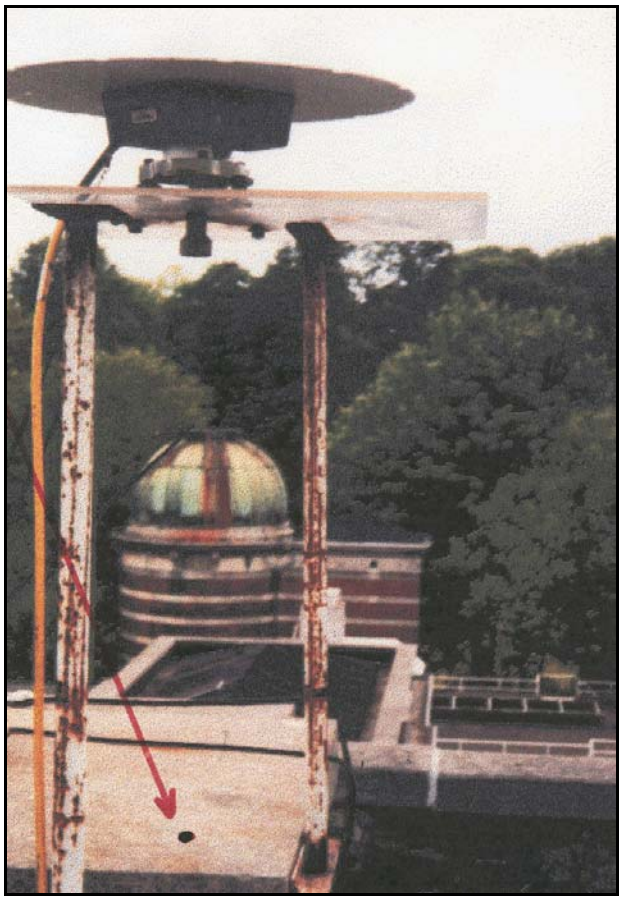


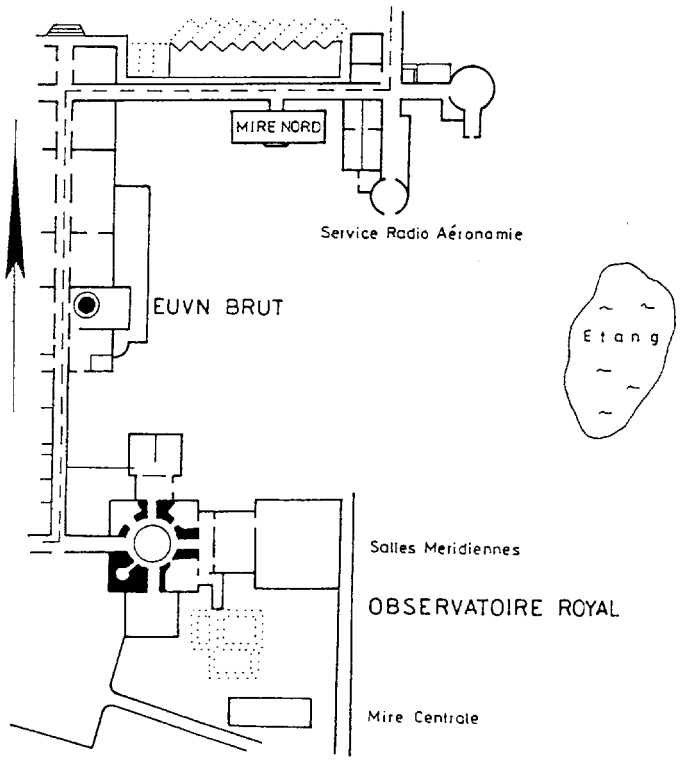
European Vertical GPS Reference Network (EUVN)

Station Brussels/Uccle

Site Identification of the GPS Monument	
4-Char. EUVN ID	BRUT
DOMES Number	13101 M 003
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Iron tube support with plate over bolt in masoned plate on building roof
Mark dot of coordinates	Centre and top of the bolt

Site Location Information	
City or Town	Brussels
State or Province	Brabant
Country	Belgium
Responsible Agency (Full Address)	Royal Observatory of Belgium Av. Circulaire No. 3 B-1180 Bruxelles Belgium
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4027828.748 m Y = 307014.080 m Z = 4919540.007 m
Height in UELN-95/98	
Gravity in ISGN71	



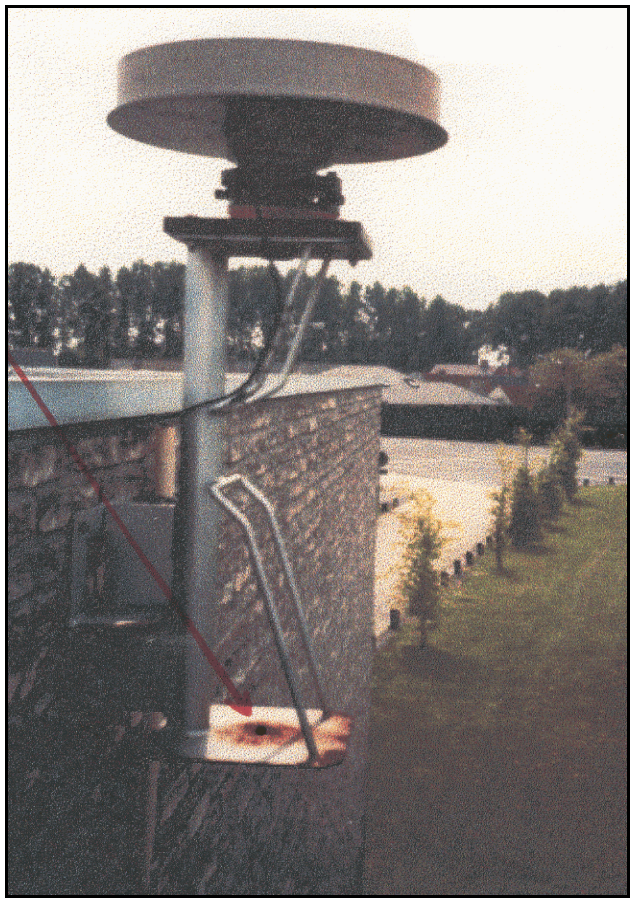


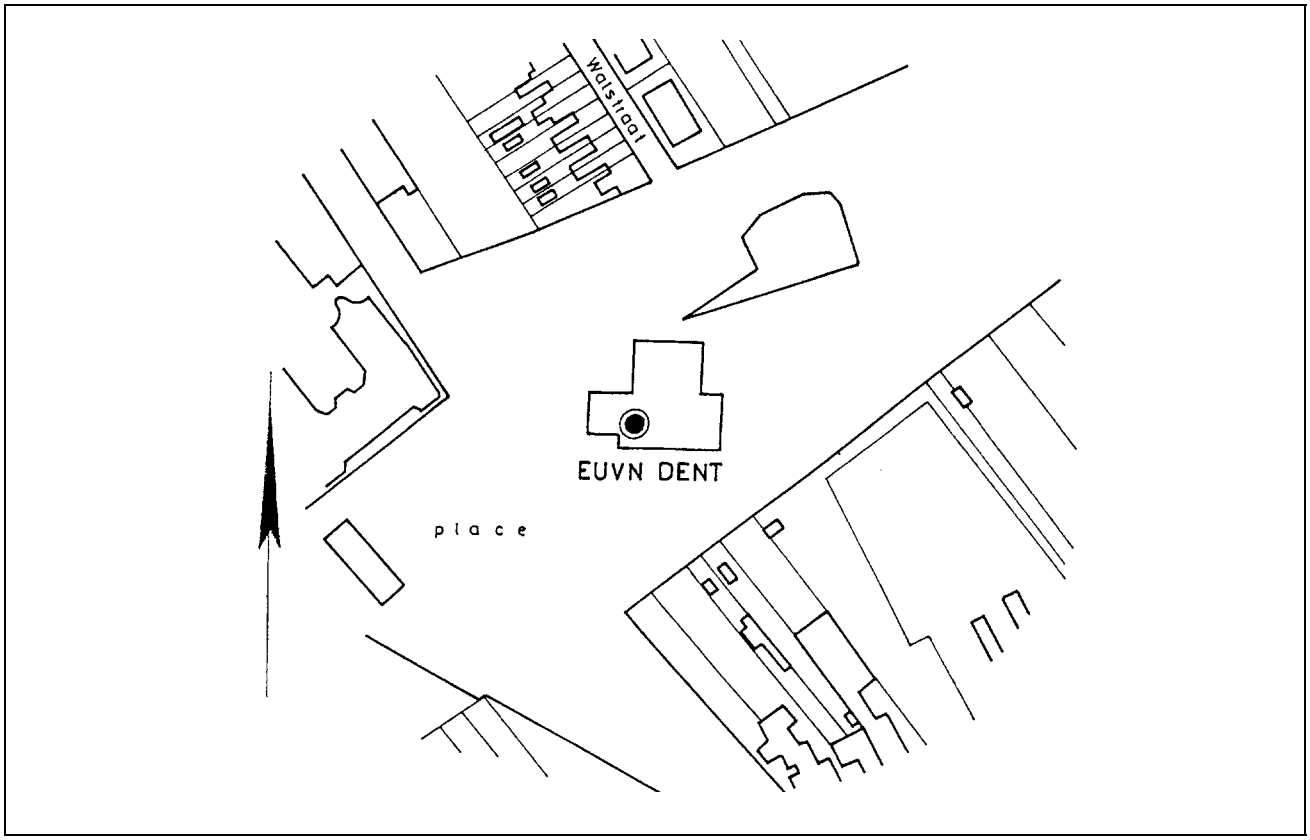
European Vertical GPS Reference Network (EUVN)

Station Dentergem

Site Identification of the GPS Monument	
4-Char. EUVN ID	DENT
DOMES Number	13112 M 001
Monument Inscription/National Site Number	21F13
Marker Type, Monumentation Type, Foundation	Iron tube support with plate over GPS marker (bolt) in metal plate on the external wall of a building
Mark dot of coordinates	Centre and top of the bolt

Site Location Information	
City or Town	Dentergem
State or Province	West-Vlaanderen
Country	Belgium
Responsible Agency (Full Address)	Royal Observatory of Belgium Av. Circulaire No. 3 B-1180 Bruxelles Belgium
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4020711.749 m Y = 238850.889 m Z = 4928949.441 m
Height in UELN-95/98	19.518 m
Gravity in ISGN71	981 129.372 mgal



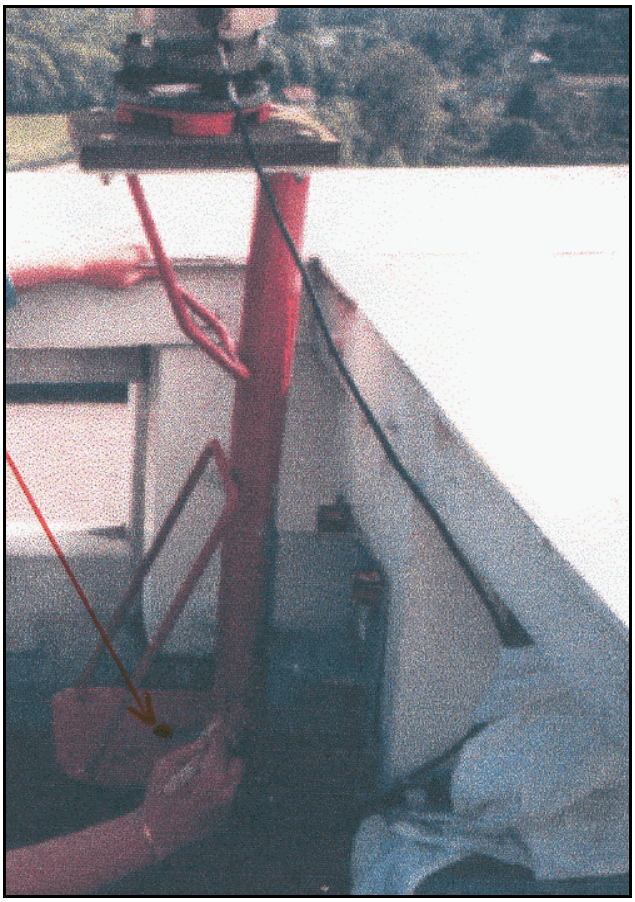


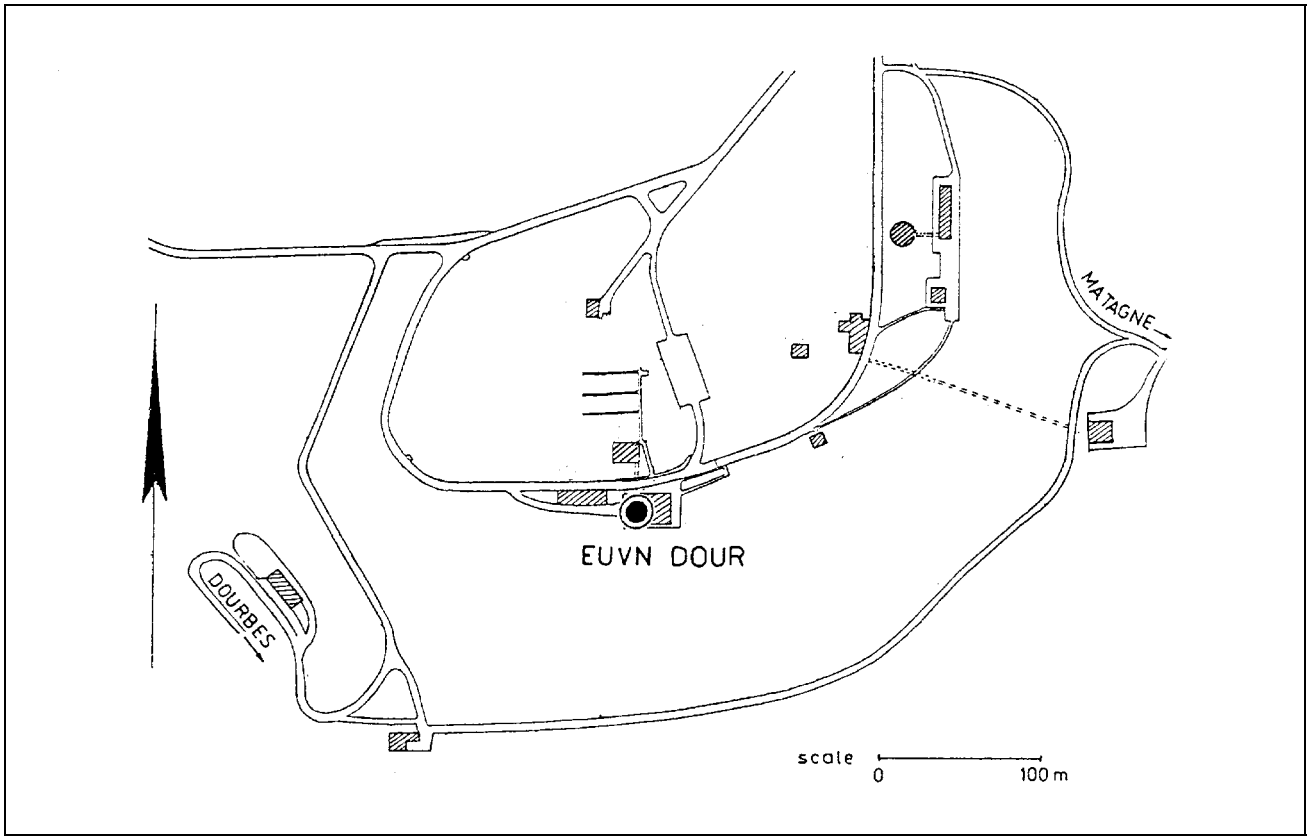
European Vertical GPS Reference Network (EUVN)

Station Dourbes

Site Identification of the GPS Monument	
4-Char. EUVN ID	DOUR
DOMES Number	13113 M 001
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Iron tube support with plate over GPS marker (bolt) in metal plate on the inside of the roof border
Mark dot of coordinates	Centre and top of the bolt

Site Location Information	
City or Town	Dourbes
State or Province	Hainout
Country	Belgium
Responsible Agency (Full Address)	Royal Observatory of Belgium Av. Circulaire No. 3 B-1180 Bruxelles Belgium
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4086778.421 m Y = 328451.758 m Z = 4869782.420 m
Height in UELN-95/98	236.643 m
Gravity in ISGN71	981 009.082 mgal



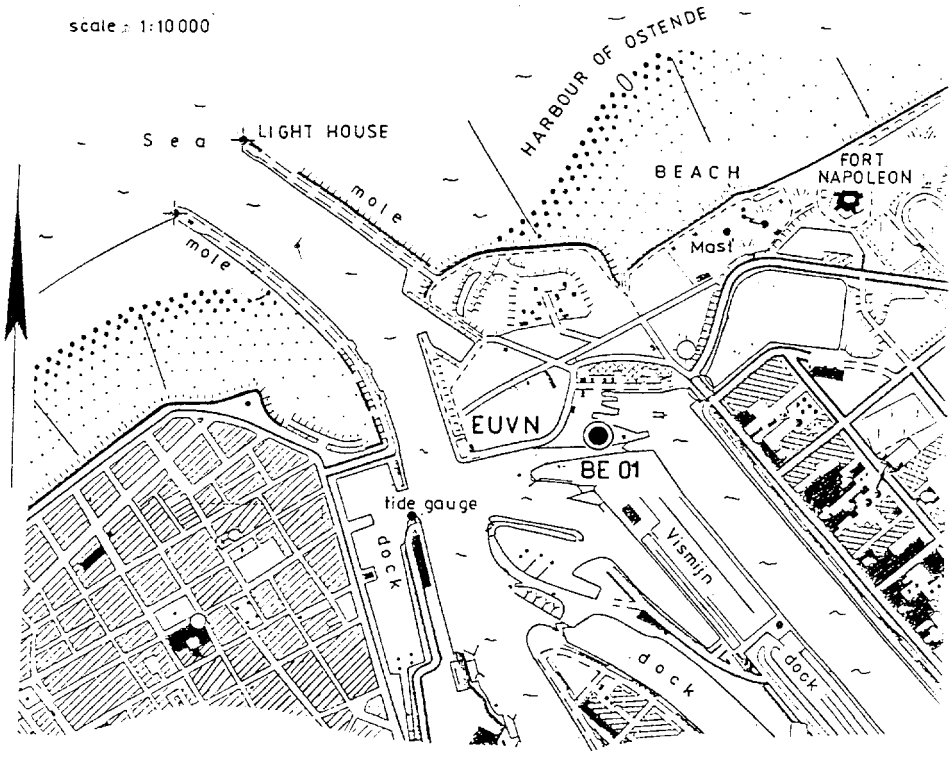


European Vertical GPS Reference Network (EUVN)

Station Ostende

Site Identification of the GPS Monument	
4-Char. EUVN ID	BE01
DOMES Number	
Monument Inscription/National Site Number	12B14R3
Marker Type, Monumentation Type, Foundation	Metal support with plate over a small pillar with inserted bolt on building roof
Mark dot of coordinates	Centre and top of the bolt

Site Location Information	
City or Town	Ostende
State or Province	
Country	Belgium
Responsible Agency (Full Address)	National Geographical Institute Abdij ter Kameren 13 B-1000 Bruxelles Belgium
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3996496.694 m Y = 204372.869 m Z = 4949993.891 m
Height in UELN-95/98	10.213 m
Gravity in ISGN71	981 172.213 mgal

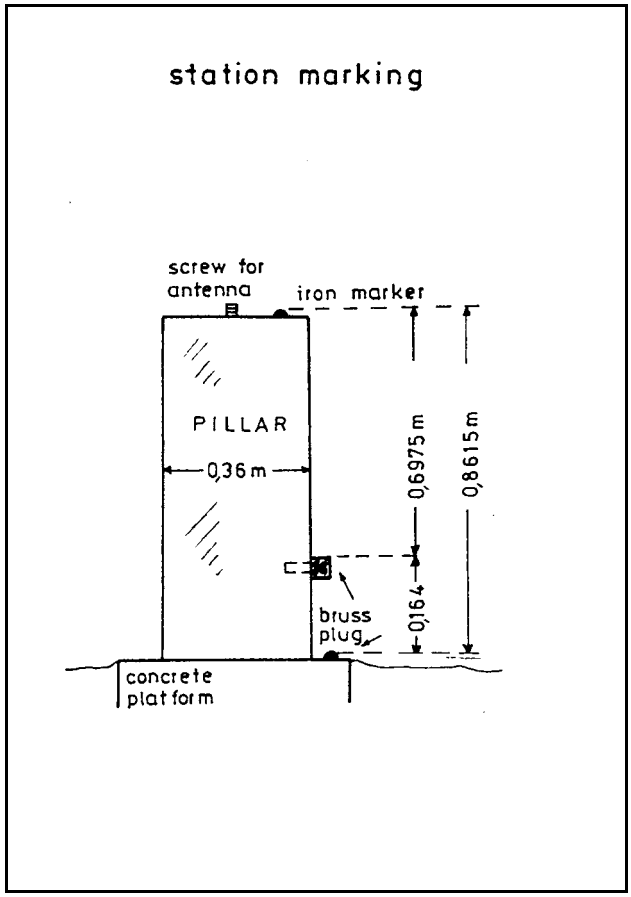


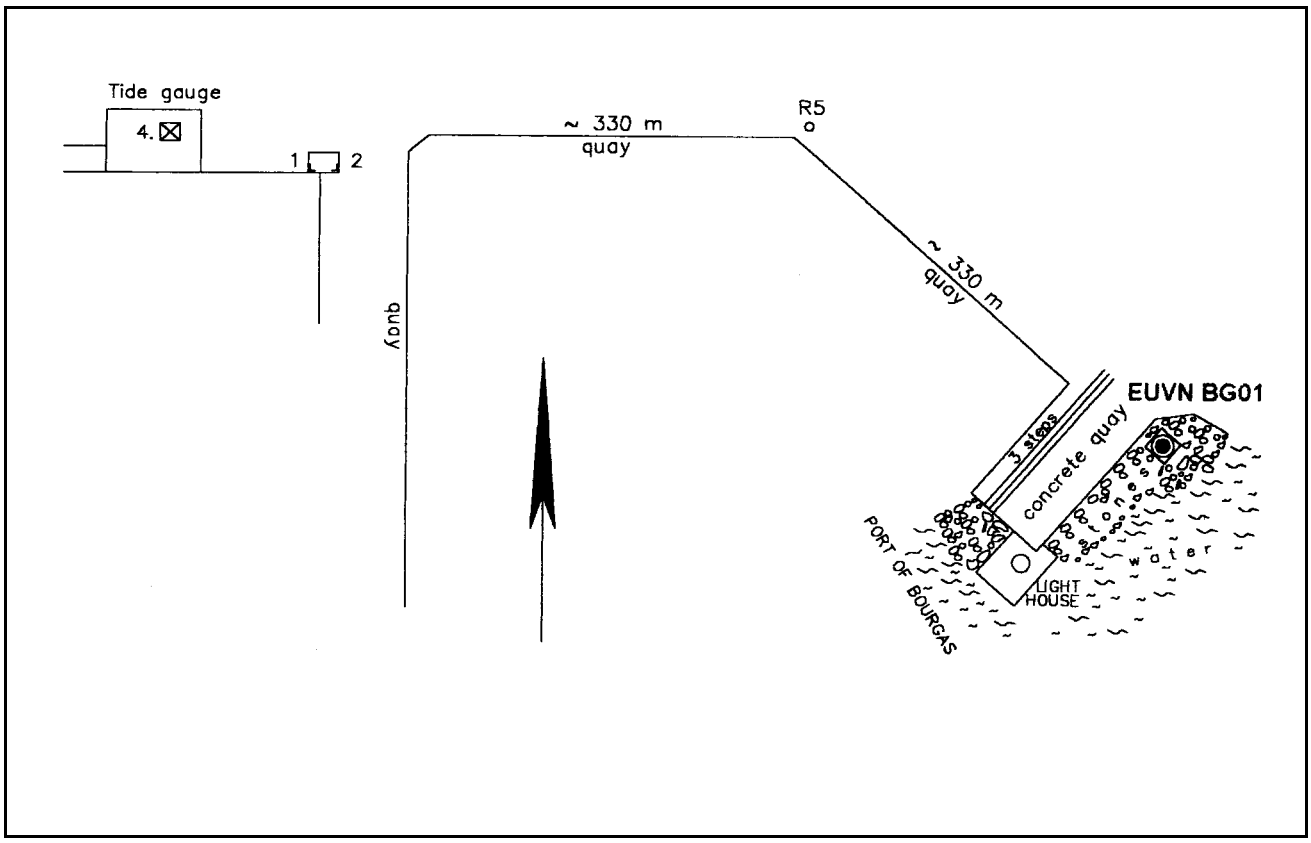
European Vertical GPS Reference Network (EUVN)

Station Burgas

Site Identification of the GPS Monument	
4-Char. EUVN ID	BG01
DOMES Number	
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Concrete pillar with brass plate and screw bolt inserted into a concrete slab, with forced centring device
Mark dot of coordinates	Centre of the screw bolt; for the height: bolt on pillar surface, inserted at the side

Site Location Information	
City or Town	Burgas
State or Province	
Country	Bulgaria
Responsible Agency (Full Address)	Ministery of Defence Military Topographic Service Boulev. Totleben Nr. 34 BG-1506 Sofia Bulgaria
Contact Agency Information	Bulgarian Academy of Sciences Central Laboratory for Geodesy Acad. G. Bonchev Srr. Bl. 1 BG – 1113 Sofia Bulgaria
Coordinates in ETRS89, Epoch 97.4	X = 4179321.660 m Y = 2173955.655 m Z = 4285391.943 m
Height in UELN-95/98	2.836 m (normal)
Gravity in ISGN71	980 436.489 mgal



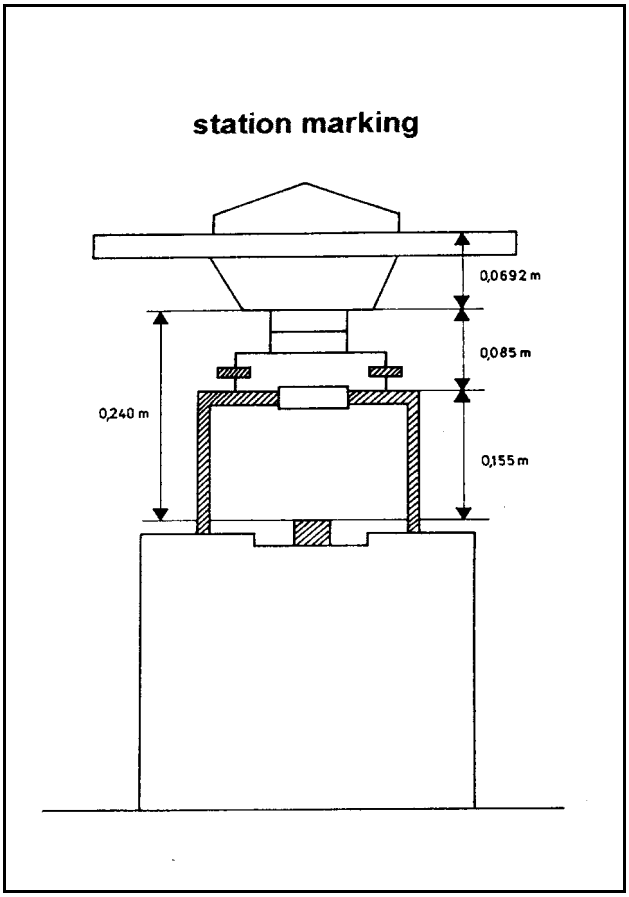


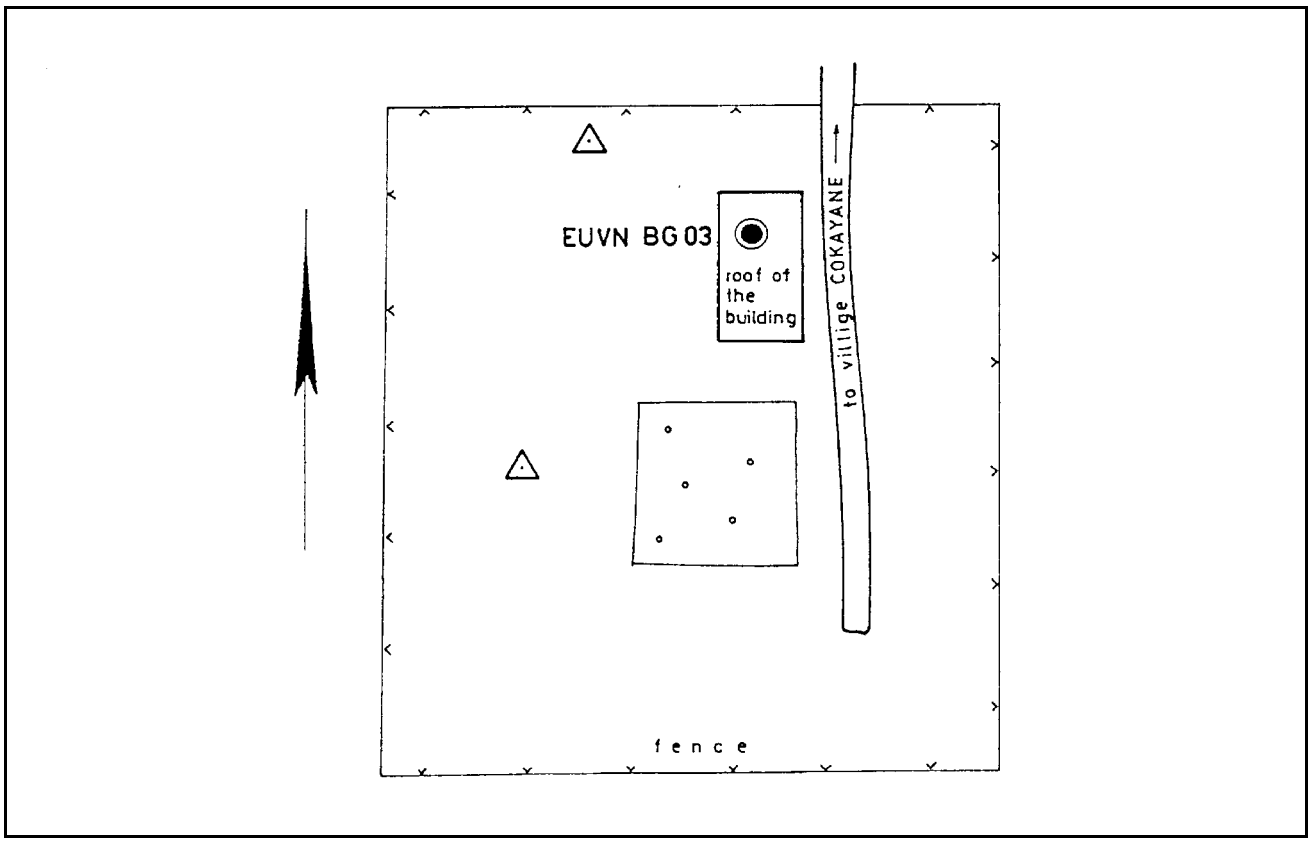
European Vertical GPS Reference Network (EUVN)

Station Sofia

Site Identification of the GPS Monument	
4-Char. EUVN ID	BG03
DOMES Number	
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Concrete pillar on the roof of the building, with iron bolt in the pilartop, with special forced centring device for tribrach
Mark dot of coordinates	Centre of the iron bolt; for the height: the upper surface of the plate of the centring device

Site Location Information	
City or Town	Sofia
State or Province	
Country	Bulgaria
Responsible Agency (Full Address)	Ministery of Defence Military Topographic Service Lewski Str. 3 BG-1000 Sofia Bulgaria
Contact Agency Information	Bulgarian Academy of Sciences Central Laboratory for Geodesy Acad. G. Bonchev Srr. Bl. 1 BG – 1113 Sofia Bulgaria
Coordinates in ETRS89, Epoch 97.4	X = 4319372.417 m Y = 1868687.544 m Z = 4292063.745 m
Height in UELN-95/98	1074.357 m (normal)
Gravity in ISGN71	980 139.836 mgal



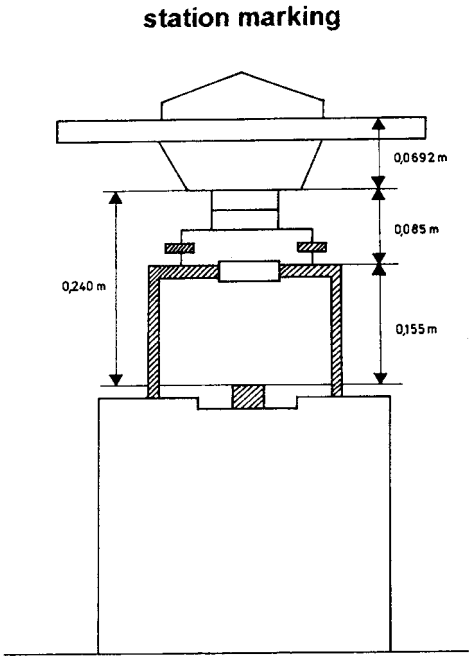


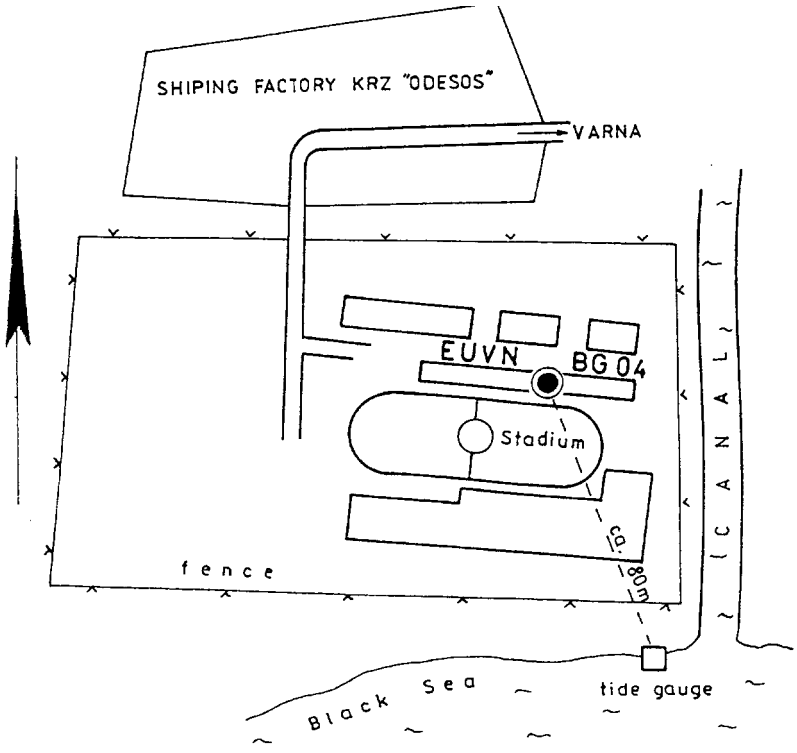
European Vertical GPS Reference Network (EUVN)

Station Varna

Site Identification of the GPS Monument	
4-Char. EUVN ID	BG04
DOMES Number	
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Pillar on base with screw bolt in brass plate on pillar top, with forced centring device for the antenna
Mark dot of coordinates	Centre of the screw bolt; for the height: the upper surface of the plate

Site Location Information	
City or Town	Varna
State or Province	
Country	Bulgaria
Responsible Agency (Full Address)	Ministry of Defence Military Topographic Service Lewski Str. 3 BG-1000 Sofia Bulgaria
Contact Agency Information	Bulgarian Academy of Sciences Central Laboratory for Geodesy Acad. G. Bonchev Srr. Bl. 1 BG – 1113 Sofia Bulgaria
Coordinates in ETRS89, Epoch 97.4	X = 4115657.895 m Y = 2179981.604 m Z = 4343159.351 m
Height in UELN-95/98	1.922 m (normal)
Gravity in ISGN71	980 471.726 mgal



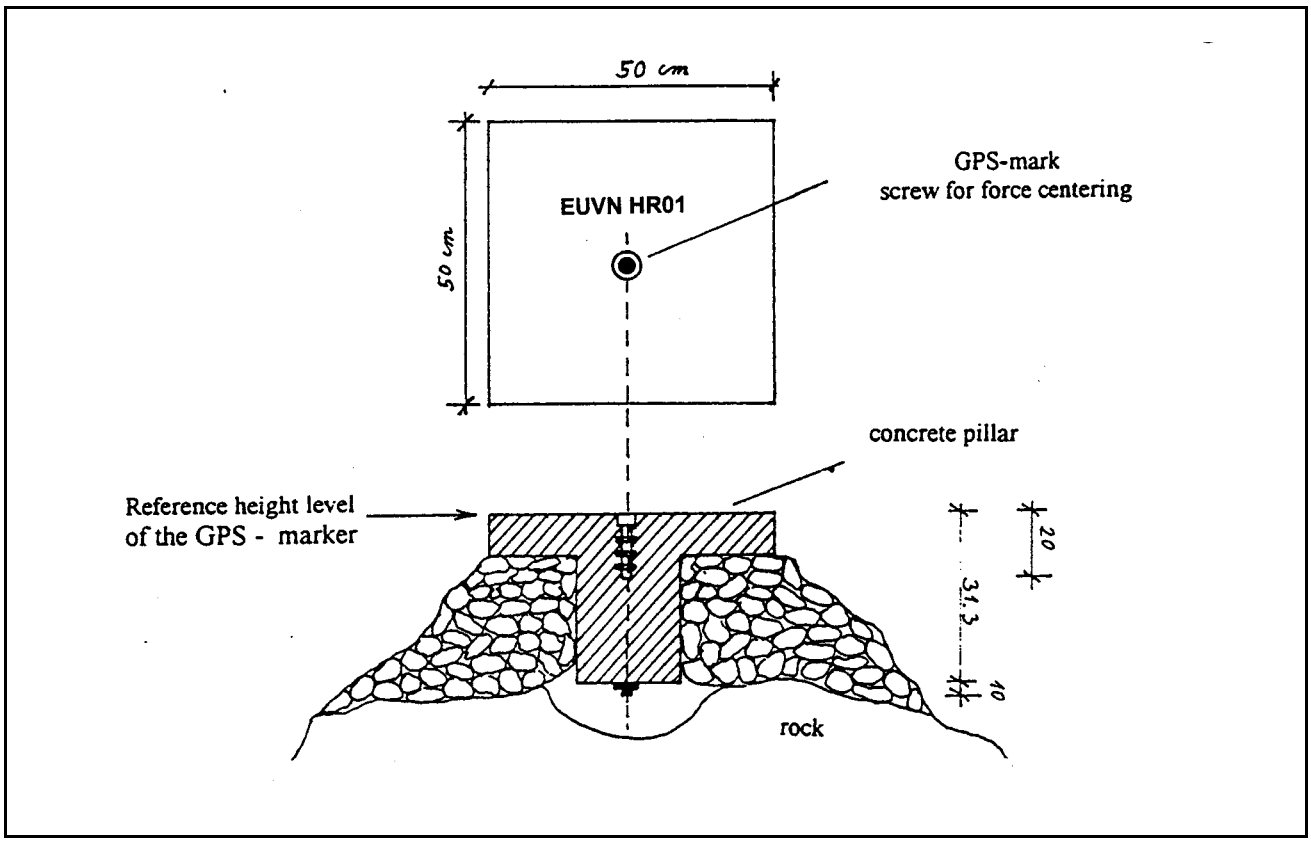


European Vertical GPS Reference Network (EUVN)

Station Bakar

Site Identification of the GPS Monument	
4-Char. EUVN ID	HR01
DOMES Number	
Monument Inscription/National Site Number	4.532
Marker Type, Monumentation Type, Foundation	Concrete pillar on rock with screw for forced centring
Mark dot of coordinates	Centre and top of the GPS marker

Site Location Information	
City or Town	Bakar
State or Province	
Country	Croatia
Responsible Agency (Full Address)	Republic of Croatia State Geodetic Administration Gruska 20 HR-10000 Zagreb Croatia
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4352648.180 m Y = 1132636.805 m Z = 4507507.009 m
Height in UELN-95/98	137.380 m
Gravity in ISGN71	

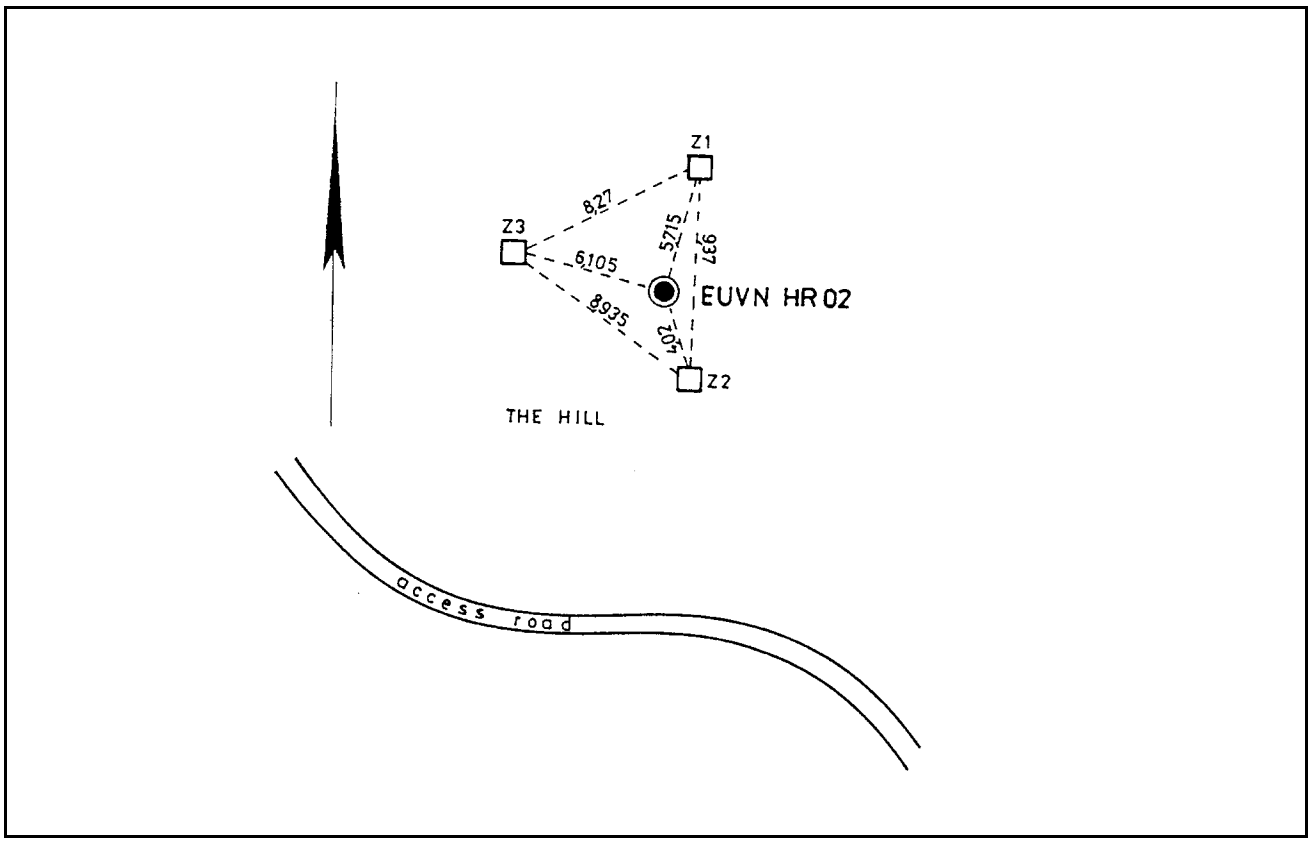


European Vertical GPS Reference Network (EUVN)

Station Brusnik

Site Identification of the GPS Monument	
4-Char. EUVN ID	HR02
DOMES Number	
Monument Inscription/National Site Number	1-384
Marker Type, Monumentation Type, Foundation	Concrete pillar with brass mark and screw for forced centring
Mark dot of coordinates	Centre and top of the brass marker

Site Location Information	
City or Town	Jastrebarsko
State or Province	
Country	Croatia
Responsible Agency (Full Address)	Republic of Croatia State Geodetic Administration Gruska 20 HR-10000 Zagreb Croatia
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4307966.082 m Y = 1200393.195 m Z = 4532778.725 m
Height in UELN-95/98	223.239 m
Gravity in ISGN71	

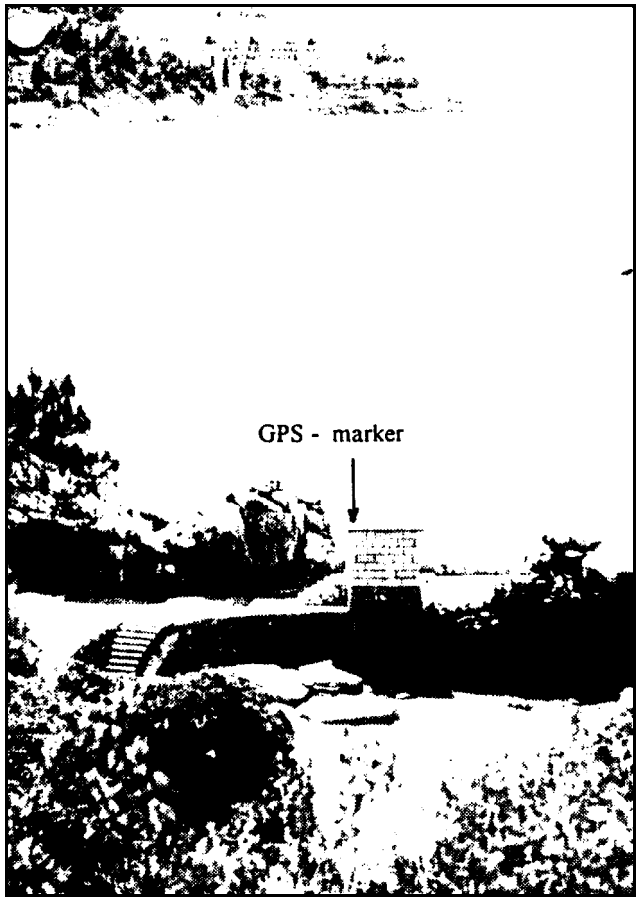


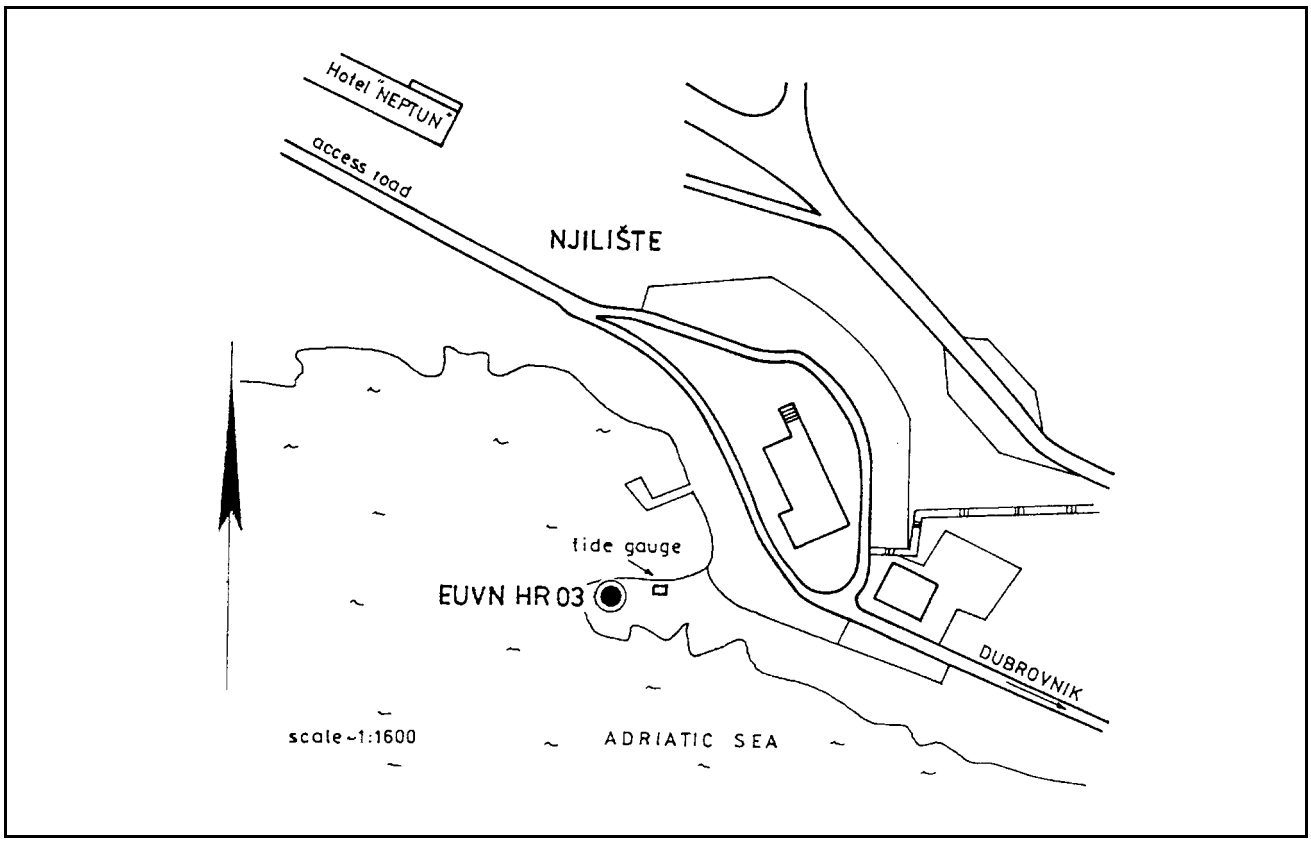
European Vertical GPS Reference Network (EUVN)

Station Dubrovnik

Site Identification of the GPS Monument	
4-Char. EUVN ID	HR03
DOMES Number	
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Screw bolt for forced centring, inserted on the roof of the tide gauge building
Mark dot of coordinates	Centre and top of the screw bolt

Site Location Information	
City or Town	Dubrovnik
State or Province	
Country	Croatia
Responsible Agency (Full Address)	Republic of Croatia State Geodetic Administration Gruska 20 HR-10000 Zagreb Croatia
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4466354.029 m Y = 1456445.241 m Z = 4299660.823 m
Height in UELN-95/98	5.347 m
Gravity in ISGN71	



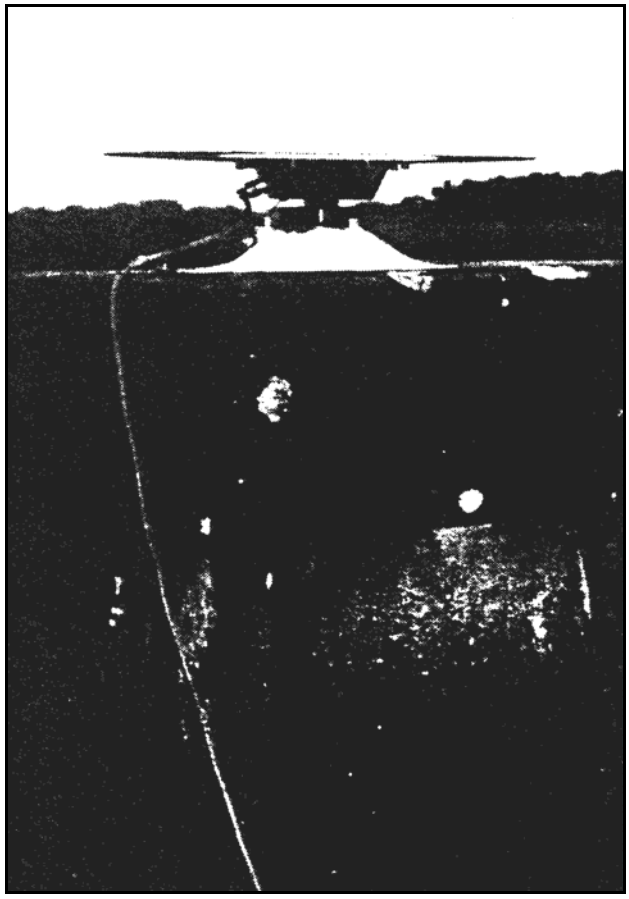


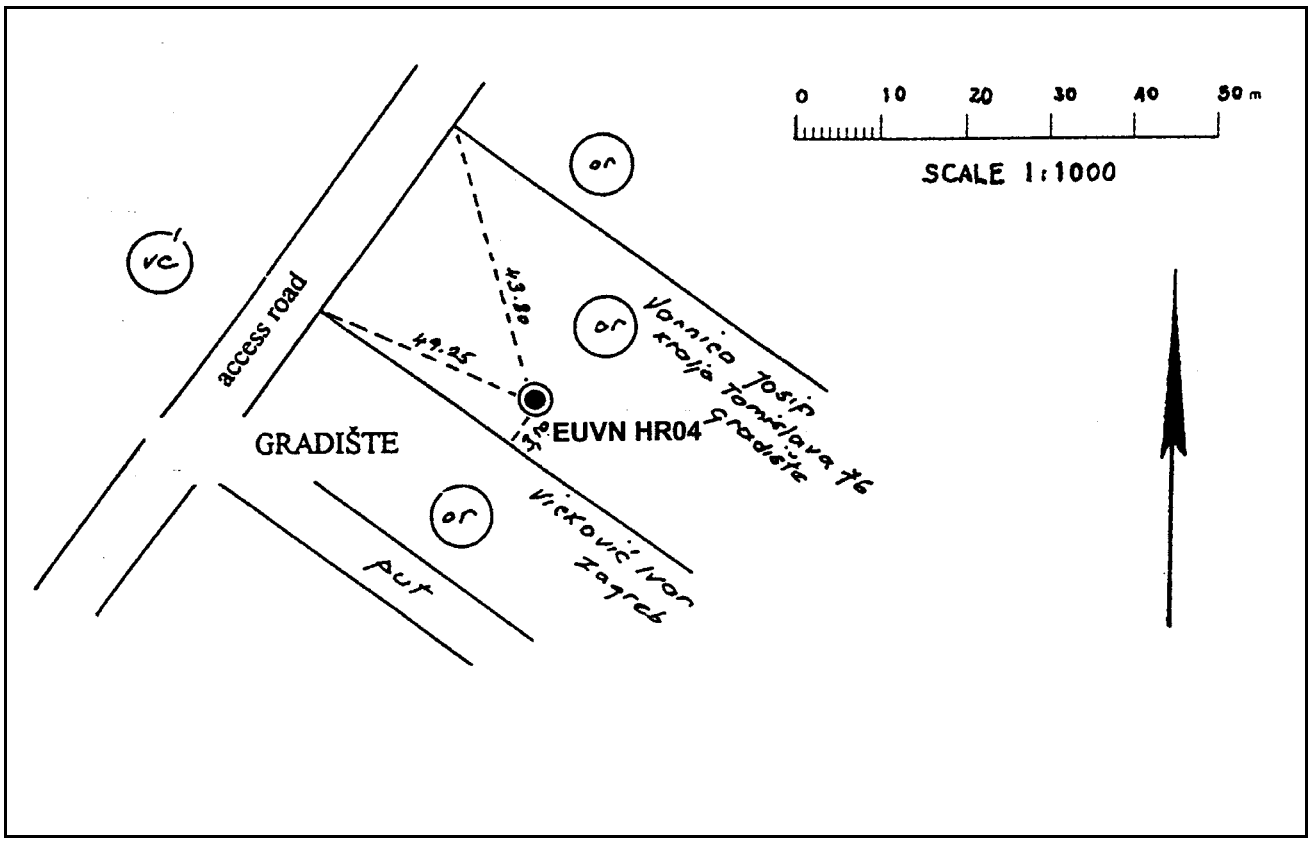
European Vertical GPS Reference Network (EUVN)

Station Veliko Gradiste

Site Identification of the GPS Monument	
4-Char. EUVN ID	HR04
DOMES Number	
Monument Inscription/National Site Number	1-362
Marker Type, Monumentation Type, Foundation	Concrete pillar with GPS marker (without forced centring device)
Mark dot of coordinates	Centre and top of the GPS marker

Site Location Information	
City or Town	Zupanja
State or Province	
Country	Croatia
Responsible Agency (Full Address)	Republic of Croatia State Geodetic Administration Gruska 20 HR-10000 Zagreb Croatia
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4267436.949 m Y = 1445417.704 m Z = 4499533.467 m
Height in UELN-95/98	101.613 m
Gravity in ISGN71	



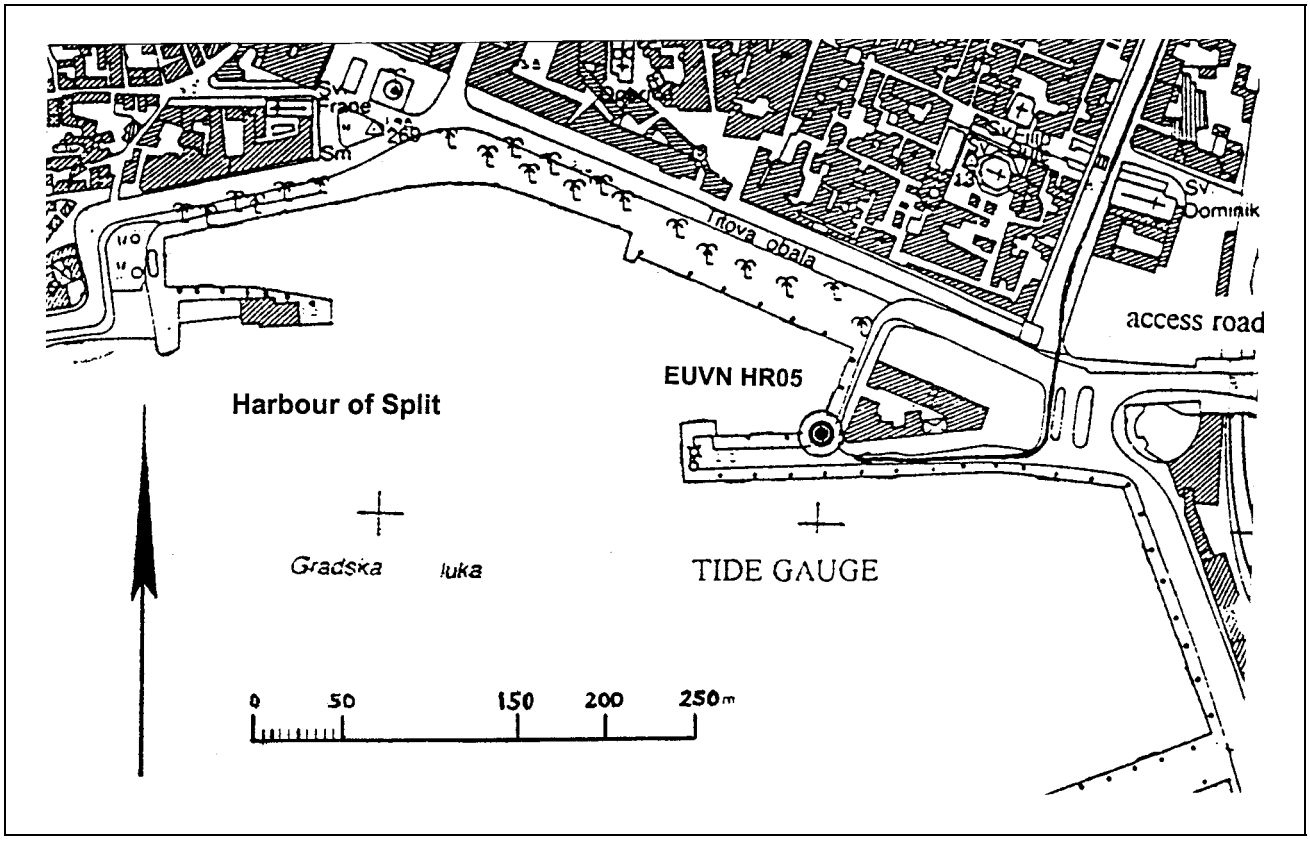


European Vertical GPS Reference Network (EUVN)

Station Split

Site Identification of the GPS Monument	
4-Char. EUVN ID	HR05
DOMES Number	
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	GPS marker with thread for forced centring, inserted on the roof of the tide gauge building
Mark dot of coordinates	Centre and top of the GPS marker

Site Location Information	
City or Town	Split
State or Province	
Country	Croatia
Responsible Agency (Full Address)	Republic of Croatia State Geodetic Administration Gruska 20 HR-10000 Zagreb Croatia
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4444024.297 m Y = 1311189.535 m Z = 4368529.871 m
Height in UELN-95/98	5.186 m
Gravity in ISGN71	

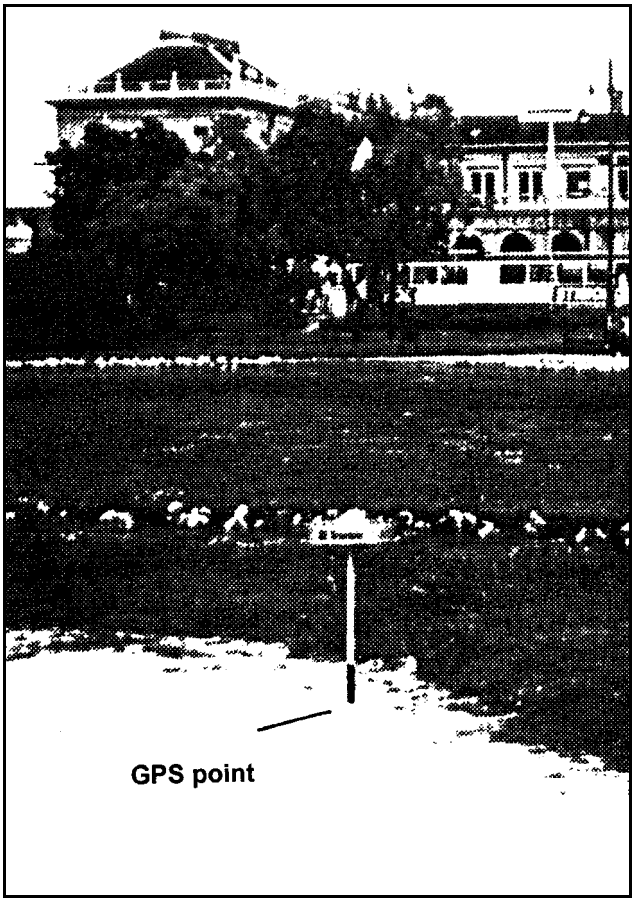


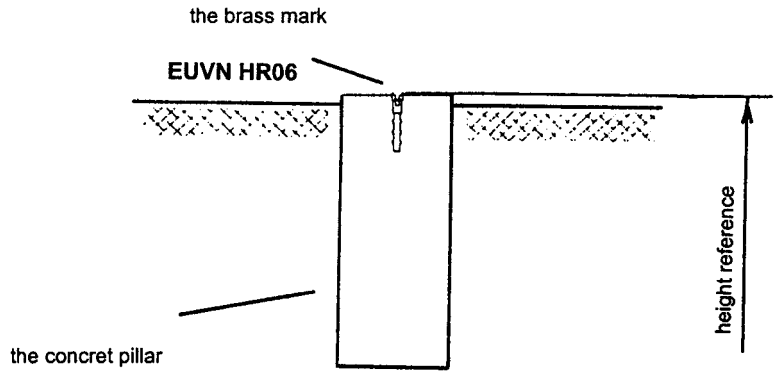
European Vertical GPS Reference Network (EUVN)

Station Zagreb

Site Identification of the GPS Monument	
4-Char. EUVN ID	HR06
DOMES Number	
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Concrete pillar with brass mark, inserted into the soil, screw for forced centring
Mark dot of coordinates	Centre and top of the brass mark

Site Location Information	
City or Town	Zagreb
State or Province	
Country	Croatia
Responsible Agency (Full Address)	Republic of Croatia State Geodetic Administration Gruska 20 HR-10000 Zagreb Croatia
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4281822.938 m Y = 1226065.933 m Z = 4550373.072 m
Height in UELN-95/98	115.025 m
Gravity in ISGN71	



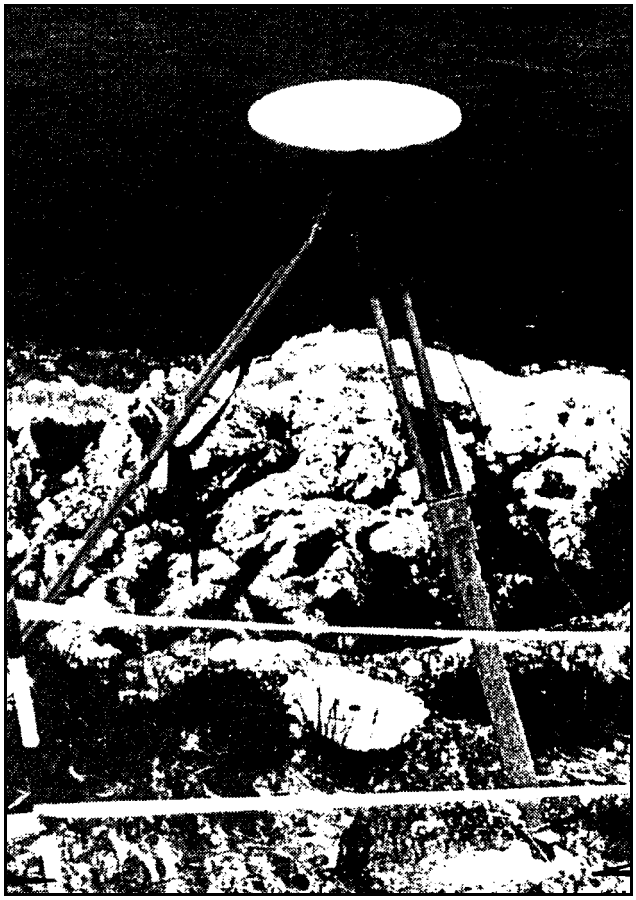


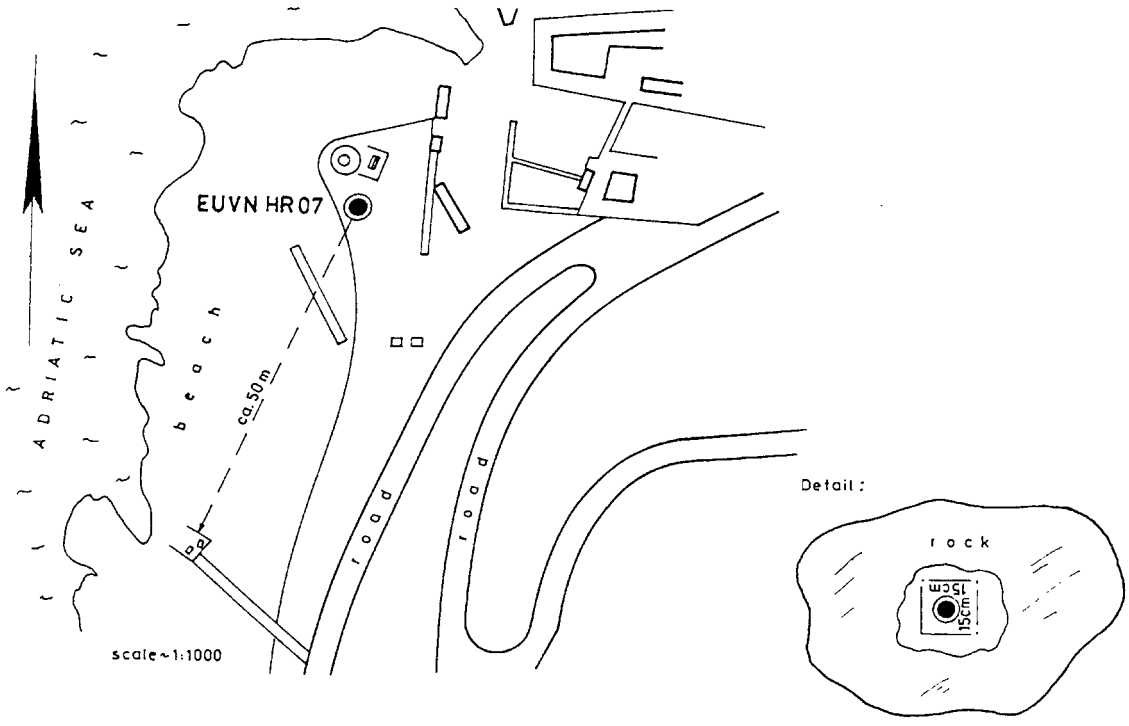
European Vertical GPS Reference Network (EUVN)

Station Rovinj

Site Identification of the GPS Monument	
4-Char. EUVN ID	HR07
DOMES Number	
Monument Inscription/National Site Number	5001
Marker Type, Monumentation Type, Foundation	Plate concreted in rock, with screw bolt for forced centring
Mark dot of coordinates	Centre and top of the screw bolt

Site Location Information	
City or Town	Rovinj
State or Province	
Country	Croatia
Responsible Agency (Full Address)	Republic of Croatia State Geodetic Administration Gruska 20 HR-10000 Zagreb Croatia
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4383992.571 m Y = 1062976.767 m Z = 4493984.390 m
Height in UELN-95/98	9.385 m
Gravity in ISGN71	



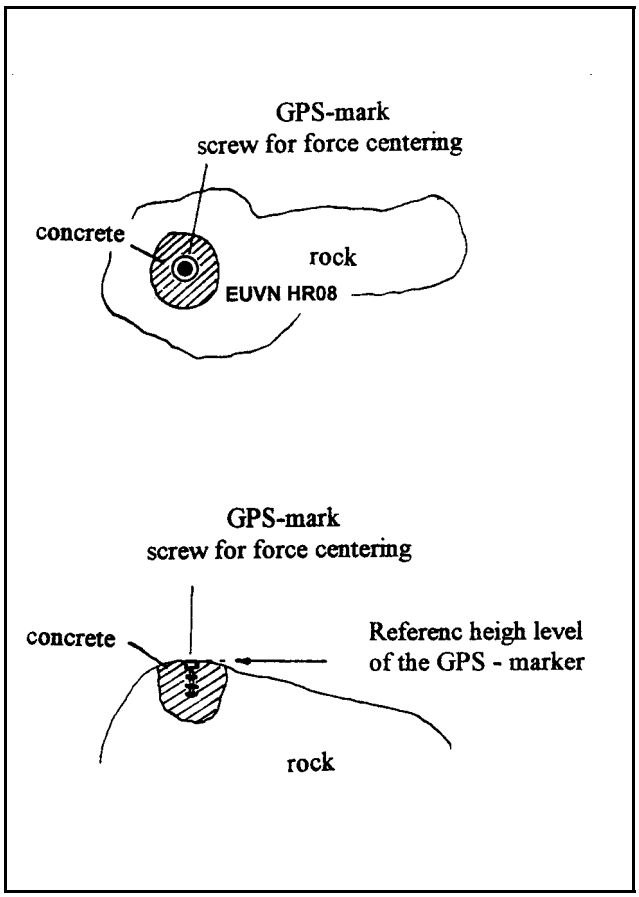


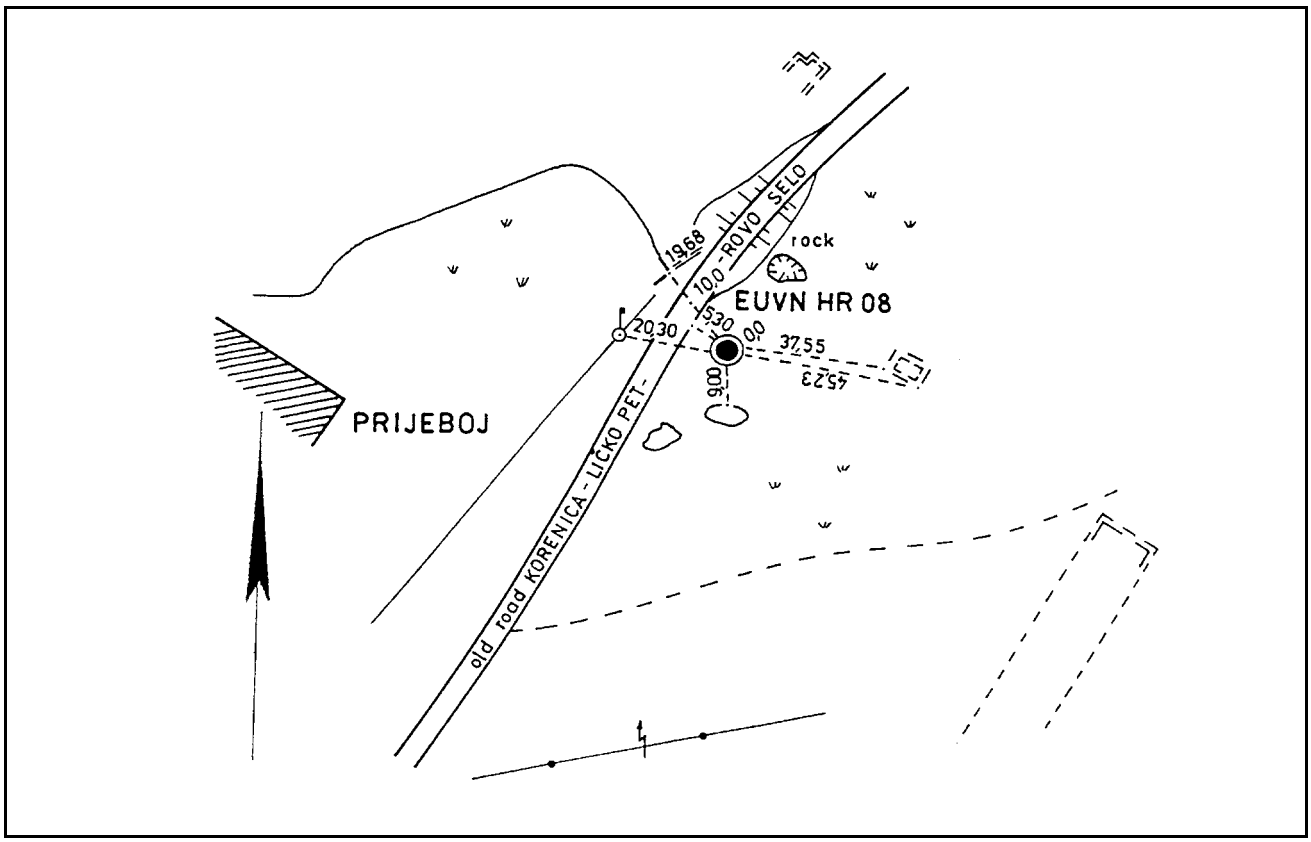
European Vertical GPS Reference Network (EUVN)

Station Plitvice Lakes

Site Identification of the GPS Monument	
4-Char. EUVN ID	HR08
DOMES Number	
Monument Inscription/National Site Number	R 22 264
Marker Type, Monumentation Type, Foundation	Screw bolt for forced centring concreted in the rock
Mark dot of coordinates	Centre and top of the GPS marker

Site Location Information	
City or Town	Plitvice Lakes
State or Province	
Country	Croatia
Responsible Agency (Full Address)	Republic of Croatia State Geodetic Administration Gruska 20 HR-10000 Zagreb Croatia
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4361672.272 m Y = 1224335.231 m Z = 4475663.112 m
Height in UELN-95/98	667.464 m
Gravity in ISGN71	



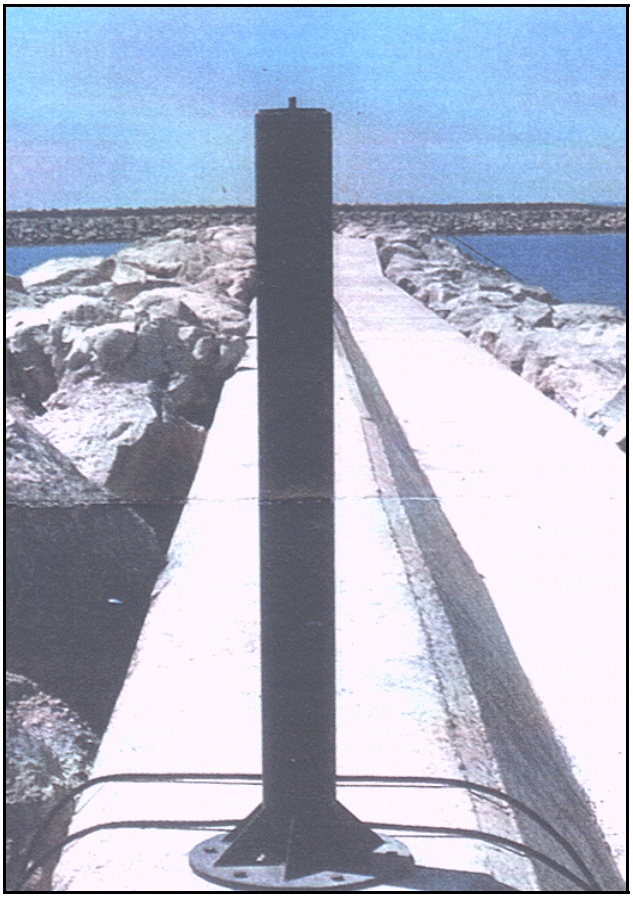


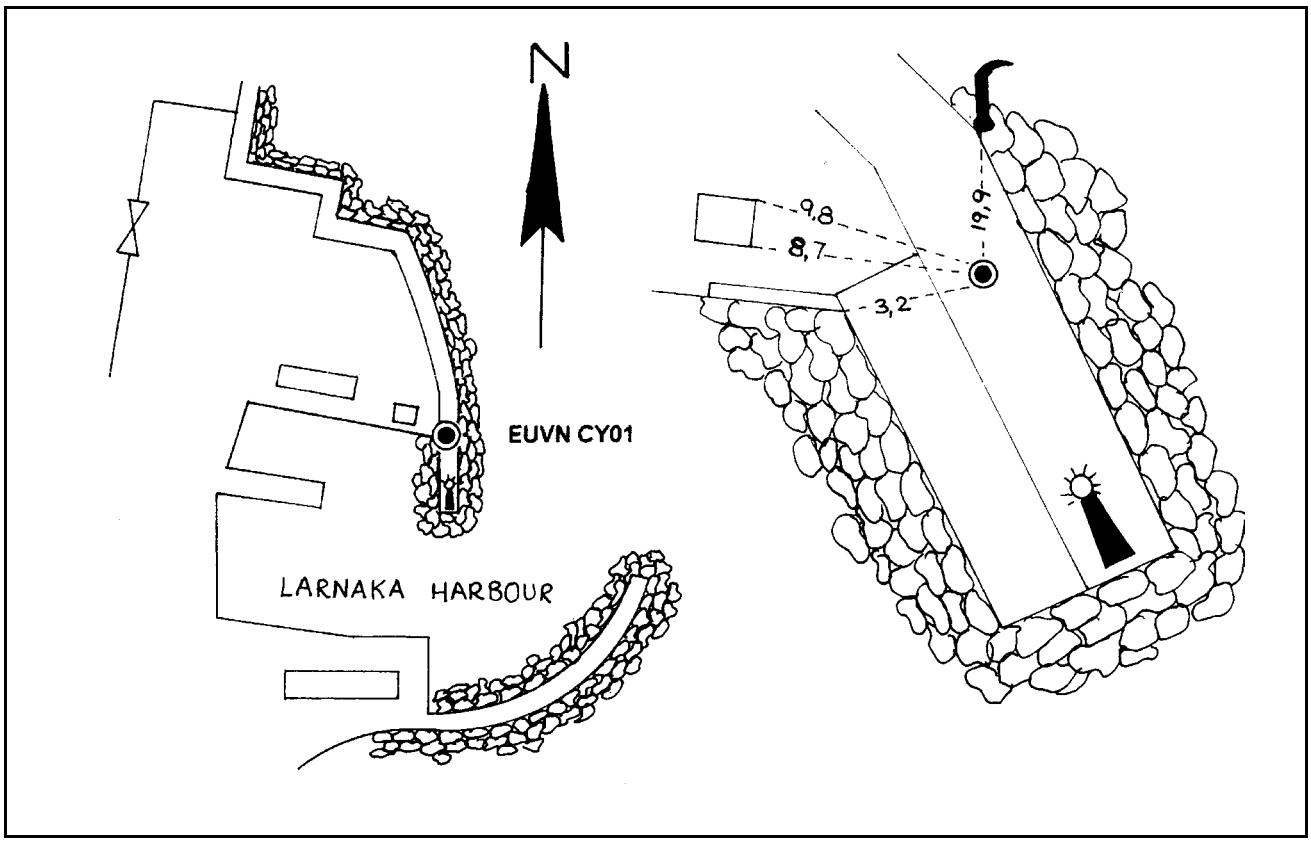
European Vertical GPS Reference Network (EUVN)

Station Larnaka

Site Identification of the GPS Monument	
4-Char. EUVN ID	CY01
DOMES Number	
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Metal pipe filled with concrete and bolted on concrete foundation, on top there is a forced centring screw
Mark dot of coordinates	Centre and top of the survey bolt with screw

Site Location Information	
City or Town	Larnaka
State or Province	
Country	Cyprus
Responsible Agency (Full Address)	Bundesamt für Kartographie und Geodäsie Fundamentalstation Wettzell D-93444 Kötzting/Bayer. Wald Germany
Contact Agency Information	Andreas Christodoulou Director Department of Lands and Surveys CY-1455 Nicosia Cyprus
Coordinates in ETRS89, Epoch 97.4	X = 4358072.339 m Y = 2900453.915 m Z = 3631353.840 m
Height in UELN-95/98	5.887 m
Gravity in ISGN71	979 855.505 mgal



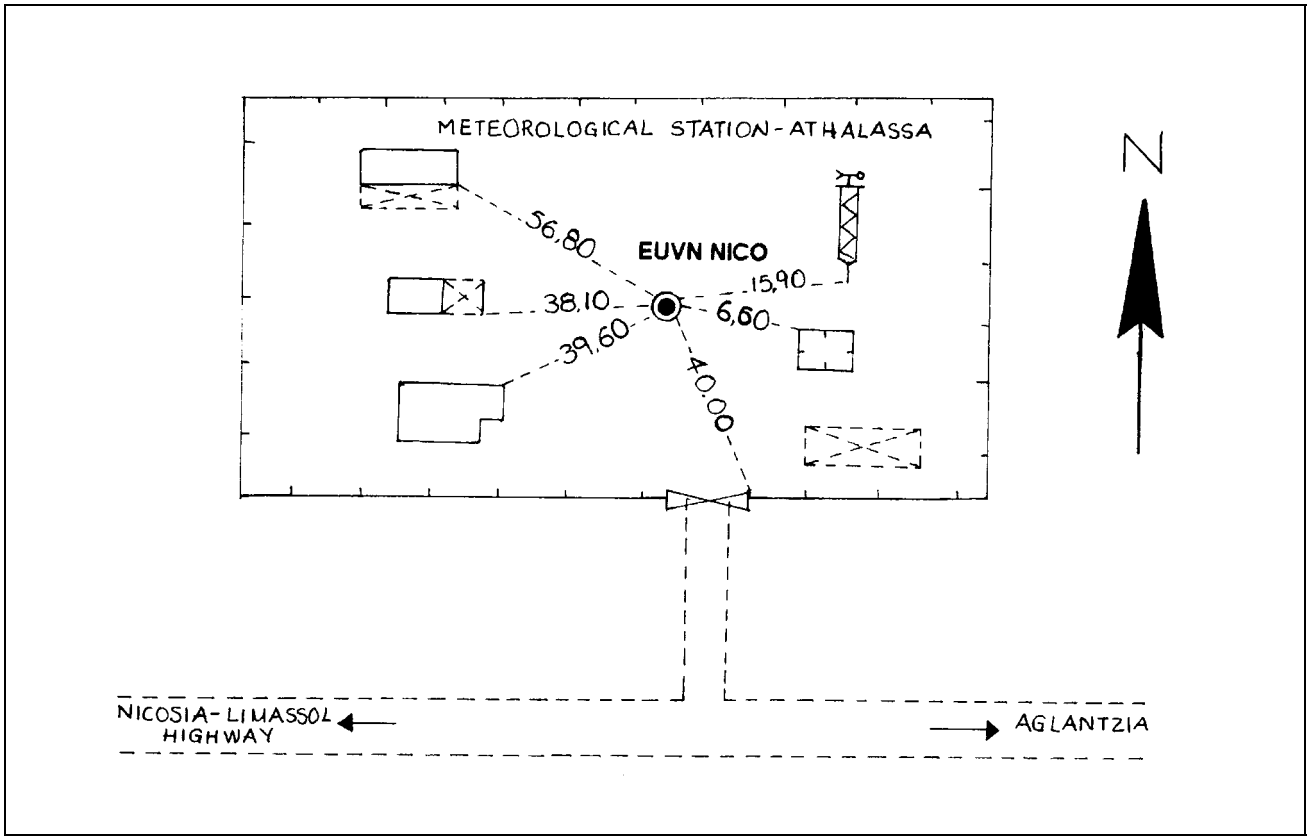


European Vertical GPS Reference Network (EUVN)

Station Nicosia

Site Identification of the GPS Monument	
4-Char. EUVN ID	NICO
DOMES Number	14302 M 001
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Pillar with survey screw bolt, with concrete foundations, with forced centring device
Mark dot of coordinates	Centre and top of the survey screw bolt

Site Location Information	
City or Town	Nicosia
State or Province	Nicosia
Country	Cyprus
Responsible Agency (Full Address)	Bundesamt für Kartographie und Geodäsie Fundamentalstation Wettzell D-93444 Kötzting/Bayer. Wald Germany
Contact Agency Information	Andreas Christodoulou Director Department of Lands and Surveys CY-1455 Nicosia Cyprus
Coordinates in ETRS89, Epoch 97.4	X = 4359416.053 m Y = 2874116.894 m Z = 3650777.599 m
Height in UELN-95/98	162.277 m
Gravity in ISGN71	979 845.496 mgal

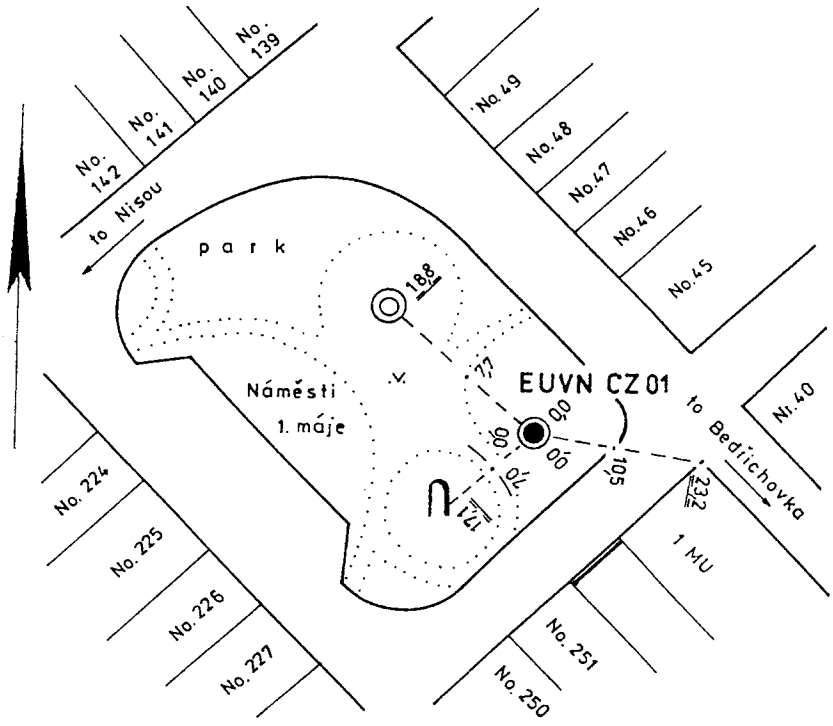


European Vertical GPS Reference Network (EUVN)

Station Chrastava

Site Identification of the GPS Monument	
4-Char. EUVN ID	CZ01
DOMES Number	
Monument Inscription/National Site Number	CZ4-13.1
Marker Type, Monumentation Type, Foundation	Steel bolt on iron tube filled with concrete, deep monumentation in bedrock under soil
Mark dot of coordinates	Centre and top of the bolt

Site Location Information	
City or Town	Chrastava
State or Province	
Country	Czech Republic
Responsible Agency (Full Address)	Land Survey Office Pod Sidlistem 9 CZ-18211 Praha 8 Czech Republic
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3900991.757 m Y = 1043027.873 m Z = 4920986.877 m
Height in UELN-95/98	295.744 m
Gravity in ISGN71	981 048.1018 mgal

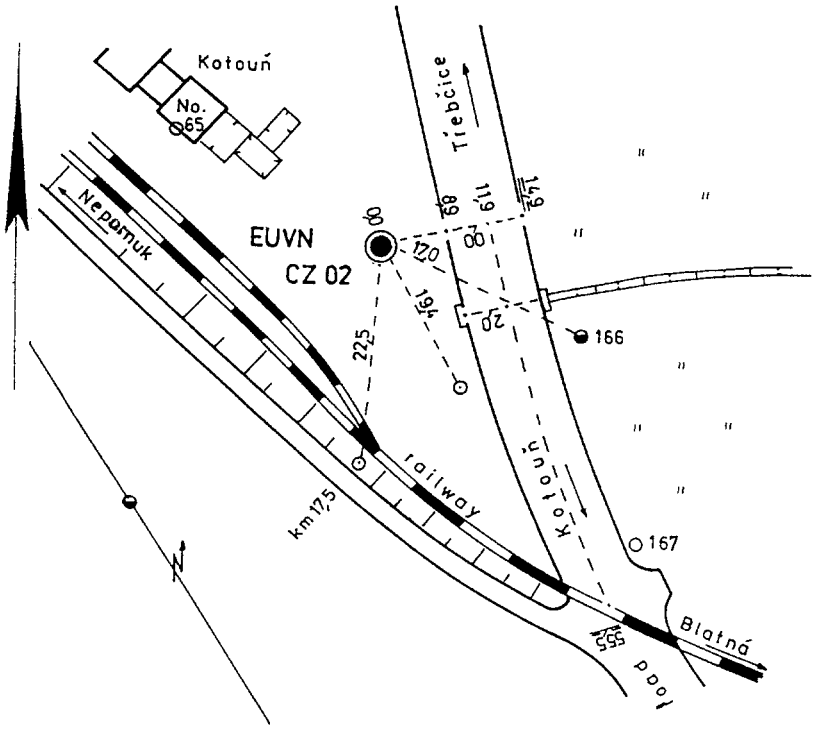


European Vertical GPS Reference Network (EUVN)

Station Kotoun

Site Identification of the GPS Monument	
4-Char. EUVN ID	CZ02
DOMES Number	
Monument Inscription/National Site Number	HM-0.1
Marker Type, Monumentation Type, Foundation	Steel bolt on iron tube filled with concrete, deep monumentation in bedrock under soil
Mark dot of coordinates	Centre and top of the bolt

Site Location Information	
City or Town	Plzen-jih
State or Province	
Country	Czech Republic
Responsible Agency (Full Address)	Land Survey Office Pod Sidlistem 9 CZ-18211 Praha 8 Czech Republic
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4036220.278 m Y = 981441.609 m Z = 4824567.786 m
Height In UELN-95/98	500.770 m
Gravity In ISGN71	980 894.62 mgal

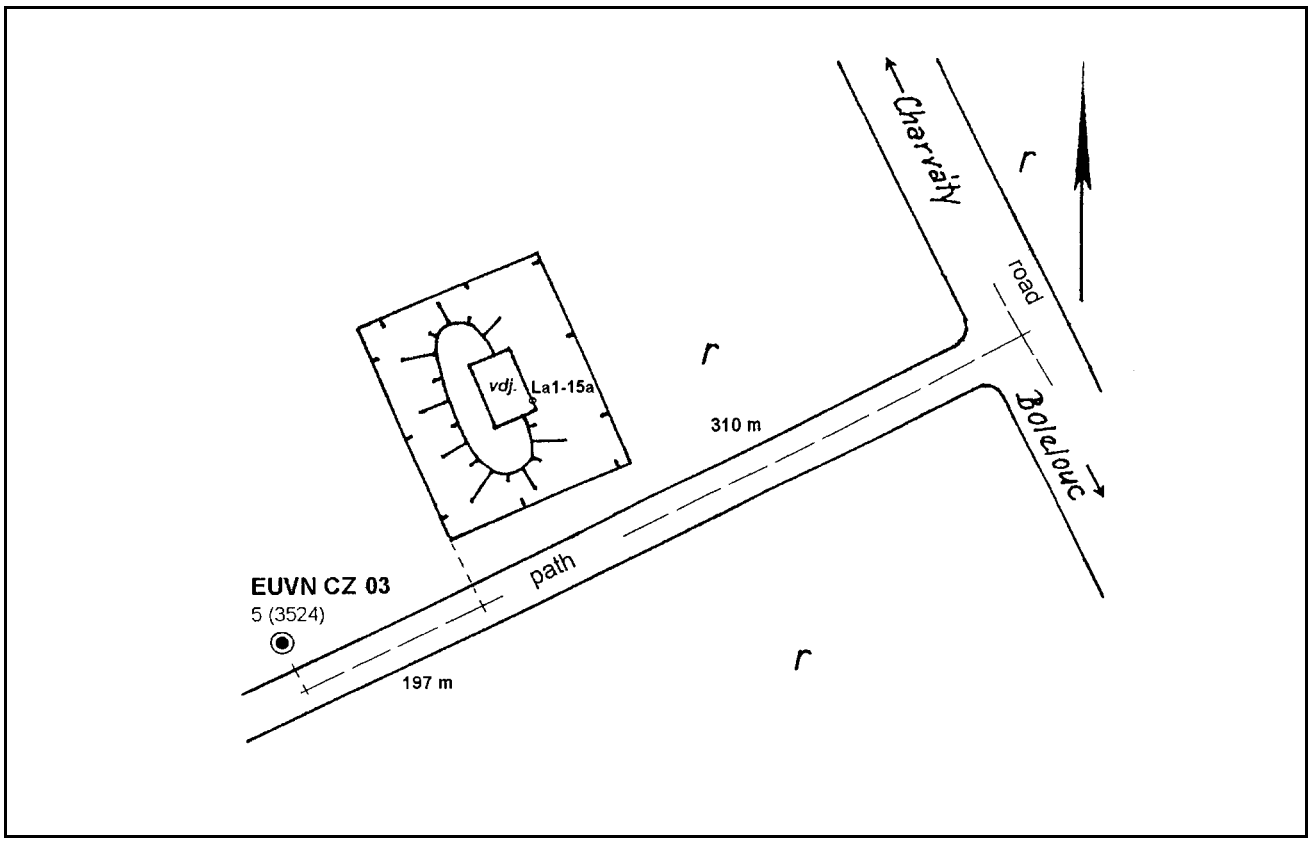


European Vertical GPS Reference Network (EUVN)

Station Predni Pricka

Site Identification of the GPS Monument	
4-Char. EUVN ID	CZ03
DOMES Number	
Monument Inscription/National Site Number	5/3524/
Marker Type, Monumentation Type, Foundation	The lower part is monument stone, granite, 30x30x89 cm, 0,70 m under surface, cross on the top
Mark dot of coordinates	Centre of the cross and top of the monument stone

Site Location Information	
City or Town	Olomouc
State or Province	
Country	Czech Republic
Responsible Agency (Full Address)	Land Survey Office Pod Sidlistem 9 CZ-18211 Praha 8 Czech Republic
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3963415.007 m Y = 1230404.339 m Z = 4827514.545 m
Height In UELN-95/98	260.283 m
Gravity In ISGN71	980 955.2505 mgal

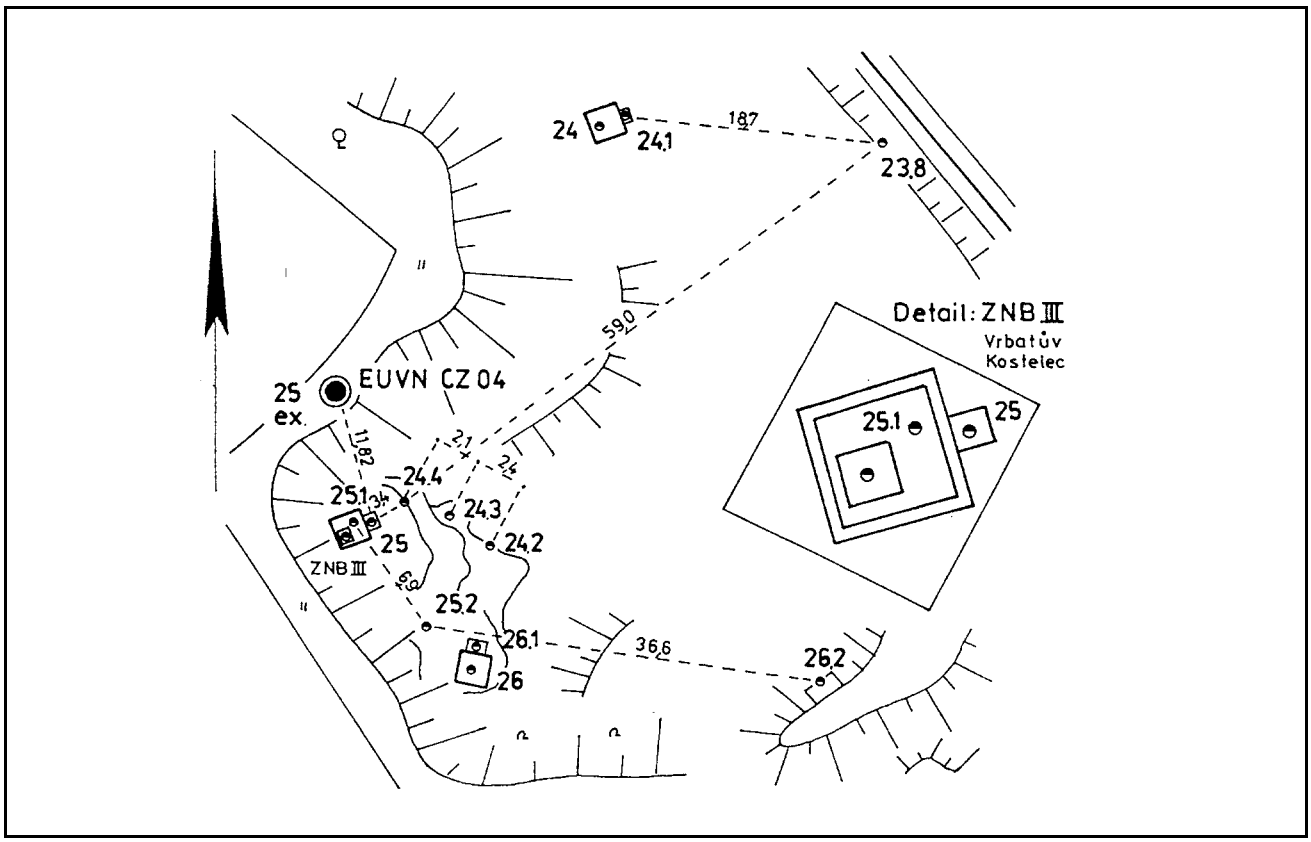


European Vertical GPS Reference Network (EUVN)

Station Kostelec

Site Identification of the GPS Monument	
4-Char. EUVN ID	CZ04
DOMES Number	
Monument Inscription/National Site Number	Eeg-25
Marker Type, Monumentation Type, Foundation	Bronze bolt with forced centring in special pillar, iron tube filled with concrete, 85 cm under surface, in rock
Mark dot of coordinates	Centre and top of the bolt

Site Location Information	
City or Town	Chrudim
State or Province	
Country	Czech Republic
Responsible Agency (Full Address)	Land Survey Office Pod Sidlistem 9 CZ-18211 Praha 8 Czech Republic
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3961862.614 m Y = 1131198.835 m Z = 4852979.219 m
Height In UELN-95/98	383.124 m
Gravity In ISGN71	980 972.4023 mgal

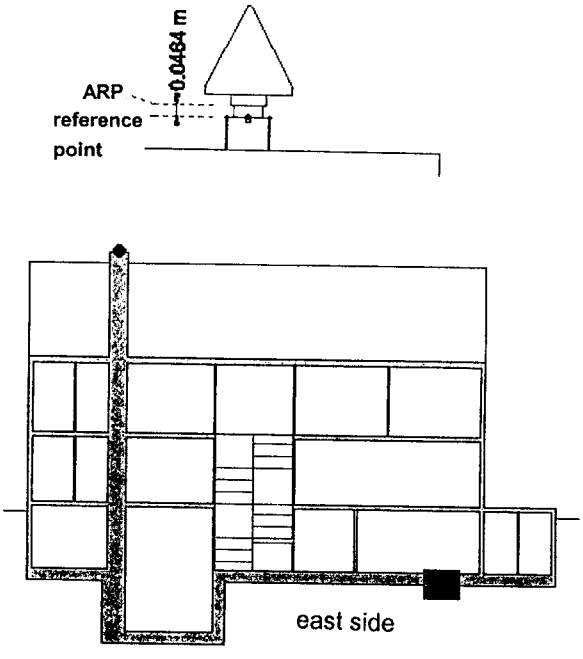


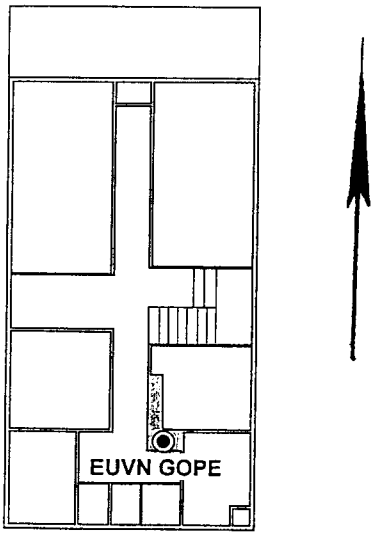
European Vertical GPS Reference Network (EUVN)

Station Pecny

Site Identification of the GPS Monument	
4-Char. EUVN ID	GOPE
DOMES Number	11502 M 002
Monument Inscription/National Site Number	GEODYN-1
Marker Type, Monumentation Type, Foundation	Pillar with forced centring device
Mark dot of coordinates	Centre and top of the GPS marker

Site Location Information	
City or Town	Ondrejov
State or Province	Bohemia
Country	Czech Republic
Responsible Agency (Full Address)	Research Institute of Geodesy CZ-25066 Zdiby 98 Czech Republic
Contact Agency Information	Research Institute of Geodesy Geodetic Observatory Pecny CZ-25165 Ondrejov 244 Czech Republic
Coordinates in ETRS89, Epoch 97.4	X = 3979316.437 m Y = 1050312.254 m Z = 4857066.895 m
Height in UELN-95/98	547.696 m
Gravity in ISGN71	980 928.9115 mgal



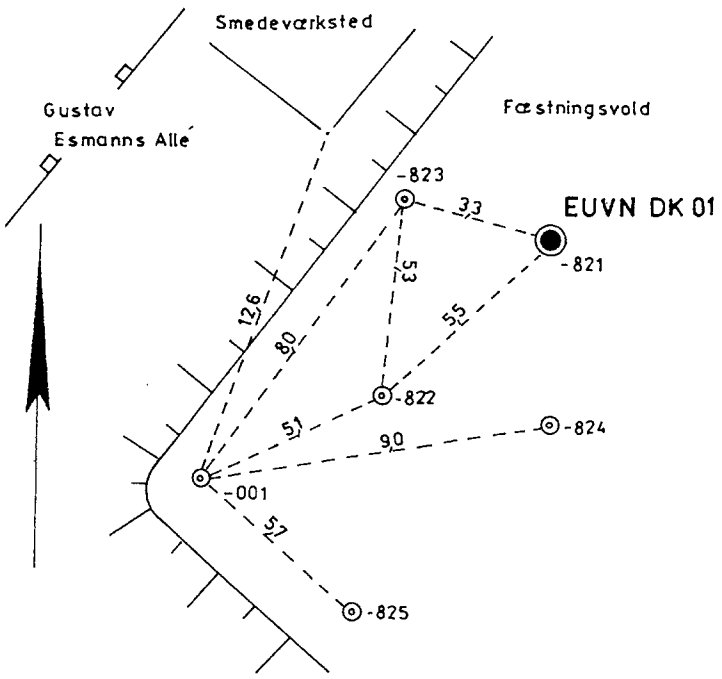


European Vertical GPS Reference Network (EUVN)

Station Kobenhavn

Site Identification of the GPS Monument	
4-Char. EUVN ID	DK01
DOMES Number	
Monument Inscription/National Site Number	1-13-821
Marker Type, Monumentation Type, Foundation	Pillar with iron plate and punch mark with fixed steel tripod
Mark dot of coordinates	Centre of punch mark and top of steel plate

Site Location Information	
City or Town	Kobenhavn
State or Province	
Country	Denmark
Responsible Agency (Full Address)	National Survey and Cadastre Rentemestervej 8 DK-2400 Copenhagen NV Denmark
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3513649.625 m Y = 778954.553 m Z = 5248201.778 m
Height in UELN-95/98	51.840 m
Gravity in ISGN71	981 542 mgal

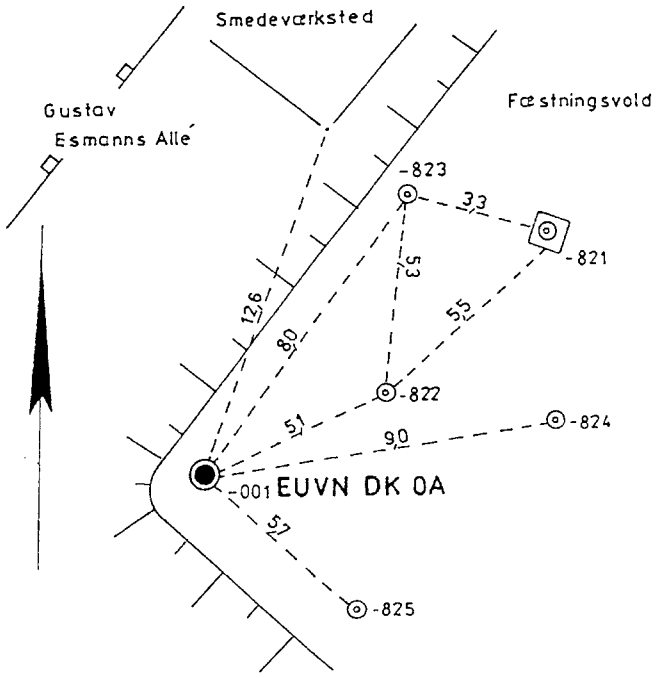


European Vertical GPS Reference Network (EUVN)

Station Kobenhavn A

Site Identification of the GPS Monument	
4-Char. EUVN ID	DK0A
DOMES Number	
Monument Inscription/National Site Number	1-13-001
Marker Type, Monumentation Type, Foundation	Concrete plate in soil with a brass bolt, with punch mark
Mark dot of coordinates	Centre of punch mark and top of brass bolt

Site Location Information	
City or Town	Kobenhavn
State or Province	
Country	Denmark
Responsible Agency (Full Address)	National Survey and Cadastre Rentemestervej 8 DK-2400 Copenhagen NV Denmark
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3513655.911 m Y = 778946.787 m Z = 5248197.262 m
Height in UELN-95/98	50.616 m
Gravity in ISGN71	

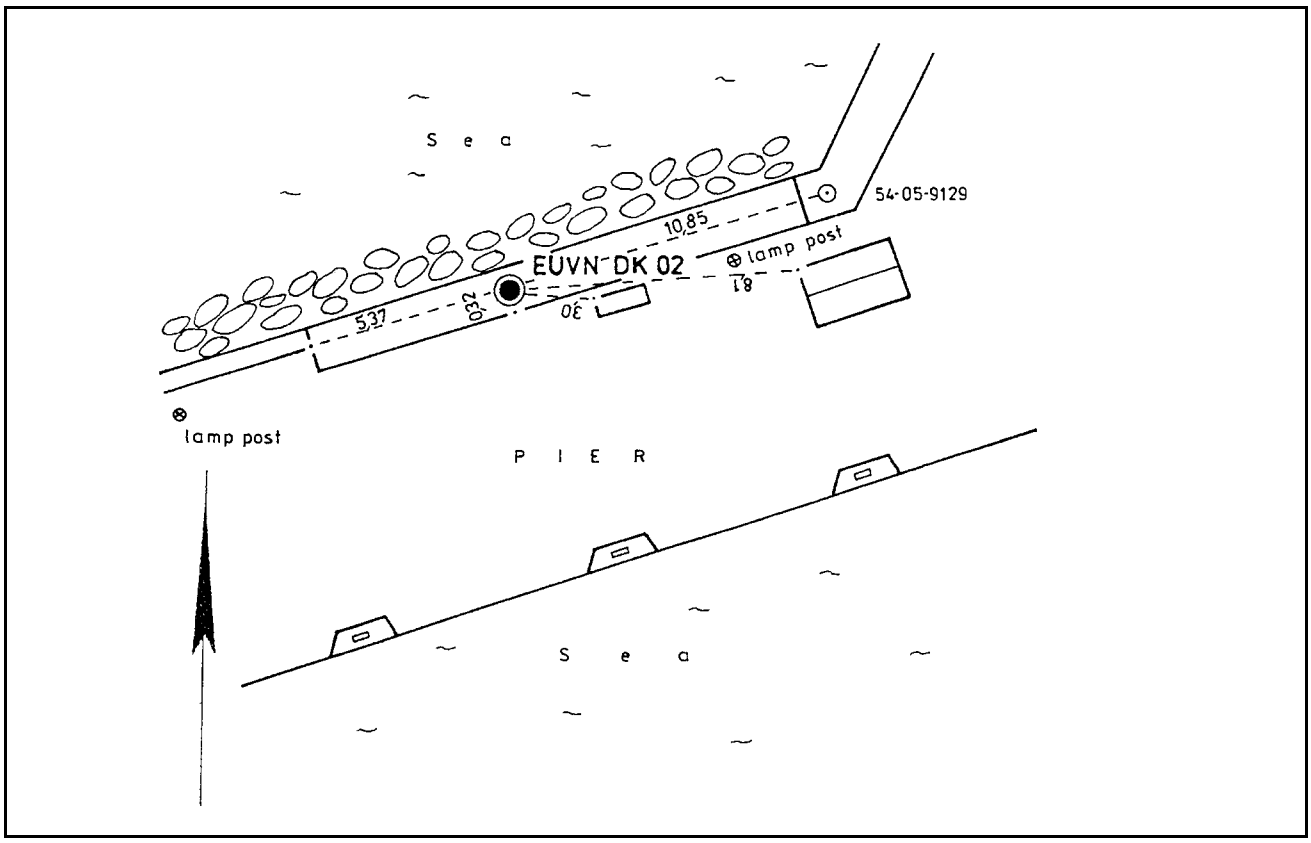


European Vertical GPS Reference Network (EUVN)

Station Hirtshals

Site Identification of the GPS Monument	
4-Char. EUVN ID	DK02
DOMES Number	
Monument Inscription/National Site Number	54-05-834
Marker Type, Monumentation Type, Foundation	Brass bolt on concrete pier
Mark dot of coordinates	Centre and top of the bolt

Site Location Information	
City or Town	Hirtshals
State or Province	
Country	Denmark
Responsible Agency (Full Address)	National Survey and Cadastre Rentemestervej 8 DK-2400 Copenhagen NV Denmark
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3374587.983 m Y = 592744.504 m Z = 5361737.832 m
Height in UELN-95/98	4.040 m
Gravity in ISGN71	981 726 mgal

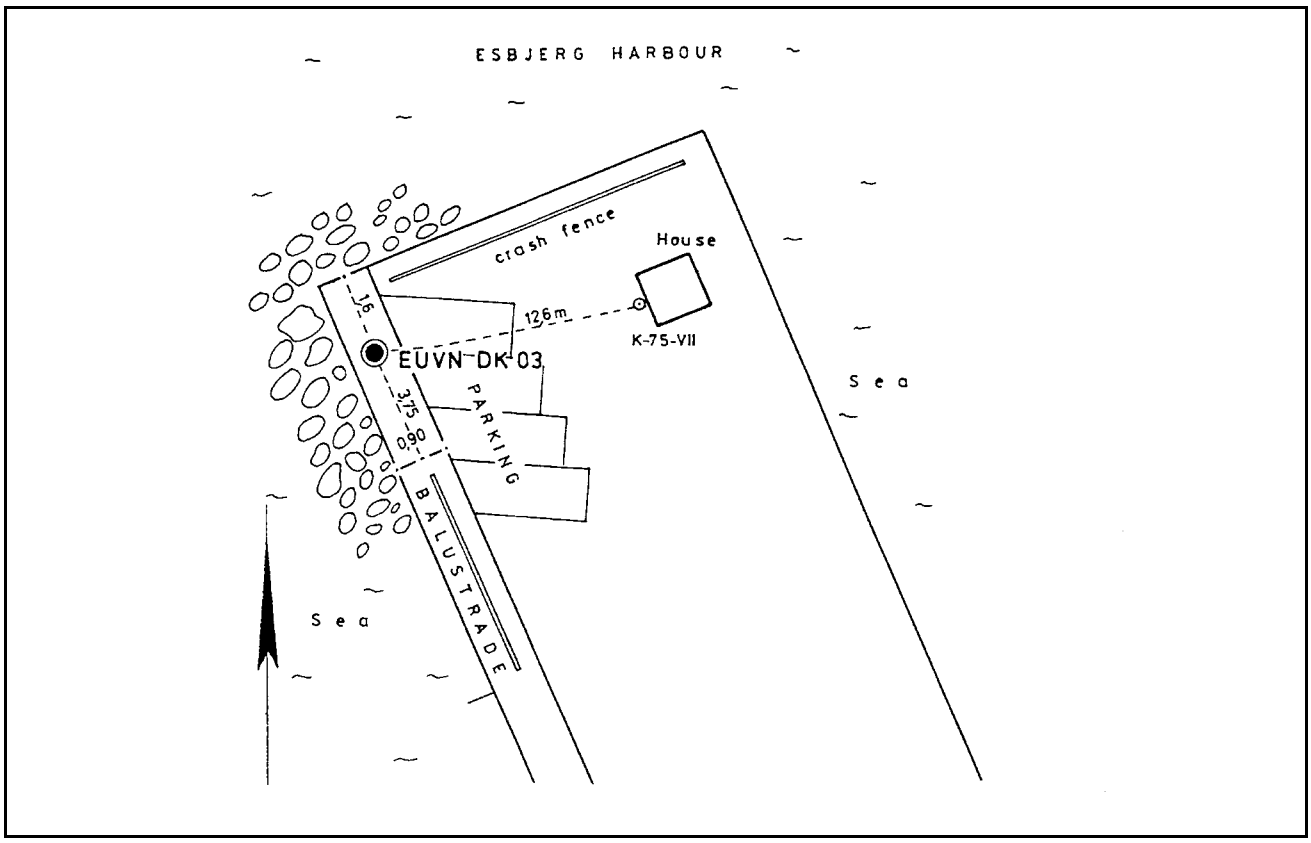


European Vertical GPS Reference Network (EUVN)

Station Esbjerg

Site Identification of the GPS Monument	
4-Char. EUVN ID	DK03
DOMES Number	
Monument Inscription/National Site Number	K-75-956
Marker Type, Monumentation Type, Foundation	Brass bolt on concrete pier
Mark dot of coordinates	Centre and top of the bolt

Site Location Information	
City or Town	Esbjerg
State or Province	
Country	Denmark
Responsible Agency (Full Address)	National Survey and Cadastre Rentemestervej 8 DK-2400 Copenhagen NV Denmark
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3585285.527 m Y = 531974.557 m Z = 5230633.475 m
Height in UELN-95/98	2.519 m
Gravity in ISGN71	981 556 mgal

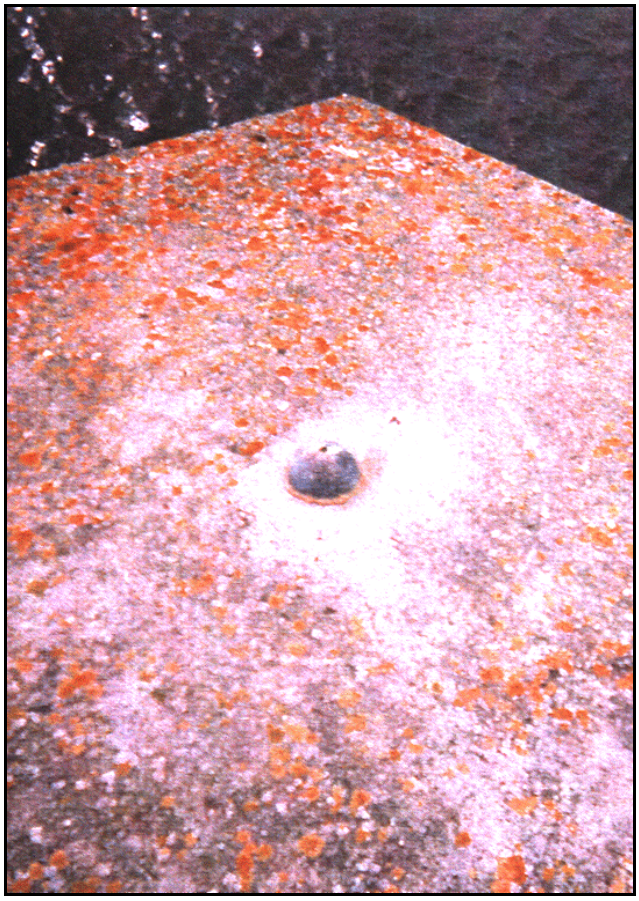


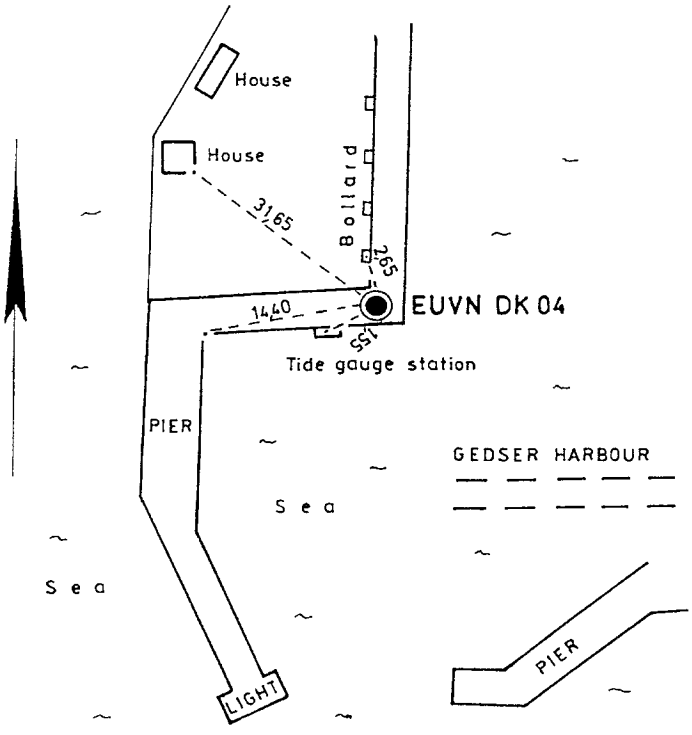
European Vertical GPS Reference Network (EUVN)

Station Gedser

Site Identification of the GPS Monument	
4-Char. EUVN ID	DK04
DOMES Number	
Monument Inscription/National Site Number	52-03-844
Marker Type, Monumentation Type, Foundation	Brass bolt on concrete pier
Mark dot of coordinates	Centre and top of the bolt

Site Location Information	
City or Town	Gedser
State or Province	
Country	Denmark
Responsible Agency (Full Address)	National Survey and Cadastre Rentemestervej 8 DK-2400 Copenhagen NV Denmark
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3625568.265 m Y = 765648.847 m Z = 5173951.362 m
Height in UELN-95/98	2.643 m
Gravity in ISGN71	981 472 mgal



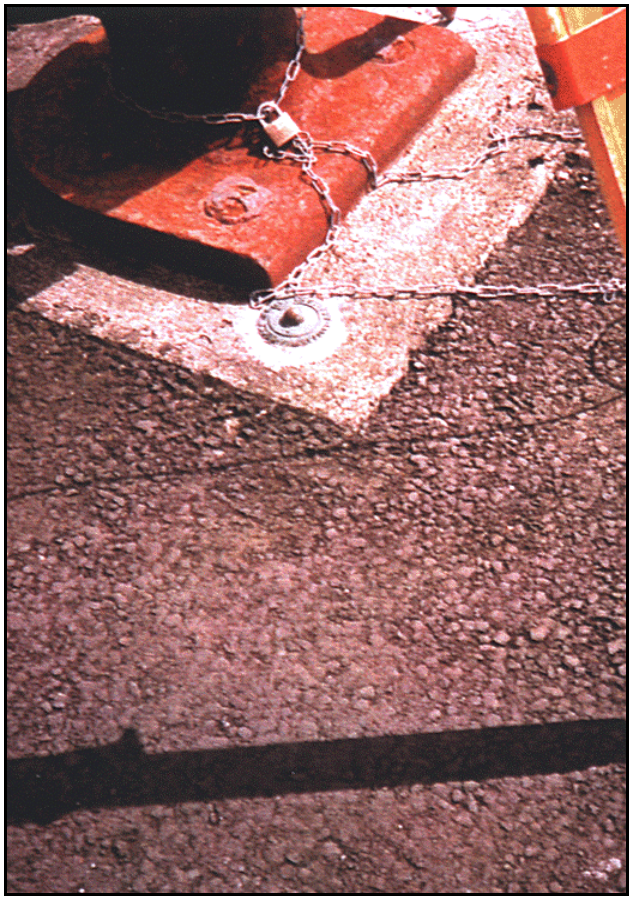


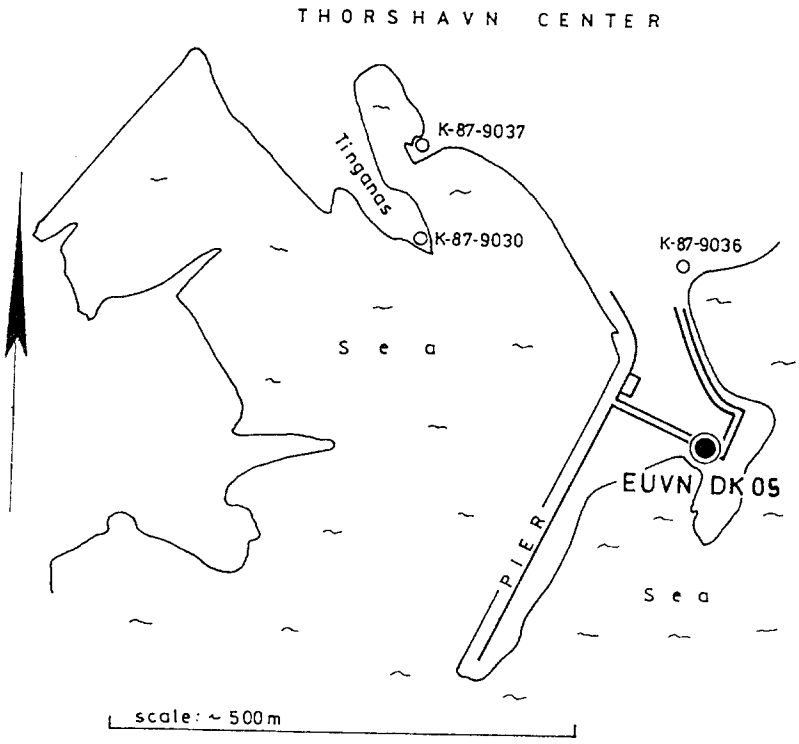
European Vertical GPS Reference Network (EUVN)

Station Thorshavn

Site Identification of the GPS Monument	
4-Char. EUVN ID	DK05
DOMES Number	
Monument Inscription/National Site Number	Geodaetisk Institut K-87-9035
Marker Type, Monumentation Type, Foundation	Concrete plate with bronze sheet and polished steel bolt
Mark dot of coordinates	Centre and top of the polished steel bolt

Site Location Information	
City or Town	Thorshavn (Torshavn)
State or Province	
Country	Denmark
Responsible Agency (Full Address)	National Survey and Cadastre Rentemestervej 8 DK-2400 Copenhagen NV Denmark
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 2980913.429 m Y = -353401.369 m Z = 5608798.593 m
Height in UELN-95/98	
Gravity in ISGN71	982 110 mgal



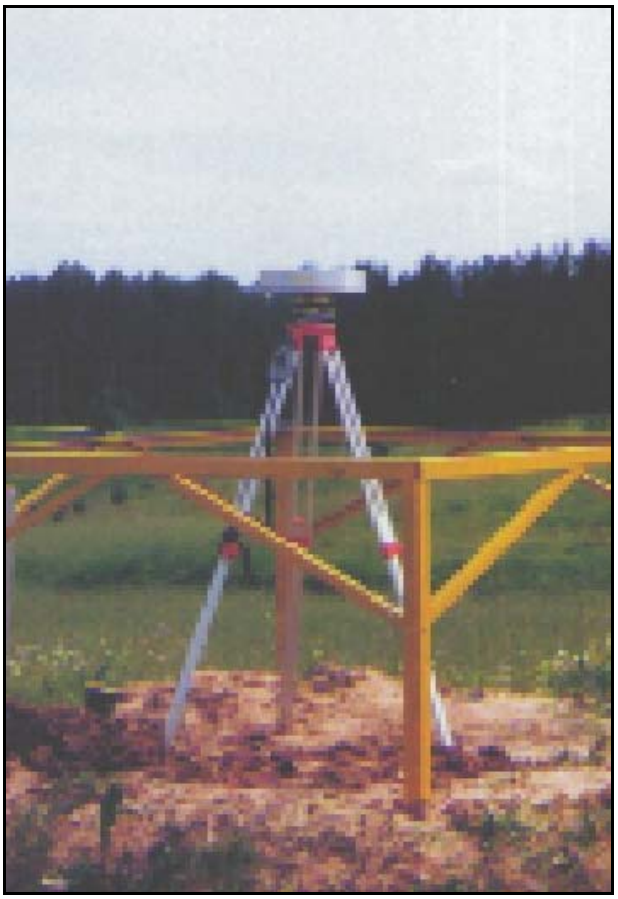


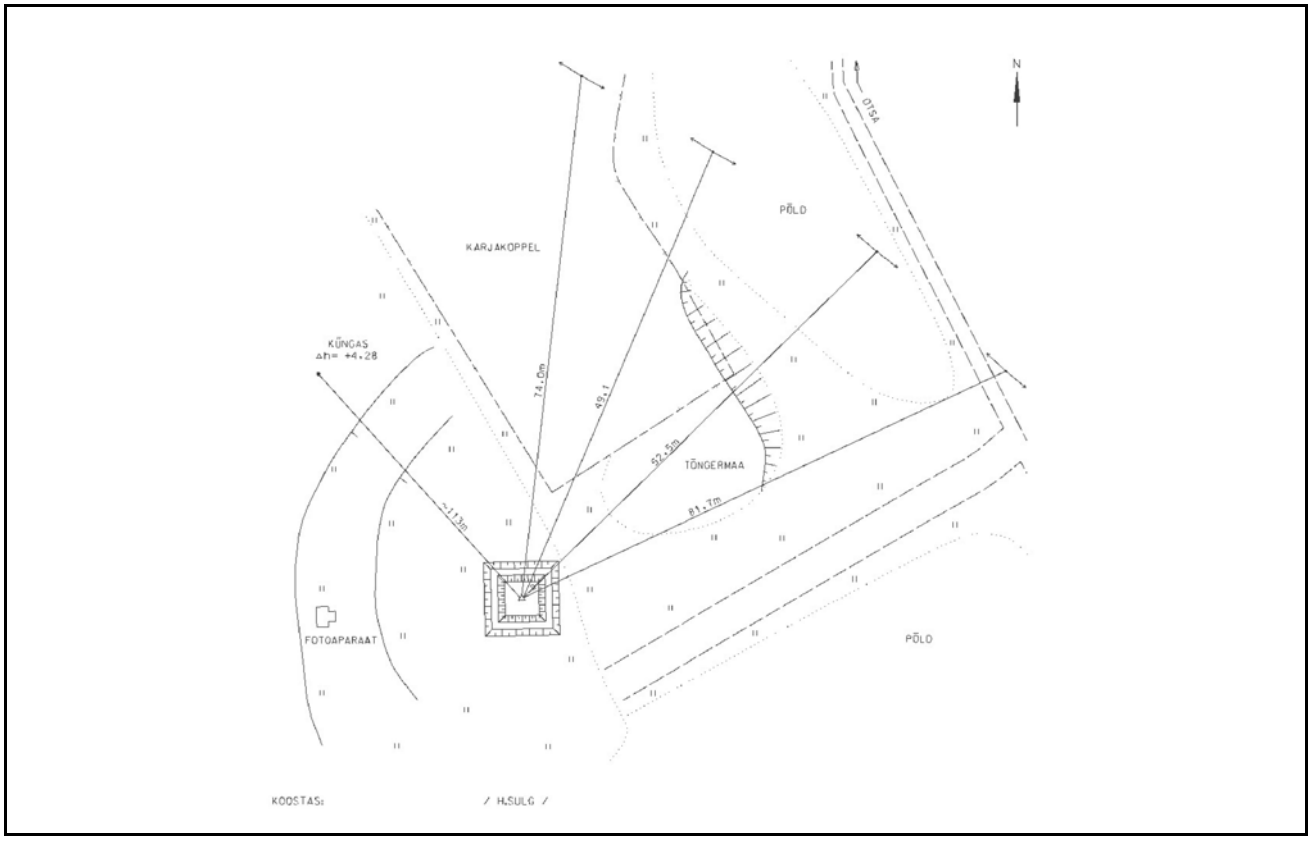
European Vertical GPS Reference Network (EUVN)

Station Otsa

Site Identification of the GPS Monument	
4-Char. EUVN ID	EE01
DOMES Number	
Monument Inscription/National Site Number	5419
Marker Type, Monumentation Type, Foundation	Ground benchmark, 1996
Mark dot of coordinates	Centre and top of the GPS marker

Site Location Information	
City or Town	Otsa
State or Province	
Country	Estonia
Responsible Agency (Full Address)	Estonian National Land Board Mustamae tee 51 P.O. Box 1635 EE – 0006 Tallinn Estonia
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3025358.378 m Y = 1558080.799 m Z = 5376502.582 m
Height in UELN-95/98	88.162 m
Gravity in ISGN71	981 717.0 mgal



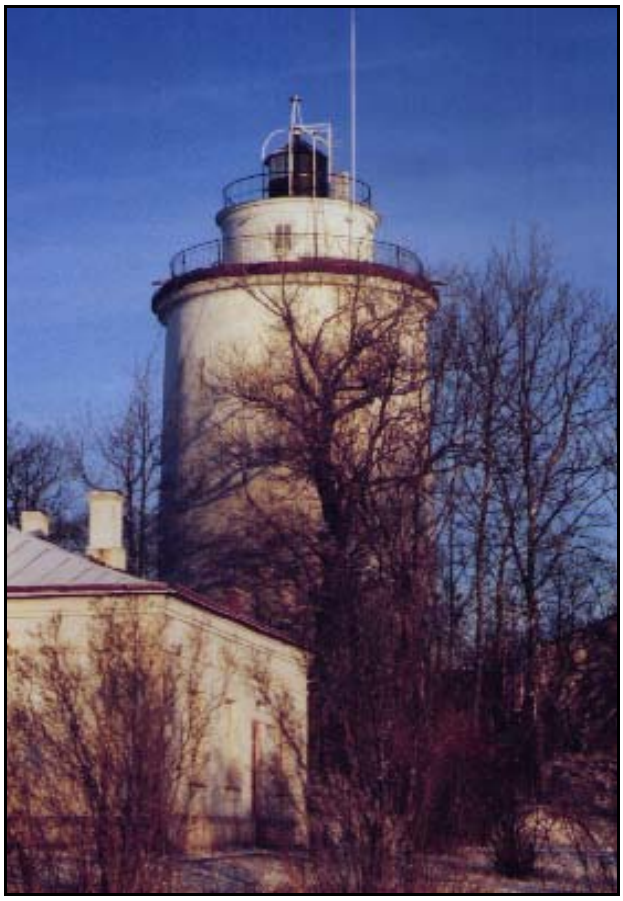


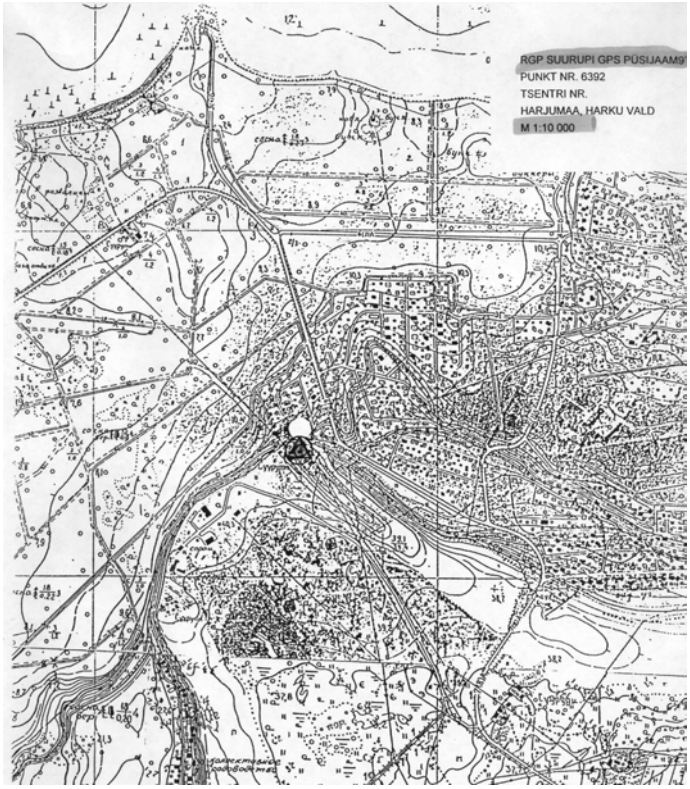
European Vertical GPS Reference Network (EUVN)

Station Suurupi

Site Identification of the GPS Monument	
4-Char. EUVN ID	EE02
DOMES Number	
Monument Inscription/National Site Number	6392
Marker Type, Monumentation Type, Foundation	Permanent GPS station, GPS antenna is mounted on the top of lighthouse
Mark dot of coordinates	Centre and top of the GPS marker

Site Location Information	
City or Town	Suurupi
State or Province	
Country	Estonia
Responsible Agency (Full Address)	Estonian National Land Board Mustamae tee 51 P.O. Box 1635 EE – 0006 Tallinn Estonia
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 2959056.670 m Y = 1341058.235 m Z = 5470427.077 m
Height in UELN-95/98	65.993 m
Gravity in ISGN71	981 816.018 mgal





European Vertical GPS Reference Network (EUVN)

Station Degerby

Site Identification of the GPS Monument	
4-Char. EUVN ID	FI01
DOMES Number	
Monument Inscription/National Site Number	36
Marker Type, Monumentation Type, Foundation	Concrete pillar with a steel support and steel plate on the top of the pillar
Mark dot of coordinates	

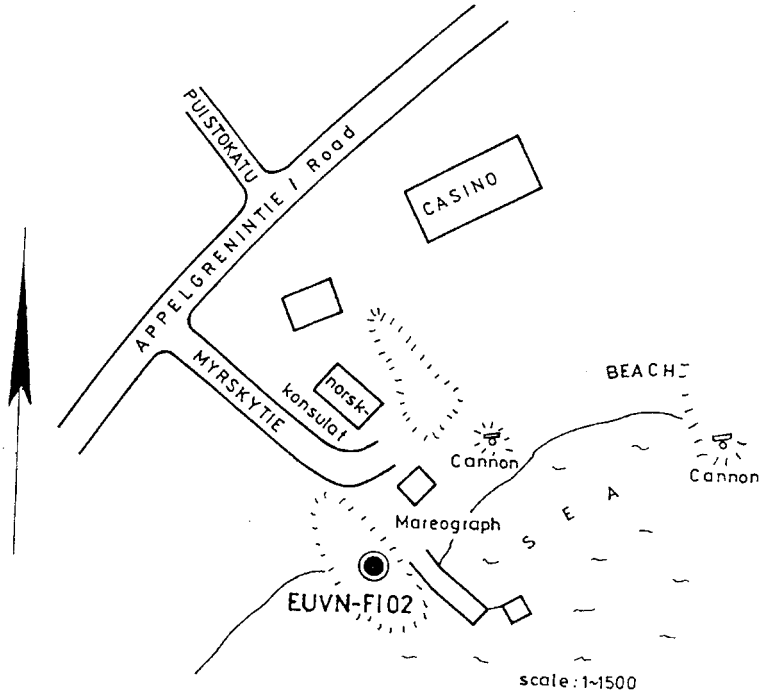
Site Location Information	
City or Town	Mariehamn
State or Province	
Country	Finland
Responsible Agency (Full Address)	Finnish Geodetic Institute Geodeetinrinne 2 FIN-02430 Masala Finland
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 2994065.119 m Y = 1112558.974 m Z = 5502241.275 m
Height in UELN-95/98	2.913 m
Gravity in IGSN71	981 872.2 mgal

European Vertical GPS Reference Network (EUVN)

Station Hanko

Site Identification of the GPS Monument	
4-Char. EUVN ID	FI02
DOMES Number	
Monument Inscription/National Site Number	37
Marker Type, Monumentation Type, Foundation	Concrete pillar with a steel support and steel plate on the top of the pillar
Mark dot of coordinates	

Site Location Information	
City or Town	Hanko
State or Province	
Country	Finland
Responsible Agency (Full Address)	Finnish Geodetic Institute Geodeetinrinne 2 FIN-02430 Masala Finland
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 2959211.157 m Y = 1254679.038 m Z = 5490594.342 m
Height in UELN-95/98	5.251 m
Gravity in IGSN71	981 902.5 mgal

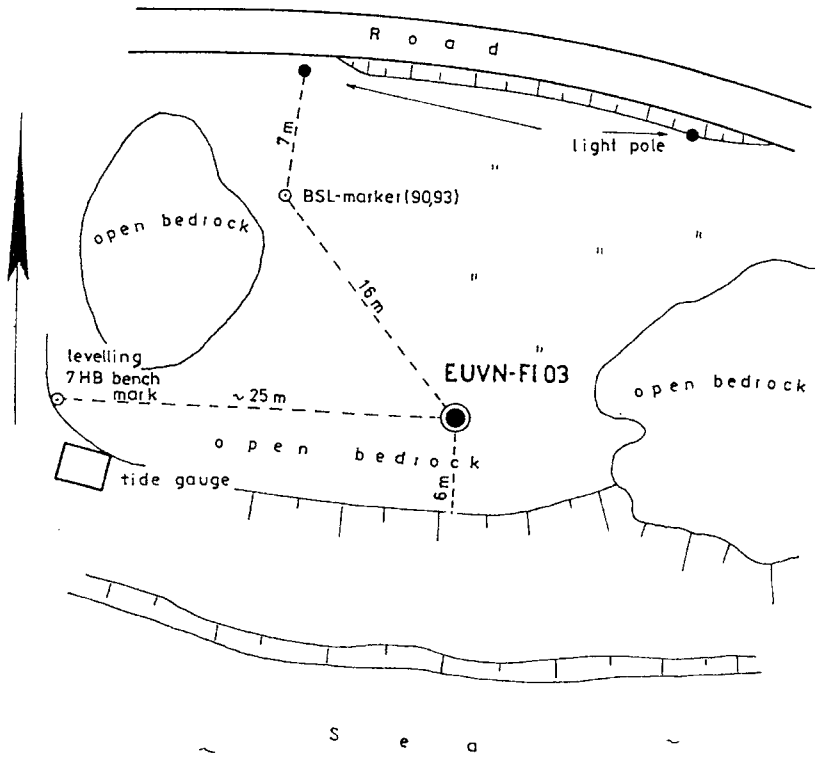


European Vertical GPS Reference Network (EUVN)

Station Helsinki

Site Identification of the GPS Monument	
4-Char. EUVN ID	FI03
DOMES Number	
Monument Inscription/National Site Number	38
Marker Type, Monumentation Type, Foundation	Granite pillar with a steel support and steel plate on the top of the pillar
Mark dot of coordinates	

Site Location Information	
City or Town	Helsinki
State or Province	
Country	Finland
Responsible Agency (Full Address)	Finnish Geodetic Institute Geodeetinrinne 2 FIN-02430 Masala Finland
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 2885137.580 m Y = 1342710.149 m Z = 5509039.022 m
Height in UELN-95/98	6.566 m
Gravity in ISGN71	981 908.1 mgal



European Vertical GPS Reference Network (EUVN)

Station Joensuu

Site Identification of the GPS Monument	
4-Char. EUVN ID	JOEN
DOMES Number	10512 M 001
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	2,5 m tall steel grid mast on bedrock, on top of mast horizontal attachment plate
Mark dot of coordinates	

Site Location Information	
City or Town	Joensuu
State or Province	
Country	Finland
Responsible Agency (Full Address)	Finnish Geodetic Institute Geodeetinrinne 2 FIN-02430 Masala Finland
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 2564139.427 m Y = 1486149.593 m Z = 5628951.263 m
Height in UELN-95/98	96.532 m
Gravity in ISGN71	982 074.6 mgal

European Vertical GPS Reference Network (EUVN)

Station Kaskinen

Site Identification of the GPS Monument	
4-Char. EUVN ID	FI05
DOMES Number	
Monument Inscription/National Site Number	40
Marker Type, Monumentation Type, Foundation	Concrete pillar, on the top with a steel support and steel plate
Mark dot of coordinates	

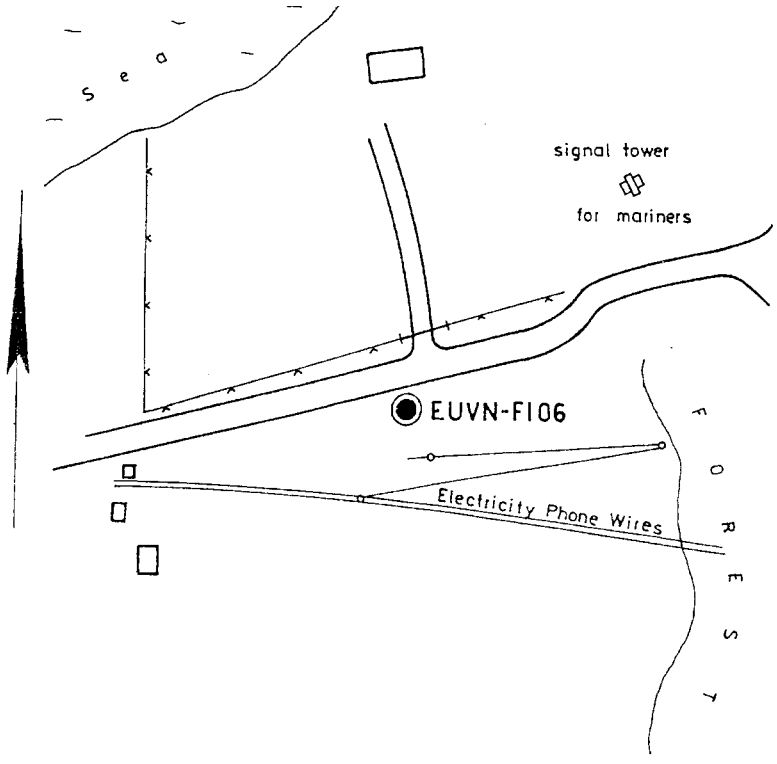
Site Location Information	
City or Town	Kaskinen
State or Province	
Country	Finland
Responsible Agency (Full Address)	Finnish Geodetic Institute Geodeetinrinne 2 FIN-02430 Masala Finland
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 2767237.554 m Y = 1074245.383 m Z = 5626366.721 m
Height in UELN-95/98	5.957 m
Gravity in ISGN71	982 070.7 mgal

European Vertical GPS Reference Network (EUVN)

Station Kemi

Site Identification of the GPS Monument	
4-Char. EUVN ID	FI06
DOMES Number	
Monument Inscription/National Site Number	41
Marker Type, Monumentation Type, Foundation	Concrete pillar, with steel support and steel plate on the top of the pillar
Mark dot of coordinates	

Site Location Information	
City or Town	Kemi
State or Province	
Country	Finland
Responsible Agency (Full Address)	Finnish Geodetic Institute Geodeetinrinne 2 FIN-02430 Masala Finland
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 2397071.765 m Y = 1093330.243 m Z = 5789108.359 m
Height in UELN-95/98	7.092 m
Gravity in ISGN71	982 299.4 mgal



European Vertical GPS Reference Network (EUVN)

Station Kuusamo

Site Identification of the GPS Monument	
4-Char. EUVN ID	KUUS
DOMES Number	
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	2,5 m tall steel grid mast on bedrock
Mark dot of coordinates	

Site Location Information	
City or Town	Kuusamo
State or Province	
Country	Finland
Responsible Agency (Full Address)	Finnish Geodetic Institute Geodeetinrinne 2 FIN-02430 Masala Finland
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 2282711.792 m Y = 1267071.718 m Z = 5800215.675 m
Height in UELN-95/98	
Gravity in ISGN71	982 247.65 mgal

European Vertical GPS Reference Network (EUVN)

Station Metsaehovi

Site Identification of the GPS Monument	
4-Char. EUVN ID	METS
DOMES Number	10503 S 011
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	21 m tall steel grid mast on bedrock, southeast corner of the tower
Mark dot of coordinates	

Site Location Information	
City or Town	Kirkkonummi
State or Province	
Country	Finland
Responsible Agency (Full Address)	Finnish Geodetic Institute Geodeetinrinne 2 FIN-02430 Masala Finland
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 2892571.116 m Y = 1311843.264 m Z = 5512633.954 m
Height in UELN-95/98	75.875 m
Gravity in ISGN71	981 912.7 mgal

European Vertical GPS Reference Network (EUVN)

Station Metsaehovi A

Site Identification of the GPS Monument	
4-Char. EUVN ID	META
DOMES Number	
Monument Inscription/National Site Number	44
Marker Type, Monumentation Type, Foundation	21 m tall steel grid mast on bedrock, northern corner of the tower
Mark dot of coordinates	

Site Location Information	
City or Town	Kirkkonummi
State or Province	
Country	Finland
Responsible Agency (Full Address)	Finnish Geodetic Institute Geodeetinrinne 2 FIN-02430 Masala Finland
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 2892570.165 m Y = 1311843.463 m Z = 5512634.348 m
Height in UELN-95/98	
Gravity in ISGN71	

European Vertical GPS Reference Network (EUVN)

Station Sodankylae

Site Identification of the GPS Monument	
4-Char. EUVN ID	SODA
DOMES Number	10513 M 001
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	2,5 m tall steel grid mast on concrete pedestal, on top a metal plate with bolt
Mark dot of coordinates	

Site Location Information	
City or Town	Sodankylae
State or Province	
Country	Finland
Responsible Agency (Full Address)	Finnish Geodetic Institute Geodeetinrinne 2 FIN-02430 Masala Finland
Contact Agency Information	Geophysical Observatory of the Finnish Academy of Sciences and Letters FIN-99600 Sodankylae Finland
Coordinates in ETRS89, Epoch 97.4	X = 2200147.005 m Y = 1091638.197 m Z = 5866870.601 m
Height in UELN-95/98	279.063 m
Gravity in ISGN71	982 362.1 mgal

European Vertical GPS Reference Network (EUVN)

Station Vaasa

Site Identification of the GPS Monument	
4-Char. EUVN ID	VAAS
DOMES Number	10511 M 001
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	2,5 m tall steel grid mast on concrete pedestal on bedrock, on top of mast a metal plate with bolt
Mark dot of coordinates	

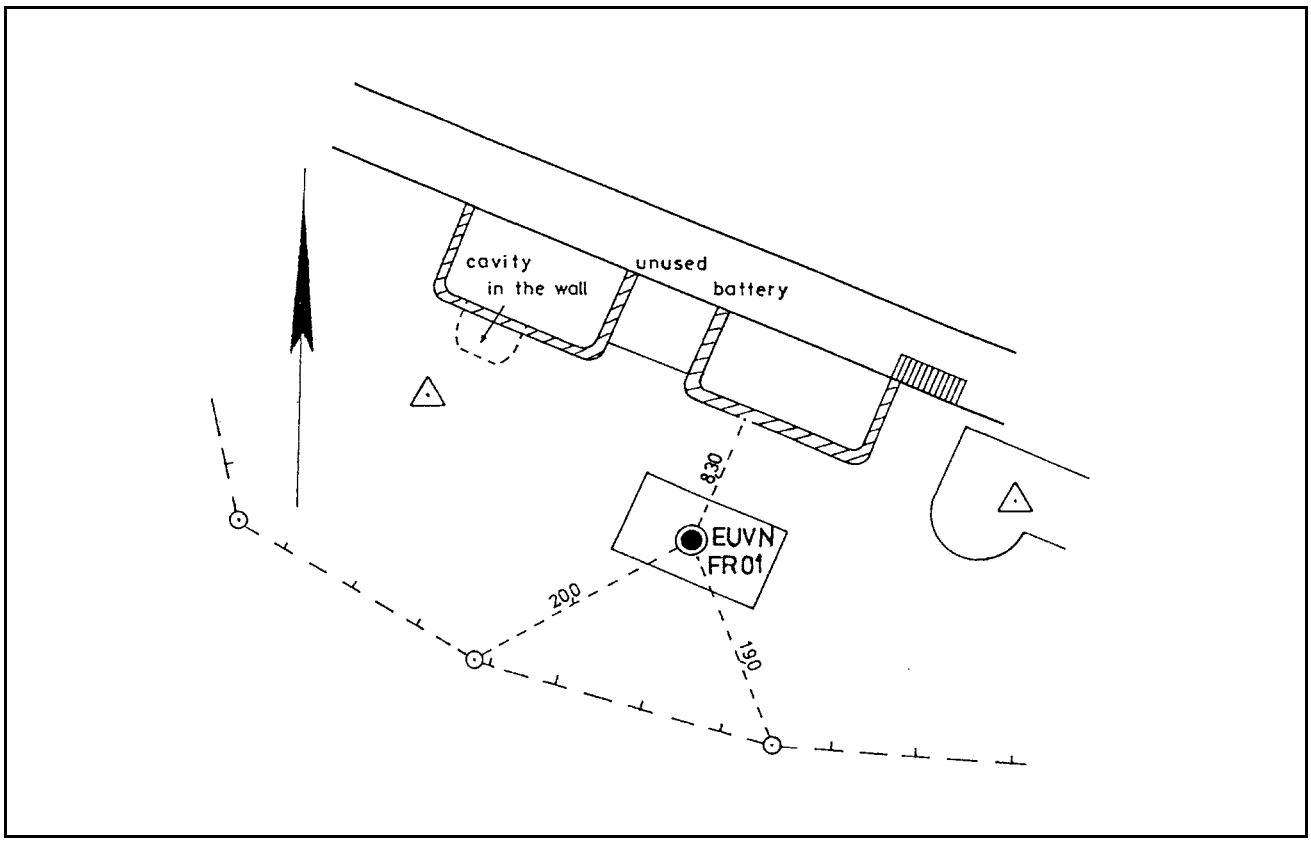
Site Location Information	
City or Town	Vaasa
State or Province	
Country	Finland
Responsible Agency (Full Address)	Finnish Geodetic Institute Geodeetinrinne 2 FIN-02430 Masala Finland
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 2699864.639 m Y = 1078263.824 m Z = 5658064.671 m
Height in UELN-95/98	40.090 m
Gravity in ISGN71	982 074.9 mgal

European Vertical GPS Reference Network (EUVN)

Station Ajaccio

Site Identification of the GPS Monument	
4-Char. EUVN ID	FR01
DOMES Number	10077 M 002
Monument Inscription/National Site Number	Réseau Géodésique Français 2A00409
Marker Type, Monumentation Type, Foundation	Concrete block with GPS marker (bolt)
Mark dot of coordinates	Centre and top of the GPS marker

Site Location Information	
City or Town	Ajaccio
State or Province	Corse-du-sud
Country	France
Responsible Agency (Full Address)	Institut Géographique National 2, Avenue Pasteur F-94165 Saint-Mandé CEDEX France
Contact Agency Information	Aeronautical Base „Marine a Ajaccio“ BP 404 F-20184 Ajaccio Cedex France
Coordinates in ETRS89, Epoch 97.4	X = 4696992.170 m Y = 724001.410 m Z = 4239671.394 m
Height in UELN-95/98	49.069 m
Gravity in ISGN71	980 346 mgal

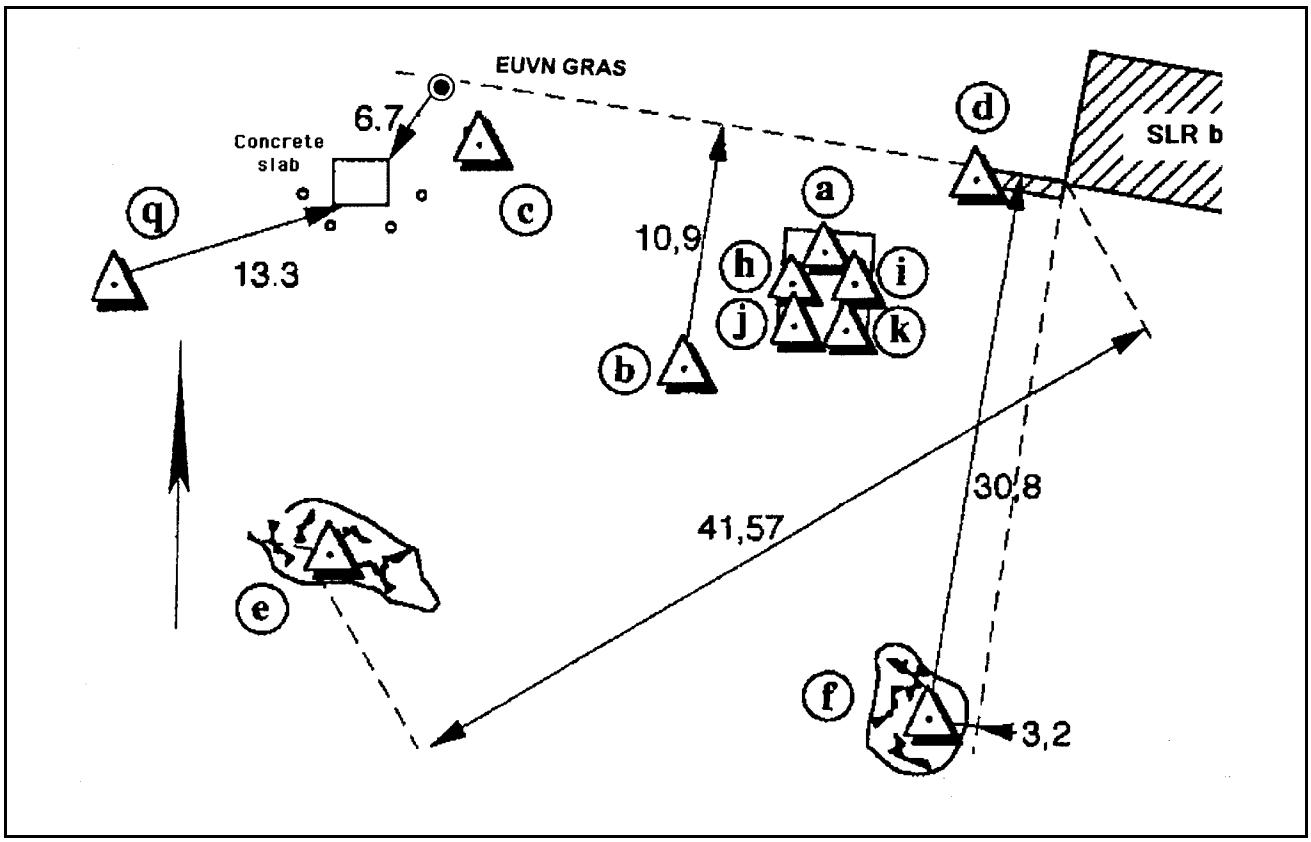


European Vertical GPS Reference Network (EUVN)

Station Grasse

Site Identification of the GPS Monument	
4-Char. EUVN ID	GRAS
DOMES Number	10002 M 006
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Concrete pillar on bedrock with forced centring plate
Mark dot of coordinates	Centre and top of the threaded bolt

Site Location Information	
City or Town	Caussols
State or Province	Alpes-Maritimes
Country	France
Responsible Agency (Full Address)	Centre National d'Études Spatiales 18, Avenue Edouard Belin F-31401 Toulouse Cedex 04 France
Contact Agency Information	Observatoire de la Côte d'Azur Avenue Nicolas Copernic F-06100 Grasse France
Coordinates in ETRS89, Epoch 97.4	X = 4581691.163 m Y = 556114.582 m Z = 4389360.552 m
Height in UELN-95/98	
Gravity in ISGN71	

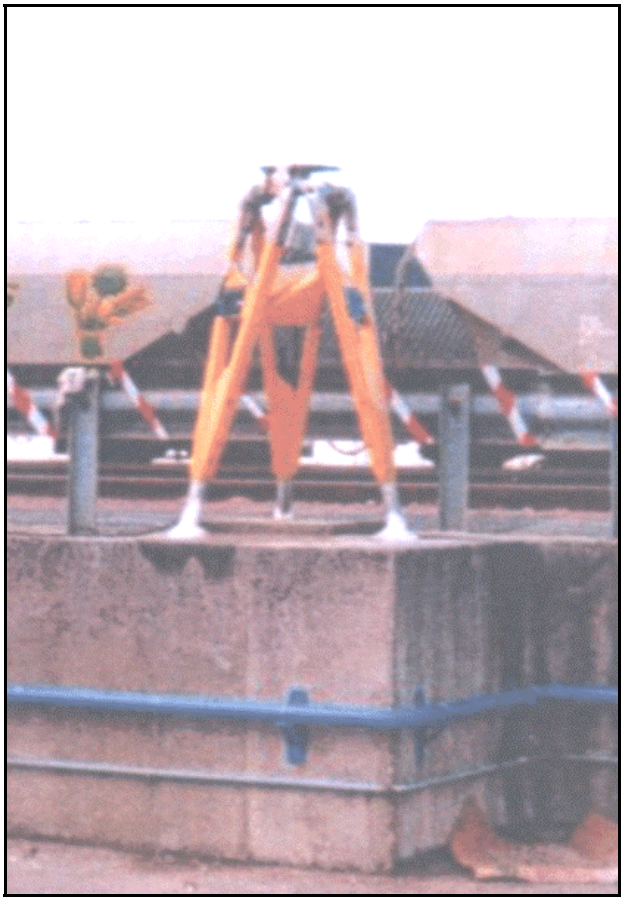


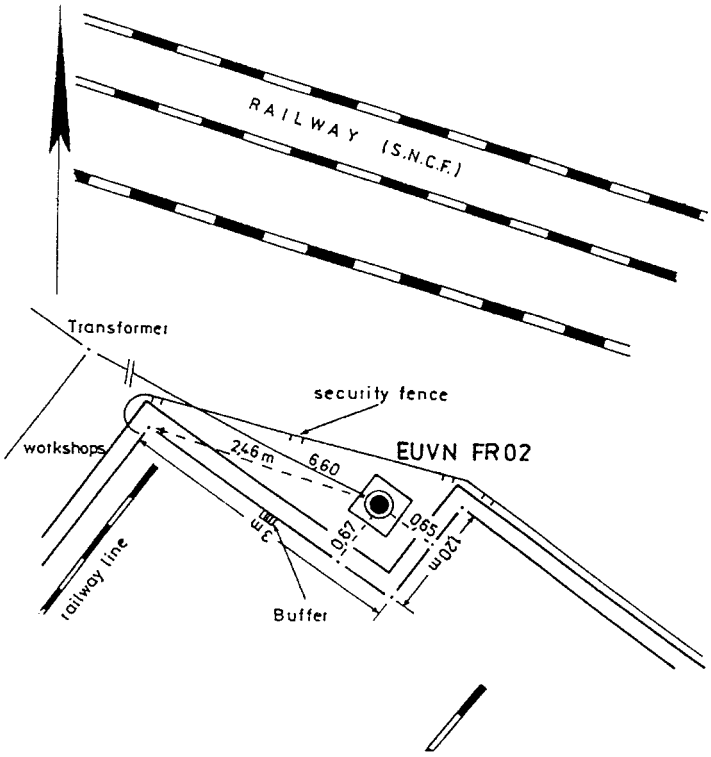
European Vertical GPS Reference Network (EUVN)

Station Bordeaux

Site Identification of the GPS Monument	
4-Char. EUVN ID	FR02
DOMES Number	10013 M 001
Monument Inscription/National Site Number	Institut Géographique National
Marker Type, Monumentation Type, Foundation	Concrete plate with domed mark
Mark dot of coordinates	Centre and top of the mark

Site Location Information	
City or Town	Bordeaux
State or Province	Gironde
Country	France
Responsible Agency (Full Address)	Institut Géographique National 2, Avenue Pasteur F-94165 Saint-Mandé CEDEX France
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4531872.862 m Y = -44441.213 m Z = 4472878.174 m
Height in UELN-95/98	7.380 m
Gravity in ISGN71	980 568 mgal



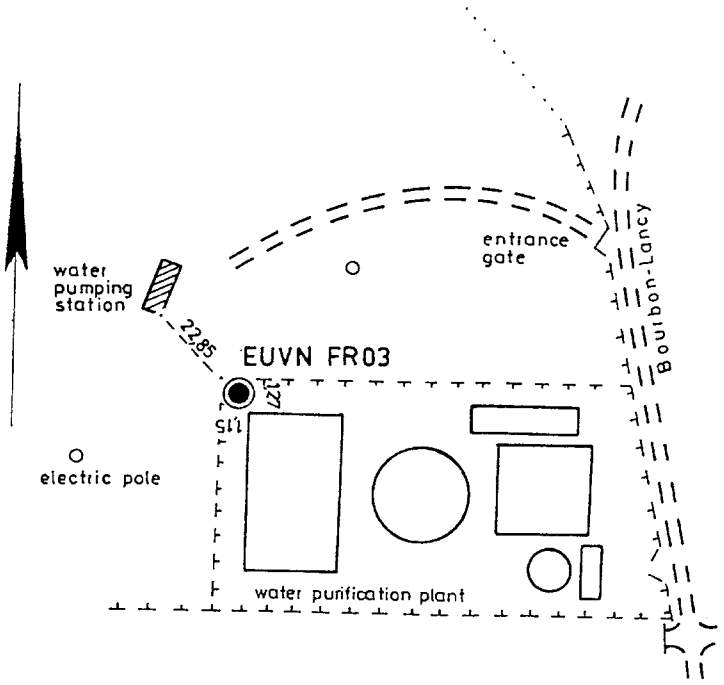


European Vertical GPS Reference Network (EUVN)

Station Bourbon-Lancy

Site Identification of the GPS Monument	
4-Char. EUVN ID	FR03
DOMES Number	10086 M 001
Monument Inscription/National Site Number	Réseau Géodésique Français
Marker Type, Monumentation Type, Foundation	Domed brass mark in a 1 m^3 concrete block
Mark dot of coordinates	Centre and top of the brass mark

Site Location Information	
City or Town	Bourbon-Lancy
State or Province	Saône-et-Loire
Country	France
Responsible Agency (Full Address)	Institut Géographique National 2, Avenue Pasteur F-94165 Saint-Mandé CEDEX France
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4379327.970 m Y = 285906.579 m Z = 4613051.899 m
Height in UELN-95/98	209.154 m
Gravity in ISGN71	980 692 mgal

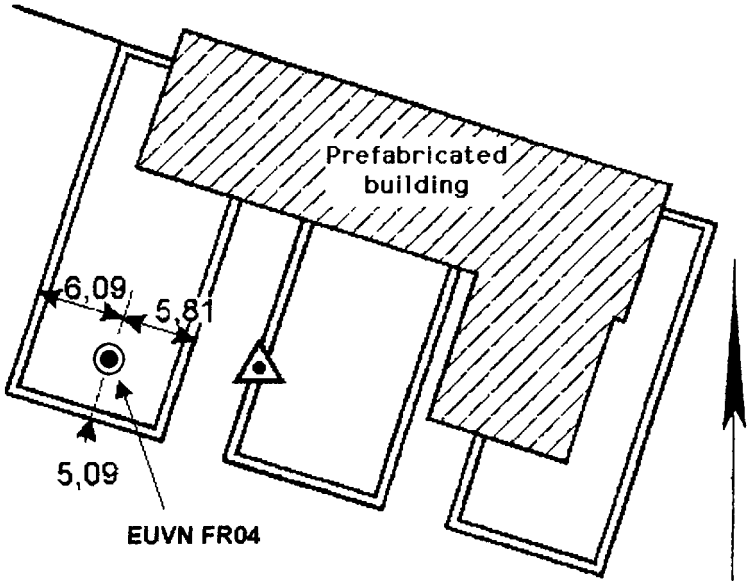


European Vertical GPS Reference Network (EUVN)

Station Brest

Site Identification of the GPS Monument	
4-Char. EUVN ID	FR04
DOMES Number	10004M002
Monument Inscription/National Site Number	29019A
Marker Type, Monumentation Type, Foundation	Brass mark in a concrete block
Mark dot of coordinates	Centre and top of the brass mark

Site Location Information	
City or Town	Brest
State or Province	Finistère
Country	France
Responsible Agency (Full Address)	EPSHOM-Section Géodesie-Géophysique 13, rue du Chatellier – BP 426 F-29275 Brest CEDEX France
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4228877.203 m Y = -333104.271 m Z = 4747180.815 m
Height in UELN-95/98	53.301 m
Gravity in ISGN71	980 928 mgal

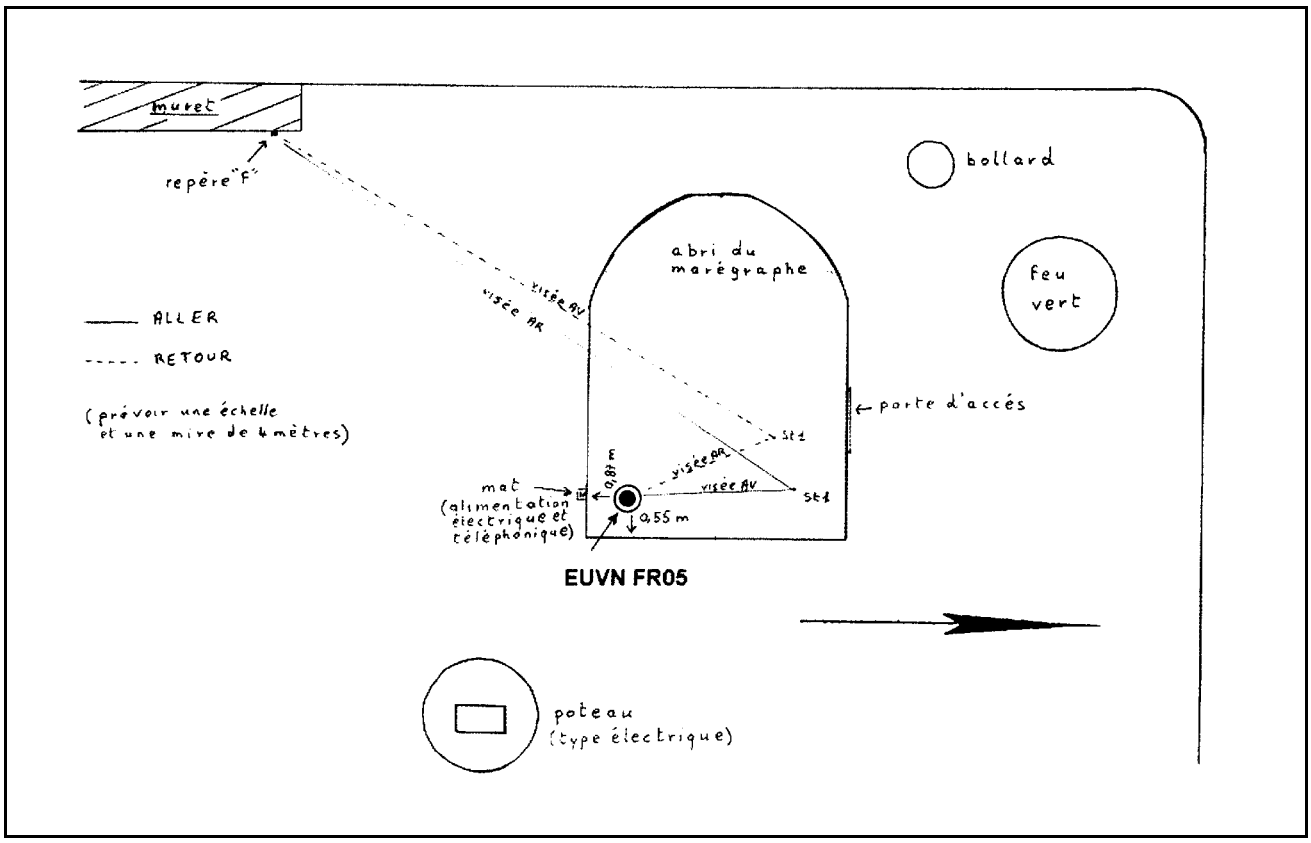


European Vertical GPS Reference Network (EUVN)

Station Le Havre

Site Identification of the GPS Monument	
4-Char. EUVN ID	FR05
DOMES Number	10067M002
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Brass mark on the roof of the tide gauge building
Mark dot of coordinates	Centre and top of the mark

Site Location Information	
City or Town	Le Havre
State or Province	Seine-Maritime
Country	France
Responsible Agency (Full Address)	EPSHOM-Section Géodesie-Géophysique 13, rue du Chatellier – BP 426 F-29275 Brest CEDEX France
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4151867.971 m Y = 7682.996 m Z = 4825589.328 m
Height in UELN-95/98	8.131 m
Gravity in ISGN71	981 011 mgal

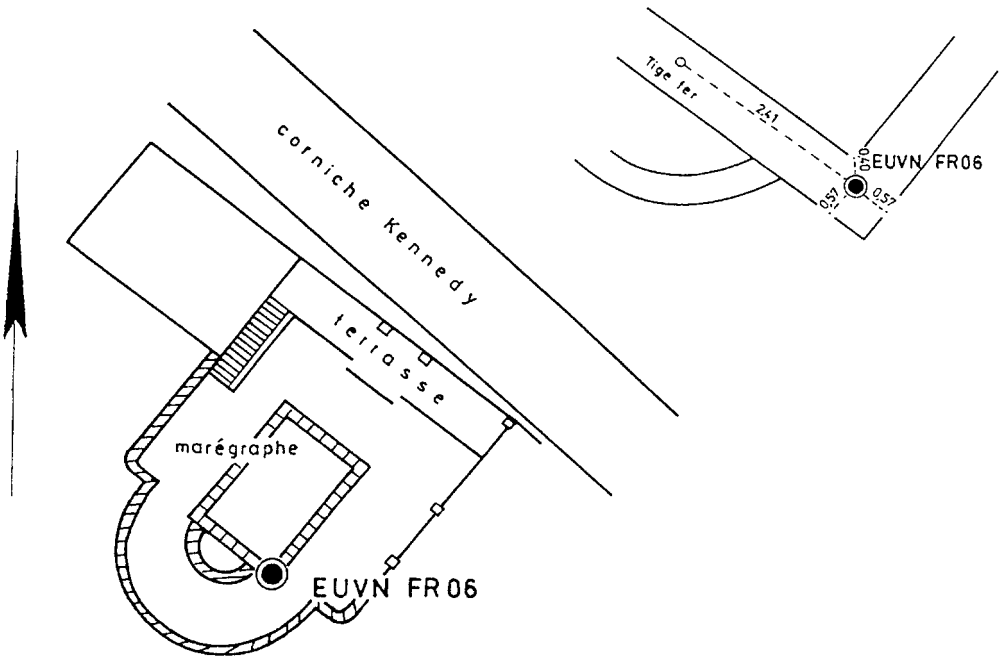


European Vertical GPS Reference Network (EUVN)

Station Marseille

Site Identification of the GPS Monument	
4-Char. EUVN ID	FR06
DOMES Number	10073 M 008
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Bolt on top of the border wall
Mark dot of coordinates	Centre and top of the bolt

Site Location Information	
City or Town	Marseille
State or Province	Bouches-du-Rhône
Country	France
Responsible Agency (Full Address)	Institut Géographique National 2, Avenue Pasteur F-94165 Saint-Mandé CEDEX France
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4630533.003 m Y = 433946.072 m Z = 4350142.477 m
Height in UELN-95/98	12.394 m
Gravity in ISGN71	980 484 mgal

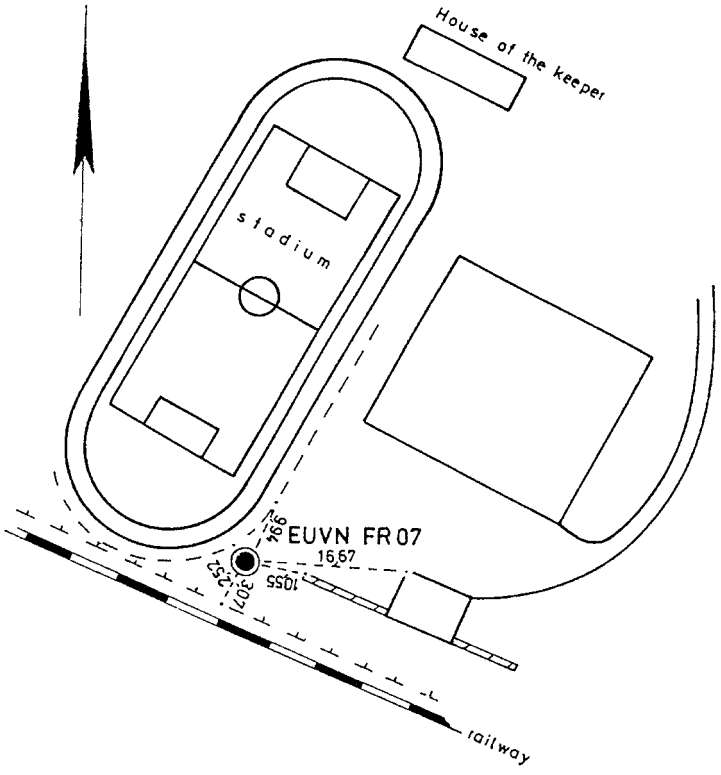


European Vertical GPS Reference Network (EUVN)

Station Frouard

Site Identification of the GPS Monument	
4-Char. EUVN ID	FR07
DOMES Number	10087 M 001
Monument Inscription/National Site Number	Réseau Géodésique Français
Marker Type, Monumentation Type, Foundation	Domed brass mark in a 1 m^3 concrete block
Mark dot of coordinates	Centre and top of the mark

Site Location Information	
City or Town	Frouard
State or Province	Meurthe-et-Moselle
Country	France
Responsible Agency (Full Address)	Institut Géographique National 2, Avenue Pasteur F-94165 Saint-Mandé CEDEX France
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4188395.295 m Y = 449710.681 m Z = 4773391.345 m
Height in UELN-95/98	194.365 m
Gravity in ISGN71	980 888 mgal

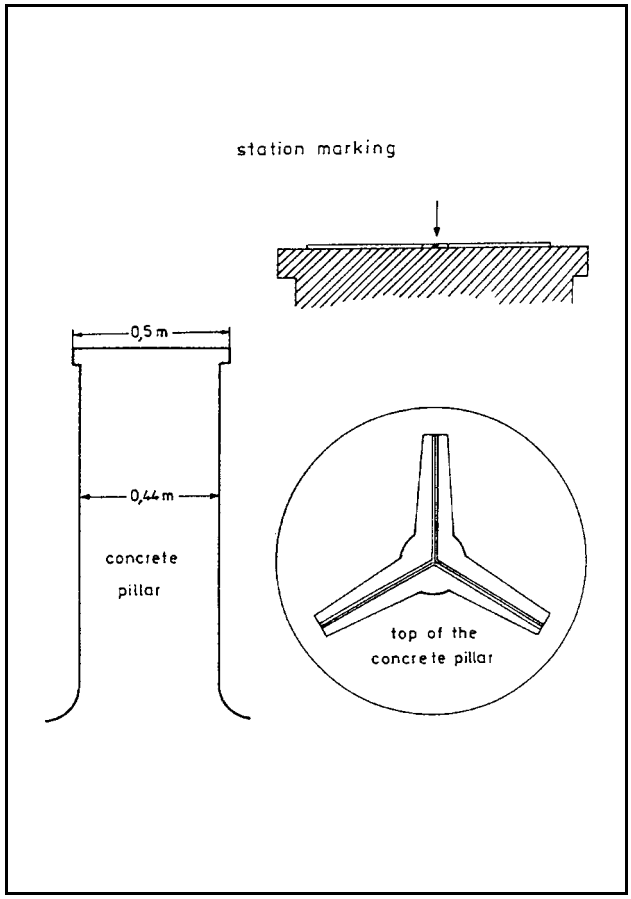


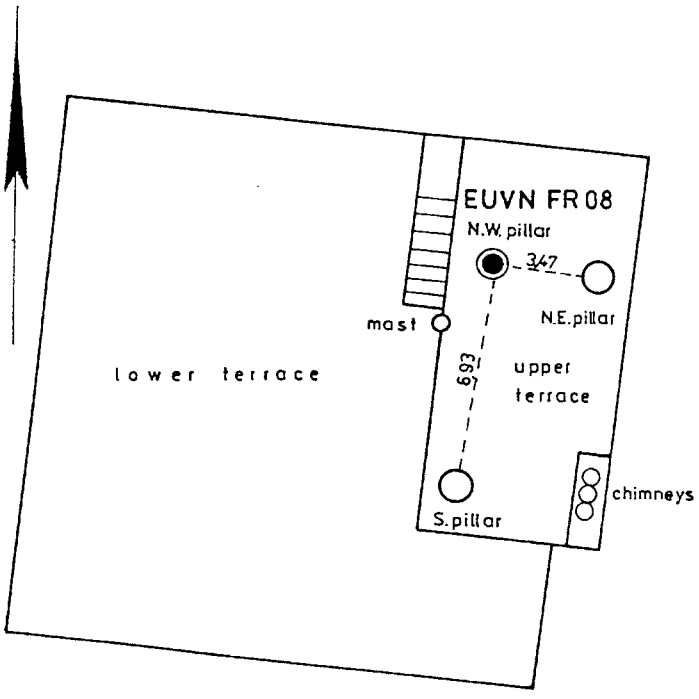
European Vertical GPS Reference Network (EUVN)

Station Paris

Site Identification of the GPS Monument	
4-Char. EUVN ID	FR08
DOMES Number	10001 M 003
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Concrete pillar with plate, with bore as point marker on top of the pillar
Mark dot of coordinates	Centre of the bore and top of the plate

Site Location Information	
City or Town	Saint Mandé
State or Province	Val-de-Marne
Country	France
Responsible Agency (Full Address)	Institut Géographique National 2, Avenue Pasteur F-94165 Saint-Mandé CEDEX France
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4201792.062 m Y = 177941.790 m Z = 4779286.899 m
Height in UELN-95/98	81.867 m
Gravity in ISGN71	





European Vertical GPS Reference Network (EUVN)

Station Toulouse

Site Identification of the GPS Monument	
4-Char. EUVN ID	TOUL
DOMES Number	10003 M 004
Monument Inscription/National Site Number	31555A
Marker Type, Monumentation Type, Foundation	Stainless steel domed mark in a small concrete pad
Mark dot of coordinates	Centre and top of the domed mark

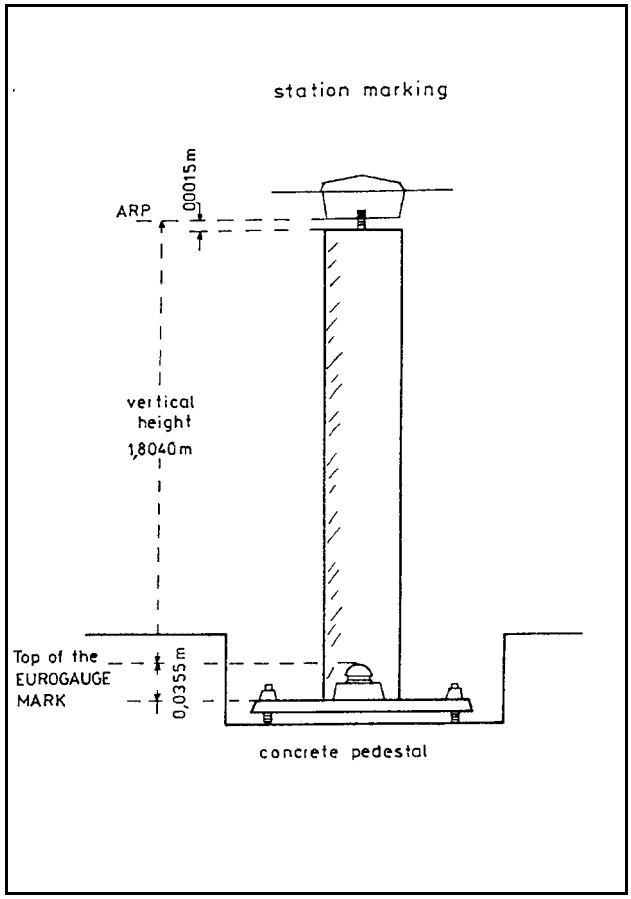
Site Location Information	
City or Town	Toulouse
State or Province	Haute-Garonne
Country	France
Responsible Agency (Full Address)	Centre National d'Études Spatiales 18, Avenue Edouard Belin F-31401 Toulouse Cedex 04 France
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4627846.269 m Y = 119629.076 m Z = 4372999.577 m
Height in UELN-95/98	157.740 m
Gravity in ISGN71	980 426 mgal

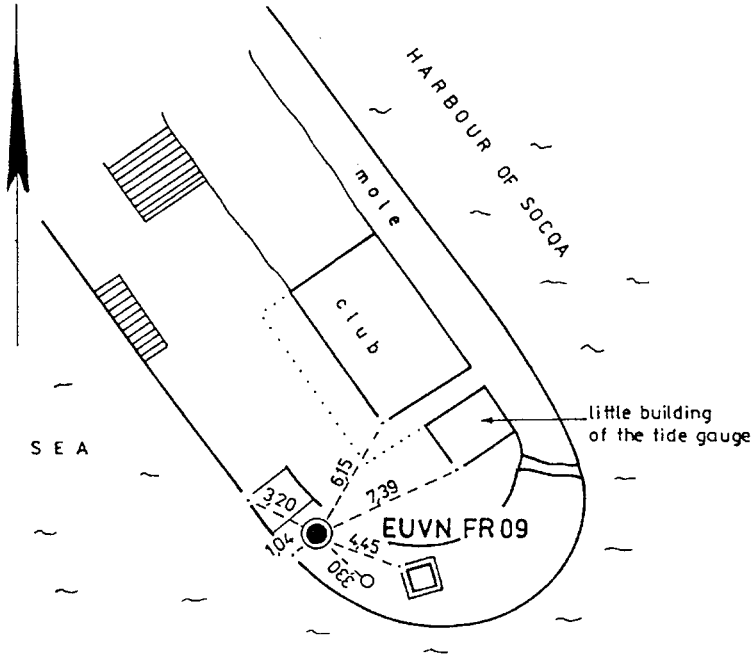
European Vertical GPS Reference Network (EUVN)

Station St. Jean de Luz

Site Identification of the GPS Monument	
4-Char. EUVN ID	FR09
DOMES Number	10088 M 001
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Screw bolt (Eurogauge marker) in a metal plate, inserted in a concrete pedestal
Mark dot of coordinates	Centre and top of the bolt

Site Location Information	
City or Town	Ciboure
State or Province	Pyrénées-Atlantiques
Country	France
Responsible Agency (Full Address)	Institut Géographique National 2, Avenue Pasteur F-94165 Saint-Mandé CEDEX France
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4639942.782 m Y = -136230.007 m Z = 4359542.295 m
Height in UELN-95/98	5.010 m
Gravity in ISGN71	980 461 mgal



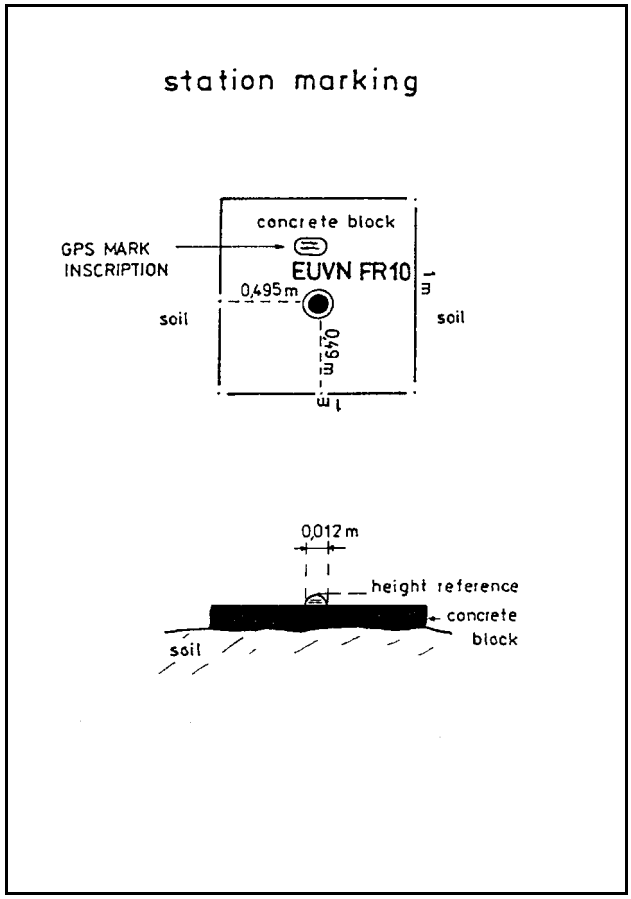


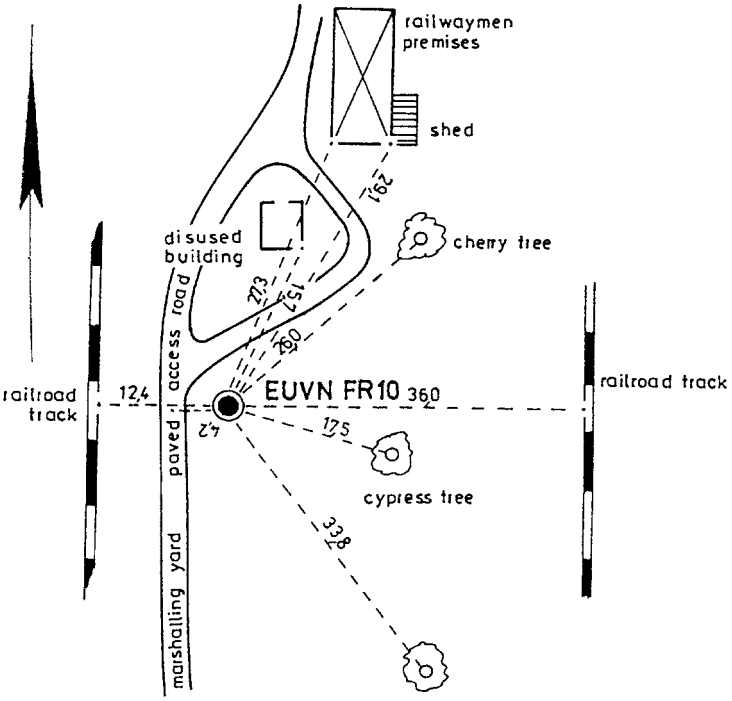
European Vertical GPS Reference Network (EUVN)

Station Thouars

Site Identification of the GPS Monument	
4-Char. EUVN ID	FR10
DOMES Number	10089 M 001
Monument Inscription/National Site Number	Réseau Géodésique Français
Marker Type, Monumentation Type, Foundation	Domed brass mark in a concrete block
Mark dot of coordinates	Centre and top of the mark

Site Location Information	
City or Town	Thouars
State or Province	Deux-Sèvres
Country	France
Responsible Agency (Full Address)	Institut Géographique National 2, Avenue Pasteur F-94165 Saint-Mandé CEDEX France
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4358530.203 m Y = -15169.732 m Z = 4641136.859 m
Height in UELN-95/98	86.065 m
Gravity in ISGN71	980 775 mgal



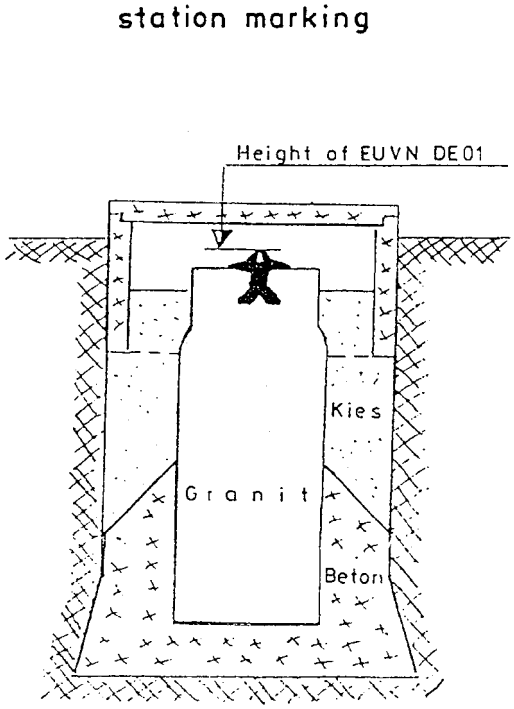


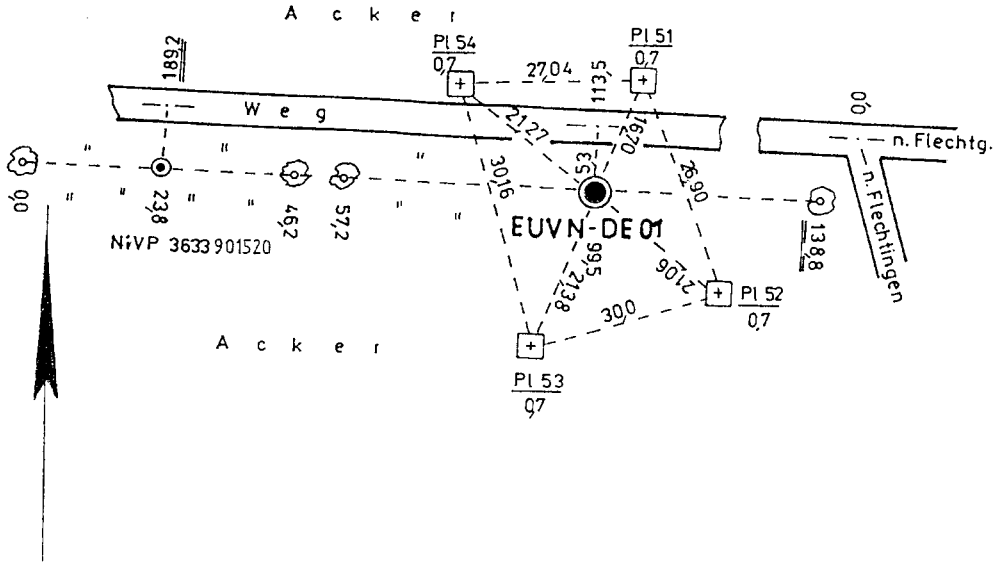
European Vertical GPS Reference Network (EUVN)

Station Flechtingen

Site Identification of the GPS Monument	
4-Char. EUVN ID	DE01
DOMES Number	
Monument Inscription/National Site Number	TP 3633006100 = NivP 3633901510
Marker Type, Monumentation Type, Foundation	Granite pillar with concrete foundation, with bolt on top of the pillar, in marking shaft
Mark dot of coordinates	Centre and top of the bolt

Site Location Information	
City or Town	Flechtingen
State or Province	Sachsen-Anhalt
Country	Germany
Responsible Agency (Full Address)	Landesamt für Landesvermessung und Datenverarbeitung Sachsen-Anhalt Barbarastr. 2 D-06110 Halle (Saale) Germany
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3830805.962 m Y = 760508.738 m Z = 5025824.656 m
Height in UELN-95/98	110.580 m
Gravity in ISGN71	981 286.25 mgal



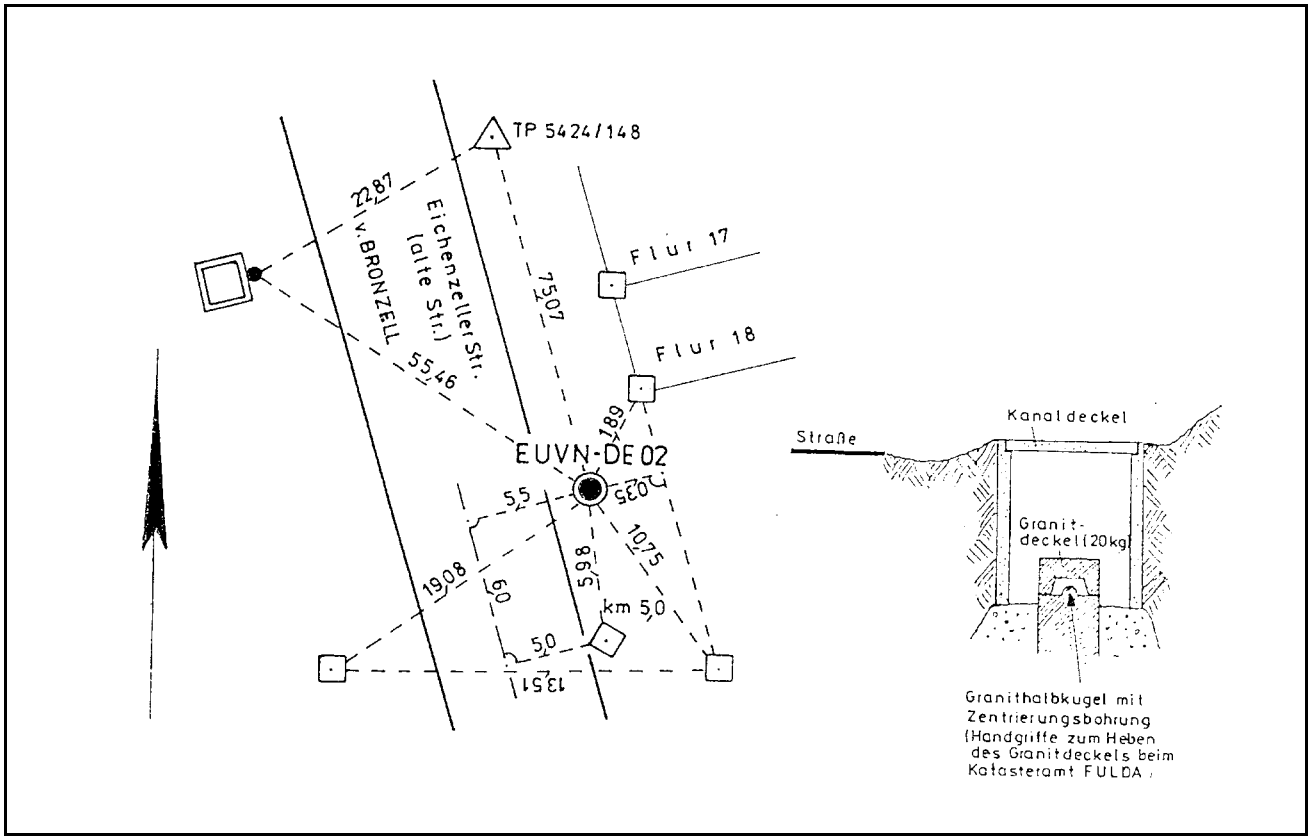


European Vertical GPS Reference Network (EUVN)

Station Bronnzell

Site Identification of the GPS Monument	
4-Char. EUVN ID	DE02
DOMES Number	
Monument Inscription/National Site Number	00426
Marker Type, Monumentation Type, Foundation	Granite pillar with worked-out granite half-ball and centring bore, marked underground in a sewer manhole
Mark dot of coordinates	Centre and top of the half-ball

Site Location Information	
City or Town	Fulda
State or Province	Hessen
Country	Germany
Responsible Agency (Full Address)	Hessisches Landesvermessungsamt Schaperstr. 16 D-65195 Wiesbaden Germany
Contact Agency Information	Katasteramt Fulda Petersberger Str. 21 D-36307 Fulda Germany
Coordinates in ETRS89, Epoch 97.4	X = 4006695.278 m Y = 683568.656 m Z = 4899211.734 m
Height in UELN-95/98	287.133 m
Gravity in ISGN71	981 051.07 mgal

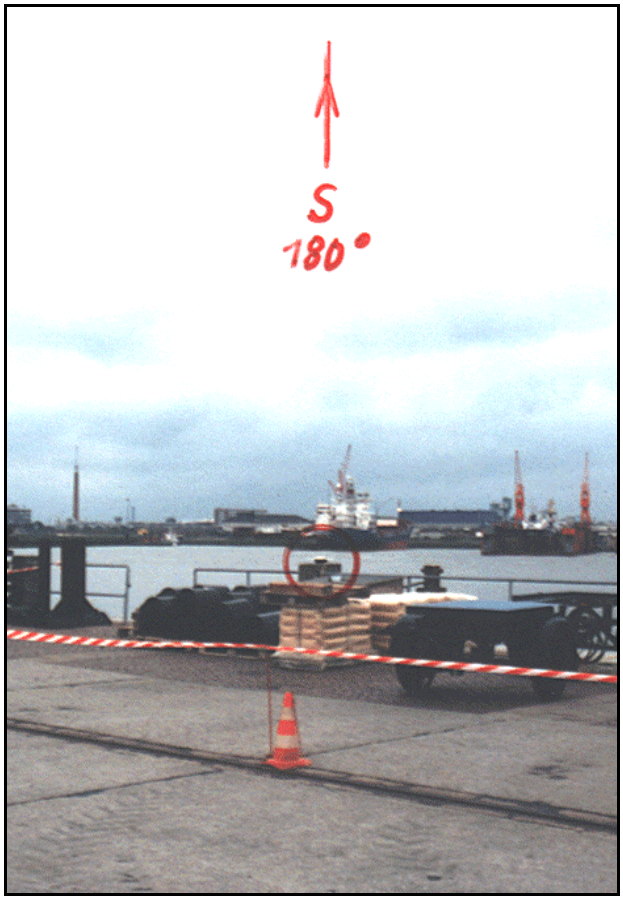


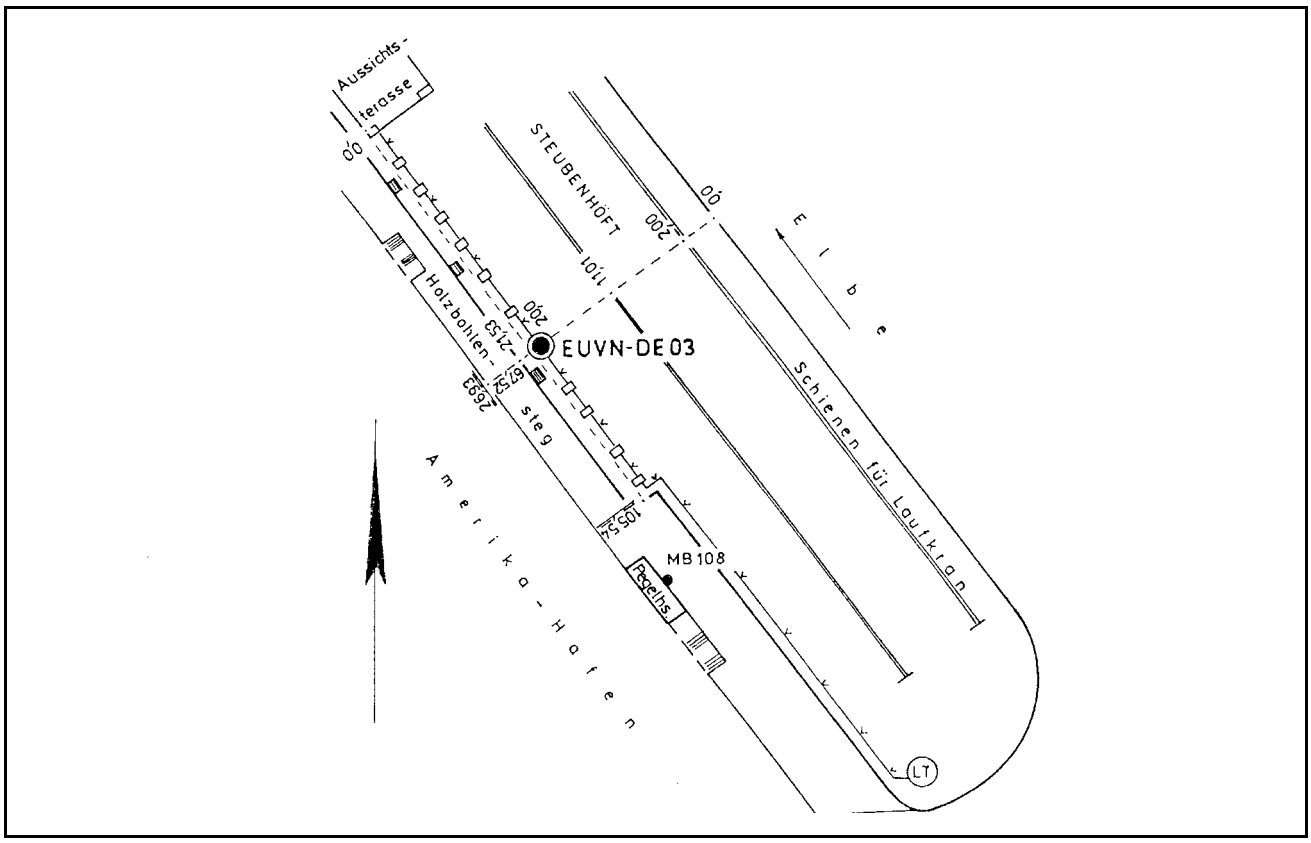
European Vertical GPS Reference Network (EUVN)

Station Cuxhaven

Site Identification of the GPS Monument	
4-Char. EUVN ID	DE03
DOMES Number	
Monument Inscription/National Site Number	2118-9-9000
Marker Type, Monumentation Type, Foundation	Concrete pillar with centring plate (plate with screw bolt) on a mole, with forced centring device
Mark dot of coordinates	Centre of the screw bolt and top of the centring plate

Site Location Information	
City or Town	Cuxhaven
State or Province	Niedersachsen
Country	Germany
Responsible Agency (Full Address)	Landesvermessung + Geobasisinformation Niedersachsen (LGN) Warmbüchenkamp 2 D-30159 Hannover Germany
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3725573.700 m Y = 571226.339 m Z = 5128135.574 m
Height in UELN-95/98	5.690 m
Gravity in ISGN71	981 382.3 mgal



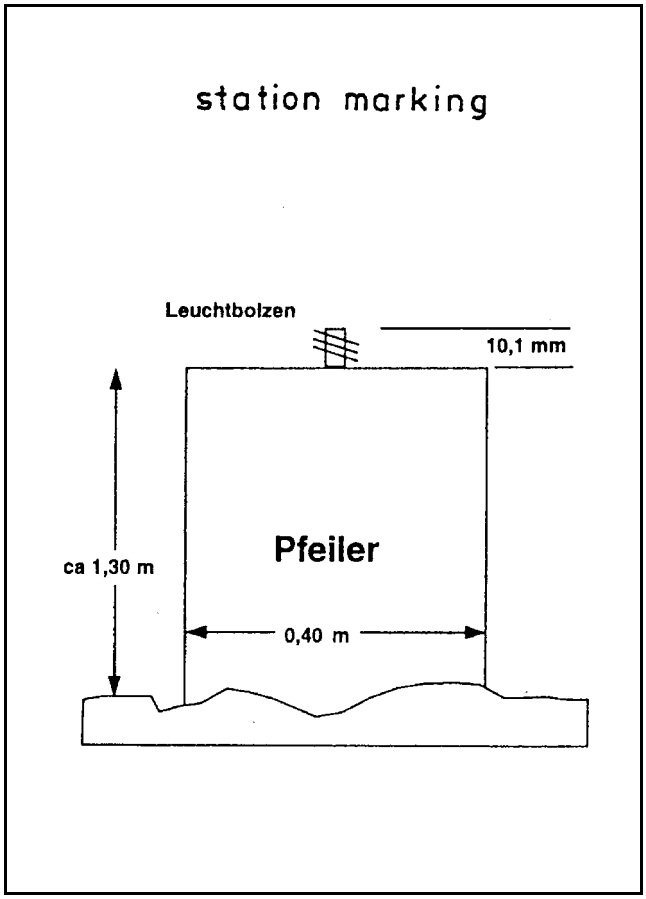


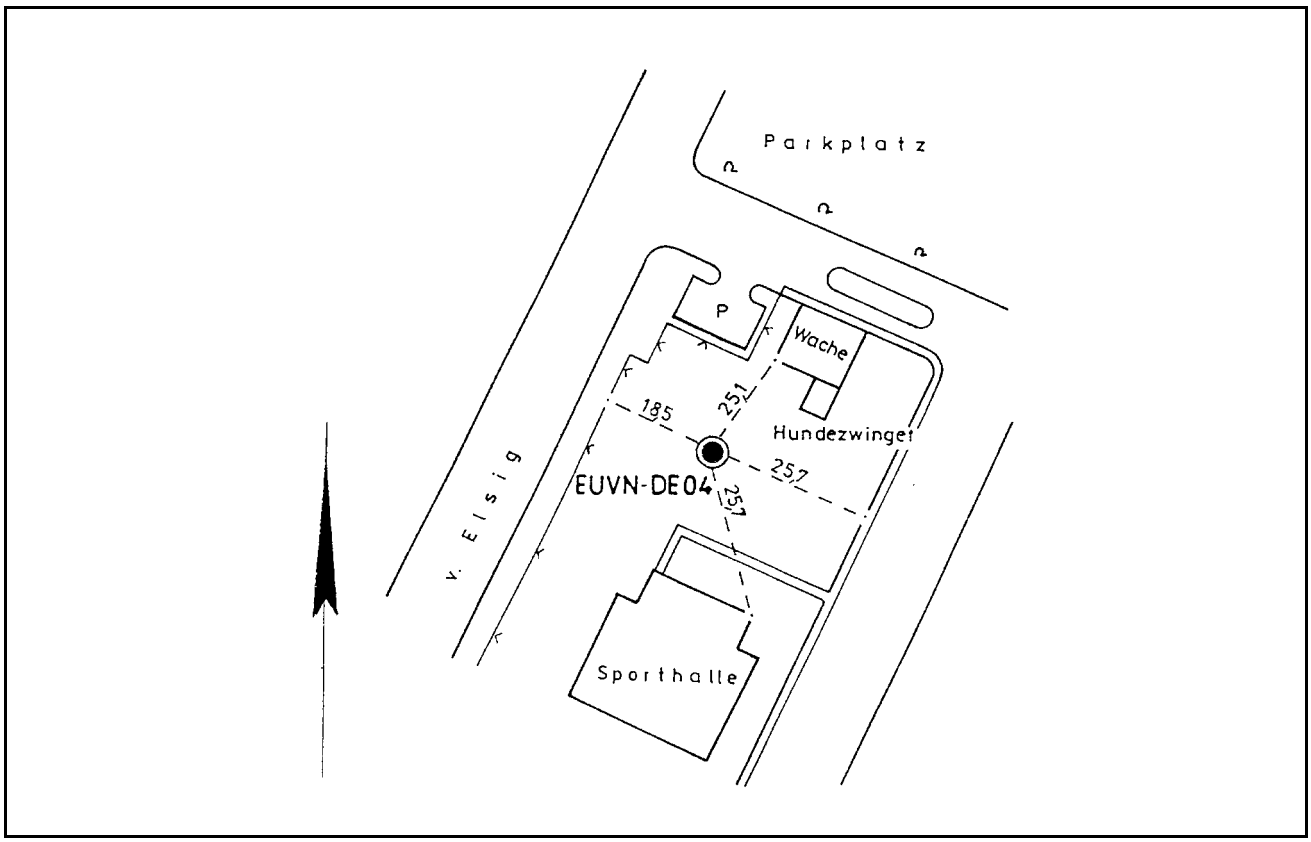
European Vertical GPS Reference Network (EUVN)

Station Euskirchen

Site Identification of the GPS Monument	
4-Char. EUVN ID	DE04
DOMES Number	
Monument Inscription/National Site Number	D93/038.2
Marker Type, Monumentation Type, Foundation	Pillar with lightkeeper's bolt and forced centring device
Mark dot of coordinates	Centre of the lightkeeper's bolt and top of the pillar

Site Location Information	
City or Town	Euskirchen
State or Province	Nordrhein-Westfalen
Country	Germany
Responsible Agency (Full Address)	Amt für Militärisches Geowesen Mercator-Kaserne Frauenberger Str. 250 D-53879 Euskirchen Germany
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4022132.037 m Y = 476874.271 m Z = 4910797.635 m
Height in UELN-95/98	170.947 m
Gravity in IGSN71	981 085.7 mgal



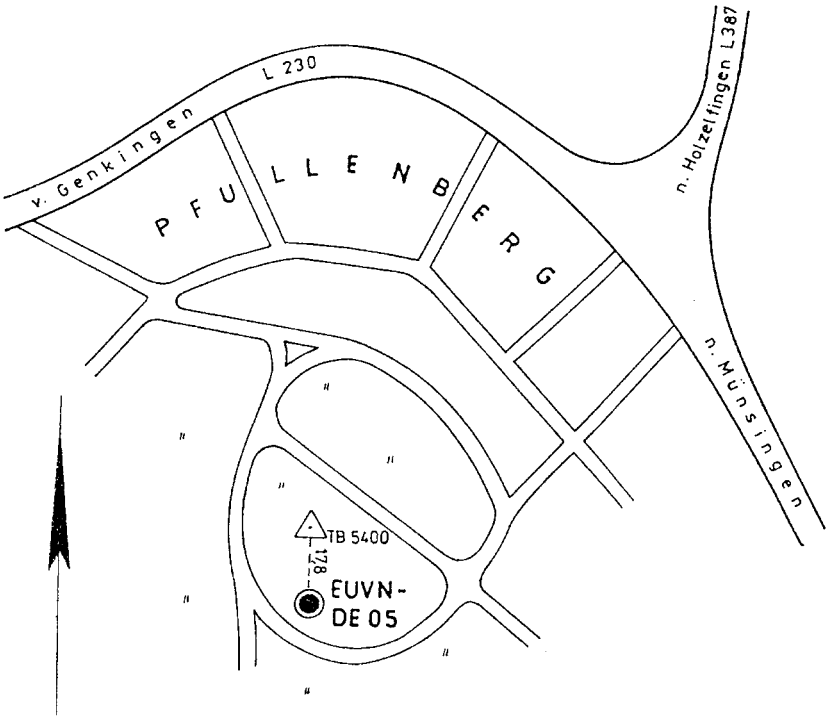


European Vertical GPS Reference Network (EUVN)

Station Honau

Site Identification of the GPS Monument	
4-Char. EUVN ID	DE05
DOMES Number	
Monument Inscription/National Site Number	752105408
Marker Type, Monumentation Type, Foundation	Granite pillar with bolt
Mark dot of coordinates	

Site Location Information	
City or Town	Honau
State or Province	Baden-Württemberg
Country	Germany
Responsible Agency (Full Address)	Landesvermessungsamt Baden-Württemberg Büchsenstraße 54 D-70174 Stuttgart Germany
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4187473.476 m Y = 684501.215 m Z = 4747104.487 m
Height in UELN-95/98	711.848 m
Gravity in IGSN71	980 750.8 mgal

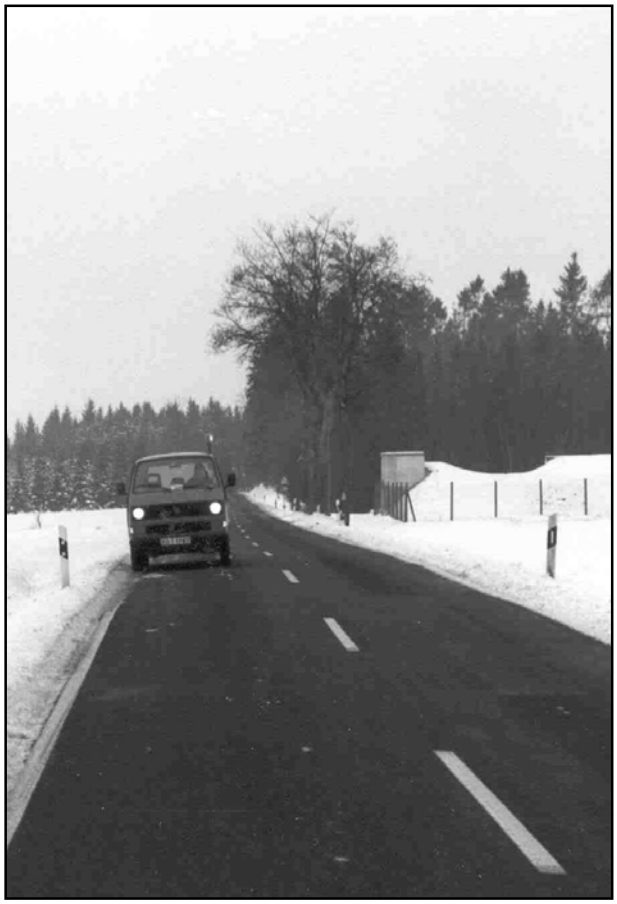


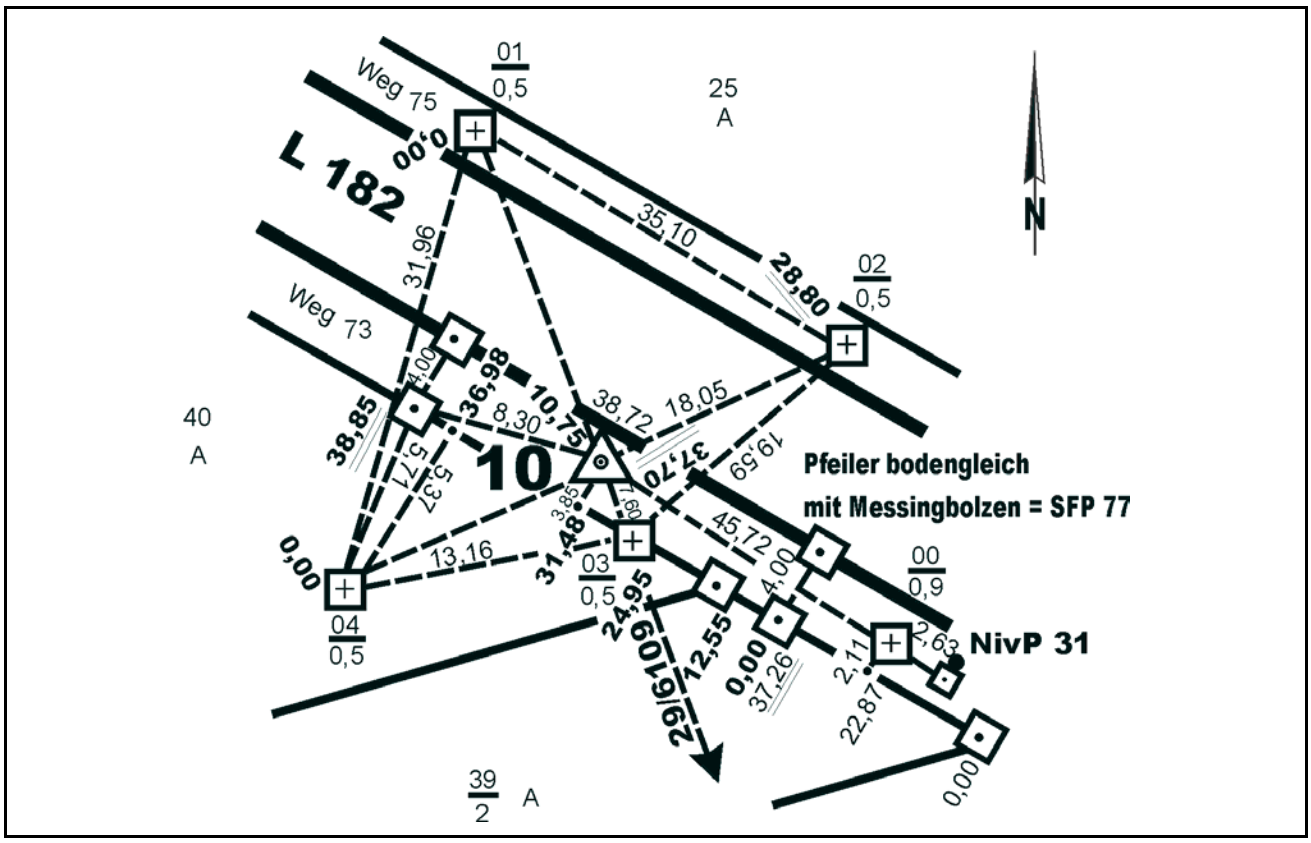
European Vertical GPS Reference Network (EUVN)

Station Niederweiler

Site Identification of the GPS Monument	
4-Char. EUVN ID	DE06
DOMES Number	
Monument Inscription/National Site Number	6009001310
Marker Type, Monumentation Type, Foundation	TP-pillar with brass bolt over TP-plate
Mark dot of coordinates	

Site Location Information	
City or Town	Niederweiler
State or Province	Rheinland-Pfalz
Country	Germany
Responsible Agency (Full Address)	Landesvermessungsamt Rheinland-Pfalz Ferdinand-Sauerbruch-Str. 15 D-56073 Koblenz Germany
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4082139.416 m Y = 522626.119 m Z = 4857094.496 m
Height in UELN-95/98	477.835 m
Gravtiy in ISGN71	980 956.505 mgal



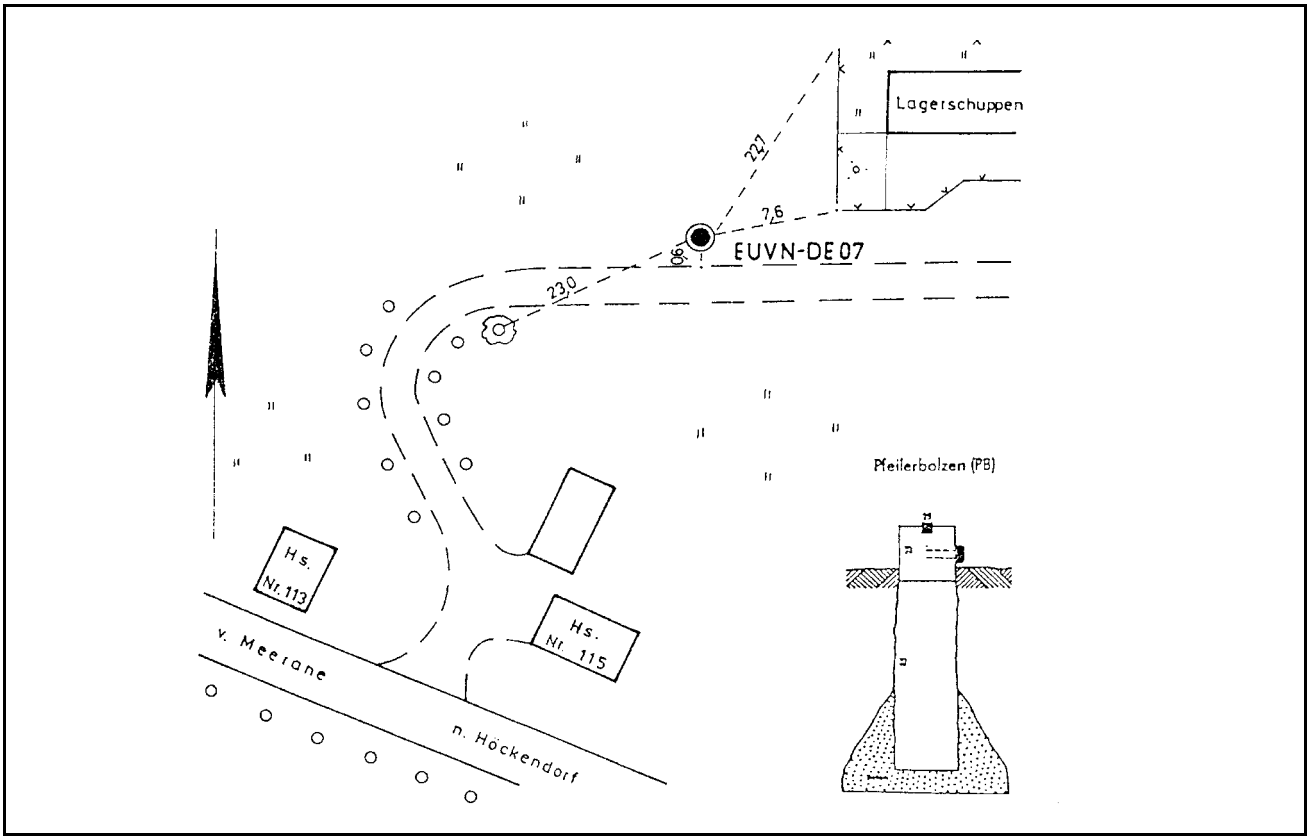


European Vertical GPS Reference Network (EUVN)

Station Meerane

Site Identification of the GPS Monument	
4-Char. EUVN ID	DE07
DOMES Number	
Monument Inscription/National Site Number	51401599
Marker Type, Monumentation Type, Foundation	Granite Niv-pillar with lightkeeper's bolt on top, with sub-surface concrete foundation
Mark dot of coordinates	Centre and top of the lightkeeper's bolt

Site Location Information	
City or Town	Meerane
State or Province	Sachsen
Country	Germany
Responsible Agency (Full Address)	Landesvermessungsamt Sachsen Olbrichtplatz 3 D-01099 Dresden Germany
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3940502.037 m Y = 872685.910 m Z = 4922646.980 m
Height in UELN-95/98	288.907 m
Gravity in IGSN71	981 087.3 mgal

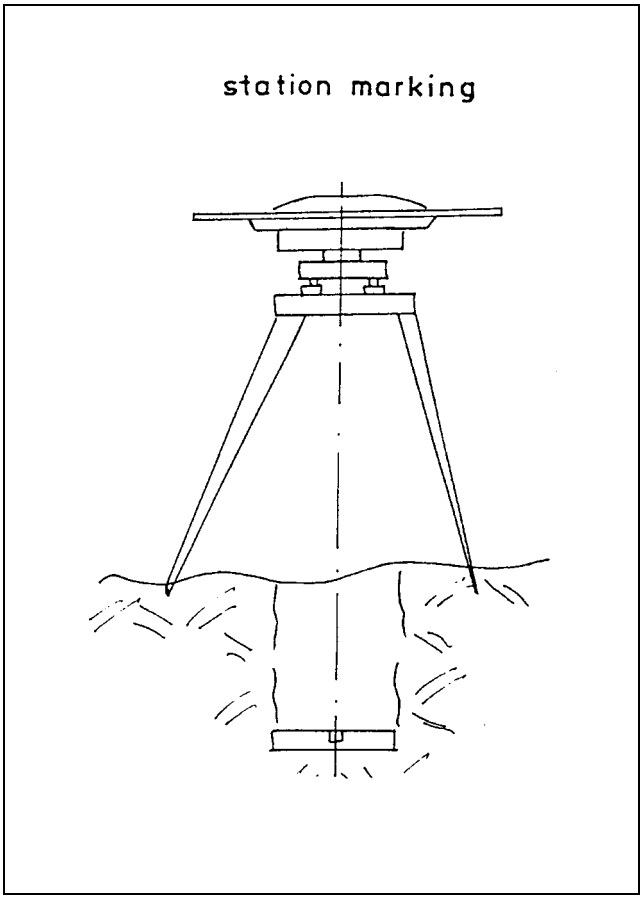


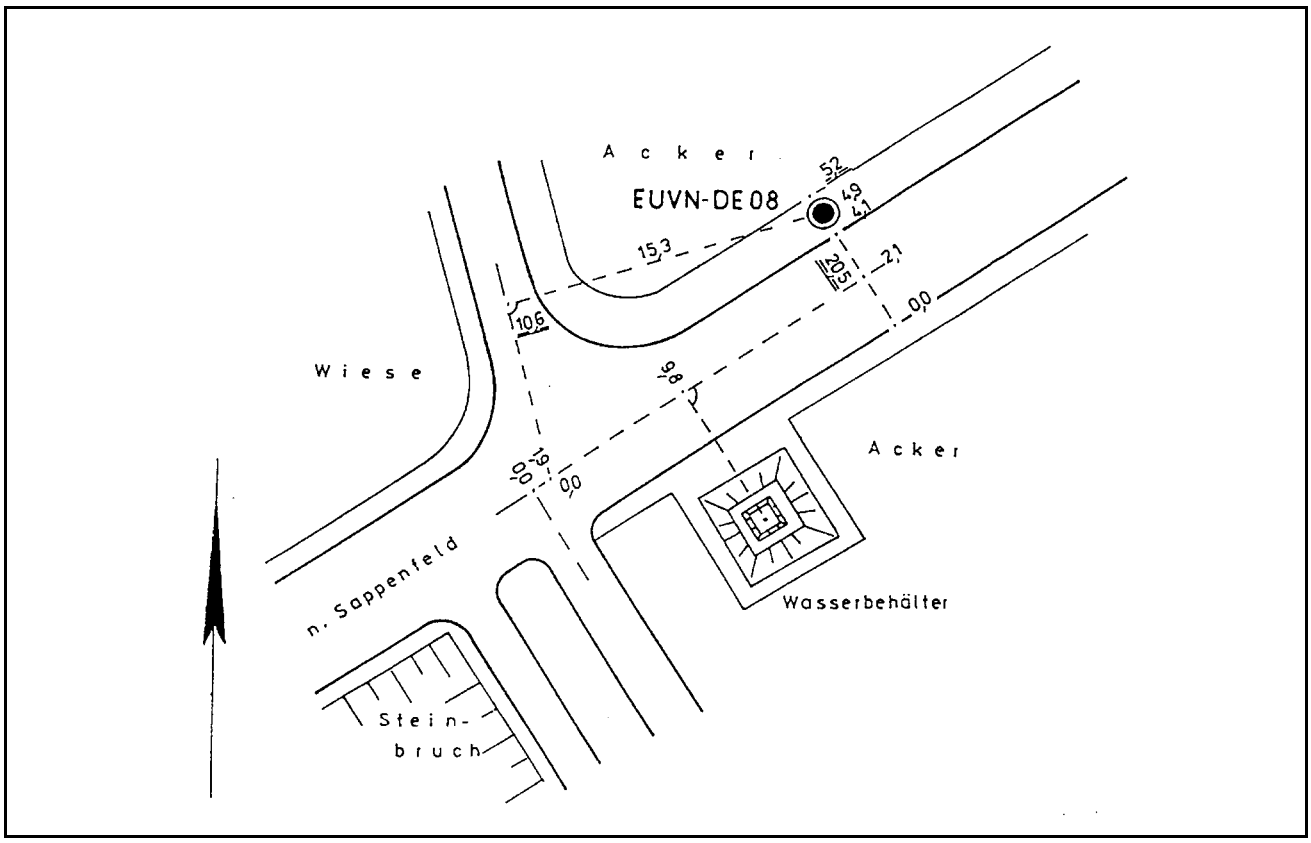
European Vertical GPS Reference Network (EUVN)

Station Schernfeld

Site Identification of the GPS Monument	
4-Char. EUVN ID	DE08
DOMES Number	
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	TP-plate with centric ceramic marker, marked 0.7 m deep
Mark dot of coordinates	Centre and top of the ceramic marker

Site Location Information	
City or Town	Eichstätt
State or Province	Bayern
Country	Germany
Responsible Agency (Full Address)	Bayerisches Landesvermessungsamt Reitmorstr. 29 D-80538 München Germany
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4120602.852 m Y = 811533.366 m Z = 4784977.338 m
Height in UELN-95/98	550.771 m
Gravity in IGSN71	980 835.3 mgal





European Vertical GPS Reference Network (EUVN)

Station Potsdam

Site Identification of the GPS Monument	
4-Char. EUVN ID	POTS
DOMES Number	14106 M 003
Monument Inscription/National Site Number	Geodetic pillar North-East on building A17
Marker Type, Monumentation Type, Foundation	Pillar with thread
Mark dot of coordinates	Centre and top of the thread

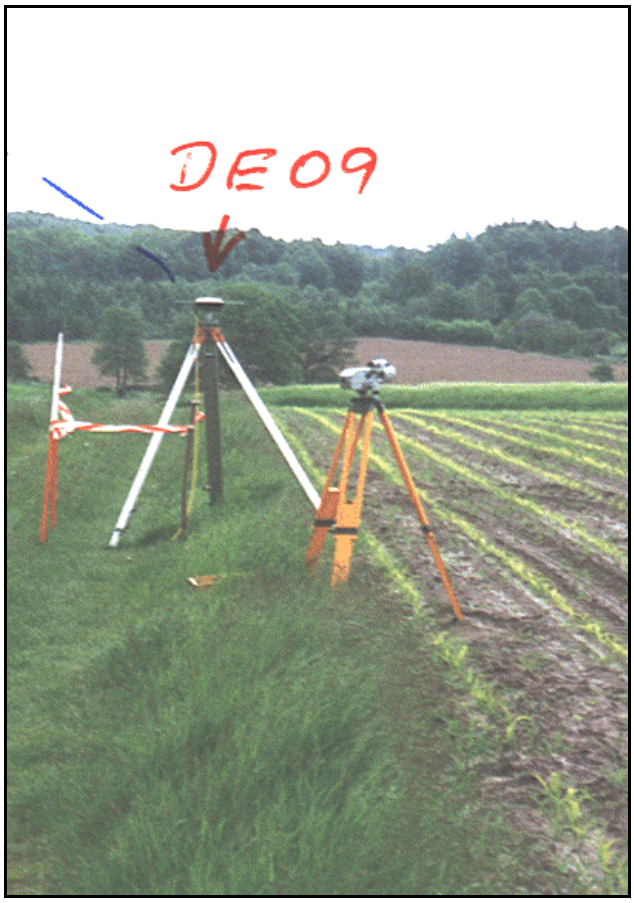
Site Location Information	
City or Town	Potsdam
State or Province	Brandenburg
Country	Germany
Responsible Agency (Full Address)	Geo-Forschungszentrum Potsdam Telegraphenberg A17 D-14473 Potsdam Germany
Contact Agency Information	Landesvermessungsamt Brandenburg Heinrich-Mann-Allee 103 D-14473 Potsdam Germany
Coordinates in ETRS89, Epoch 97.4	X = 3800689.944 m Y = 882077.176 m Z = 5028791.125 m
Height in UELN-95/98	104.216 m
Gravity in ISGN71	981 263.1 mgal

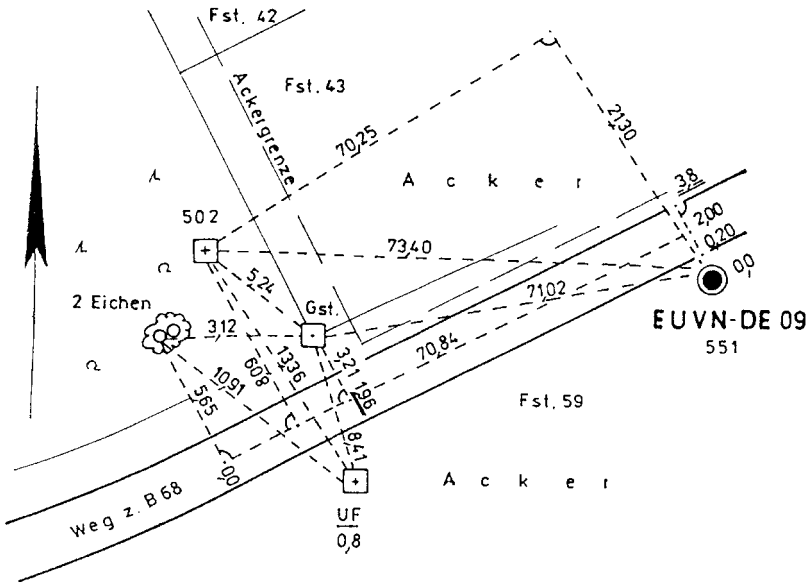
European Vertical GPS Reference Network (EUVN)

Station Wallenhorst

Site Identification of the GPS Monument	
4-Char. EUVN ID	DE09
DOMES Number	
Monument Inscription/National Site Number	3614/551
Marker Type, Monumentation Type, Foundation	Granite plate with brass bolt, sub-surface marker
Mark dot of coordinates	Centre and top of the brass bolt

Site Location Information	
City or Town	Wallenhorst
State or Province	Niedersachsen
Country	Germany
Responsible Agency (Full Address)	Landesvermessung und Geobasisinformationen Niedersachsen Warmbüchenkamp 2 D-30149 Hannover Germany
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3864996.248 m Y = 543689.134 m Z = 5027735.482 m
Height in UELN-95/98	85.191 m
Gravity in IGSN71	981 289.8 mgal



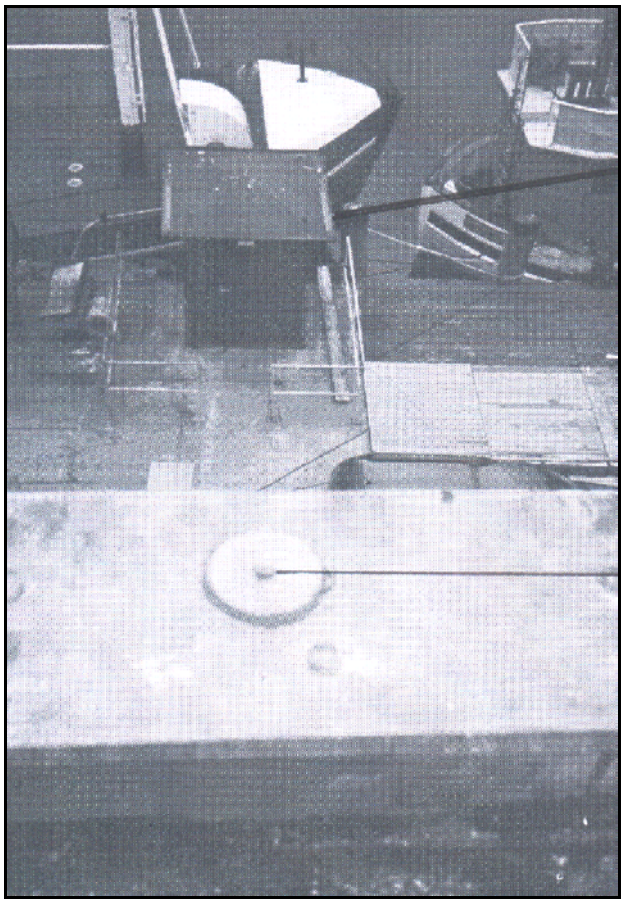


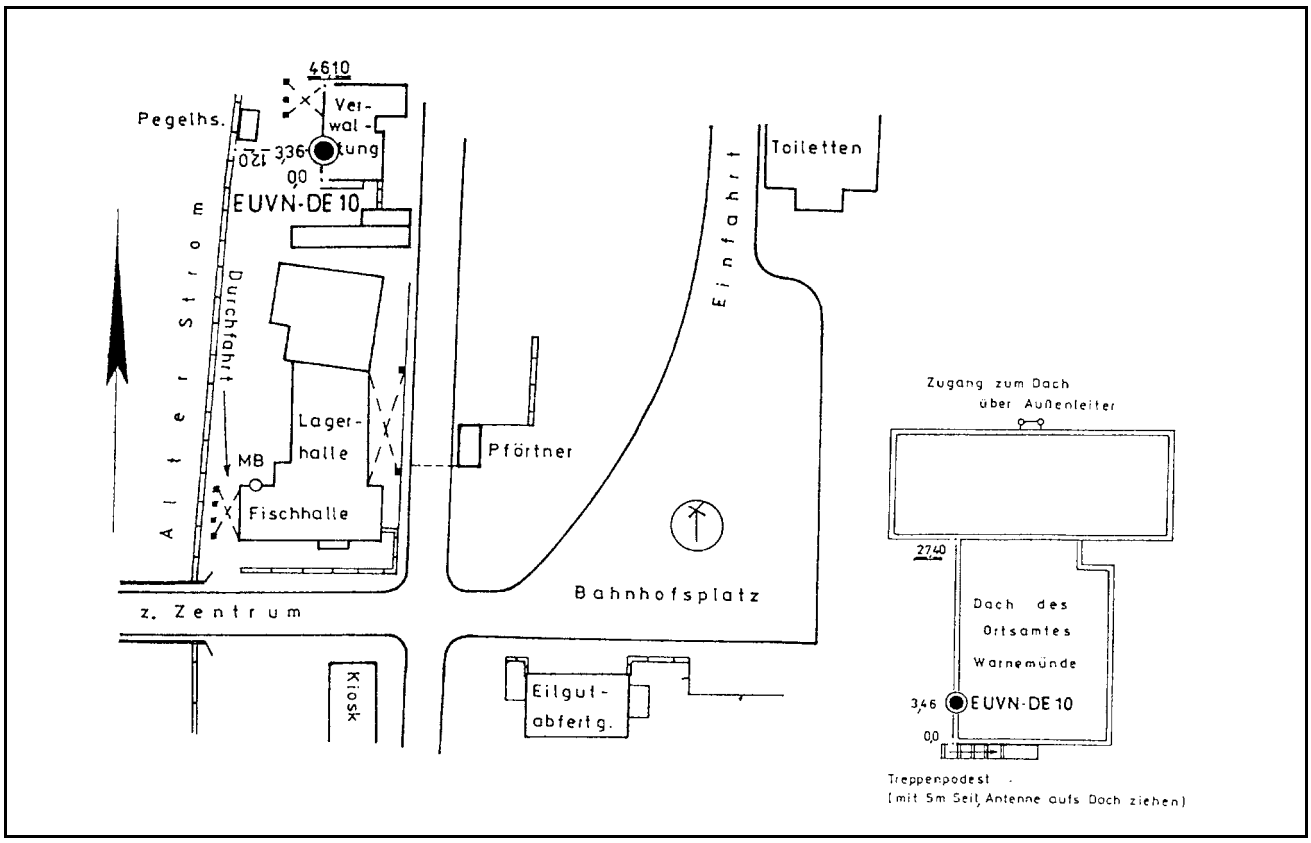
European Vertical GPS Reference Network (EUVN)

Station Warnemuende

Site Identification of the GPS Monument	
4-Char. EUVN ID	DE10
DOMES Number	
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Steel plate with screw bolt on jamb wall of the roof
Mark dot of coordinates	Centre and top of screw bolt

Site Location Information	
City or Town	Rostock-Warnemuende
State or Province	Mecklenburg-Vorpommern
Country	Germany
Responsible Agency (Full Address)	Techn. Universität Dresden Institut für Planetare Geodäsie Mommsenstr. 13 D-01062 Dresden Germany
Contact Agency Information	Landesvermessungsamt Mecklenburg-Vorpommern Lübecker Straße 289 D-19059 Schwerin Germany
Coordinates in ETRS89, Epoch 97.4	X = 3658231.877 m Y = 783518.224 m Z = 5148404.237 m
Height in UELN-95/98	11.251 m
Gravity in IGSN71	981 436.2 mgal



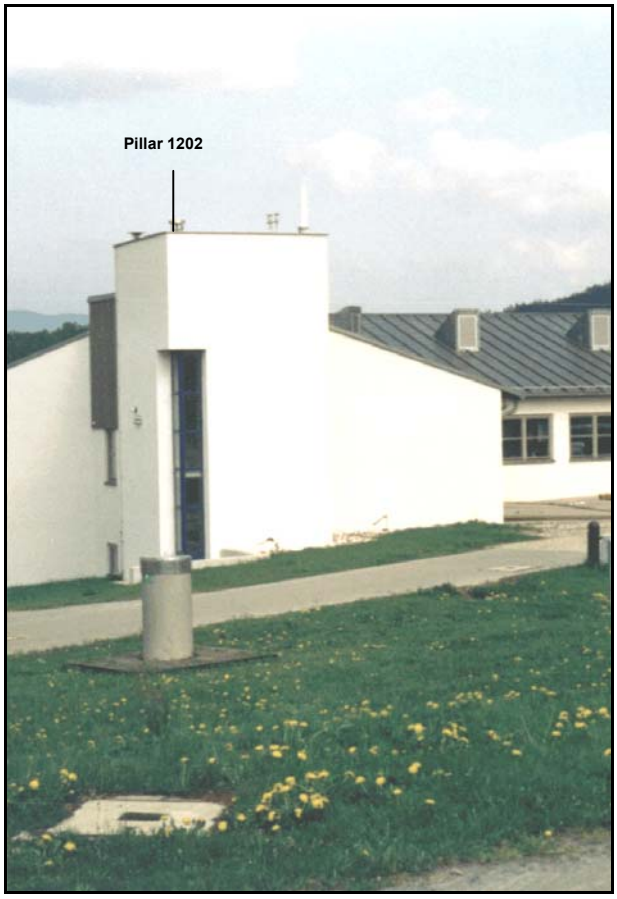


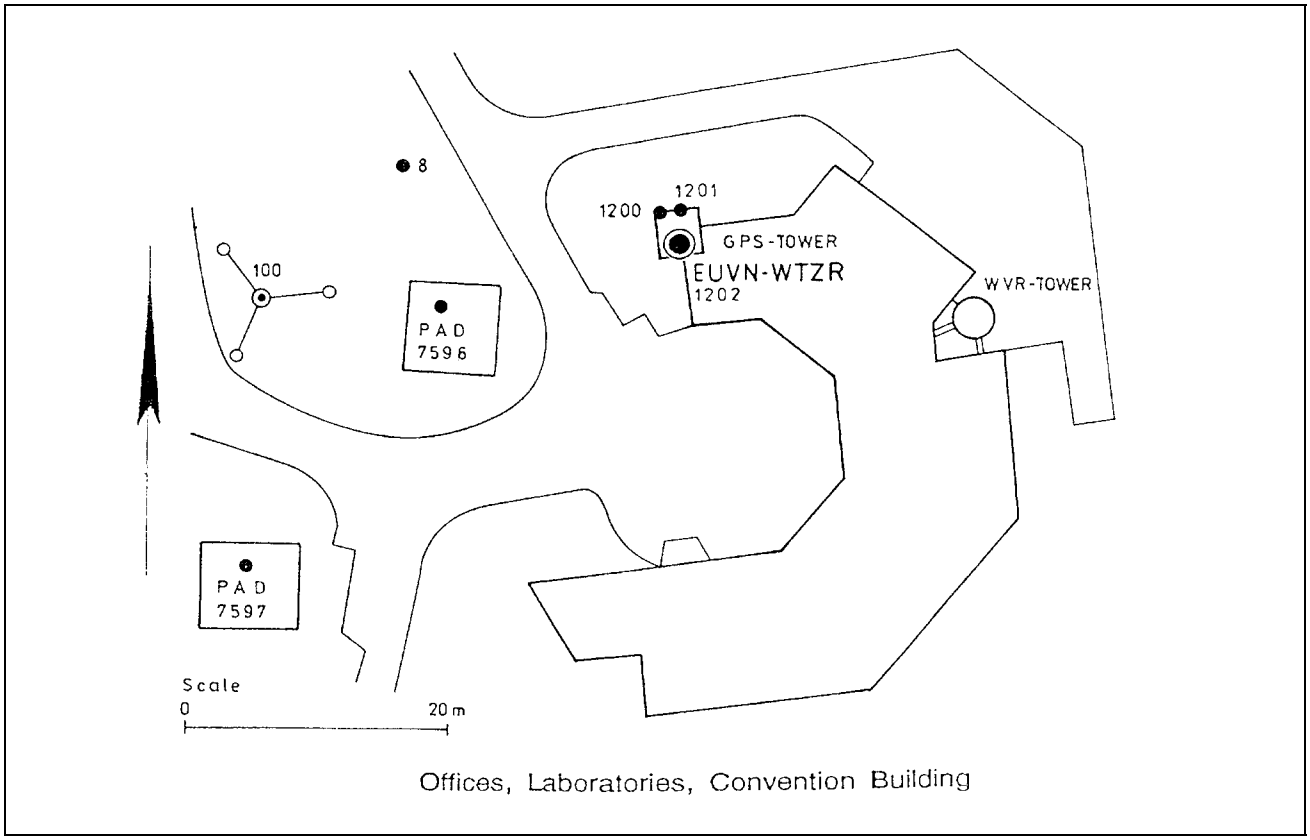
European Vertical GPS Reference Network (EUVN)

Station Wettzell

Site Identification of the GPS Monument	
4-Char. EUVN ID	WTZR
DOMES Number	14201 M 010
Monument Inscription/National Site Number	Pillar 1202
Marker Type, Monumentation Type, Foundation	High point with observation console and screw marker for forced centring device
Mark dot of coordinates	Centre and top of the steel screw marker

Site Location Information	
City or Town	Kötzting
State or Province	Bavaria
Country	Germany
Responsible Agency (Full Address)	Bundesamt für Kartographie und Geodäsie Richard-Strauss-Allee 11 D-60598 Frankfurt am Main Germany
Contact Agency Information	Bundesamt für Kartographie und Geodäsie Fundamentalstation Wettzell Sackenrieder Str. 25 D-93444 Kötzting Germany
Coordinates in ETRS89, Epoch 97.4	X = 4075580.854 m Y = 931853.571 m Z = 4801567.923 m
Height in UELN-95/98	619.339 m
Gravity in ISGN71	980 837.1 mgal



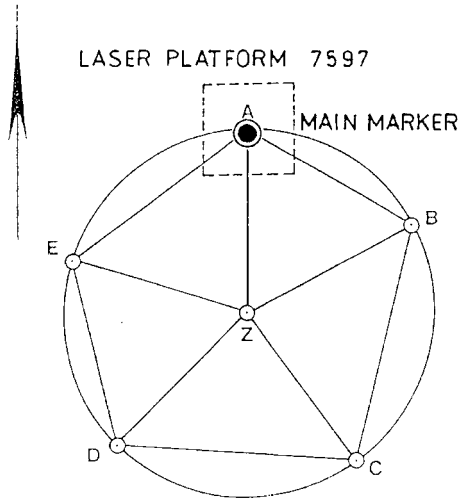


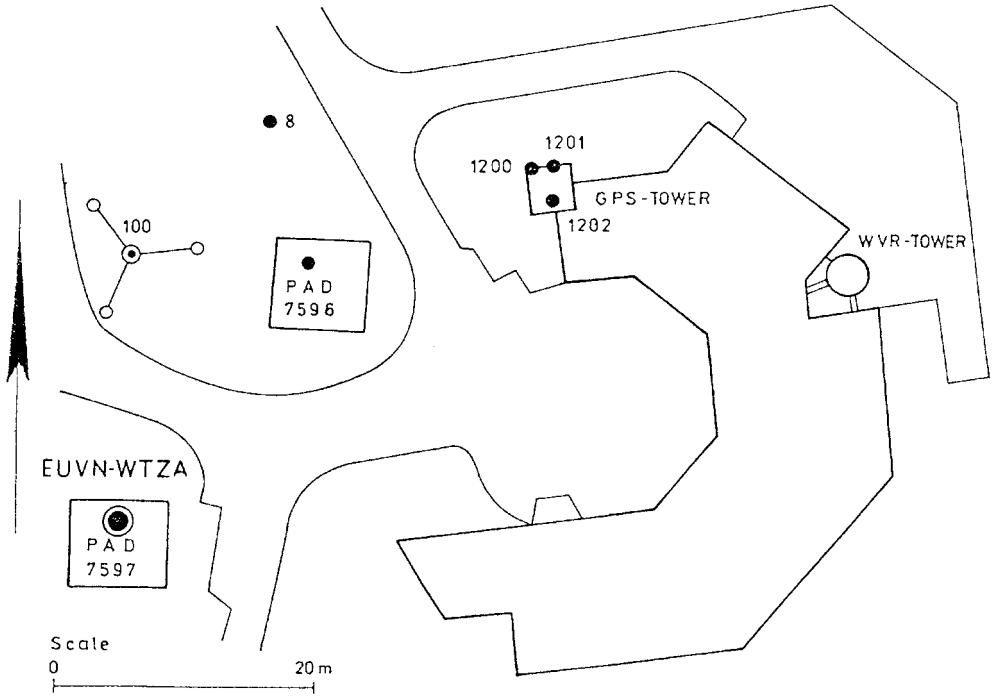
European Vertical GPS Reference Network (EUVN)

Station Wettzell A

Site Identification of the GPS Monument	
4-Char. EUVN ID	WTZA
DOMES Number	
Monument Inscription/National Site Number	Laser-platform 7597, main marker A
Marker Type, Monumentation Type, Foundation	
Mark dot of coordinates	

Site Location Information	
City or Town	Kötzting
State or Province	Bavaria
Country	Germany
Responsible Agency (Full Address)	Bundesamt für Kartographie und Geodäsie Richard-Strauss-Allee 11 D-60598 Frankfurt am Main Germany
Contact Agency Information	Bundesamt für Kartographie und Geodäsie Fundamentalstation Wettzell Sackenrieder Str. 25 D-93444 Kötzting Germany
Coordinates in ETRS89, Epoch 97.4	X = 4075602.065 m Y = 931826.451 m Z = 4801547.660 m
Height in UELN-95/98	613.594 m
Gravity in ISGN71	980 838.8 mgal



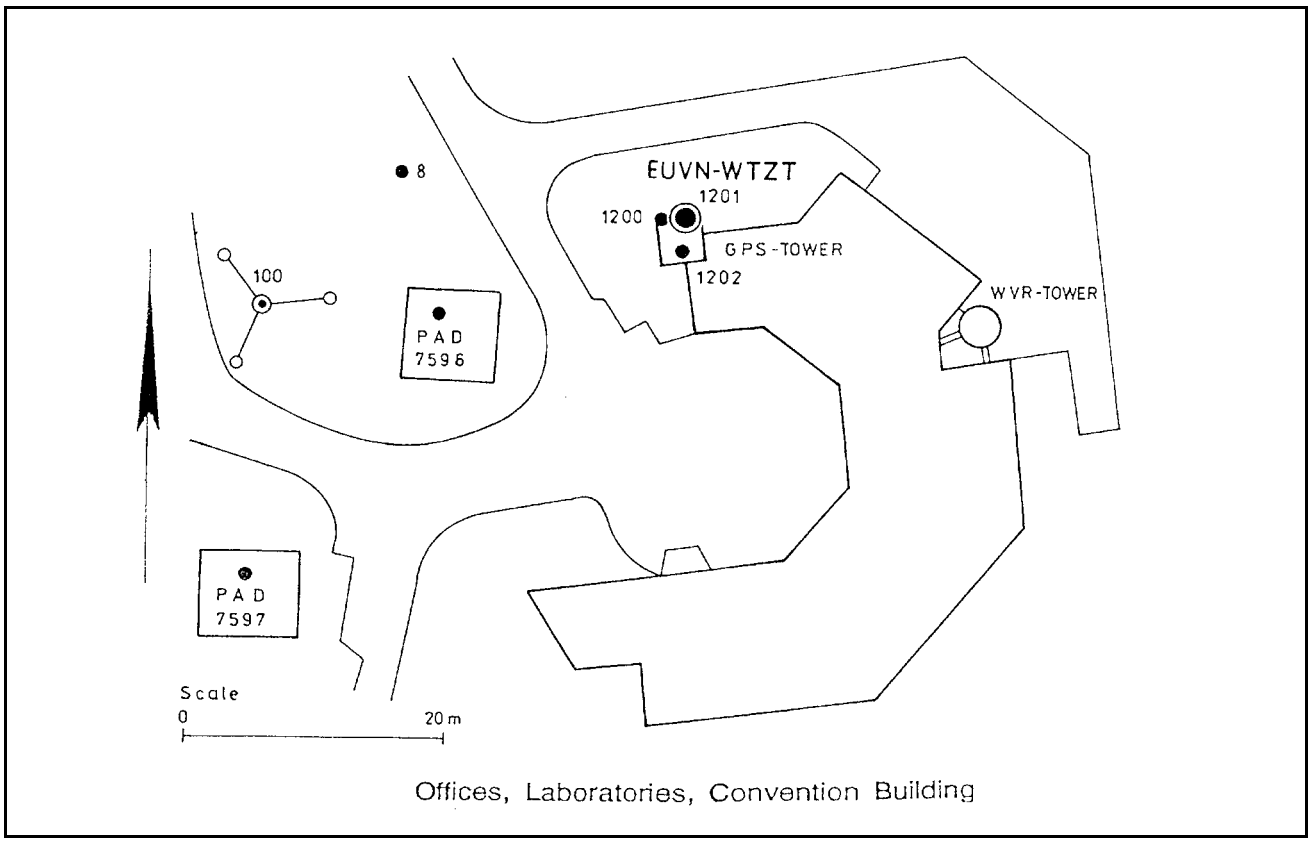


European Vertical GPS Reference Network (EUVN)

Station Wettzell T

Site Identification of the GPS Monument	
4-Char. EUVN ID	WTZT
DOMES Number	14201 M 011
Monument Inscription/National Site Number	Pillar 1201
Marker Type, Monumentation Type, Foundation	High point with observation console and screw marker for forced centring device
Mark dot of coordinates	Centre and top of the steel screw marker

Site Location Information	
City or Town	Kötzting
State or Province	Bavaria
Country	Germany
Responsible Agency (Full Address)	Bundesamt für Kartographie und Geodäsie Richard-Strauss-Allee 11 D-60598 Frankfurt am Main Germany
Contact Agency Information	Bundesamt für Kartographie und Geodäsie Fundamentalstation Wettzell Sackenrieder Str. 25 D-93444 Kötzting Germany
Coordinates in ETRS89, Epoch 97.4	X = 4075577.785 m Y = 931855.192 m Z = 4801570.081 m
Height in UELN-95/98	619.249 m
Gravity in ISGN71	980 837.1 mgal

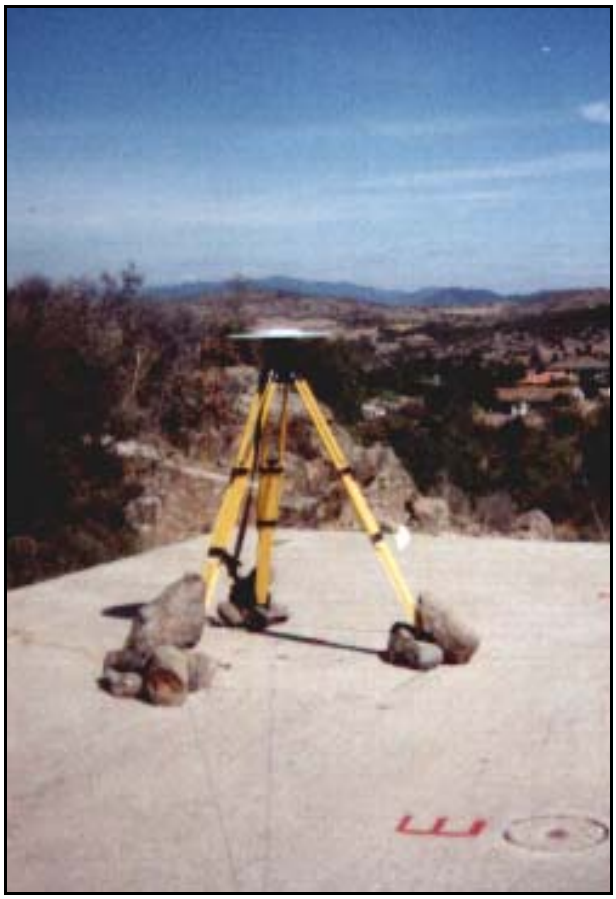


European Vertical GPS Reference Network (EUVN)

Station Askites

Site Identification of the GPS Monument	
4-Char. EUVN ID	GR01
DOMES Number	
Monument Inscription/National Site Number	ASKI (from SELF catalog) 7510A
Marker Type, Monumentation Type, Foundation	Wegener-Medlas platform
Mark dot of coordinates	At the centre of "A" point on tripod

Site Location Information	
City or Town	Askites
State or Province	Evros
Country	Greece
Responsible Agency (Full Address)	Hellenic Military Geographical Service Evelpidon 4 GR – 11362 Athens Greece
Contact Agency Information	Hellenic Military Geographical Service Evelpidon 4 GR – 11362 Athens Greece
Coordinates in ETRS89, Epoch 97.4	X = 4353444.889 m Y = 2082666.364 m Z = 4156506.618 m
Height in UELN-95/98	141.838 m
Gravity in ISGN71	980 246.381 mgal

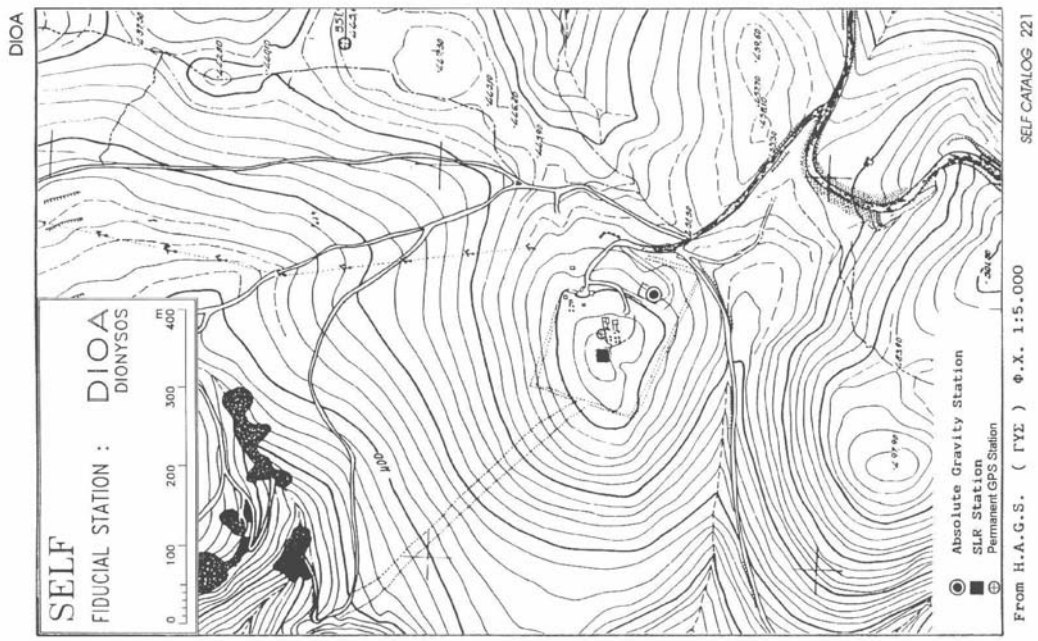


European Vertical GPS Reference Network (EUVN)

Station Dionysos

Site Identification of the GPS Monument	
4-Char. EUVN ID	DION
DOMES Number	
Monument Inscription/National Site Number	DION GPS
Marker Type, Monumentation Type, Foundation	Permanent GPS station
Mark dot of coordinates	At the top of post-pole

Site Location Information	
City or Town	Dionysos
State or Province	Athens
Country	Greece
Responsible Agency (Full Address)	National Technical University of Athens Higher Geodesy Lab H. Polytechniou 9 GR – 15780 Zographos Greece
Contact Agency Information	National Technical University of Athens Higher Geodesy Lab H. Polytechniou 9 GR – 15780 Zographos Greece
Coordinates in ETRS89, Epoch 97.4	X = 4595216.632 m Y = 2039452.852 m Z = 3912626.688 m
Height in UELN-95/98	475.593 m
Gravity in ISGN71	979 958.521 mgal



European Vertical GPS Reference Network (EUVN)

Station Karitsa

Site Identification of the GPS Monument	
4-Char. EUVN ID	GR02
DOMES Number	
Monument Inscription/National Site Number	KARI (from SELF catalog) 7520 A
Marker Type, Monumentation Type, Foundation	Wegener-Medlas platform
Mark dot of coordinates	At the centre of "A" point on tripod

Site Location Information	
City or Town	Karitsa
State or Province	Ioannina
Country	Greece
Responsible Agency (Full Address)	Hellenic Military Geographical Service Evelpidon 4 GR – 11362 Athens Greece
Contact Agency Information	Hellenic Military Geographical Service Evelpidon 4 GR – 11362 Athens Greece
Coordinates in ETRS89, Epoch 97.4	X = 4596042.651 m Y = 1733476.784 m Z = 4055720.834 m
Height in UELN-95/98	566.089 m
Gravity in ISGN71	979 921.280 mgal

European Vertical GPS Reference Network (EUVN)

Station Katakolo

Site Identification of the GPS Monument	
4-Char. EUVN ID	GR03
DOMES Number	
Monument Inscription/National Site Number	KATK (from SELF catalog)
Marker Type, Monumentation Type, Foundation	Tide-point, GPS point for SELF project
Mark dot of coordinates	At the centre of "M" point on tripod

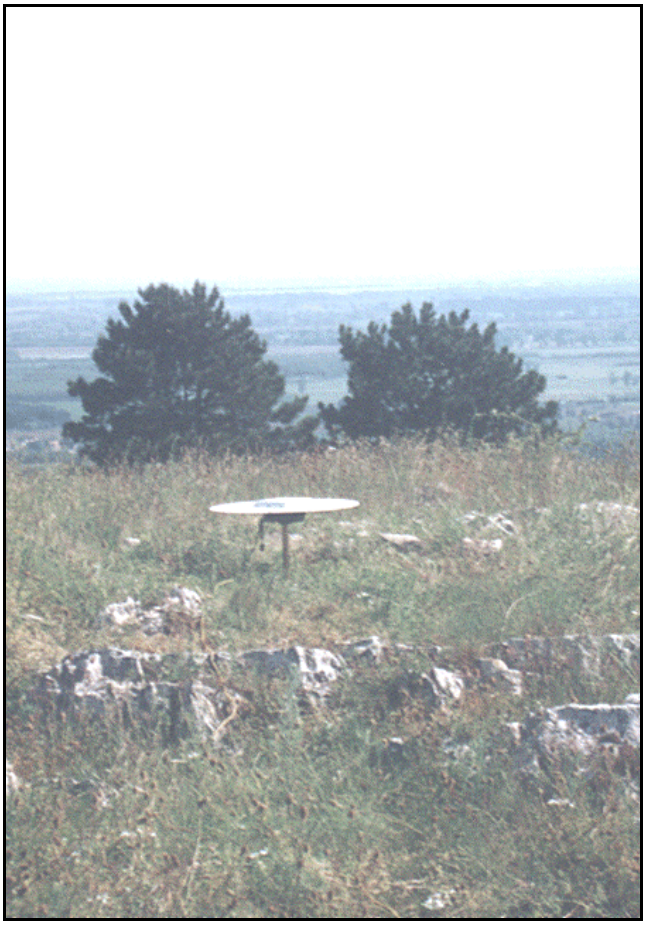
Site Location Information	
City or Town	Katakolo
State or Province	Patra
Country	Greece
Responsible Agency (Full Address)	Hellenic Military Geographical Service Evelpidon 4 GR – 11362 Athens Greece
Contact Agency Information	Hellenic Military Geographical Service Evelpidon 4 GR – 11362 Athens Greece
Coordinates in ETRS89, Epoch 97.4	X = 4710606.799 m Y = 1838512.663 m Z = 3874257.448 m
Height in UELN-95/98	3.424 m
Gravity in ISGN71	979 897.786 mgal

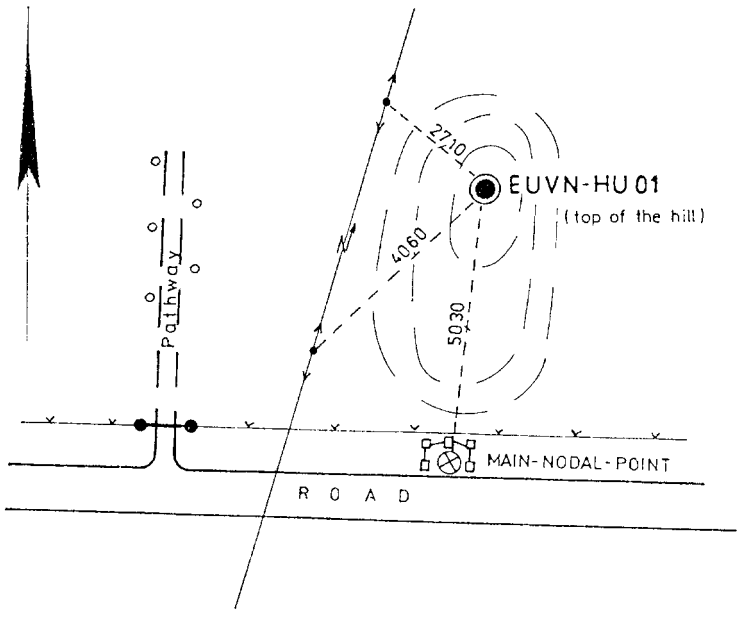
European Vertical GPS Reference Network (EUVN)

Station Baksipart

Site Identification of the GPS Monument	
4-Char. EUVN ID	HU01
DOMES Number	
Monument Inscription/National Site Number	99-0001
Marker Type, Monumentation Type, Foundation	Hidden pointmark fixed to the bedrock
Mark dot of coordinates	Centre and 20 mm under the top of the sleeve-nut

Site Location Information	
City or Town	Sátoraljaújhely
State or Province	
Country	Hungary
Responsible Agency (Full Address)	FÖMI Satellite Geodetic Observatory P.O. Box 546 H-1373 Budapest Hungary
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3945623.002 m Y = 1564760.485 m Z = 4744941.513 m
Height in UELN-95/98	116.021 m
Gravity in ISGN71	980 920.6 mgal



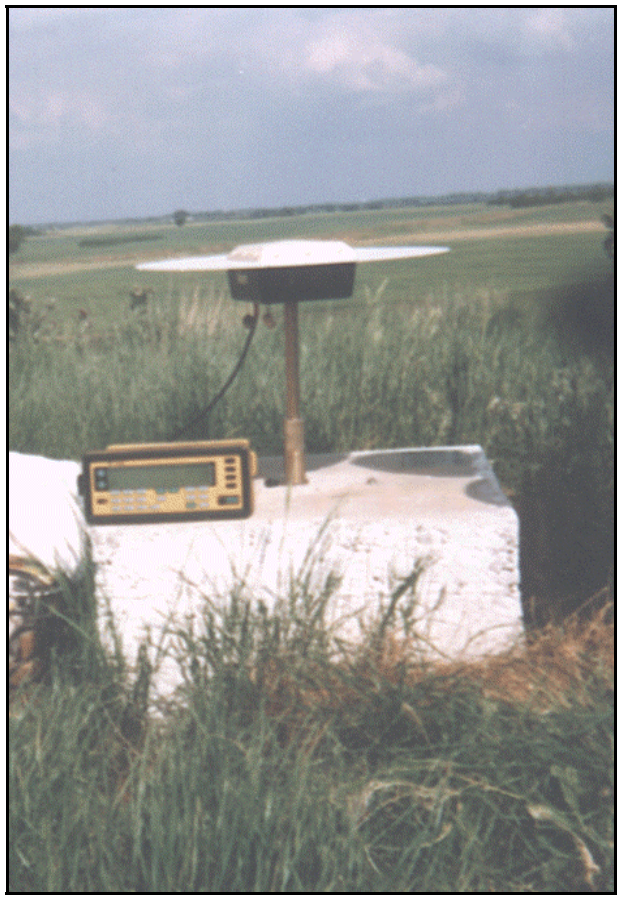


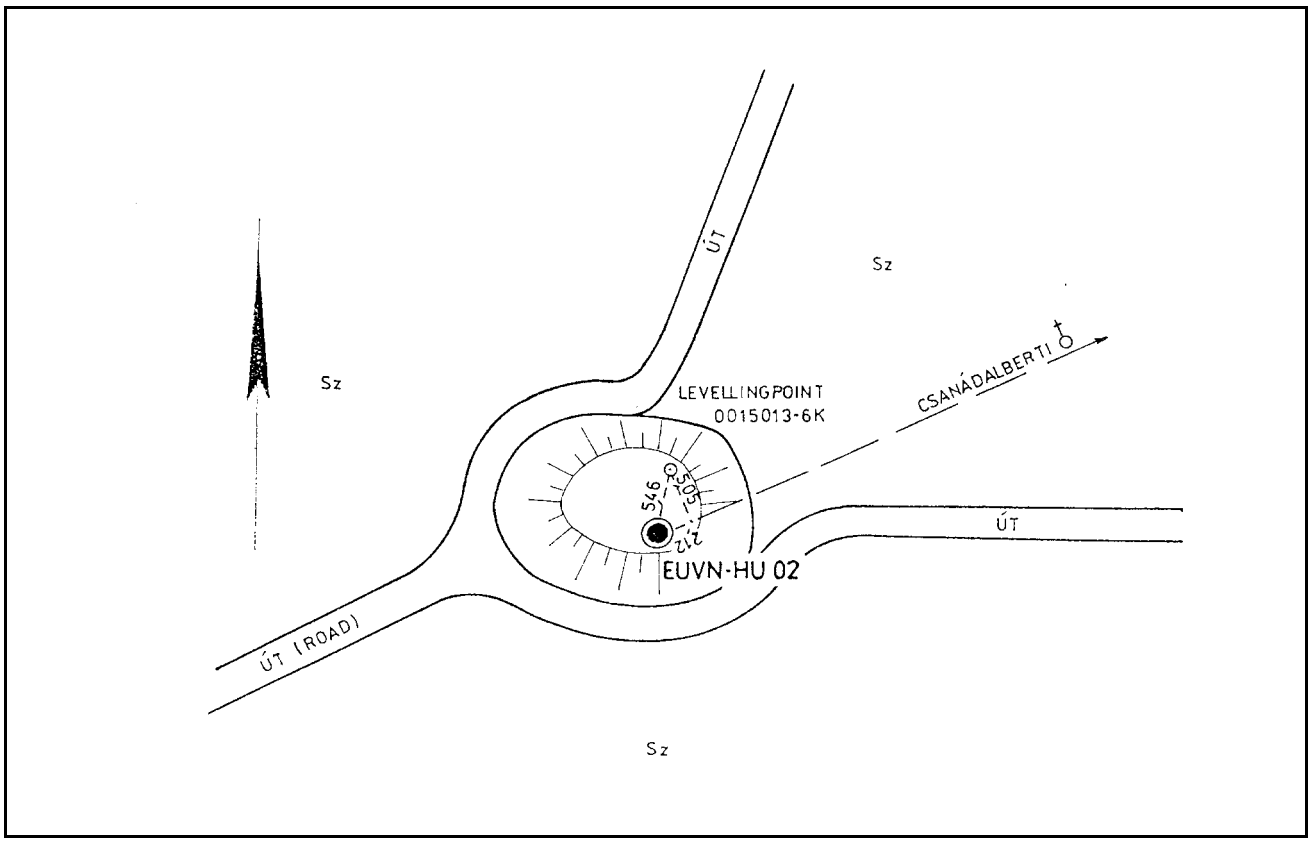
European Vertical GPS Reference Network (EUVN)

Station Csanádalberti

Site Identification of the GPS Monument	
4-Char. EUVN ID	HU02
DOMES Number	
Monument Inscription/National Site Number	28-0001
Marker Type, Monumentation Type, Foundation	Concrete block with GPS point mark
Mark dot of coordinates	Centre and 200 mm under the top of the sleeve-nut

Site Location Information	
City or Town	Csanádalberti
State or Province	
Country	Hungary
Responsible Agency (Full Address)	FÖMI Satellite Geodetic Observatory P.O. Box 546 H-1373 Budapest Hungary
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4128720.673 m Y = 1557707.352 m Z = 4589954.252 m
Height in UELN-95/98	100.000 m
Gravity in ISGN71	980 728 mgal



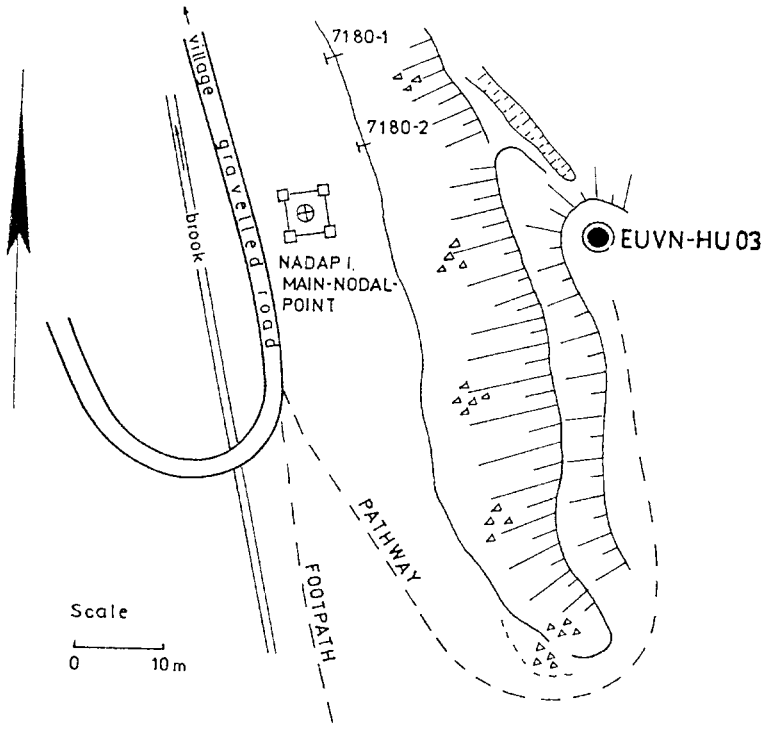


European Vertical GPS Reference Network (EUVN)

Station Nadap

Site Identification of the GPS Monument	
4-Char. EUVN ID	HU03
DOMES Number	
Monument Inscription/National Site Number	54-0001
Marker Type, Monumentation Type, Foundation	Hidden point mark fixed to the bedrock
Mark dot of coordinates	Centre and 20 mm under the top of the sleeve-nut

Site Location Information	
City or Town	Nadap
State or Province	
Country	Hungary
Responsible Agency (Full Address)	FÖMI Satellite Geodetic Observatory P.O. Box 546 H-1373 Budapest Hungary
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4110020.396 m Y = 1384712.037 m Z = 4661276.921 m
Height in UELN-95/98	190.670 m
Gravity in ISGN71	980 809.3 mgal

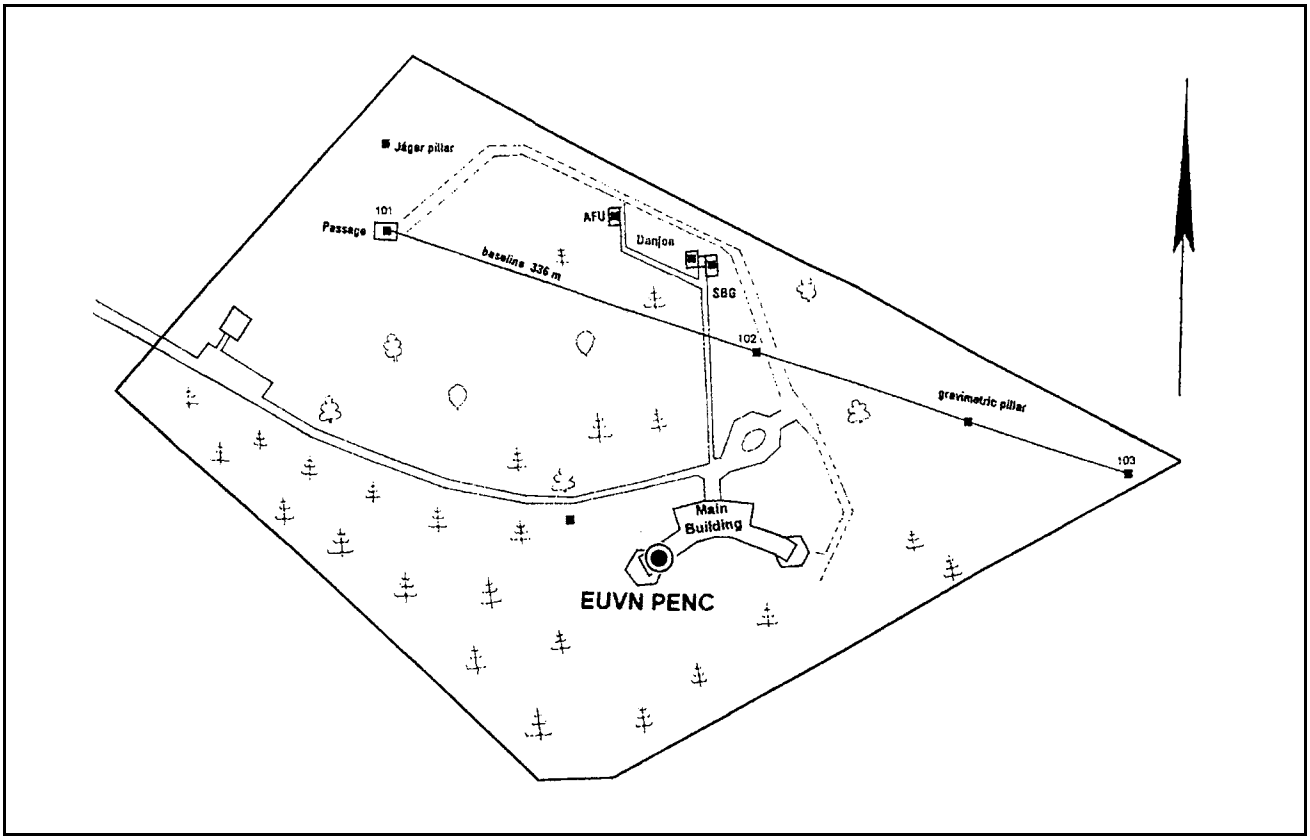


European Vertical GPS Reference Network (EUVN)

Station Penc

Site Identification of the GPS Monument	
4-Char. EUVN ID	PENC
DOMES Number	11206 M 006
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Concrete pillar on the roof of main building
Mark dot of coordinates	Centre and top of the GPS marker thread inserted into the pillar

Site Location Information	
City or Town	Penc
State or Province	
Country	Hungary
Responsible Agency (Full Address)	FÖMI Satellite Geodetic Observatory P.O. Box 546 H-1373 Budapest Hungary
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4052449.808 m Y = 1417680.901 m Z = 4701406.910 m
Height in UELN-95/98	248.387 m
Gravity in ISGN71	980 845.7 mgal

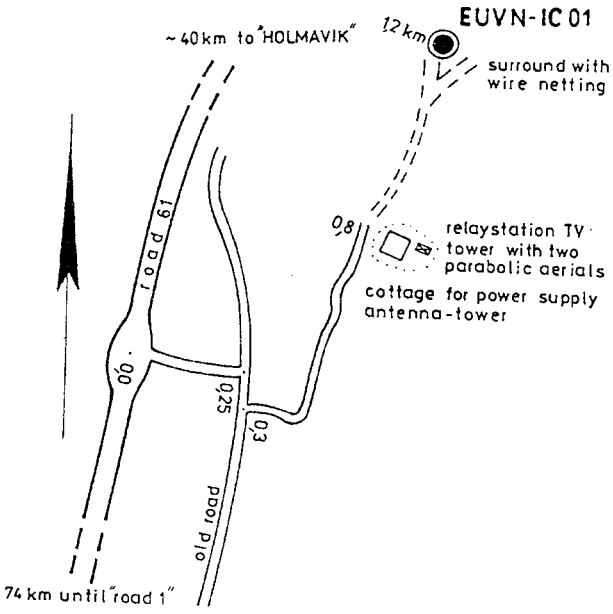


European Vertical GPS Reference Network (EUVN)

Station Ennishoefdi

Site Identification of the GPS Monument	
4-Char. EUVN ID	IC01
DOMES Number	
Monument Inscription/National Site Number	LM 1260
Marker Type, Monumentation Type, Foundation	Concrete pillar with iron bolt, with bore in the pillar head
Mark dot of coordinates	Centre and top of the bolt

Site Location Information	
City or Town	Strandasýsla
State or Province	
Country	Iceland
Responsible Agency (Full Address)	Iceland Geodetic Survey Landmaelingar Islands Laugavegur 178 IC-105 Reykjavik Iceland
Contact Agency Information	Bundesamt für Kartographie und Geodäsie Außenstelle Leipzig Karl-Rothe-Str. 10-14 D-04105 Leipzig Germany
Coordinates in ETRS89, Epoch 97.4	X = 2463207.256 m Y = -961488.337 m Z = 5785116.226 m
Height in UELN-95/98	
Gravity in ISGN71	

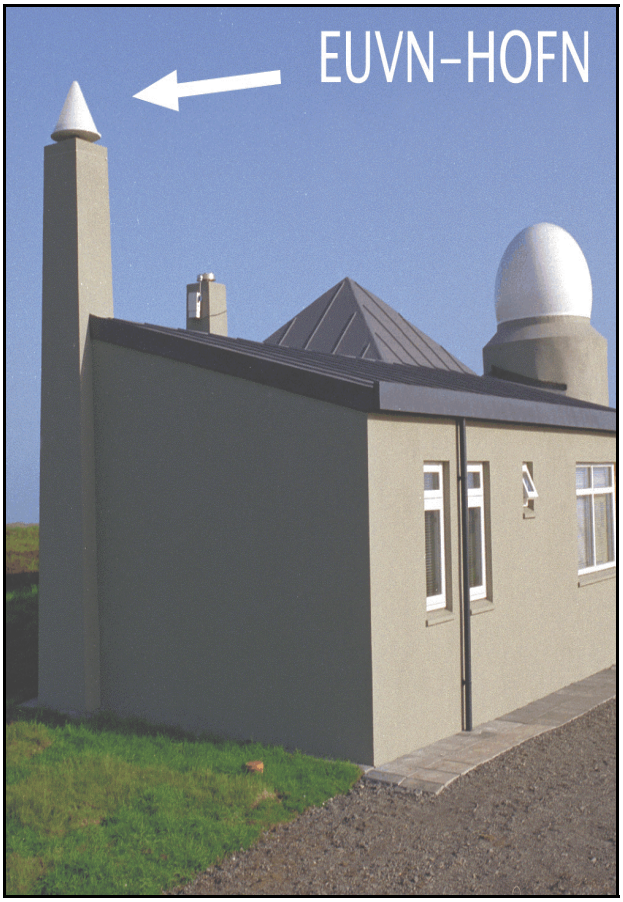


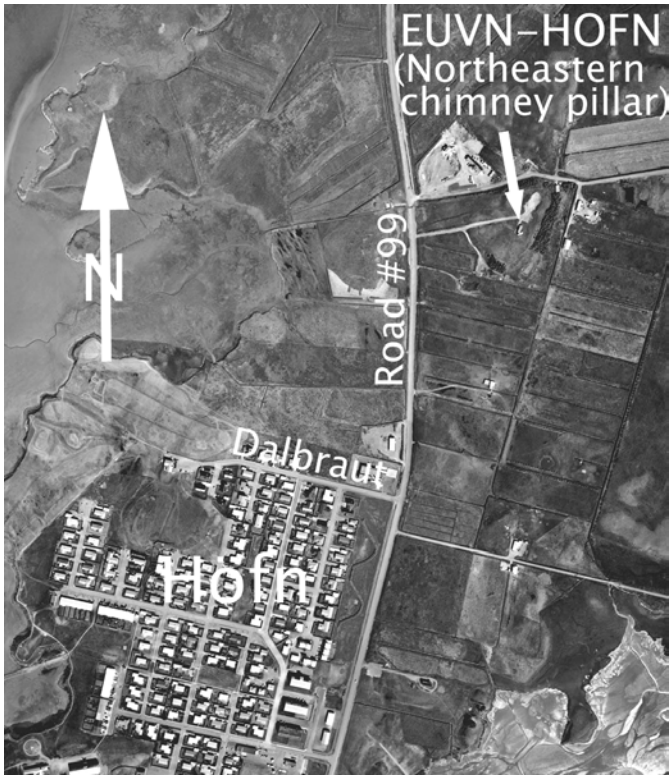
European Vertical GPS Reference Network (EUVN)

Station Hoefn

Site Identification of the GPS Monument	
4-Char. EUVN ID	HOFN
DOMES Number	
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Northern pillar direct on the house with screw bolt on the top of the pillar
Mark dot of coordinates	Centre and top of the screw bolt

Site Location Information	
City or Town	Hoefn
State or Province	
Country	Iceland
Responsible Agency (Full Address)	Iceland Geodetic Survey Landmaelingar Islands Laugavegur 178 IC-105 Reykjavik Iceland
Contact Agency Information	Bundesamt für Kartographie und Geodäsie Fundamentalstation Wettzell D-93444 Kötzting Germany
Coordinates in ETRS89, Epoch 97.4	X = 2679690.145 m Y = -727951.398 m Z = 5722789.017 m
Height in UELN-95/98	
Gravity in ISGN71	



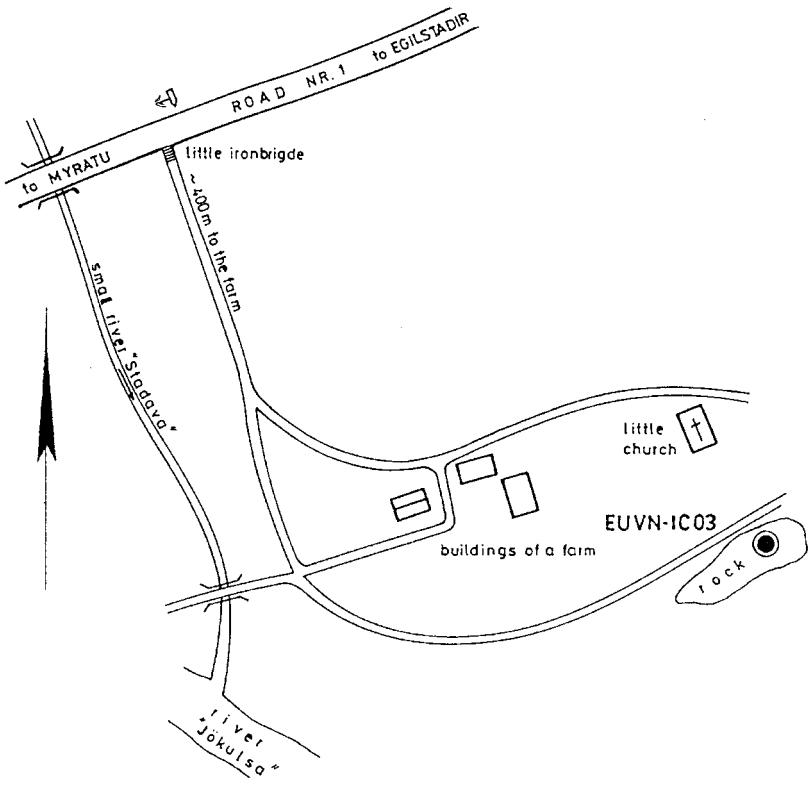


European Vertical GPS Reference Network (EUVN)

Station Hofteigur

Site Identification of the GPS Monument	
4-Char. EUVN ID	IC03
DOMES Number	
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Concrete pillar on the rock with metal plate and screw bolt, with forced centring
Mark dot of coordinates	Centre and top of the screw bolt

Site Location Information	
City or Town	Egilstadir/Jökuldalur
State or Province	
Country	Iceland
Responsible Agency (Full Address)	Iceland Geodetic Survey Landmaelingar Islands Laugavegur 178 IC-105 Reykjavik Iceland
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 2577684.270 m Y = -684377.867 m Z = 5774580.128 m
Height in UELN-95/98	
Gravity in ISGN71	

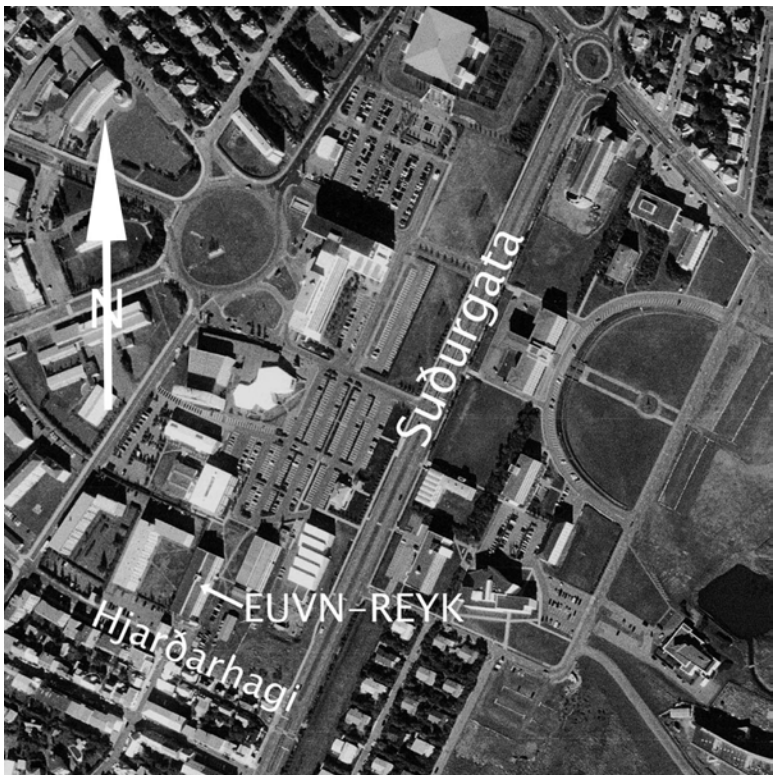


European Vertical GPS Reference Network (EUVN)

Station Reykjavik

Site Identification of the GPS Monument	
4-Char. EUVN ID	REYK
DOMES Number	10202 M 001
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	
Mark dot of coordinates	

Site Location Information	
City or Town	Reykjavik
State or Province	
Country	Iceland
Responsible Agency (Full Address)	Iceland Geodetic Survey Landmaelingar Islands Laugavegur 178 IC-105 Reykjavik Iceland
Contact Agency Information	Bundesamt für Kartographie und Geodäsie Fundamentalstation Wettzell D-93444 Kötzting Germany
Coordinates in ETRS89, Epoch 97.4	X = 2587384.622 m Y = -1043033.572 m Z = 5716563.868 m
Height in UELN-95/98	
Gravity in ISGN71	

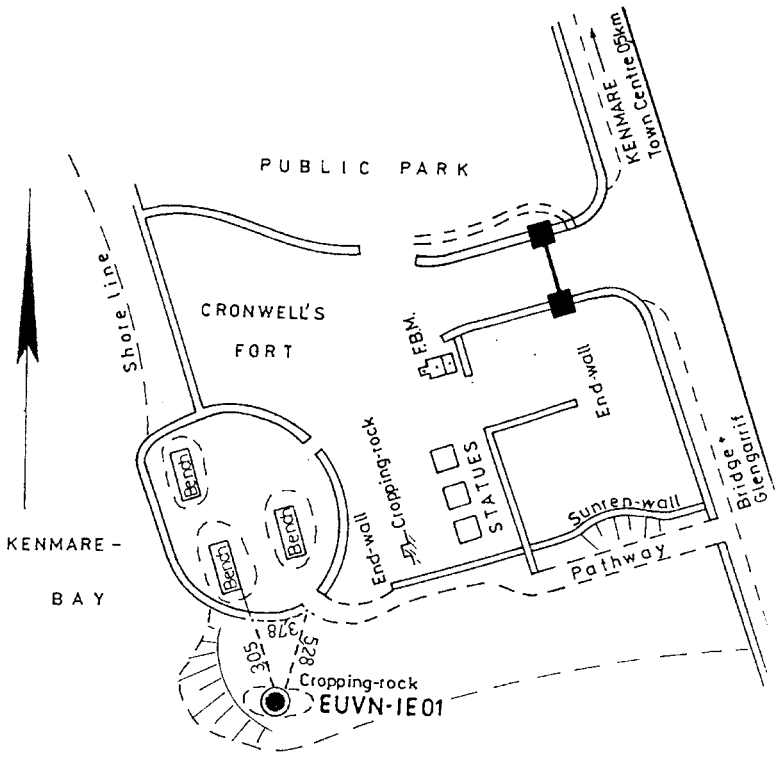


European Vertical GPS Reference Network (EUVN)

Station Kenmare

Site Identification of the GPS Monument	
4-Char. EUVN ID	IE01
DOMES Number	
Monument Inscription/National Site Number	Z014
Marker Type, Monumentation Type, Foundation	Brass rivet in cropping rock
Mark dot of coordinates	Centre and top of the brass rivet

Site Location Information	
City or Town	Kerry
State or Province	Munster
Country	Ireland
Responsible Agency (Full Address)	Ordnance Survey of Ireland Phoenix Park IE-Dublin 8 Ireland
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3891188.638 m Y = -656960.680 m Z = 4994036.441 m
Orthom. Height T. G. Malin Head	4.464 m
Gravity in ISGN71	

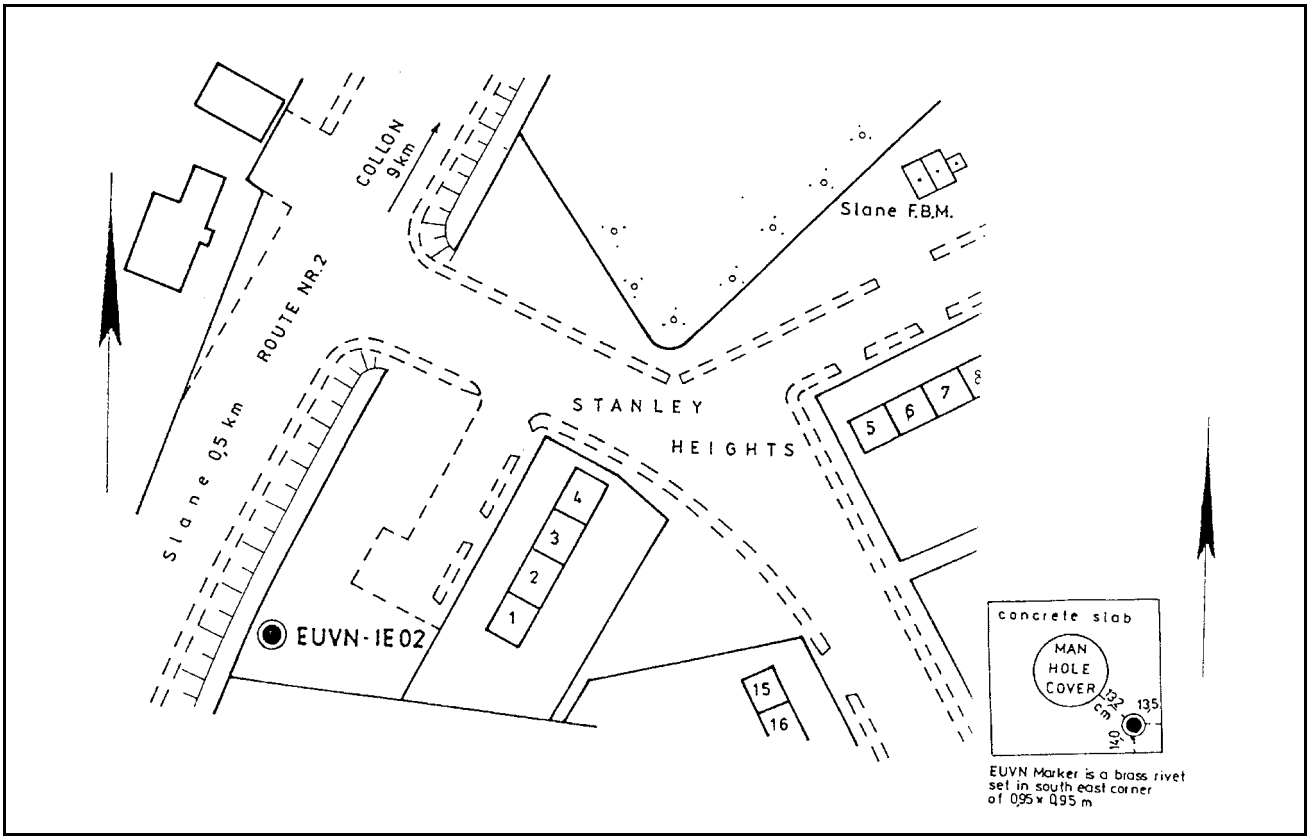


European Vertical GPS Reference Network (EUVN)

Station Slane

Site Identification of the GPS Monument	
4-Char. EUVN ID	IE02
DOMES Number	
Monument Inscription/National Site Number	Z013
Marker Type, Monumentation Type, Foundation	Brass rivet in the south east corner of concrete surround for man hole
Mark dot of coordinates	Centre and top of the brass rivet

Site Location Information	
City or Town	Slane co Meath
State or Province	Leinster
Country	Ireland
Responsible Agency (Full Address)	Ordnance Survey of Ireland Phoenix Park IE-Dublin 8 Ireland
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3758592.308 m Y = -430971.821 m Z = 5117917.963 m
Orthom. Height T. G. Malin Head	79.140 m
Gravity in ISGN71	

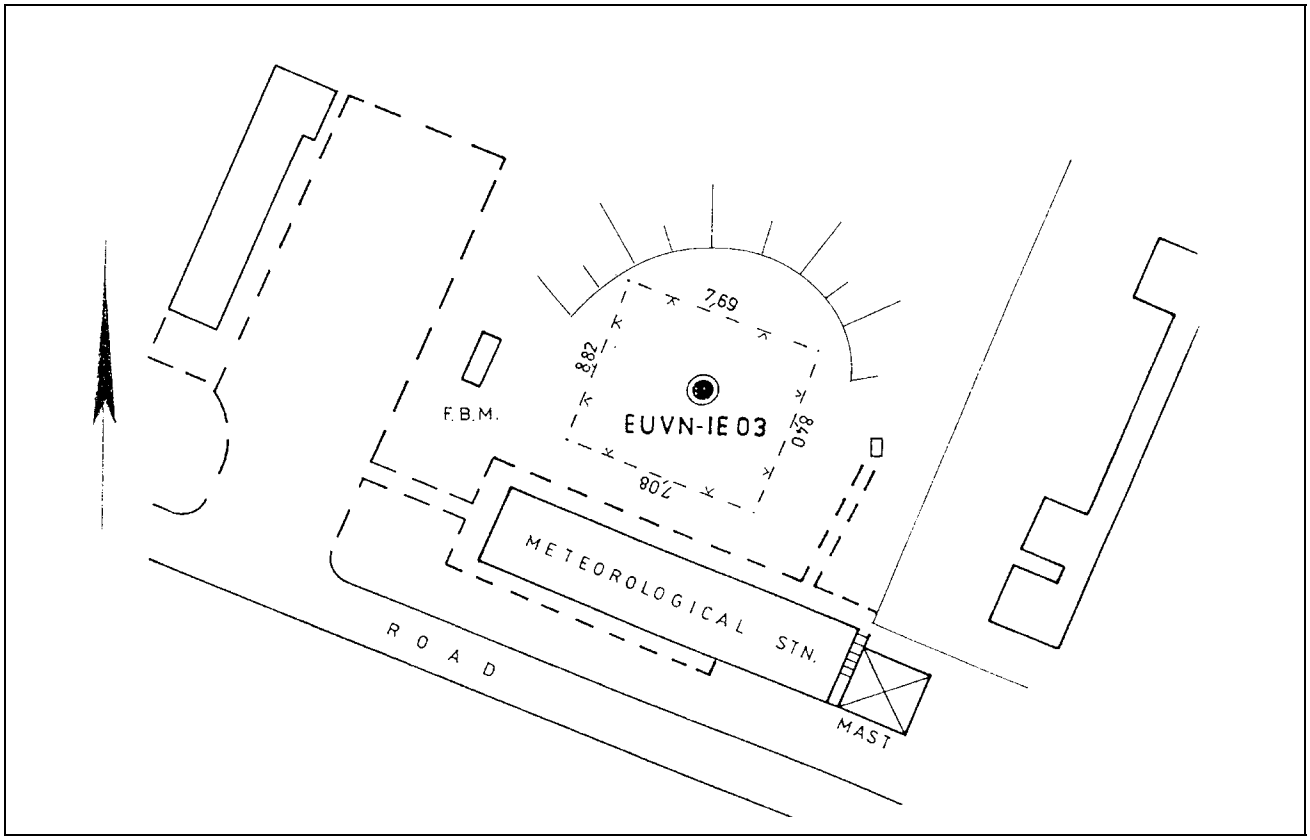


European Vertical GPS Reference Network (EUVN)

Station Malin Head

Site Identification of the GPS Monument	
4-Char. EUVN ID	IE03
DOMES Number	
Monument Inscription/National Site Number	Z001
Marker Type, Monumentation Type, Foundation	Brass plate with centre bung in concrete over cropping rock
Mark dot of coordinates	Centre bung and top of the plate

Site Location Information	
City or Town	Donegal
State or Province	Illster
Country	Ireland
Responsible Agency (Full Address)	Ordnance Survey of Ireland Phoenix Park IE-Dublin 8 Ireland
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3602912.202 m Y = -464038.628 m Z = 5225072.558 m
Orthom. Height T. G. Malin Head	25.617 m
Gravity in ISGN71	

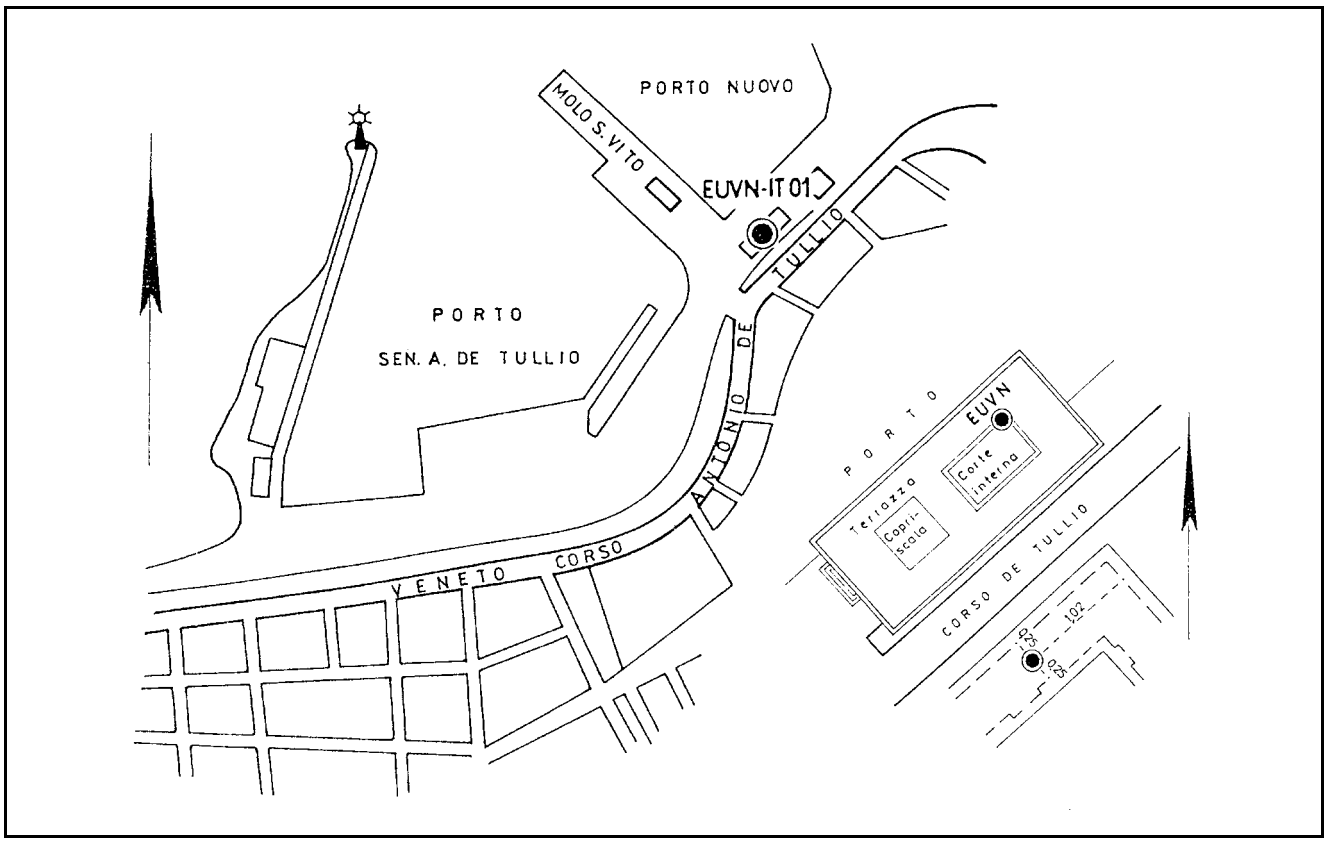


European Vertical GPS Reference Network (EUVN)

Station Bari

Site Identification of the GPS Monument	
4-Char. EUVN ID	IT01
DOMES Number	
Monument Inscription/National Site Number	177802
Marker Type, Monumentation Type, Foundation	Steel plate as GPS marker on parapet wall of a roof terrace
Mark dot of coordinates	Centre and top of GPS marker

Site Location Information	
City or Town	Bari
State or Province	
Country	Italy
Responsible Agency (Full Address)	Istituto Geógrafico Militare Via di Novoli 93 I-50127 Firenze Italy
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4604016.027 m Y = 1395989.959 m Z = 4173523.188 m
Height in UELN-95/98	17.251 m
Gravity in ISGN71	980 355.34 mgal



European Vertical GPS Reference Network (EUVN)

Station Cagliari

Site Identification of the GPS Monument	
4-Char. EUVN ID	CAGL
DOMES Number	12725 M 003
Monument Inscription/National Site Number	Pillar Marker „G“
Marker Type, Monumentation Type, Foundation	
Mark dot of coordinates	

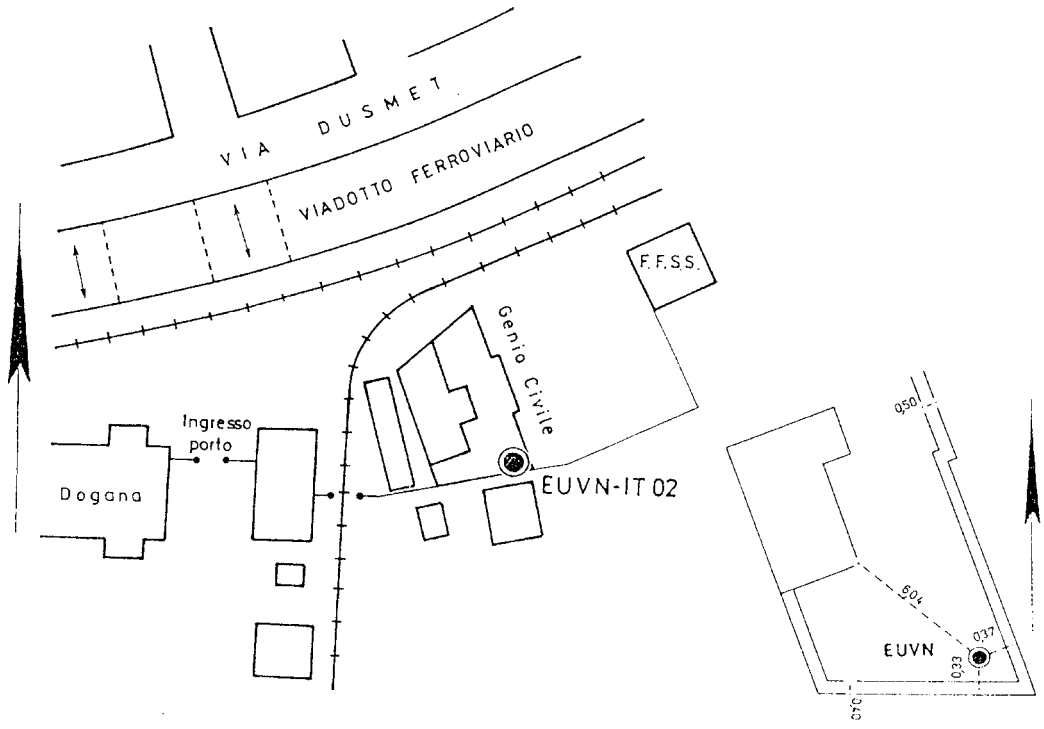
Site Location Information	
City or Town	Cagliari
State or Province	
Country	Italy
Responsible Agency (Full Address)	Agenzia Spéziale Italiana P.O. Box 155 I-75100 Matera Italy
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4893379.088 m Y = 772649.517 m Z = 4004181.915 m
Height in UELN-95/98	
Gravity in ISGN71	

European Vertical GPS Reference Network (EUVN)

Station Catania

Site Identification of the GPS Monument	
4-Char. EUVN ID	IT02
DOMES Number	
Monument Inscription/National Site Number	(IGM-CT-GPS) 270701
Marker Type, Monumentation Type, Foundation	Steel plate as GPS marker lowered into the floor of a roof terrace
Mark dot of coordinates	Centre and top of the GPS marker

Site Location Information	
City or Town	Catania
State or Province	
Country	Italy
Responsible Agency (Full Address)	Istituto Geógrafico Militare Via di Novoli 93 I-50127 Firenze Italy
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4891562.569 m Y = 1319356.187 m Z = 3861697.311 m
Height in UELN-95/98	10.502 m
Gravity in ISGN71	980 055.00 mgal

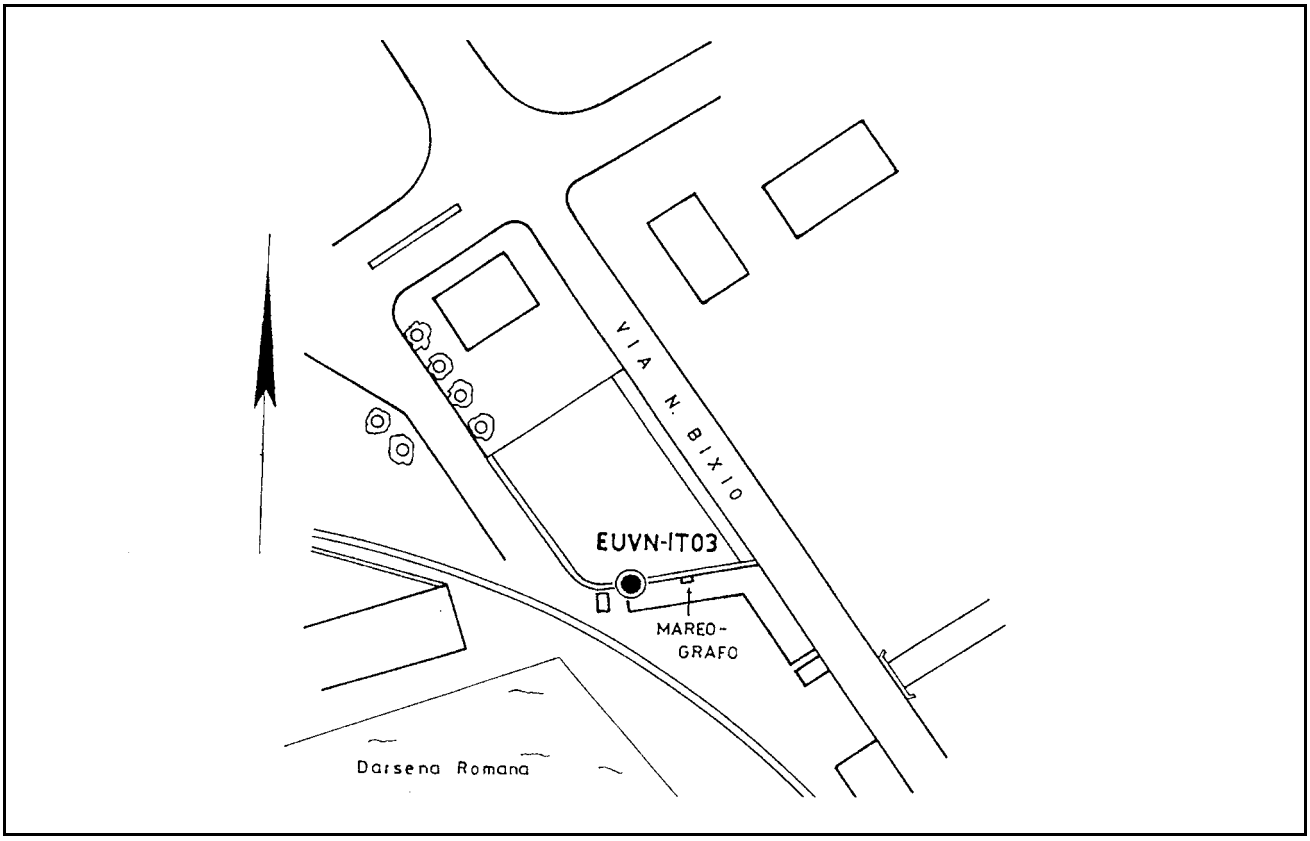


European Vertical GPS Reference Network (EUVN)

Station Civitavecchia

Site Identification of the GPS Monument	
4-Char. EUVN ID	IT03
DOMES Number	
Monument Inscription/National Site Number	(IGM-CS LIV)
Marker Type, Monumentation Type, Foundation	GPS-marker set in the wall surface
Mark dot of coordinates	Centre and top of the GPS marker

Site Location Information	
City or Town	Civitavecchia
State or Province	
Country	Italy
Responsible Agency (Full Address)	Istituto Geógrafico Militare Via di Novoli 93 I-50127 Firenze Italy
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4639918.427 m Y = 968326.462 m Z = 4253578.452 m
Height in UELN-95/98	9.050 m
Gravity in ISGN71	980 409.99 mgal

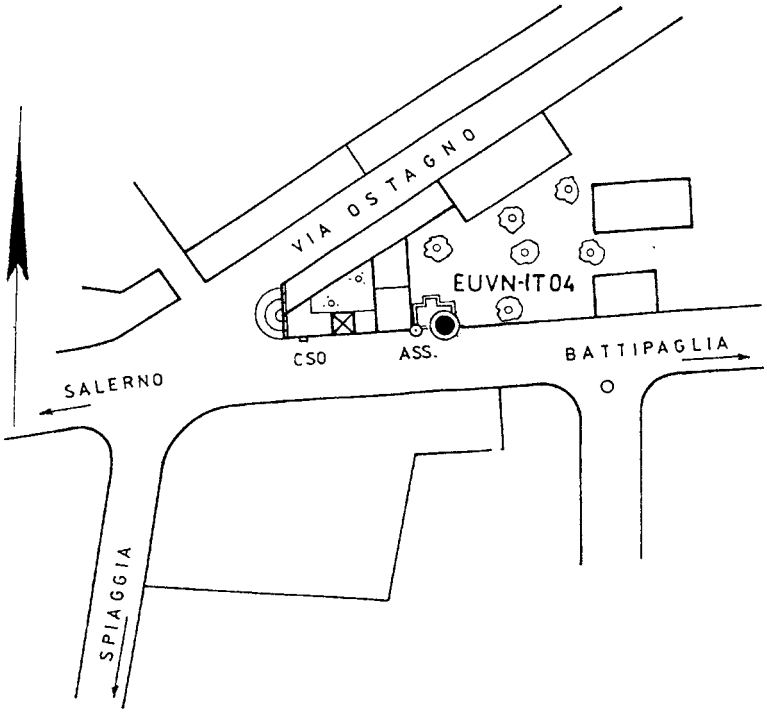


European Vertical GPS Reference Network (EUVN)

Station Battipaglia

Site Identification of the GPS Monument	
4-Char. EUVN ID	IT04
DOMES Number	
Monument Inscription/National Site Number	(IGM-CT GPS)
Marker Type, Monumentation Type, Foundation	Plate as GPS marker set on the top of a roof flash
Mark dot of coordinates	Centre and top of the GPS marker

Site Location Information	
City or Town	Salerno
State or Province	
Country	Italy
Responsible Agency (Full Address)	Istituto Geógrafico Militare Via di Novoli 93 I-50127 Firenze Italy
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4684234.905 m Y = 1242031.940 m Z = 4133027.319 m
Height in UELN-95/98	39.101 m
Gravity in ISGN71	980 255.59 mgal

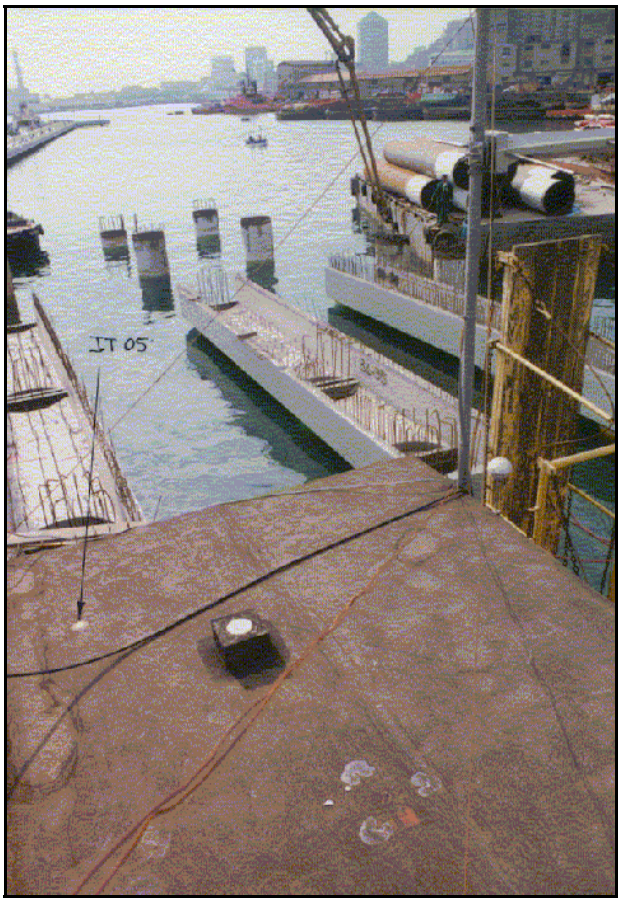


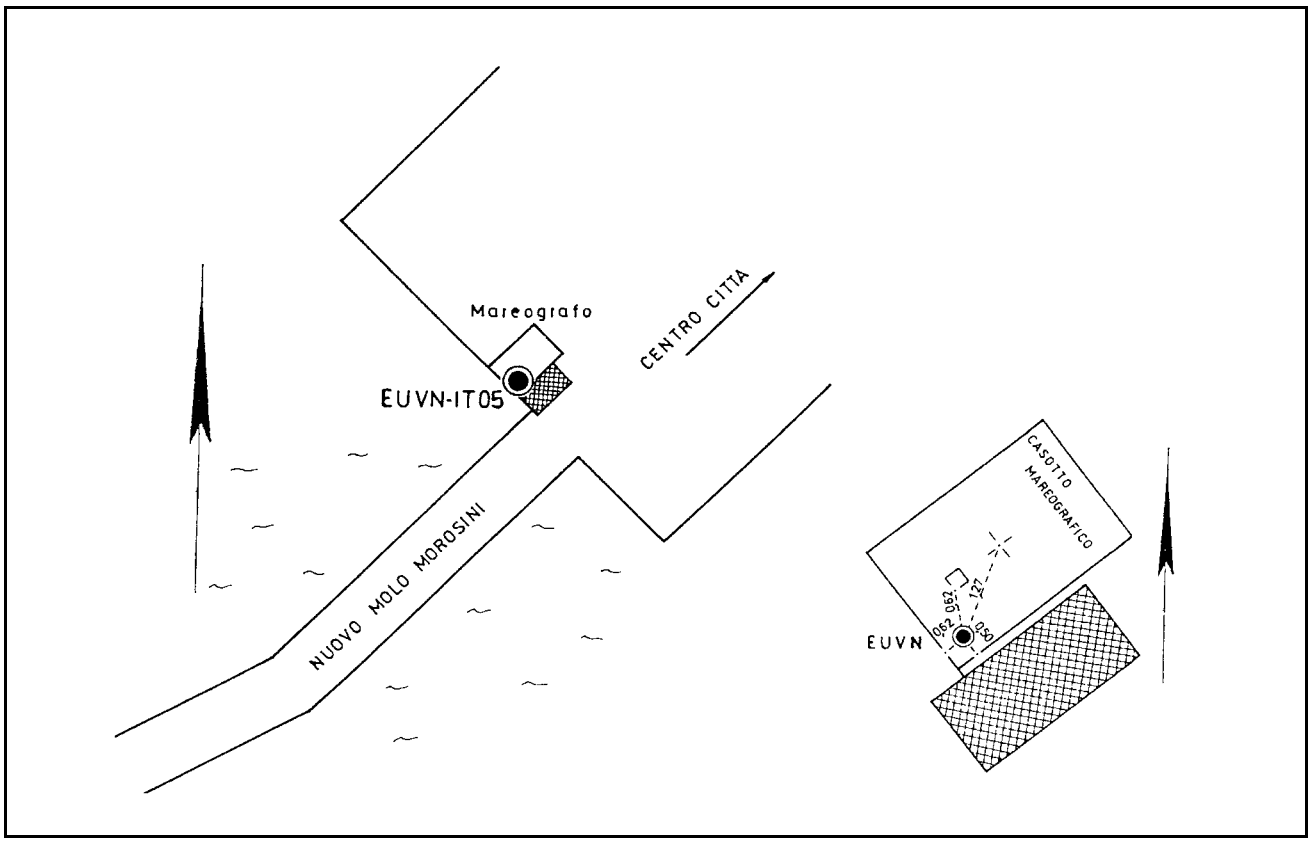
European Vertical GPS Reference Network (EUVN)

Station Genova

Site Identification of the GPS Monument	
4-Char. EUVN ID	IT05
DOMES Number	
Monument Inscription/National Site Number	(IGM-CT GPS) 082802
Marker Type, Monumentation Type, Foundation	Steel plate as GPS marker on the flat roof of a harbour building
Mark dot of coordinates	Centre and top of the GPS marker

Site Location Information	
City or Town	Genova
State or Province	
Country	Italy
Responsible Agency (Full Address)	Istituto Geógrafico Militare Via di Novoli 93 I-50127 Firenze Italy
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4508321.116 m Y = 708053.133 m Z = 4440951.116 m
Height in UELN-95/98	4.014 m
Gravity in ISGN71	980 575.25 mgal



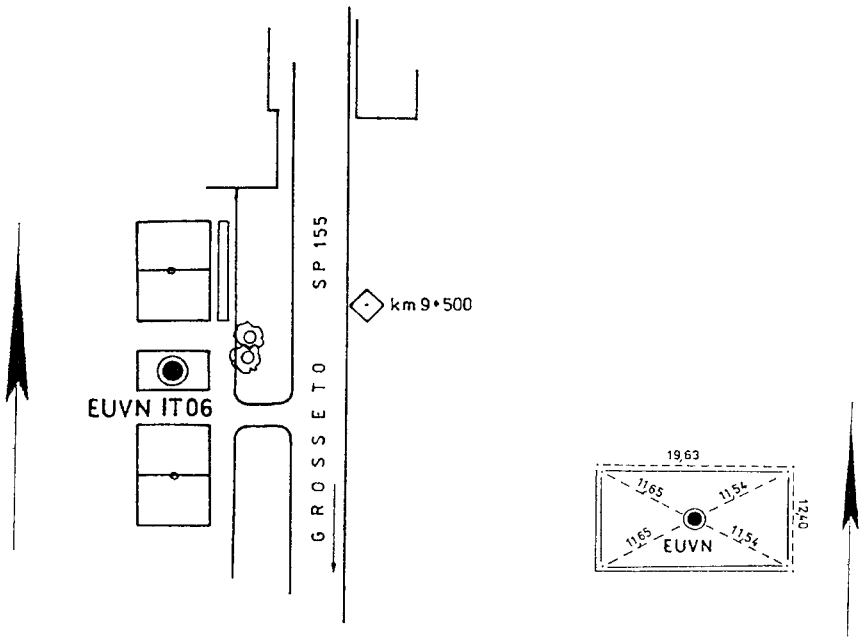


European Vertical GPS Reference Network (EUVN)

Station Montepescali

Site Identification of the GPS Monument	
4-Char. EUVN ID	IT06
DOMES Number	
Monument Inscription/National Site Number	(IGM-CT GPS) 128801
Marker Type, Monumentation Type, Foundation	Steel badge as GPS marker on the flat roof of a building
Mark dot of coordinates	Centre and top of the GPS marker

Site Location Information	
City or Town	Braccagni
State or Province	
Country	Italy
Responsible Agency (Full Address)	Istituto Geógrafico Militare Via di Novoli 93 I-50127 Firenze Italy
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4594522.627 m Y = 899334.030 m Z = 4317112.299 m
Height in UELN-95/98	19.904 m
Gravity in ISGN71	980 468.15 mgal

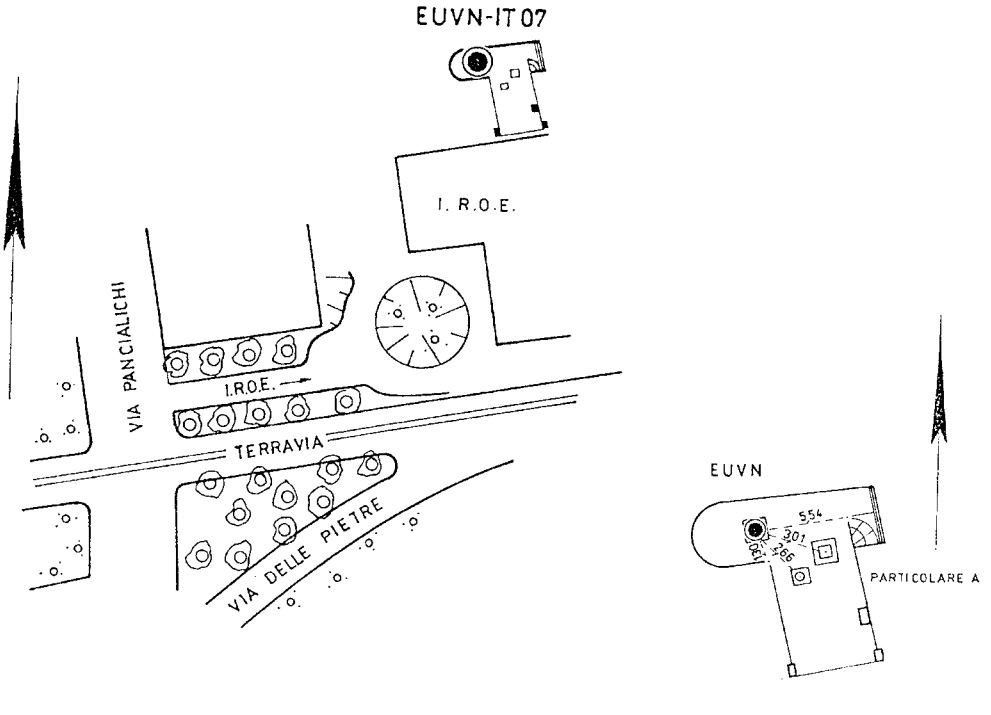


European Vertical GPS Reference Network (EUVN)

Station Iroe

Site Identification of the GPS Monument	
4-Char. EUVN ID	IT07
DOMES Number	
Monument Inscription/National Site Number	(IGM-CT GPS) 106905
Marker Type, Monumentation Type, Foundation	Concrete plate with steel badge as GPS marker on the flat roof of a building
Mark dot of coordinates	Centre and top of the GPS marker

Site Location Information	
City or Town	Firenze
State or Province	
Country	Italy
Responsible Agency (Full Address)	Istituto Geógrafico Militare Via di Novoli 93 I-50127 Firenze Italy
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4522401.822 m Y = 898001.781 m Z = 4392484.865 m
Height in UELN-95/98	99.295 m
Gravity in ISGN71	980 492.66 mgal



European Vertical GPS Reference Network (EUVN)

Station Matera

Site Identification of the GPS Monument	
4-Char. EUVN ID	MATE
DOMES Number	12734 M 008
Monument Inscription/National Site Number	Pillar Marker „R“
Marker Type, Monumentation Type, Foundation	
Mark dot of coordinates	

Site Location Information	
City or Town	Matera
State or Province	
Country	Italy
Responsible Agency (Full Address)	Nuova Telespazio S. p. A. P.O. Box 155 I-75100 Matera Italy
Contact Agency Information	Agenzia Spaziale Italiana P.O. Box 11 I-75100 Matera Italy
Coordinates in ETRS89, Epoch 97.4	X = 4641949.872 m Y = 1393045.174 m Z = 4133287.206 m
Height in UELN-95/98	490.042 m
Gravity in ISGN71	980 198.36 mgal

European Vertical GPS Reference Network (EUVN)

Station Medicina

Site Identification of the GPS Monument	
4-Char. EUVN ID	MEDI
DOMES Number	12711 M 003
Monument Inscription/National Site Number	Pillar Marker „R“
Marker Type, Monumentation Type, Foundation	
Mark dot of coordinates	

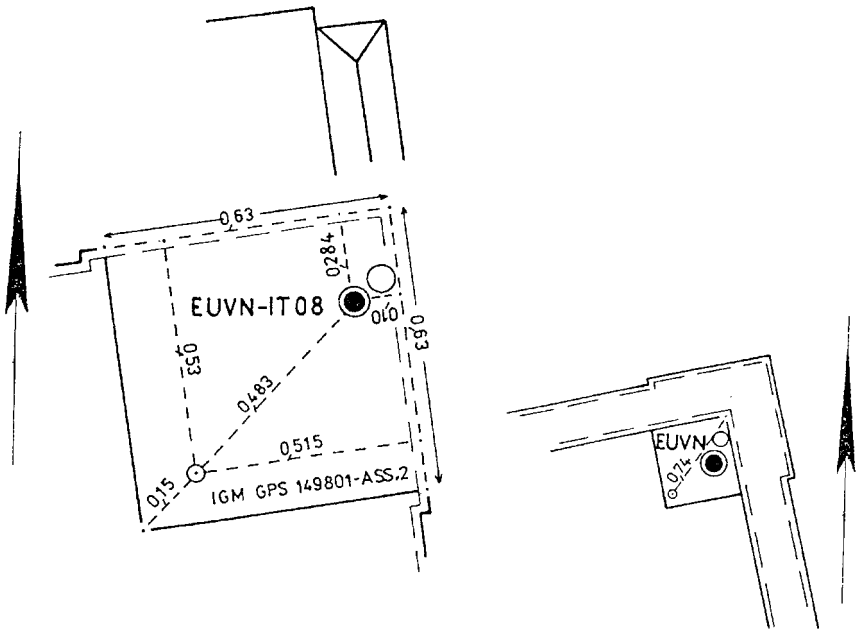
Site Location Information	
City or Town	Medicina
State or Province	
Country	Italy
Responsible Agency (Full Address)	Nuova Telespazio S. p. A. P.O. Box 155 I-75100 Matera Italy
Contact Agency Information	Agenzia Spaziale Italiana P.O. Box 11 I-75100 Matera Italy
Coordinates in ETRS89, Epoch 97.4	X = 4461401.061 m Y = 919593.325 m Z = 4449504.547 m
Height in UELN-95/98	
Gravity in ISGN71	

European Vertical GPS Reference Network (EUVN)

Station Mte Mario

Site Identification of the GPS Monument	
4-Char. EUVN ID	IT08
DOMES Number	
Monument Inscription/National Site Number	(EUREF IGM) 149801A SS.1
Marker Type, Monumentation Type, Foundation	Steel badge as GPS marker on a masoned pedestal on the flat roof
Mark dot of coordinates	Centre and top of the GPS marker

Site Location Information	
City or Town	Roma
State or Province	
Country	Italy
Responsible Agency (Full Address)	Istituto Geógrafico Militare Via di Novoli 93 I-50127 Firenze Italy
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4641093.123 m Y = 1024874.122 m Z = 4239336.853 m
Height in UELN-95/98	153.528 m
Gravity in ISGN71	980 336.83 mgal



European Vertical GPS Reference Network (EUVN)

Station Noto

Site Identification of the GPS Monument	
4-Char. EUVN ID	NOTO
DOMES Number	12717 M 003
Monument Inscription/National Site Number	Marker „R“
Marker Type, Monumentation Type, Foundation	Concrete pillar
Mark dot of coordinates	Top of the small tube on the pillar

Site Location Information	
City or Town	Noto
State or Province	
Country	Italy
Responsible Agency (Full Address)	Nuova Telespázio S.p.A. P.O. Box 155 I-75100 Matera Italy
Contact Agency Information	Agenzia Spaziale Italiana P.O. Box 11 I-75100 Firenze Italy
Coordinates in ETRS89, Epoch 97.4	X = 4934528.814 m Y = 1321262.120 m Z = 3806479.378 m
Height in UELN-95/98	84.441 m
Gravity in ISGN71	980 007.28 mgal

European Vertical GPS Reference Network (EUVN)

Station Padova

Site Identification of the GPS Monument	
4-Char. EUVN ID	UPAD
DOMES Number	12750 M 002
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Metallic pillar
Mark dot of coordinates	

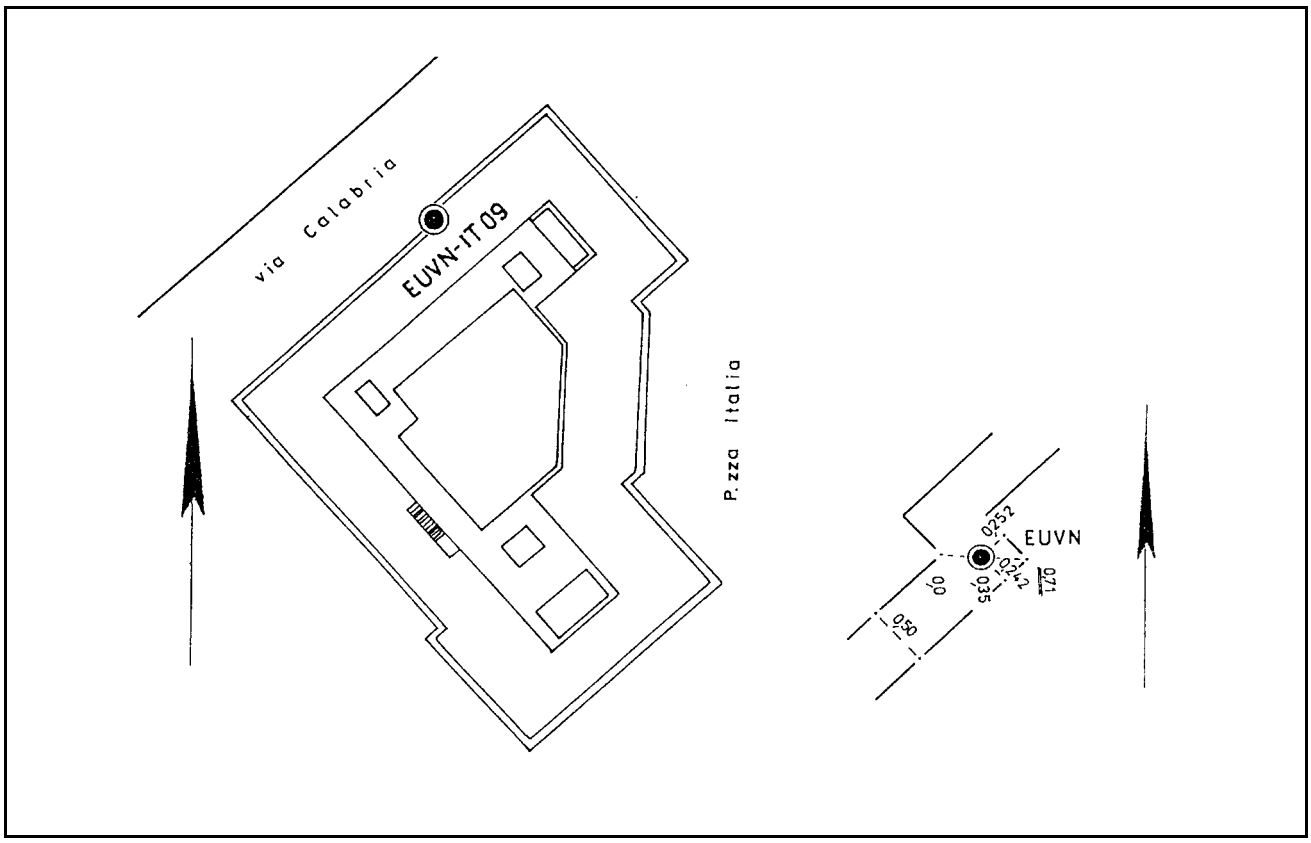
Site Location Information	
City or Town	Padova
State or Province	
Country	Italy
Responsible Agency (Full Address)	University of Padova Dept. of Geology, Paleontology and Geophysics Via Giotto 1 I-35137 Padova Italy
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4389531.451 m Y = 923253.545 m Z = 4519256.214 m
Height in UELN-95/98	39.582 m
Gravity in ISGN71	980 649.12 mgal

European Vertical GPS Reference Network (EUVN)

Station Pescara

Site Identification of the GPS Monument	
4-Char. EUVN ID	IT09
DOMES Number	
Monument Inscription/National Site Number	(IGM-CT GPS) 141903
Marker Type, Monumentation Type, Foundation	Steel badge as GPS marker on parapet wall of a flat roof
Mark dot of coordinates	Centre and top of the GPS marker

Site Location Information	
City or Town	Pescara
State or Province	
Country	Italy
Responsible Agency (Full Address)	istituto Geógrafico Militare Via di Novoli 93 I-50127 Firenze Italy
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4568085.650 m Y = 1157023.939 m Z = 4283890.480 m
Height in UELN-95/98	24.921 m
Gravity in ISGN71	980 346.33 mgal

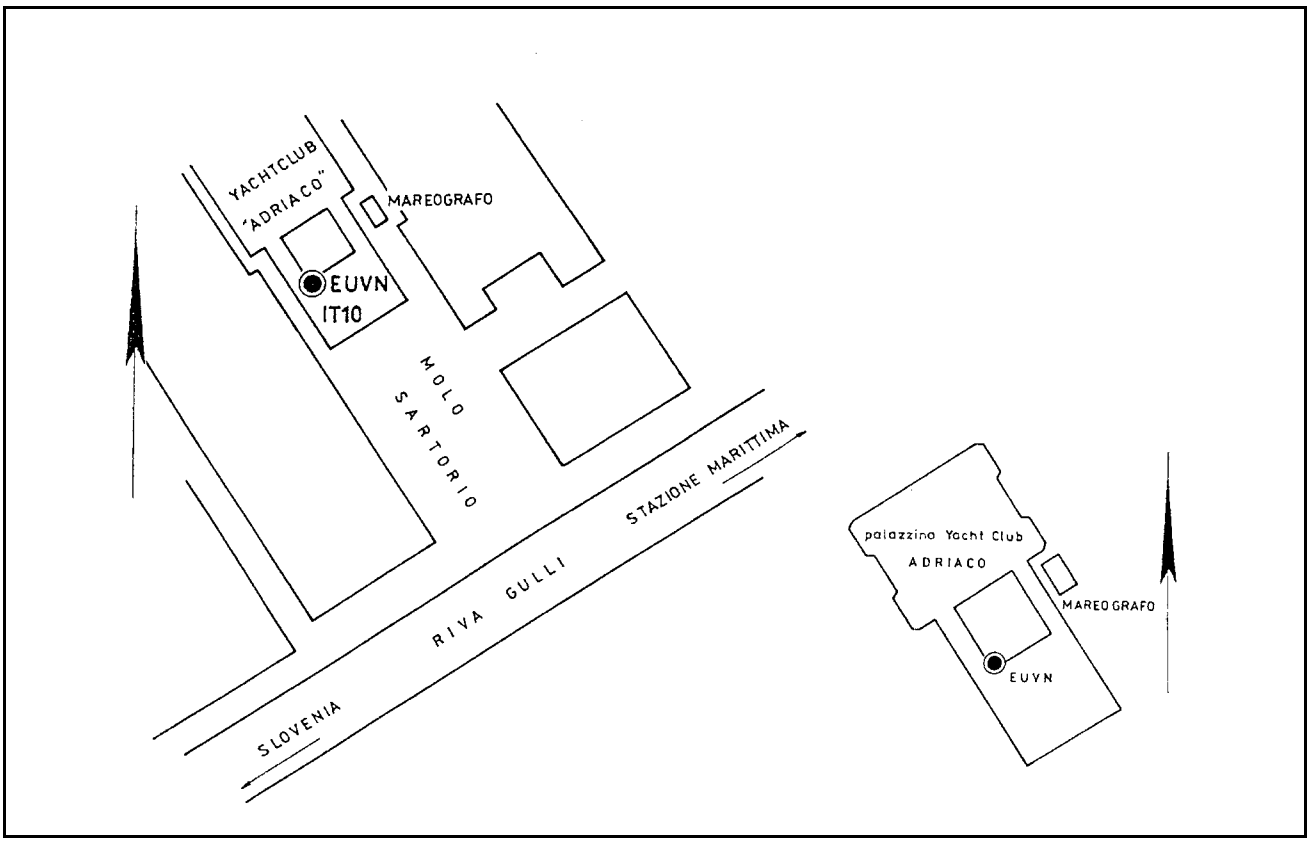


European Vertical GPS Reference Network (EUVN)

Station Trieste

Site Identification of the GPS Monument	
4-Char. EUVN ID	IT10
DOMES Number	
Monument Inscription/National Site Number	(IGM-CS LIV) 53A902
Marker Type, Monumentation Type, Foundation	Steel badge as GPS marker on parapet wall of a flat roof
Mark dot of coordinates	Centre and top of the GPS marker

Site Location Information	
City or Town	Trieste
State or Province	
Country	Italy
Responsible Agency (Full Address)	Istituto Geógrafico Militare Via di Novoli 93 I-50127 Firenze Italy
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4338307.138 m Y = 1062332.346 m Z = 4537962.507 m
Height in UELN-95/98	11.075 m
Gravity in ISGN71	980 662.32 mgal

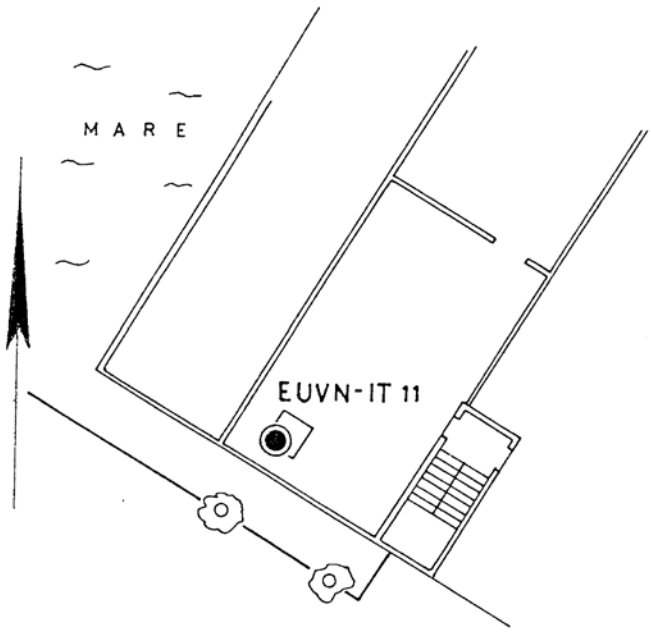


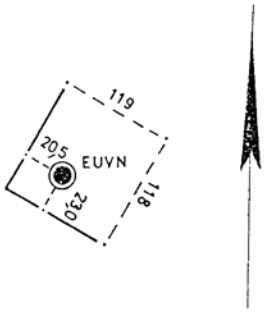
European Vertical GPS Reference Network (EUVN)

Station Cagliari Habour

Site Identification of the GPS Monument	
4-Char. EUVN ID	IT11
DOMES Number	
Monument Inscription/National Site Number	(EUREF IGM) 234802
Marker Type, Monumentation Type, Foundation	
Mark dot of coordinates	

Site Location Information	
City or Town	Cagliari
State or Province	
Country	Italy
Responsible Agency (Full Address)	Istituto Geógrafico Militare Via di Novoli 93 I-50127 Firenze Italy
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4886140.726 m Y = 783960.742 m Z = 4010490.727 m
Height in UELN-95/98	14.681 m
Gravity in ISGN71	980 118.11 mgal



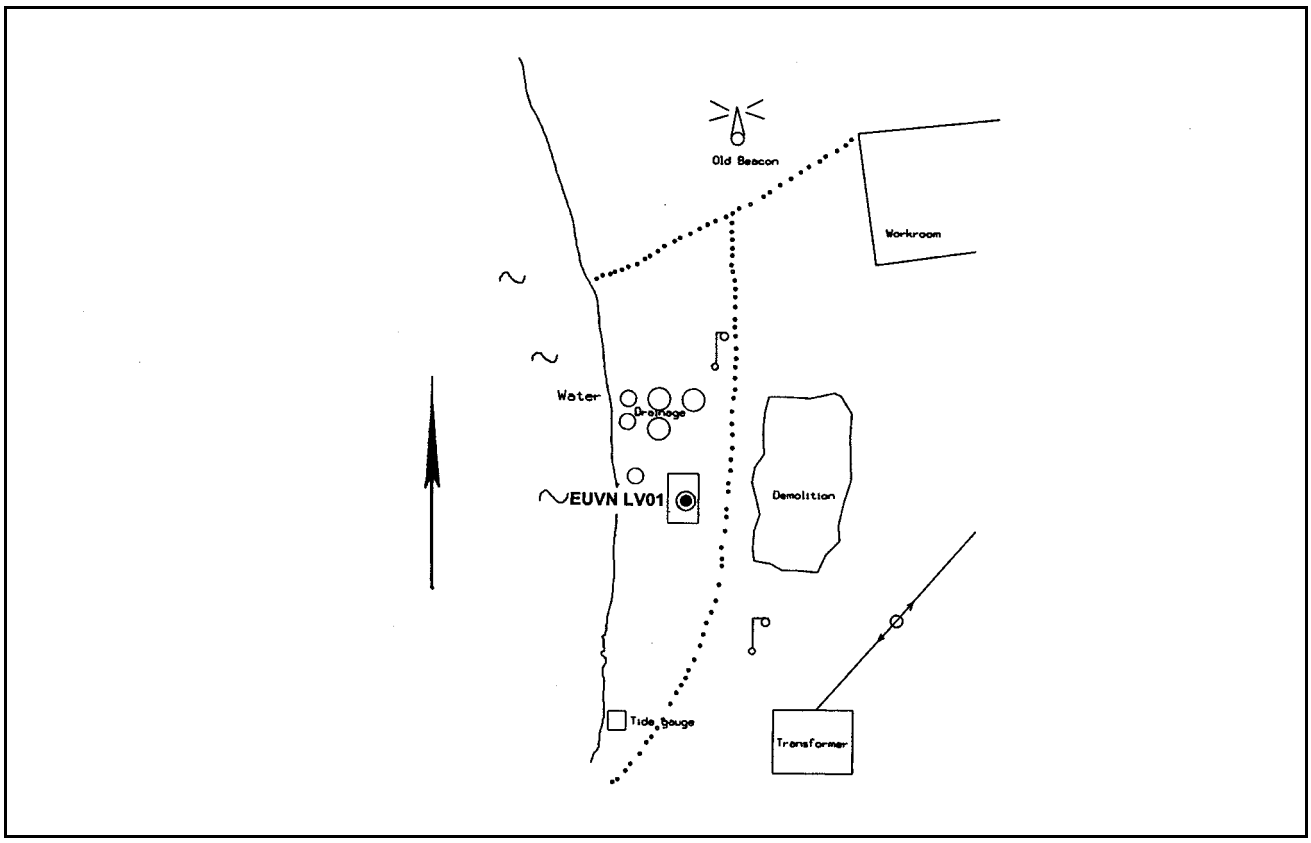


European Vertical GPS Reference Network (EUVN)

Station Skulte

Site Identification of the GPS Monument	
4-Char. EUVN ID	LV01
DOMES Number	
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Bolt set in the flat roof of a building
Mark dot of coordinates	Centre and top of the bolt

Site Location Information	
City or Town	Saulkrasti
State or Province	Vidzeme
Country	Latvia
Responsible Agency (Full Address)	The State Land Service of the Republic of Latvia 11. Novembra krastmala 31. LV-1484 Riga Latvia
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3143836.897 m Y = 1426774.999 m Z = 5345000.562 m
Normal Height T. G. Kronstadt	6.760 m
Gravity in IGSN71	

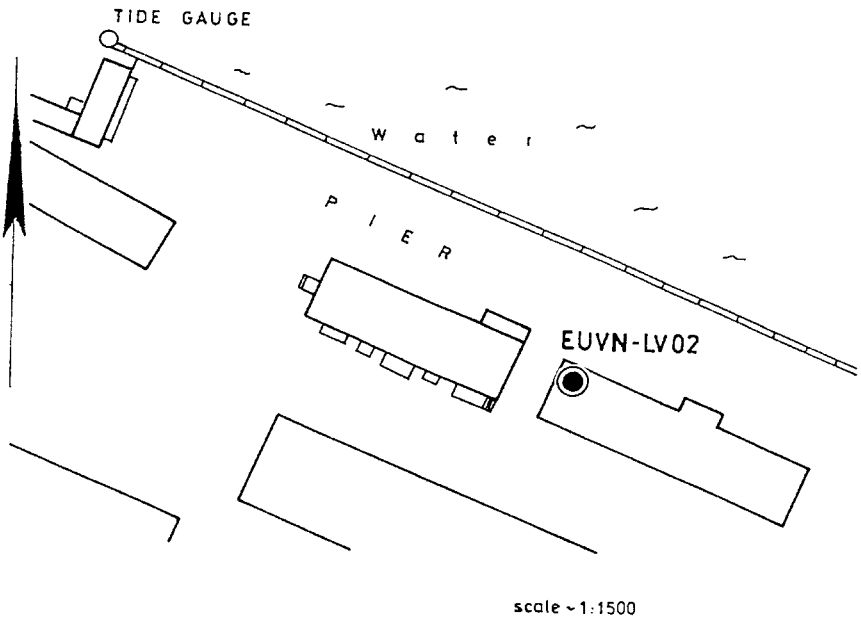


European Vertical GPS Reference Network (EUVN)

Station Liepaja

Site Identification of the GPS Monument	
4-Char. EUVN ID	LV02
DOMES Number	
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Bolt set in the flat roof of a building
Mark dot of coordinates	Centre and top of the bolt

Site Location Information	
City or Town	Liepaja
State or Province	
Country	Latvia
Responsible Agency (Full Address)	The State Land Service of the Republic of Latvia 11. Novembra krastmala 31. LV-1484 Riga Latvia
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3292890.529 m Y = 1264082.081 m Z = 5296320.792 m
Normal Height T. G. Kronstadt	12.184 m
Gravity in IGSN71	



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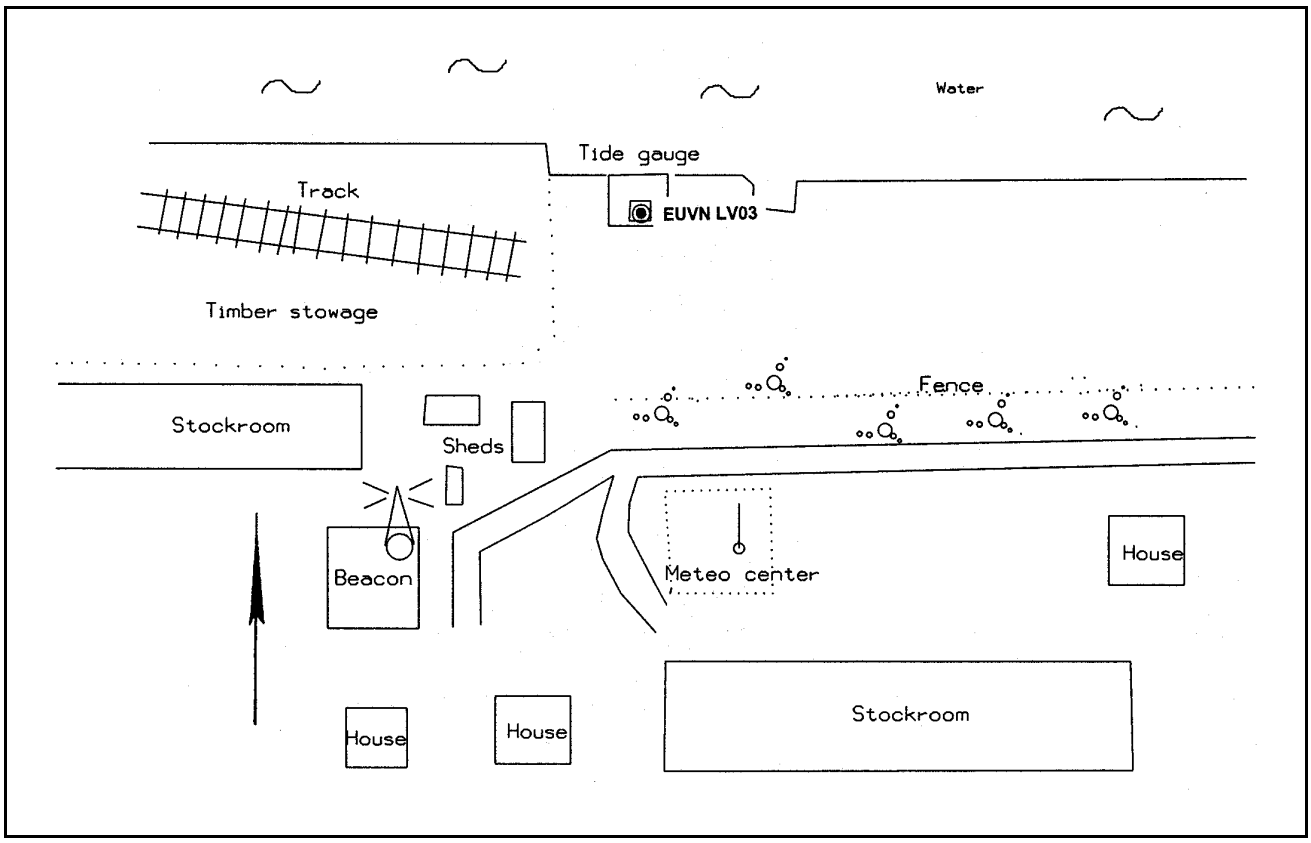
European Vertical GPS Reference Network (EUVN)

Station Ventspils

Site Identification of the GPS Monument	
4-Char. EUVN ID	LV03
DOMES Number	
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Pillar with bolt
Mark dot of coordinates	Centre and top of the bolt

Site Location Information	
City or Town	Ventspils
State or Province	Kurzeme
Country	Latvia
Responsible Agency (Full Address)	The State Land Service of the Republic of Latvia 11. Novembra krastmala 31. LV-1484 Riga Latvia
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3204401.634 m Y = 1264700.335 m Z = 5349807.913 m
Normal Height T. G. Kronstadt	6.633 m
Gravity in ISGN71	

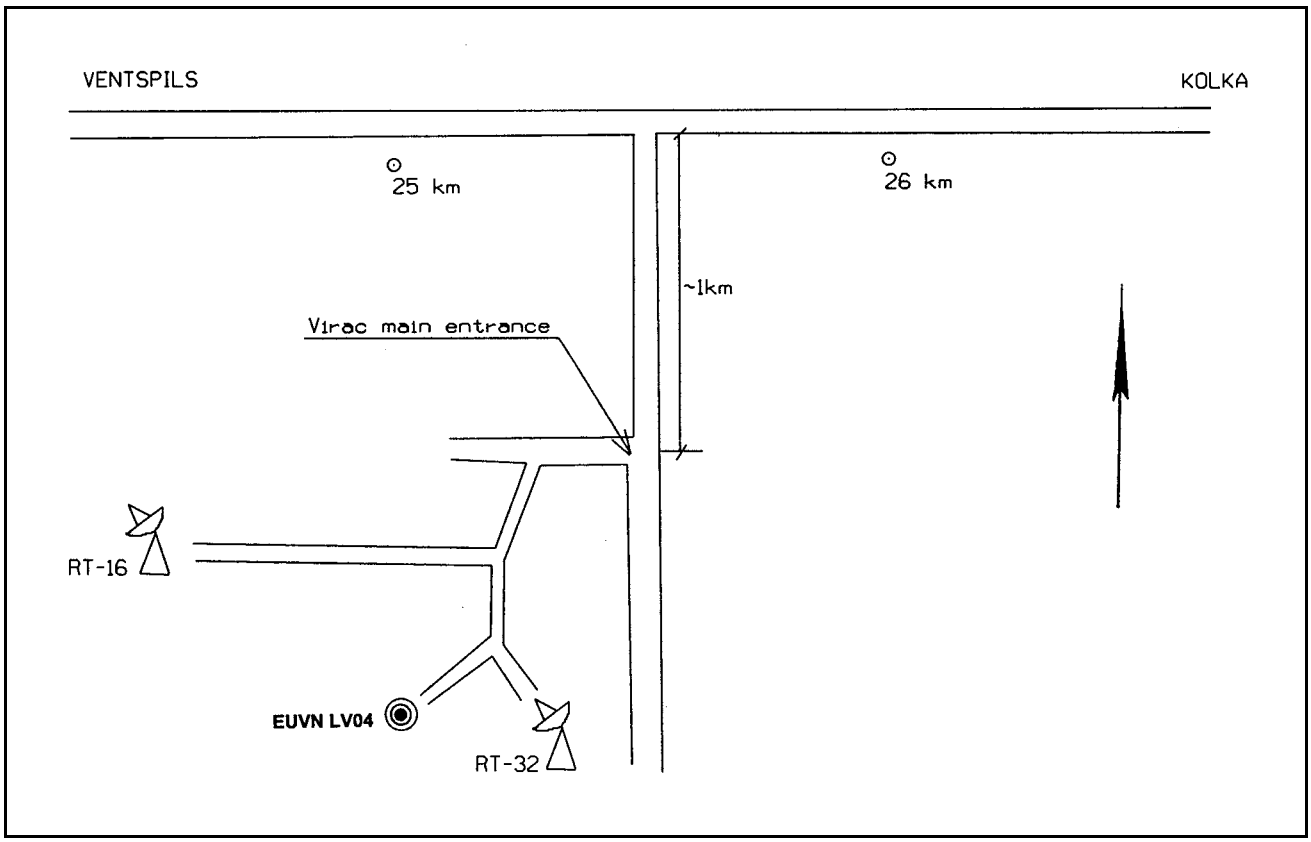


European Vertical GPS Reference Network (EUVN)

Station Irbene

Site Identification of the GPS Monument	
4-Char. EUVN ID	LV04
DOMES Number	
Monument Inscription/National Site Number	495/VGT (VZD-1994)
Marker Type, Monumentation Type, Foundation	Geodetic marker inside dome
Mark dot of coordinates	Centre and top of the Geodetic marker

Site Location Information	
City or Town	Ventspils district
State or Province	Kurzeme
Country	Latvia
Responsible Agency (Full Address)	Ventspils International Radioastronomy Centre Akademijas laukums 1 LV-1524 Riga Latvia
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3183612.344 m Y = 1276706.474 m Z = 5359310.651 m
Normal Height T. G. Kronstadt	19.645 m
Gravity in IGSN71	

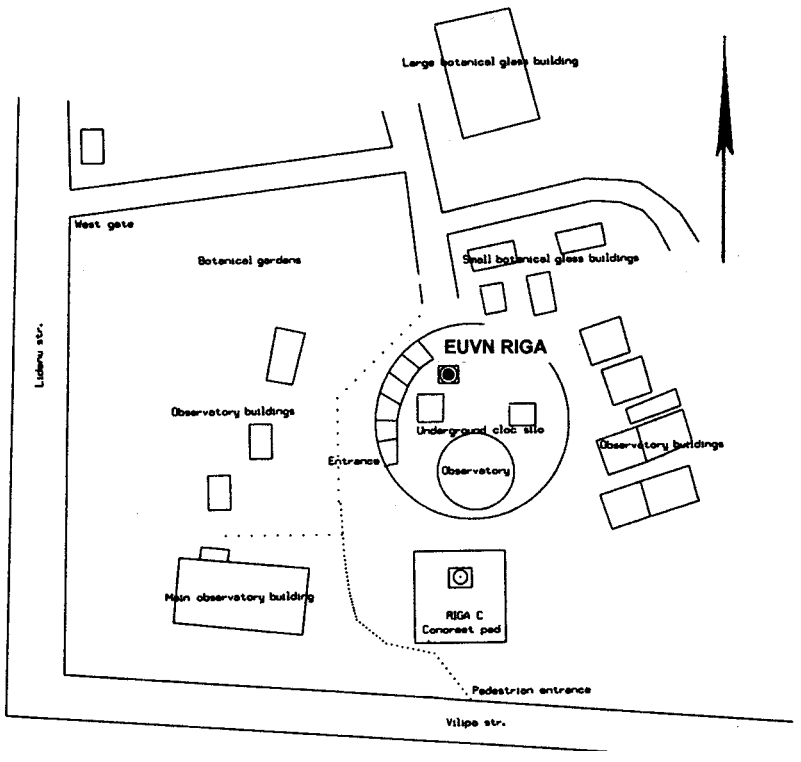


European Vertical GPS Reference Network (EUVN)

Station Riga

Site Identification of the GPS Monument	
4-Char. EUVN ID	RIGA
DOMES Number	12302 M 002
Monument Inscription/National Site Number	10371
Marker Type, Monumentation Type, Foundation	Pillar with bolt
Mark dot of coordinates	Centre and top of the bolt

Site Location Information	
City or Town	Riga
State or Province	Vidzeme
Country	Latvia
Responsible Agency (Full Address)	Astronomical Institute University of Latvia Blvd. Rainis 19 LV-1586 Riga Latvia
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3183899.538 m Y = 1421478.299 m Z = 5322810.625 m
Normal Height T. G. Kronstadt	14.017 m
Gravity in IGSN71	

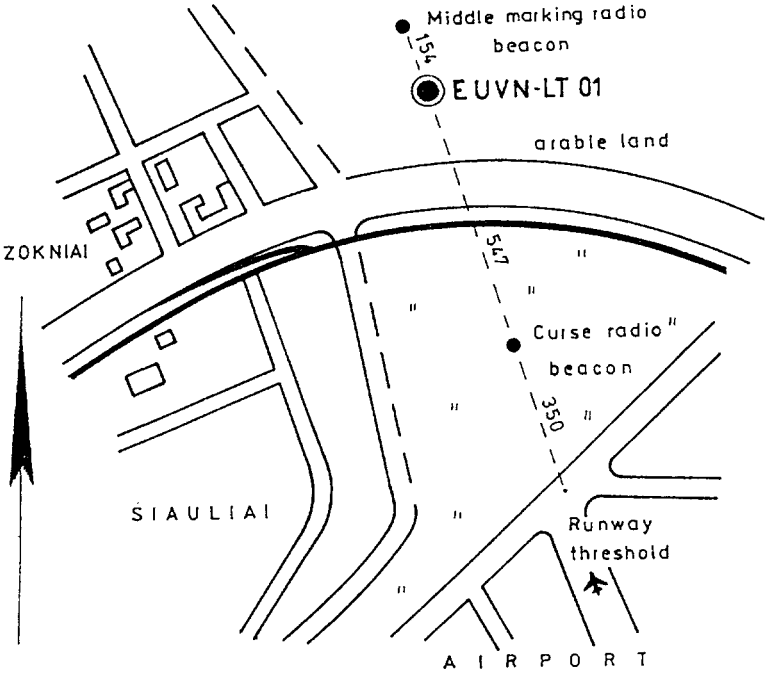


European Vertical GPS Reference Network (EUVN)

Station Siauliai

Site Identification of the GPS Monument	
4-Char. EUVN ID	LT01
DOMES Number	
Monument Inscription/National Site Number	55S-0128
Marker Type, Monumentation Type, Foundation	Plate with GPS marker on pillar
Mark dot of coordinates	

Site Location Information	
City or Town	Siauliai
State or Province	
Country	Lithuania
Responsible Agency (Full Address)	Institute of Geodesy of Vilnius Gediminas Technical University Sauletekio al. 11 LT-2040 Vilnius Lithuania
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3288941.635 m Y = 1421306.133 m Z = 5259190.286 m
Normal Height T. G. Kronstadt	141.381 m
Gravity in ISGN71	981 533.6 mgal

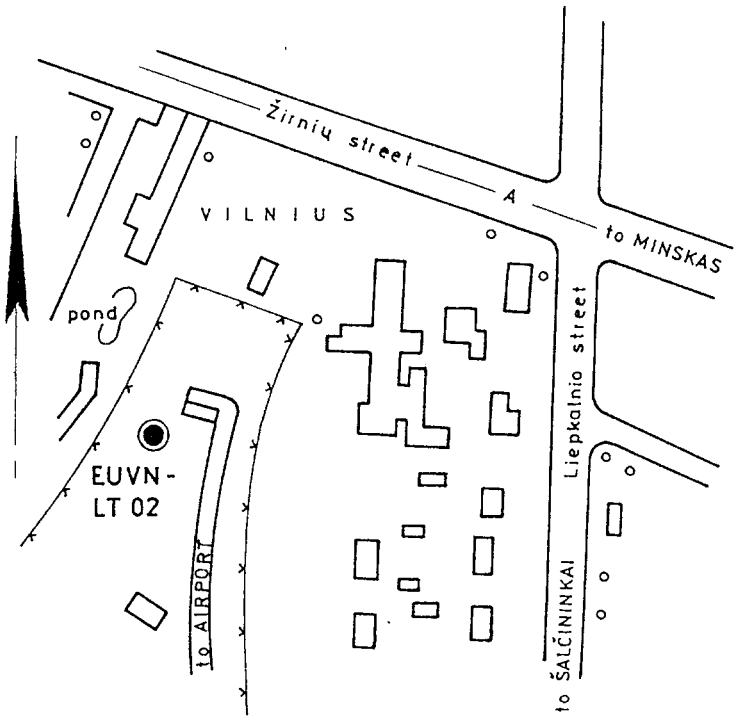


European Vertical GPS Reference Network (EUVN)

Station Vilnius

Site Identification of the GPS Monument	
4-Char. EUVN ID	LT02
DOMES Number	
Monument Inscription/National Site Number	73S-0271
Marker Type, Monumentation Type, Foundation	Plate with GPS marker on pillar
Mark dot of coordinates	

Site Location Information	
City or Town	Vilnius
State or Province	
Country	Lithuania
Responsible Agency (Full Address)	Institute of Geodesy of Vilnius Gediminas Technical University Sauletekio al. 11 LT-2040 Vilnius Lithuania
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3343600.968 m Y = 1580417.549 m Z = 5179337.116 m
Normal Height T. G. Kronstadt	215.798 m
Gravity in ISGN71	981 433.8 mgal

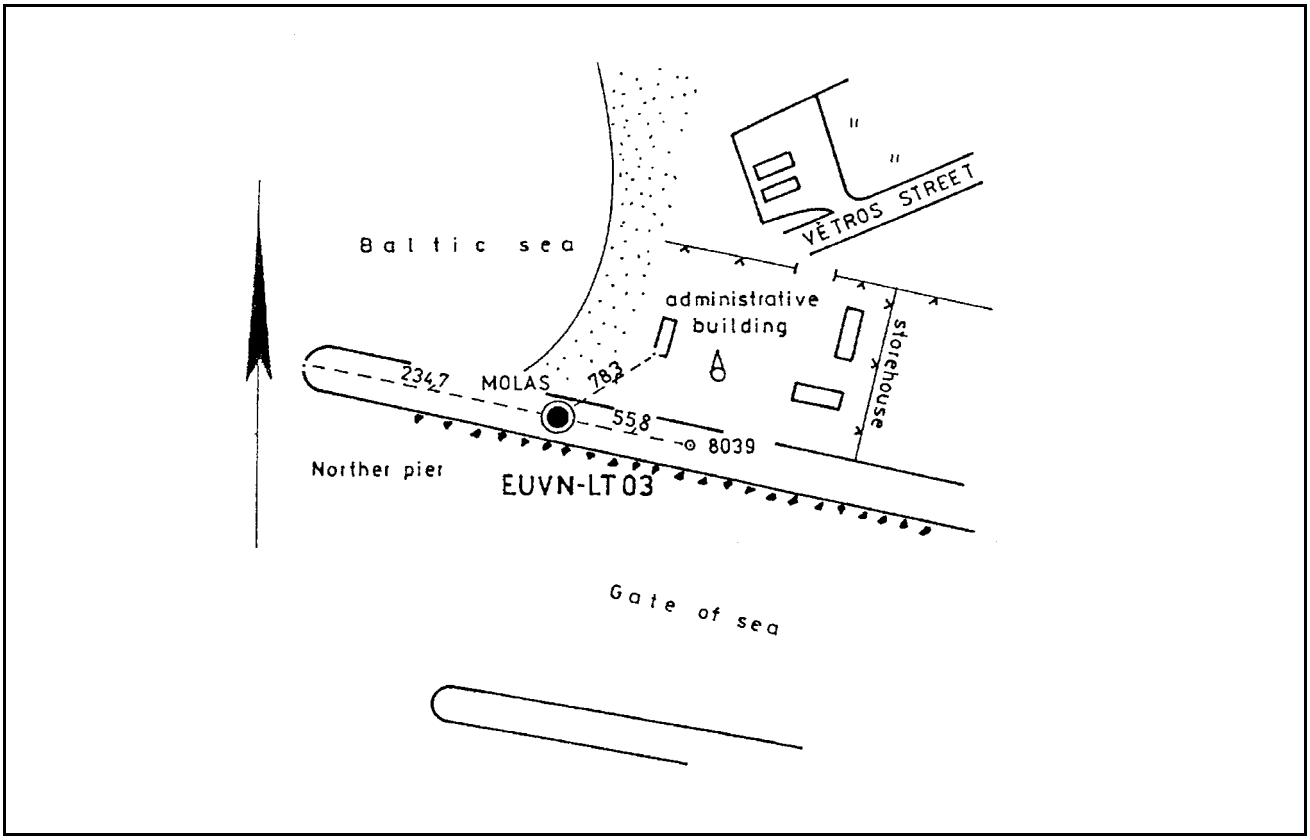


European Vertical GPS Reference Network (EUVN)

Station Molas

Site Identification of the GPS Monument	
4-Char. EUVN ID	LT03
DOMES Number	
Monument Inscription/National Site Number	25S-1522
Marker Type, Monumentation Type, Foundation	Concrete pedestal with inserted GPS marker with bolt on the Norther pier
Mark dot of coordinates	Centre and top of the bolt

Site Location Information	
City or Town	Klaipeda
State or Province	
Country	Lithuania
Responsible Agency (Full Address)	Institute of Geodesy of Vilnius Gediminas Technical University Sauletekio al. 11 LT-2040 Vilnius Lithuania
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3358793.563 m Y = 1294907.325 m Z = 5247584.294 m
Normal Height T. G. Kronstadt	4.638 m
Gravity in ISGN71	981 549.6 mgal



European Vertical GPS Reference Network (EUVN)

Station Borova Cuka

Site Identification of the GPS Monument	
4-Char. EUVN ID	MK01
DOMES Number	
Monument Inscription/National Site Number	115
Marker Type, Monumentation Type, Foundation	Concrete pillar with bolt
Mark dot of coordinates	Centre and top of the bolt

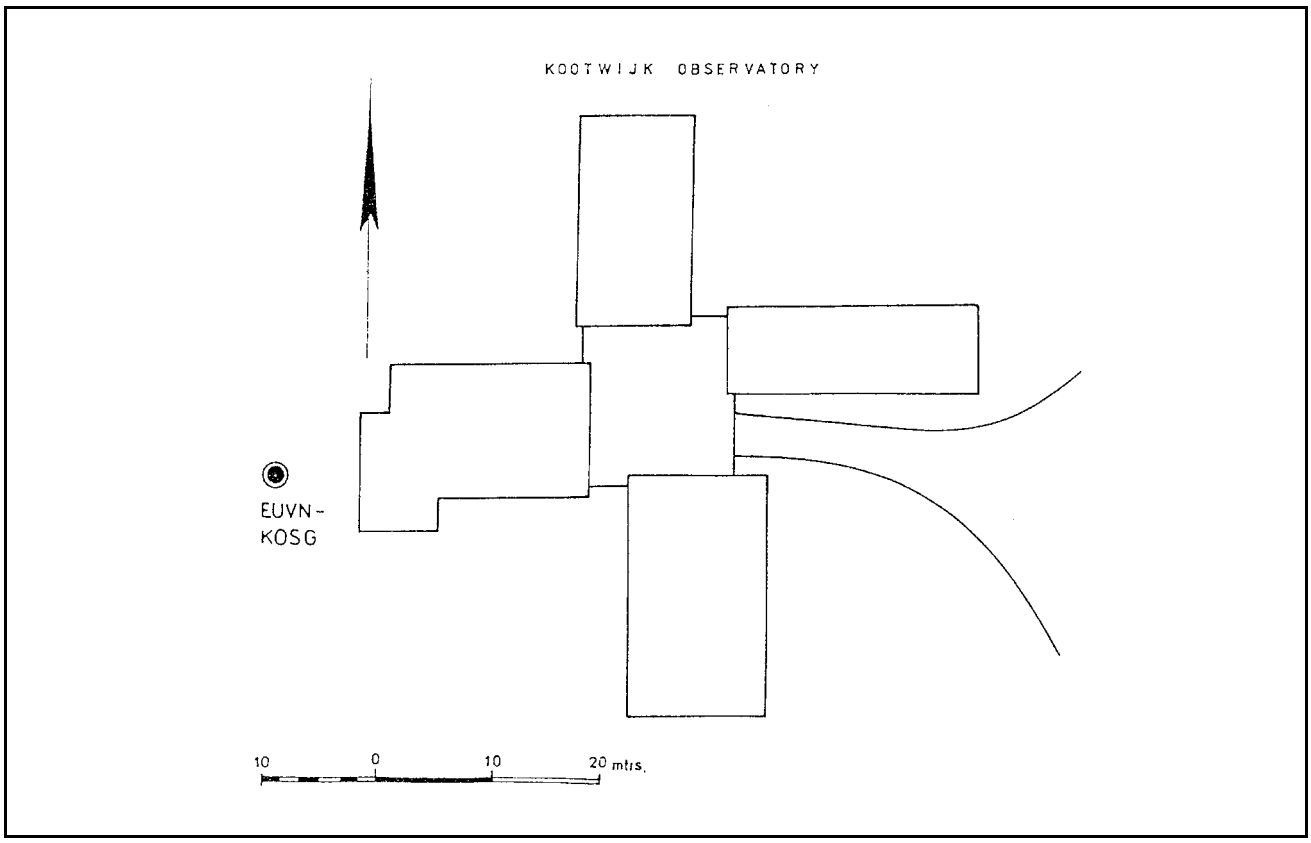
Site Location Information	
City or Town	Delcevo
State or Province	
Country	FYRO Macedonia
Responsible Agency (Full Address)	Land Registry and Geodetic Survey ul. Trifun Hadzi Janev 4 MK - 91000 Skopje FYRO Macedonia
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4374796.640 m Y = 1844718.301 m Z = 4246576.974 m
Norm.-orth. Height T. G. Trieste	1219.003 m
Gravity in ISGN71	

European Vertical GPS Reference Network (EUVN)

Station Kootwijk

Site Identification of the GPS Monument	
4-Char. EUVN ID	KOSG
DOMES Number	13504 M 003
Monument Inscription/National Site Number	RD 339 334 25
Marker Type, Monumentation Type, Foundation	Antenna on top of mast, founded on stable sand layers deposited during the last ice age
Mark dot of coordinates	Top of mast

Site Location Information	
City or Town	Kootwijk
State or Province	
Country	The Netherlands
Responsible Agency (Full Address)	Delft Institute for Earth-Oriented Space research (DEOS) Delft University of Technology Postbus 5030 NL-2600 GA Delft The Netherlands
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3899225.408 m Y = 396731.722 m Z = 5015078.224 m
Height in UELN-95/98	53.589 m
Gravity in ISGN71	981 247.202 mgal

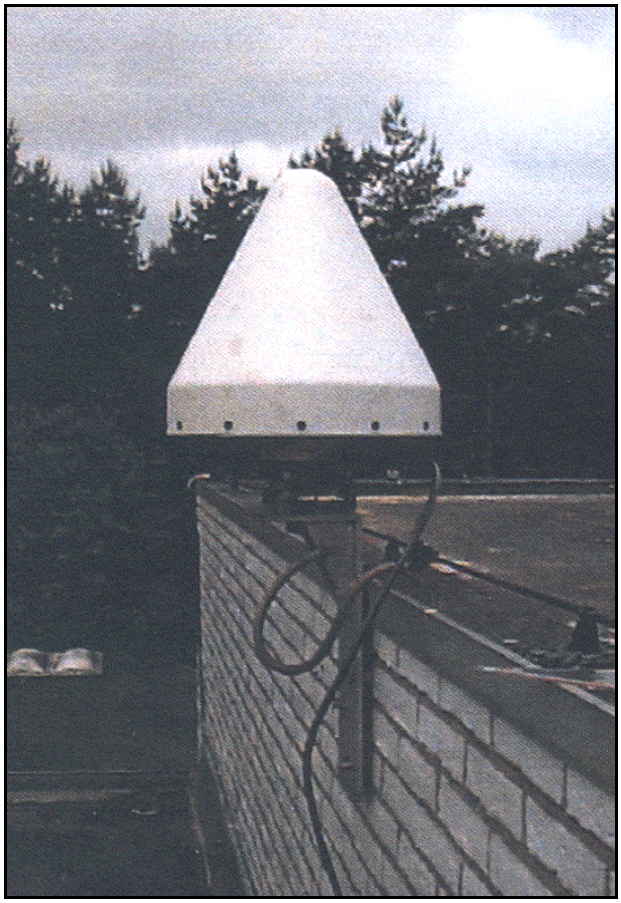


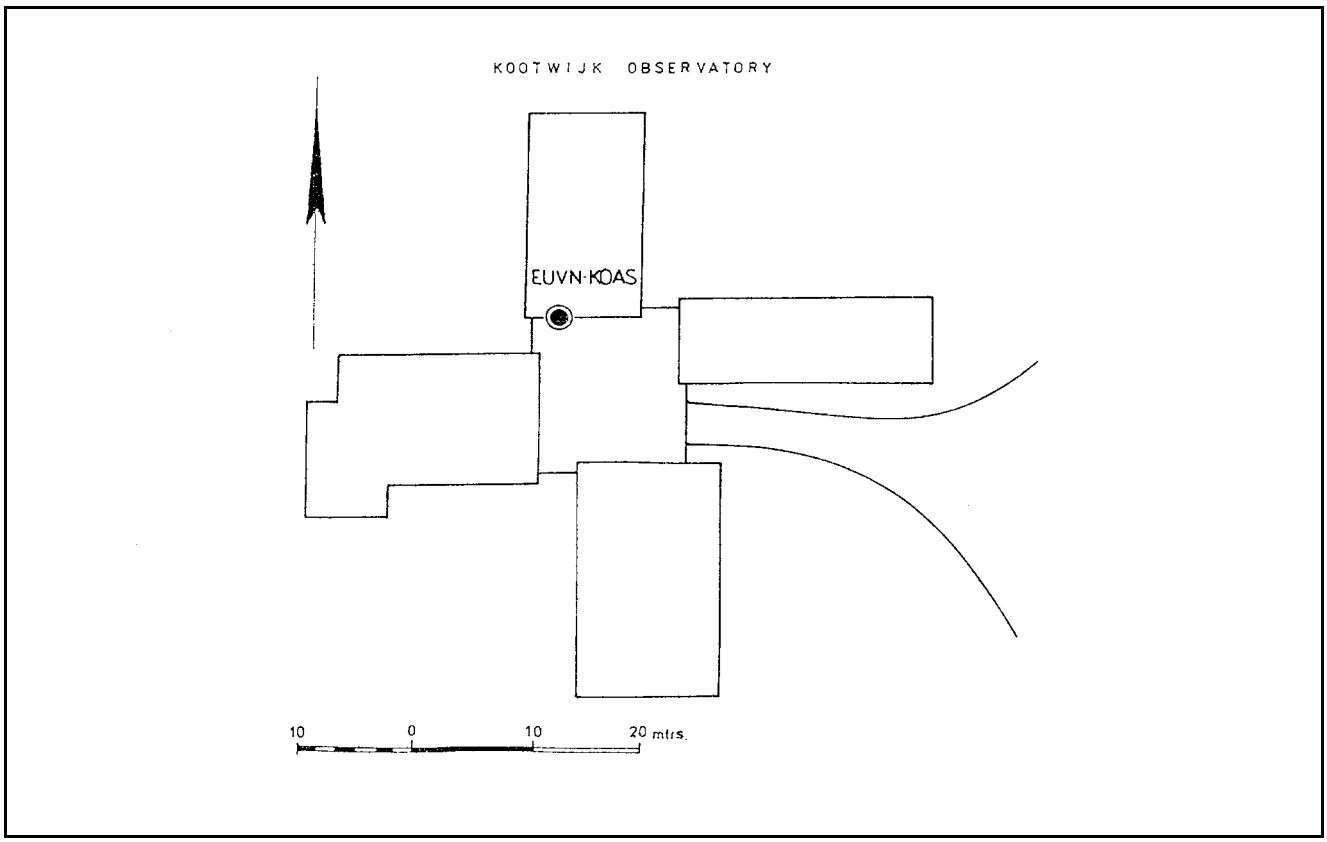
European Vertical GPS Reference Network (EUVN)

Station Kootwijk A

Site Identification of the GPS Monument	
4-Char. EUVN ID	KOAS
DOMES Number	
Monument Inscription/National Site Number	RD 339 334 31
Marker Type, Monumentation Type, Foundation	Steel aluminium construction with plate and screw bolt mounted on the outer wall of the observatory
Mark dot of coordinates	Centre of the screw bolt and top of the plate

Site Location Information	
City or Town	Kootwijk
State or Province	
Country	The Netherlands
Responsible Agency (Full Address)	Delft Institute for Earth-Oriented Space research (DEOS) Delft University of Technology Postbus 5030 NL-2600 GA Delft The Netherlands
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3899208.596 m Y = 396761.118 m Z = 5015079.358 m
Height in UELN-95/98	
Gravity in ISGN71	981 249.547 mgal



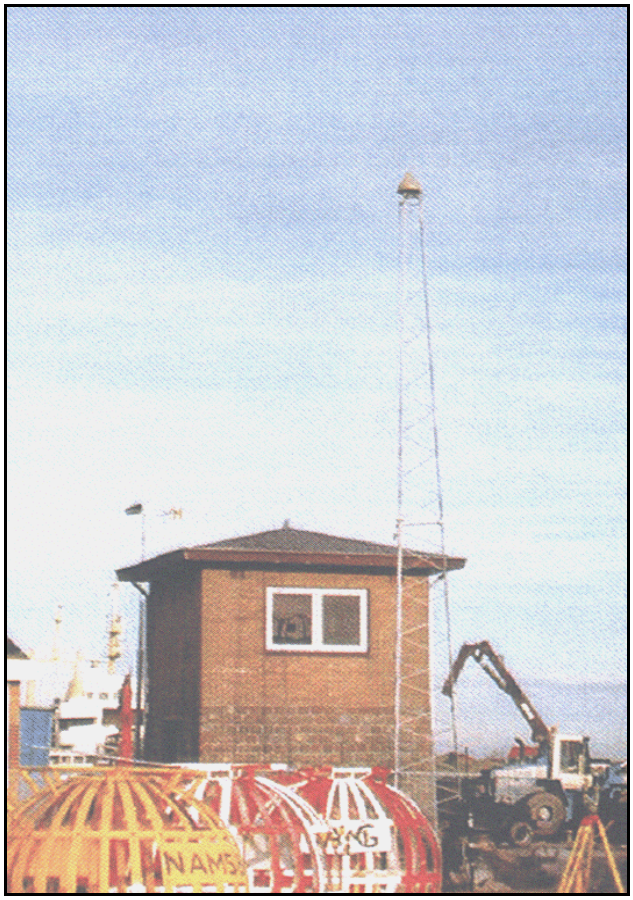


European Vertical GPS Reference Network (EUVN)

Station Terschelling

Site Identification of the GPS Monument	
4-Char. EUVN ID	TERS
DOMES Number	13534 M 001
Monument Inscription/National Site Number	RD 059 306 02
Marker Type, Monumentation Type, Foundation	Antenna on top of 12 m steel mast, founded on stable sand layers using concrete pillars
Mark dot of coordinates	Top of mast

Site Location Information	
City or Town	West-Terschelling
State or Province	
Country	The Netherlands
Responsible Agency (Full Address)	Actief GPS Referentie Systeem voor Nederland (AGRS.NL) p/a Postbus 9046 NL-7300 GH Apeldoorn The Netherlands
Contact Agency Information	Rijkswaterstaat Survey Department Postbus 5023 NL-2600 GA Delft The Netherlands
Coordinates in ETRS89, Epoch 97.4	X = 3798580.870 m Y = 346993.831 m Z = 5094780.819 m
Height in UELN-95/98	14.718 m
Gravity in ISGN71	981 359.54 mgal

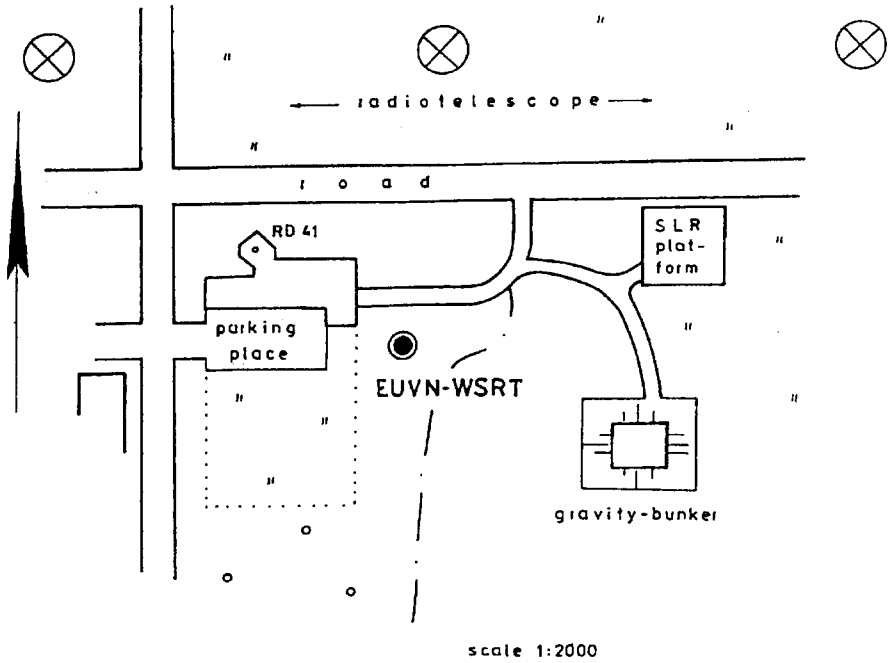


European Vertical GPS Reference Network (EUVN)

Station Westerbork

Site Identification of the GPS Monument	
4-Char. EUVN ID	WSRT
DOMES Number	13506 M 006
Monument Inscription/National Site Number	RD 179 811 01
Marker Type, Monumentation Type, Foundation	Antenna on top of 24 m steel mast, founded on stable sand layers, the vertical component is controlled by an invar wire construction
Mark dot of coordinates	Little ball on invar wire

Site Location Information	
City or Town	Westerbork
State or Province	
Country	The Netherlands
Responsible Agency (Full Address)	Delft Institute for Earth-Oriented Space research (DEOS) Delft University of Technology Postbus 5030 NL-2600 GA Delft The Netherlands
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3828736.152 m Y = 443304.741 m Z = 5064884.507 m
Height in UELN-95/98	40.747 m
Gravity in ISGN71	981 301.864 mgal

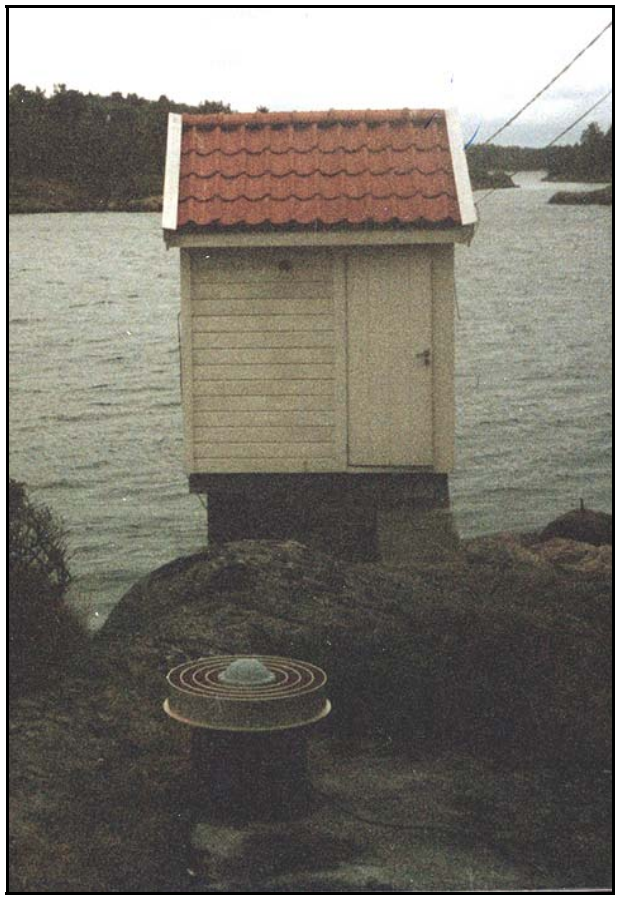


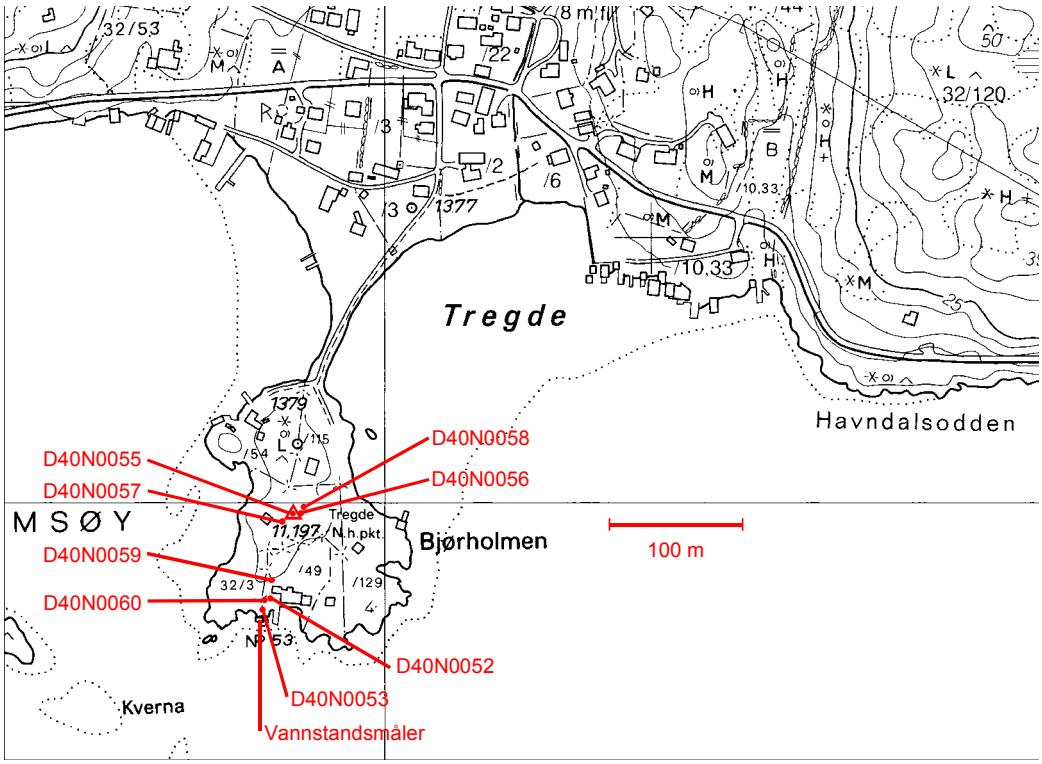
European Vertical GPS Reference Network (EUVN)

Station Tregde

Site Identification of the GPS Monument	
4-Char. EUVN ID	NO01
DOMES Number	
Monument Inscription/National Site Number	(Statens Kartverk 1995)
Marker Type, Monumentation Type, Foundation	Concrete pillar with brass plate and screw bolt (Wild) on bedrock, with forced centring
Mark dot of coordinates	Centre of bolt and top of plate (foot of screw)

Site Location Information	
City or Town	Tregde
State or Province	
Country	Norway
Responsible Agency (Full Address)	Statens Kartverk Geodesidiv N-3500 Hoenefoss Norway
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3358069.204 m Y = 445365.441 m Z = 5386157.750 m
Height in UELN-95/98	2.804 m
Gravity in ISGN71	981 760.2 mgal



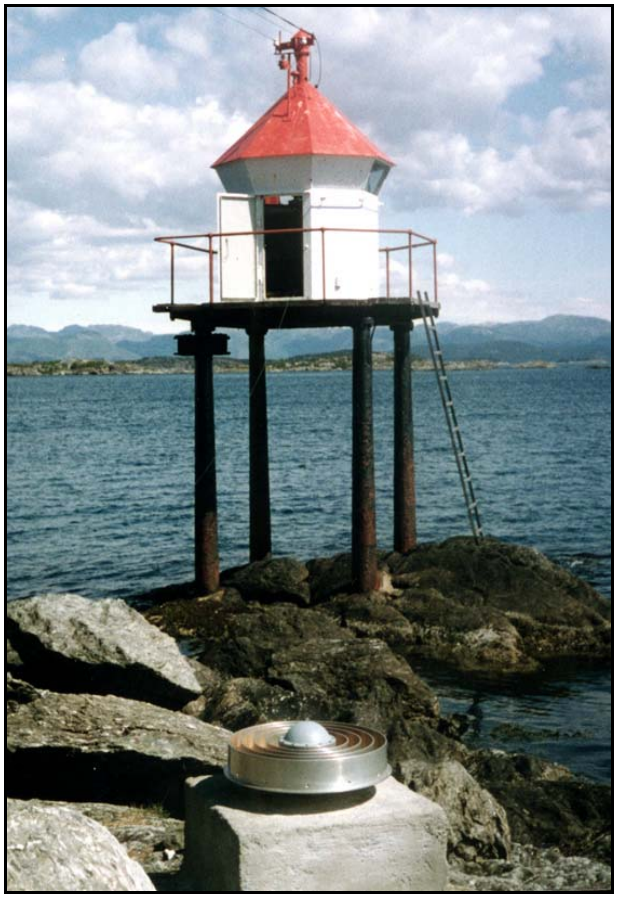


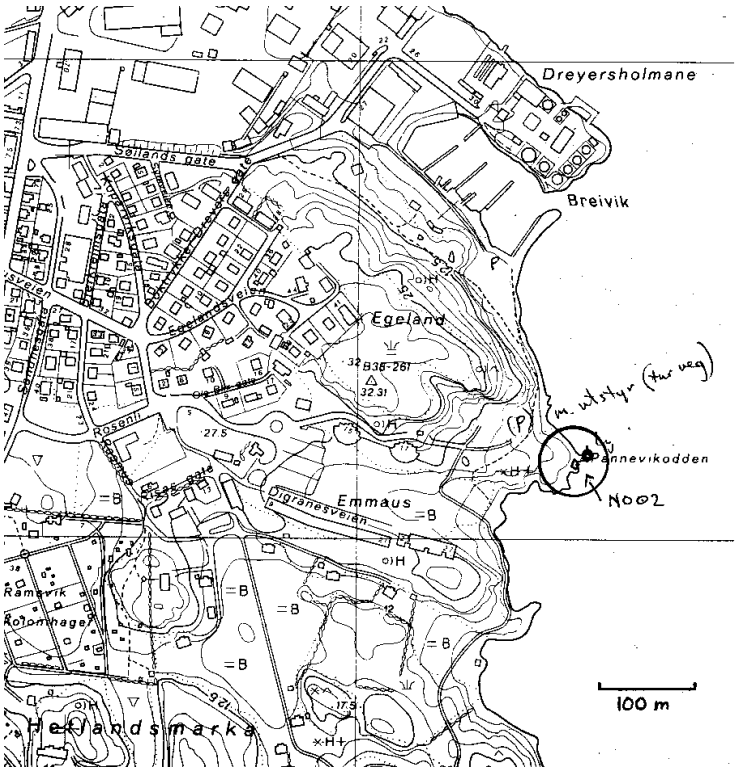
European Vertical GPS Reference Network (EUVN)

Station Stavanger

Site Identification of the GPS Monument	
4-Char. EUVN ID	NO02
DOMES Number	
Monument Inscription/National Site Number	(Statens Kartverk 1995)
Marker Type, Monumentation Type, Foundation	Concrete pillar with plate and screw bolt on bedrock, with forced centring
Mark dot of coordinates	Centre of bolt and top of plate (foot of screw)

Site Location Information	
City or Town	Stavanger
State or Province	
Country	Norway
Responsible Agency (Full Address)	Statens Kartverk Geodesidiv N-3500 Hoenefoss Norway
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3280060.098 m Y = 331383.587 m Z = 5441785.336 m
Height in UELN-95/98	1.879 m
Gravity in ISGN71	981 825.95 mgal



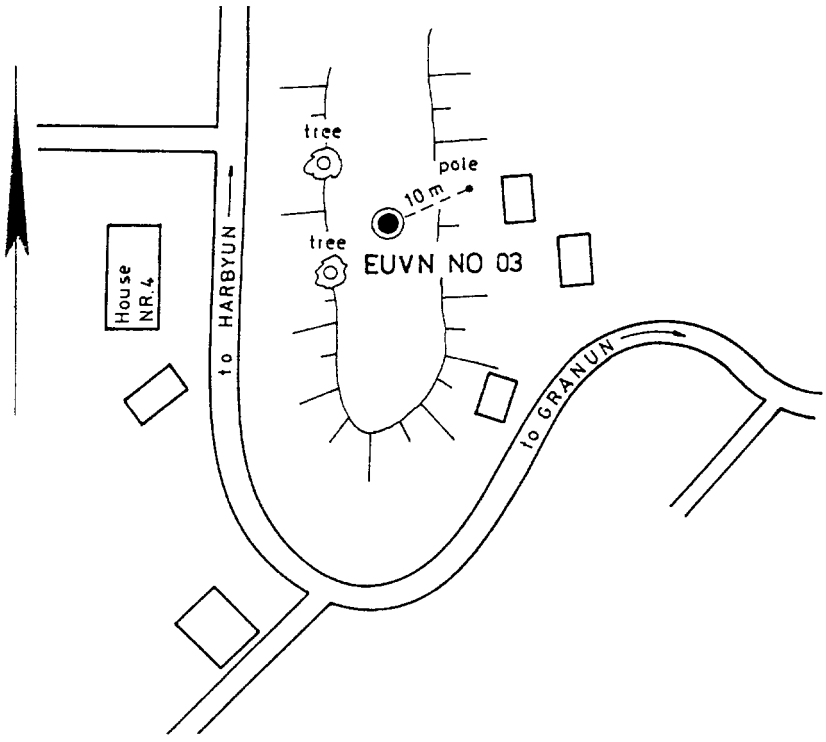


European Vertical GPS Reference Network (EUVN)

Station Halden

Site Identification of the GPS Monument	
4-Char. EUVN ID	NO03
DOMES Number	
Monument Inscription/National Site Number	(Statens Kartverk 1995)
Marker Type, Monumentation Type, Foundation	Concrete pillar with plate and screw bolt on bedrock, with forced centring
Mark dot of coordinates	Centre of bolt and top of plate (foot of screw)

Site Location Information	
City or Town	Halden
State or Province	
Country	Norway
Responsible Agency (Full Address)	Statens Kartverk Geodesidiv N-3500 Hoenefoss Norway
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3215956.891 m Y = 650881.951 m Z = 5451251.510 m
Height in UELN-95/98	104.895 m
Gravity in ISGN71	981 812.92 mgal

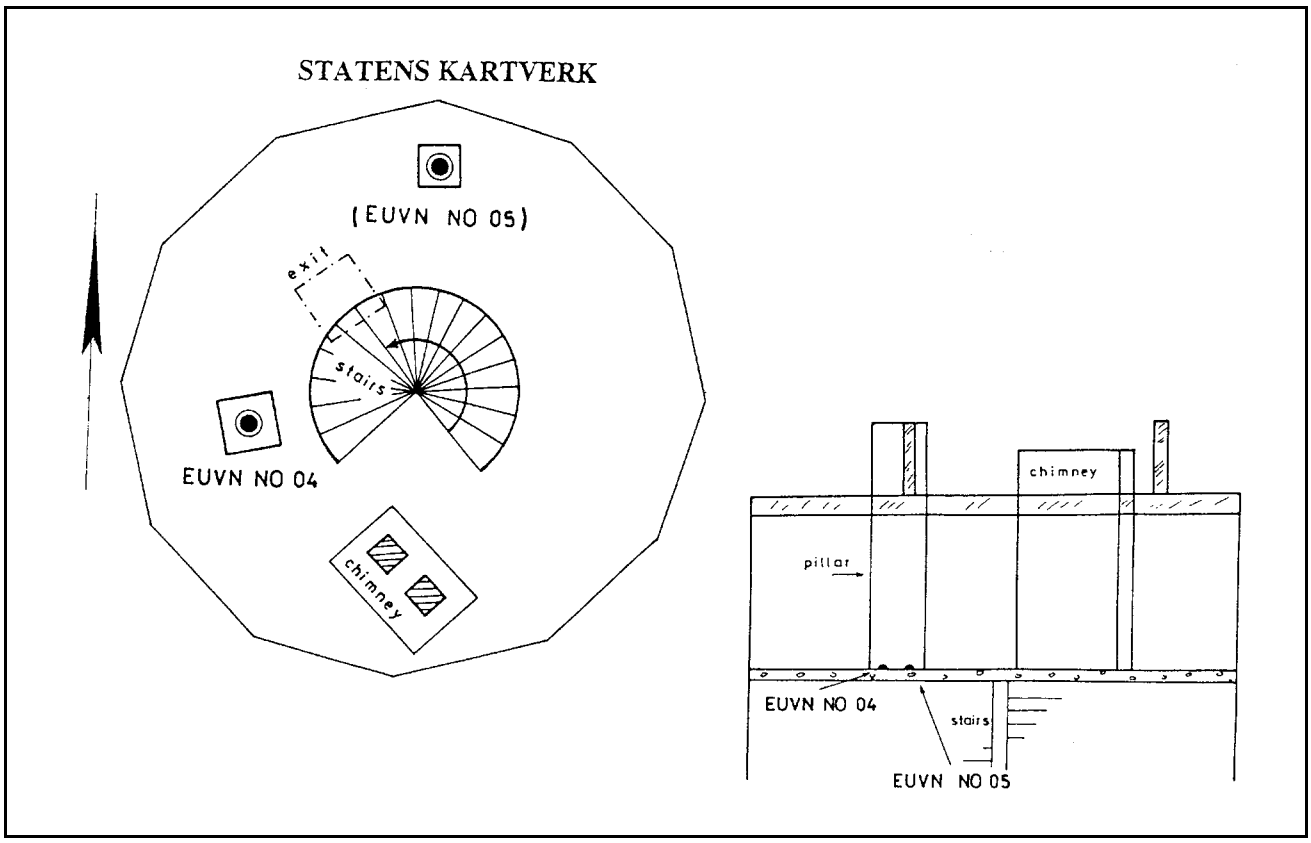


European Vertical GPS Reference Network (EUVN)

Station Hoenefoss

Site Identification of the GPS Monument	
4-Char. EUVN ID	NO04
DOMES Number	
Monument Inscription/National Site Number	BU08
Marker Type, Monumentation Type, Foundation	Concrete pillar established on the upper floor in the tower of the main building, the top of the pillar is 1 m above the roof, the marker is in the concrete floor in the upper floor of the tower
Mark dot of coordinates	Centre and top of the GPS marker

Site Location Information	
City or Town	Hoenefoss
State or Province	
Country	Norway
Responsible Agency (Full Address)	Statens Kartverk Geodesidiv N-3500 Hoenefoss Norway
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3132539.120 m Y = 566401.729 m Z = 5508609.825 m
Height in UELN-95/98	137.358 m
Gravity in ISGN71	981 893.9 mgal

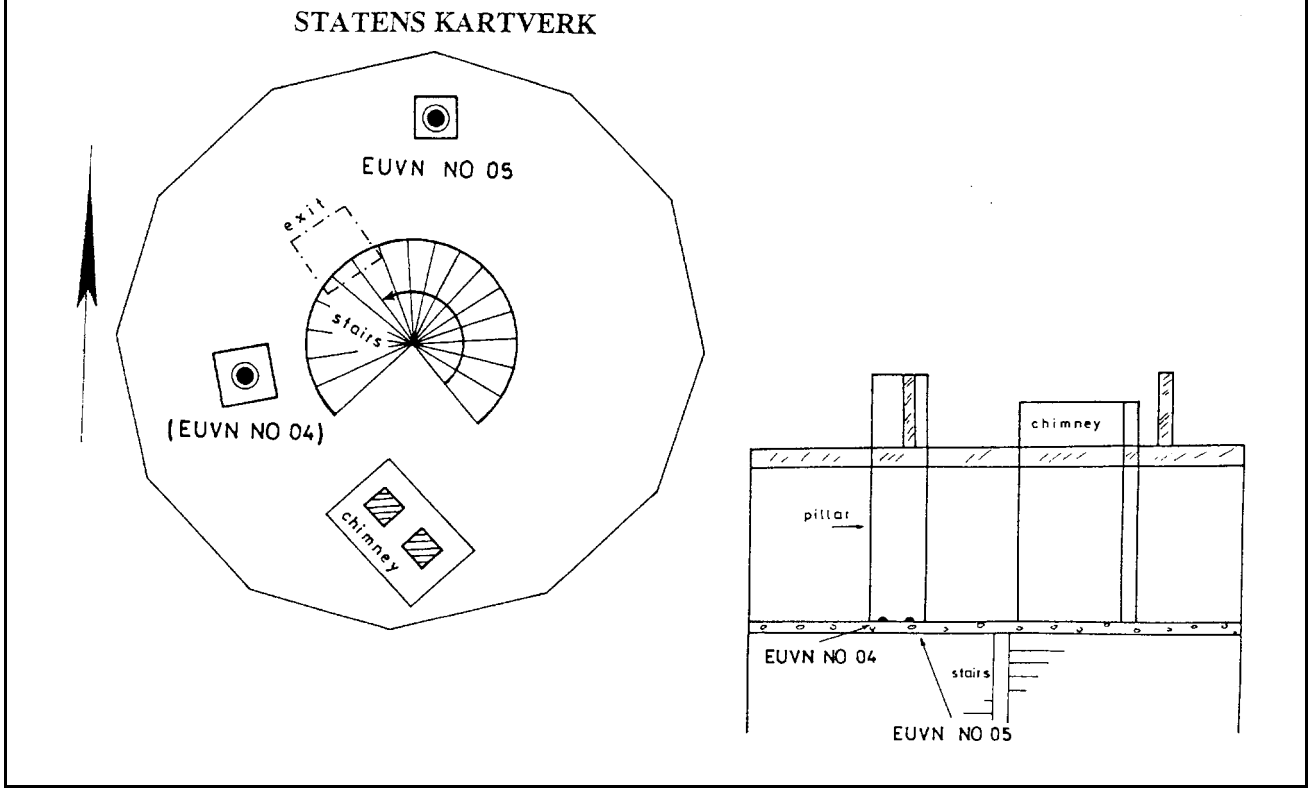


European Vertical GPS Reference Network (EUVN)

Station Hoenefoss A

Site Identification of the GPS Monument	
4-Char. EUVN ID	NO05
DOMES Number	
Monument Inscription/National Site Number	BU08
Marker Type, Monumentation Type, Foundation	Steel pillar established on the roof of the tower of the main building, the marker is in the concrete floor in the upper floor of the tower
Mark dot of coordinates	Centre and top of the GPS marker

Site Location Information	
City or Town	Hoenefoss
State or Province	
Country	Norway
Responsible Agency (Full Address)	Statens Kartverk Geodesidiv N-3500 Hoenefoss Norway
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3132535.772 m Y = 566401.485 m Z = 5508611.757 m
Height in UELN-95/98	
Gravity in ISGN71	

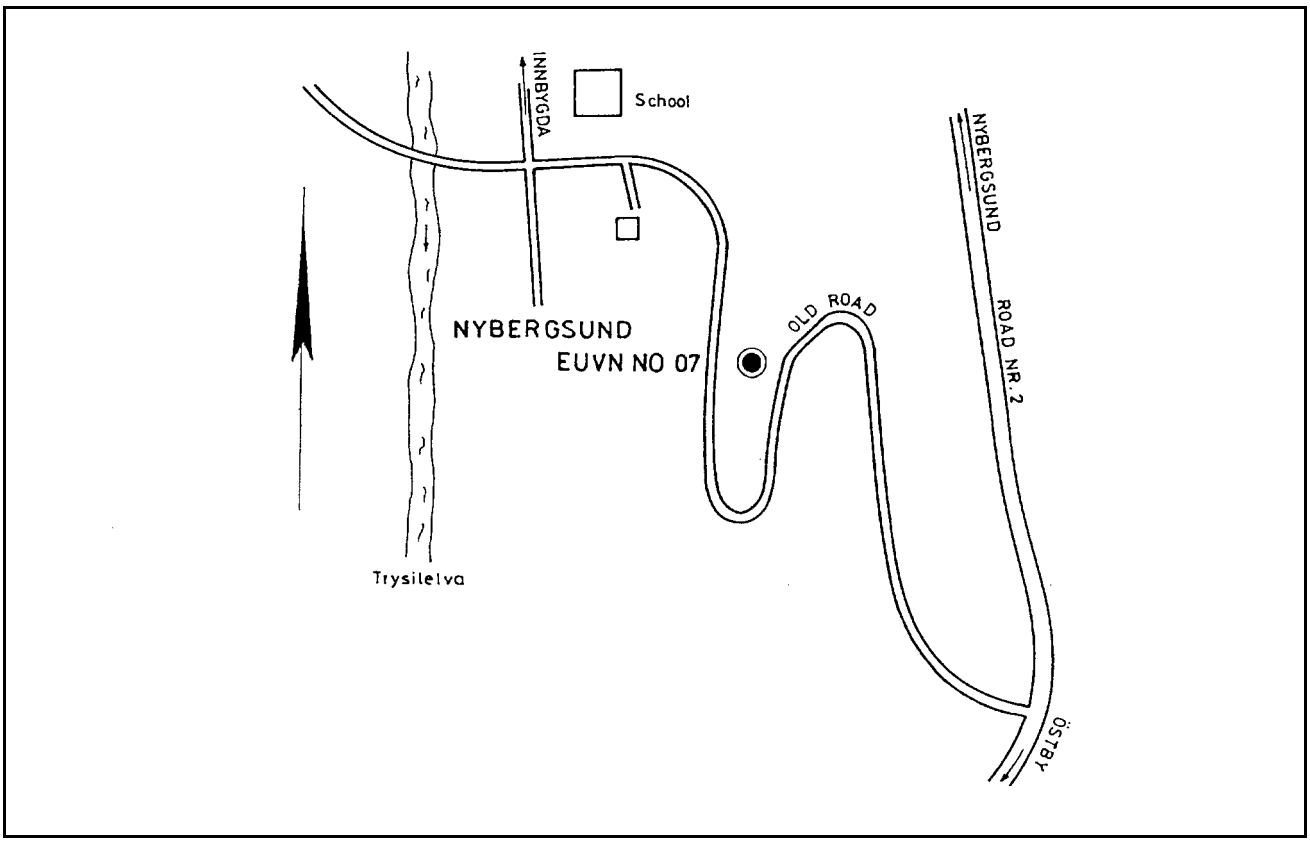


European Vertical GPS Reference Network (EUVN)

Station Nybergsund

Site Identification of the GPS Monument	
4-Char. EUVN ID	NO07
DOMES Number	
Monument Inscription/National Site Number	(Statens Kartverk 1995) HE63
Marker Type, Monumentation Type, Foundation	Concrete pillar with plate and screw bolt on bedrock, with forced centring
Mark dot of coordinates	Centre of bolt and top of plate (foot of screw)

Site Location Information	
City or Town	Nybergsund
State or Province	
Country	Norway
Responsible Agency (Full Address)	Statens Kartverk Geodesidiv N-3500 Hoenefoss Norway
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3003947.767 m Y = 656925.362 m Z = 5569744.172 m
Height in UELN-95/98	413.484 m
Gravity in ISGN71	981 865.48 mgal

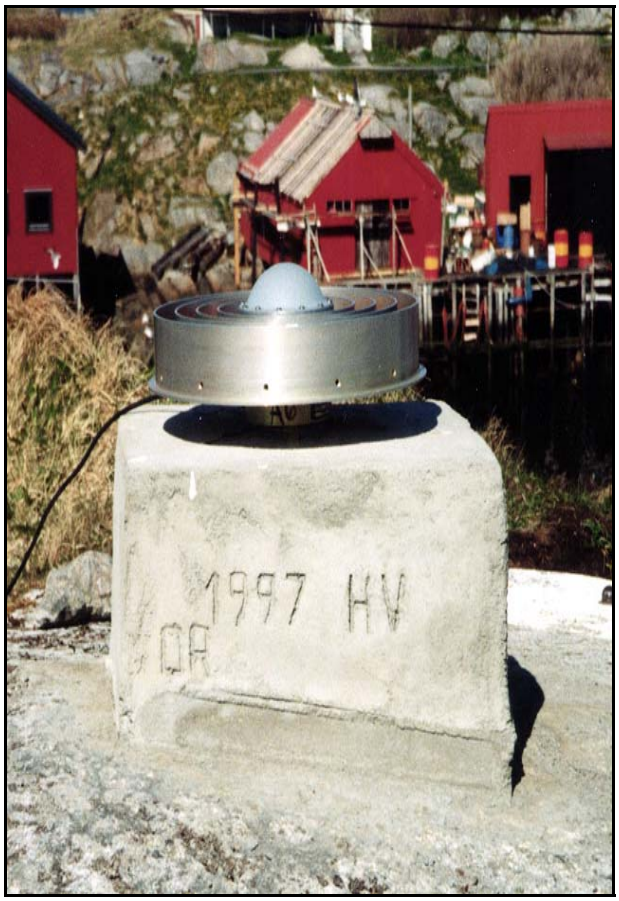


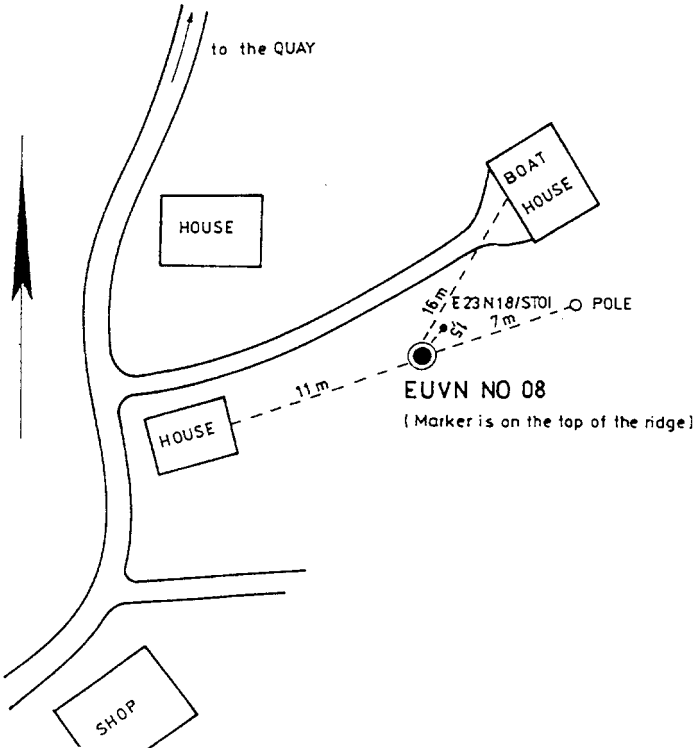
European Vertical GPS Reference Network (EUVN)

Station Mausundvaer

Site Identification of the GPS Monument	
4-Char. EUVN ID	NO08
DOMES Number	
Monument Inscription/National Site Number	(Statens Kartverk 1995) STOI
Marker Type, Monumentation Type, Foundation	Concrete pillar with plate and screw bolt on bedrock, with forced centring
Mark dot of coordinates	Centre of bolt and top of plate (foot of screw)

Site Location Information	
City or Town	Mausundvaer
State or Province	
Country	Norway
Responsible Agency (Full Address)	Statens Kartverk Geodesidiv N-3500 Hoenefoss Norway
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 2784637.377 m Y = 424345.457 m Z = 5703313.761 m
Height in UELN-95/98	9.204 m
Gravity in ISGN71	982 238.2 mgal





European Vertical GPS Reference Network (EUVN)

Station Ny Aalesund

Site Identification of the GPS Monument	
4-Char. EUVN ID	NYAL
DOMES Number	10317 M 001
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Steel grid mast, on concrete block in permafrost gravel, the base extends about 1 m below the surface
Mark dot of coordinates	Centre and top of marker

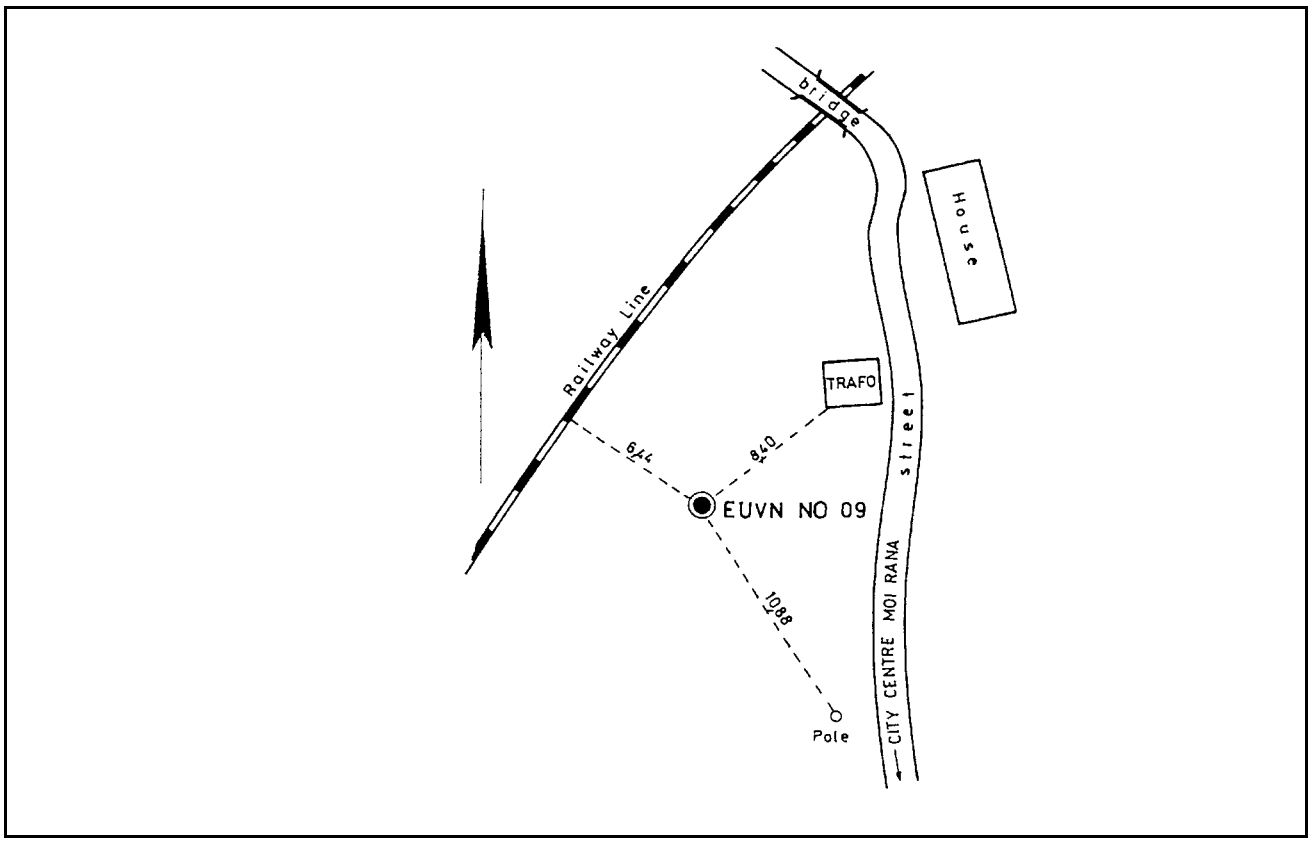
Site Location Information	
City or Town	Ny Aalesund
State or Province	
Country	Norway
Responsible Agency (Full Address)	Geodetic Institute Norwegian Mapping Authority N-3500 Hoenefoss Norway
Contact Agency Information	Norwegian Polar Research Institute N-9173 Ny Aalesund Norway
Coordinates in ETRS89, Epoch 97.4	X = 1202430.821 m Y = 252626.617 m Z = 6237767.444 m
Height in UELN-95/98	
Gravity in ISGN71	

European Vertical GPS Reference Network (EUVN)

Station Rana

Site Identification of the GPS Monument	
4-Char. EUVN ID	NO09
DOMES Number	
Monument Inscription/National Site Number	(Statens Kartverk 1995)
Marker Type, Monumentation Type, Foundation	Concrete pillar with plate and screw bolt on bedrock, with forced centring
Mark dot of coordinates	Centre of bolt and top of plate (foot of screw)

Site Location Information	
City or Town	Mo i Rana
State or Province	
Country	Norway
Responsible Agency (Full Address)	Statens Kartverk Geodesidiv N-3500 Hoenefoss Norway
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 2491540.701 m Y = 627261.000 m Z = 5818227.555 m
Height in UELN-95/98	7.039 m
Gravity in ISGN71	982 308.89 mgal

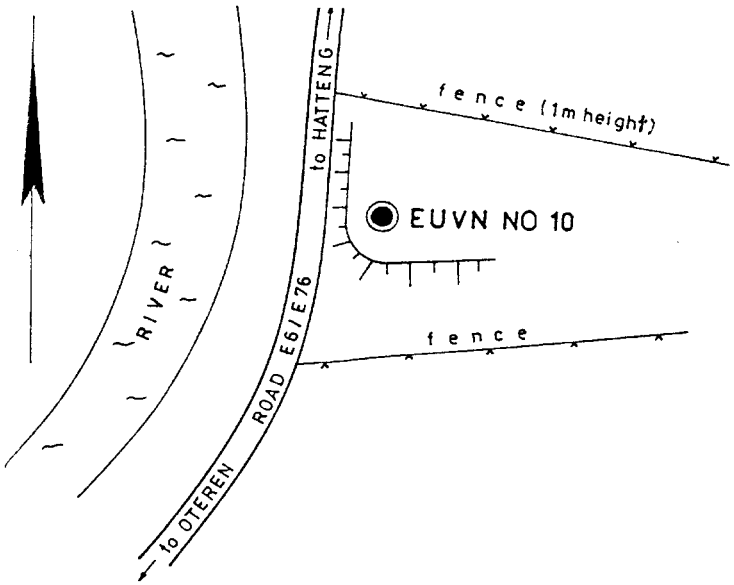


European Vertical GPS Reference Network (EUVN)

Station Storfjord

Site Identification of the GPS Monument	
4-Char. EUVN ID	NO10
DOMES Number	
Monument Inscription/National Site Number	(Statens Kartverk 1995) TR04
Marker Type, Monumentation Type, Foundation	Concrete pillar with plate and screw bolt on bedrock, with forced centring
Mark dot of coordinates	Centre of bolt and top of plate (foot of screw)

Site Location Information	
City or Town	Storfjord
State or Province	
Country	Norway
Responsible Agency (Full Address)	Statens Kartverk Geodesidiv N-3500 Hoenefoss Norway
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 2129342.692 m Y = 771959.687 m Z = 5942490.009 m
Height in UELN-95/98	14.437 m
Gravity in ISGN71	982 497 mgal

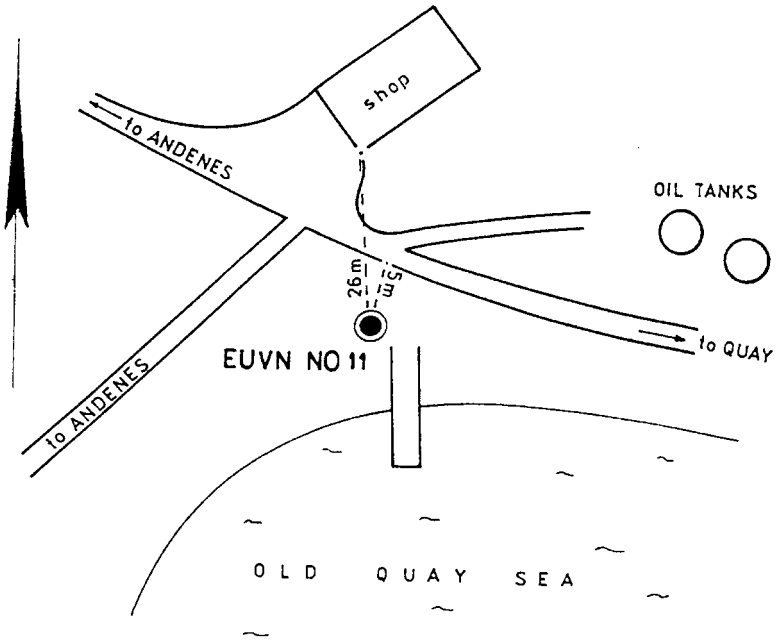


European Vertical GPS Reference Network (EUVN)

Station Andenes

Site Identification of the GPS Monument	
4-Char. EUVN ID	NO11
DOMES Number	
Monument Inscription/National Site Number	(Statens Kartverk 1995) NP2
Marker Type, Monumentation Type, Foundation	Concrete pillar with plate and screw bolt on bedrock, with forced centring
Mark dot of coordinates	Centre of bolt and top of plate (foot of screw)

Site Location Information	
City or Town	Andenes
State or Province	
Country	Norway
Responsible Agency (Full Address)	Statens Kartverk Geodesidiv N-3500 Hoenefoss Norway
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 2169937.929 m Y = 627585.653 m Z = 5944784.460 m
Height in UELN-95/98	3.755 m
Gravity in ISGN71	982 621.59 mgal

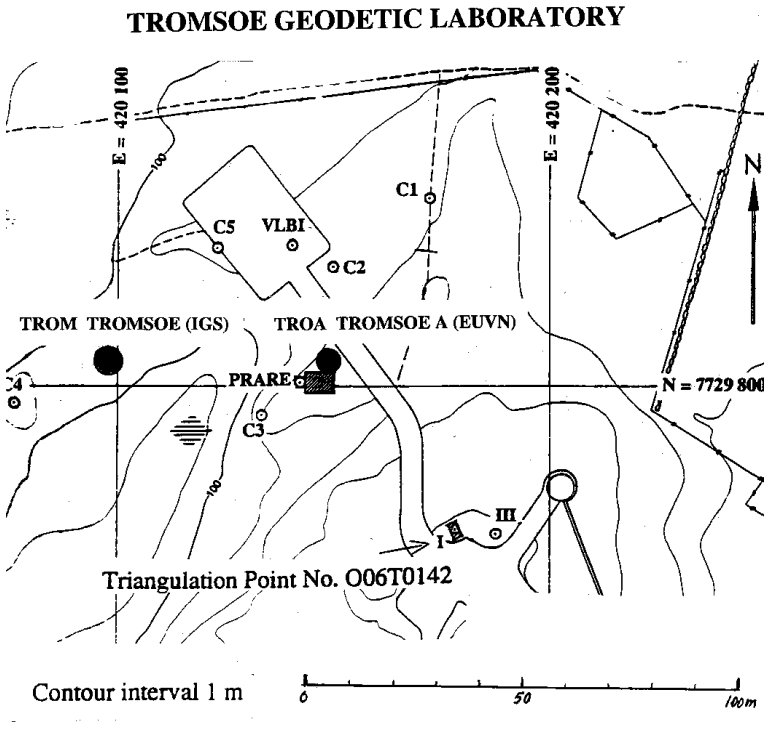


European Vertical GPS Reference Network (EUVN)

Station Tromsoe A

Site Identification of the GPS Monument	
4-Char. EUVN ID	TROA
DOMES Number	
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Steel grid mast, established on bedrock
Mark dot of coordinates	

Site Location Information	
City or Town	Tromsoe
State or Province	
Country	Norway
Responsible Agency (Full Address)	Statens Kartverk Geodesidiv N-3500 Hoenefoss Norway
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 2102928.805 m Y = 721619.319 m Z = 5958196.103 m
Height in UELN-95/98	
Gravity in ISGN71	

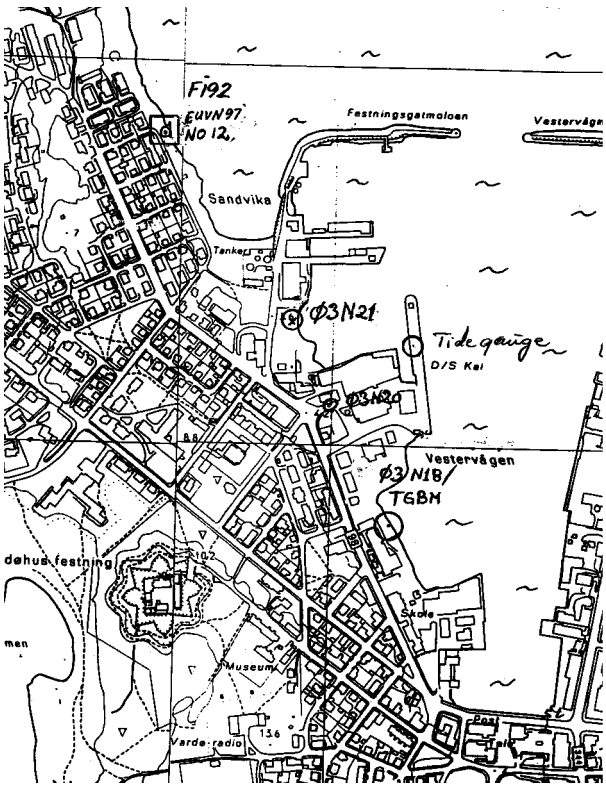


European Vertical GPS Reference Network (EUVN)

Station Vardoe

Site Identification of the GPS Monument	
4-Char. EUVN ID	NO12
DOMES Number	
Monument Inscription/National Site Number	(Statens Kartverk 1995) FI92
Marker Type, Monumentation Type, Foundation	Concrete pillar with screw bolt (Wild) and brass marker on bedrock, with forced centring
Mark dot of coordinates	Centre of screw bolt and top of bench mark (foot of Wild-screw)

Site Location Information	
City or Town	Vardoe
State or Province	
Country	Norway
Responsible Agency (Full Address)	Statens Kartverk Geodesidiv N-3500 Hoenefoss Norway
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 1839607.095 m Y = 1109535.896 m Z = 5985335.449 m
Height in UELN-95/98	2.968 m
Gravity in ISGN71	982 635.62 mgal

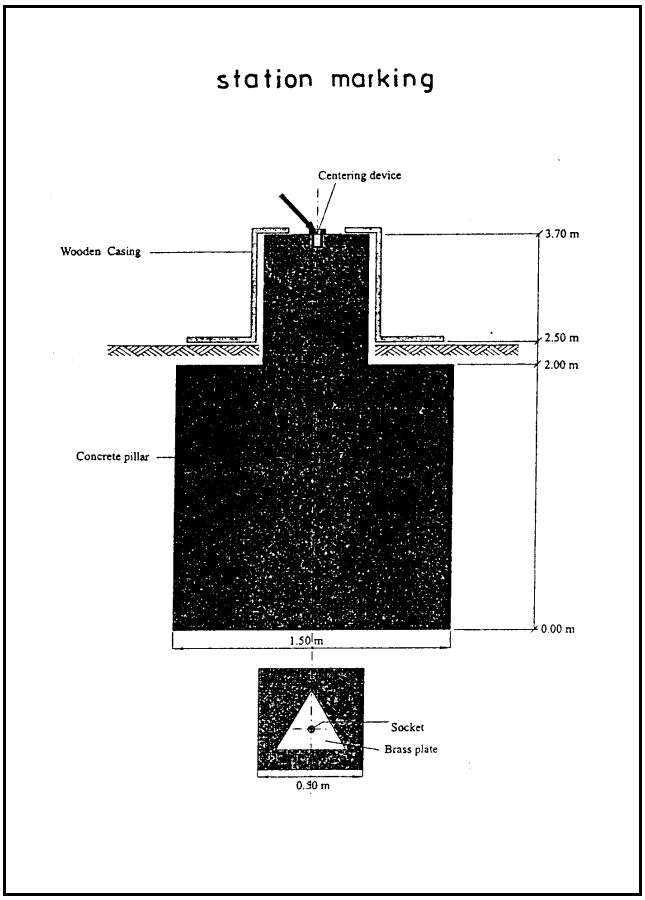


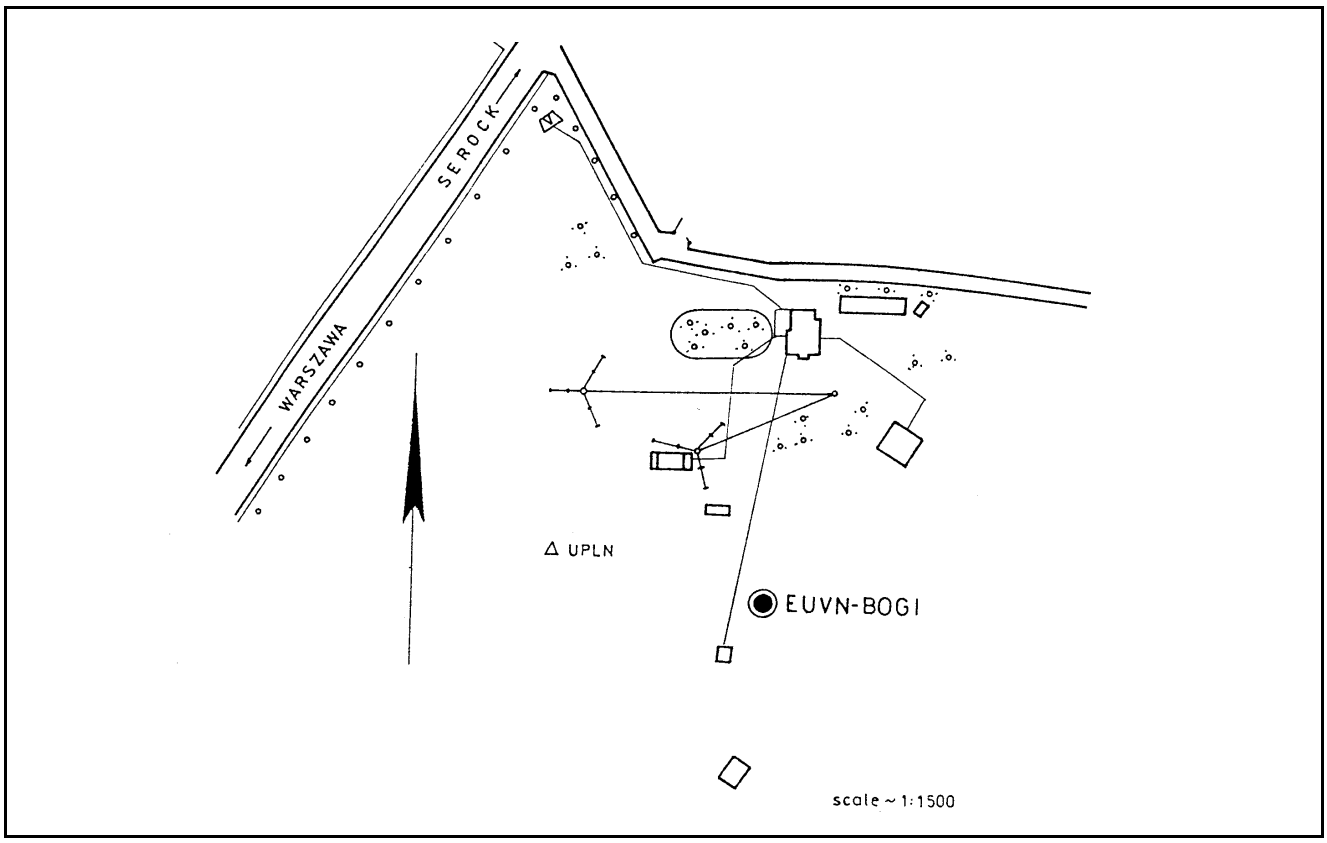
European Vertical GPS Reference Network (EUVN)

Station Borowa Gora I

Site Identification of the GPS Monument	
4-Char. EUVN ID	BOGI
DOMES Number	
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Concrete pillar covered with wooden casing, on the top of the pillar brass plate with centring device
Mark dot of coordinates	Centre of the centring device and top of the brass plate

Site Location Information	
City or Town	Borowa Gora
State or Province	
Country	Poland
Responsible Agency (Full Address)	Institute of Geodesy and Cartography ul. Jasna 2/4 PL-00950 Warsaw Poland
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3633815.657 m Y = 1397453.917 m Z = 5035280.779 m
Height in UELN-95/98	108.760 m
Gravity in IGSN71	981 249.6 mgal





European Vertical GPS Reference Network (EUVN)

Station Borowiec

Site Identification of the GPS Monument	
4-Char. EUVN ID	BOR1
DOMES Number	12205 M 002
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Stable geodynamical pillar on the roof of the main building
Mark dot of coordinates	

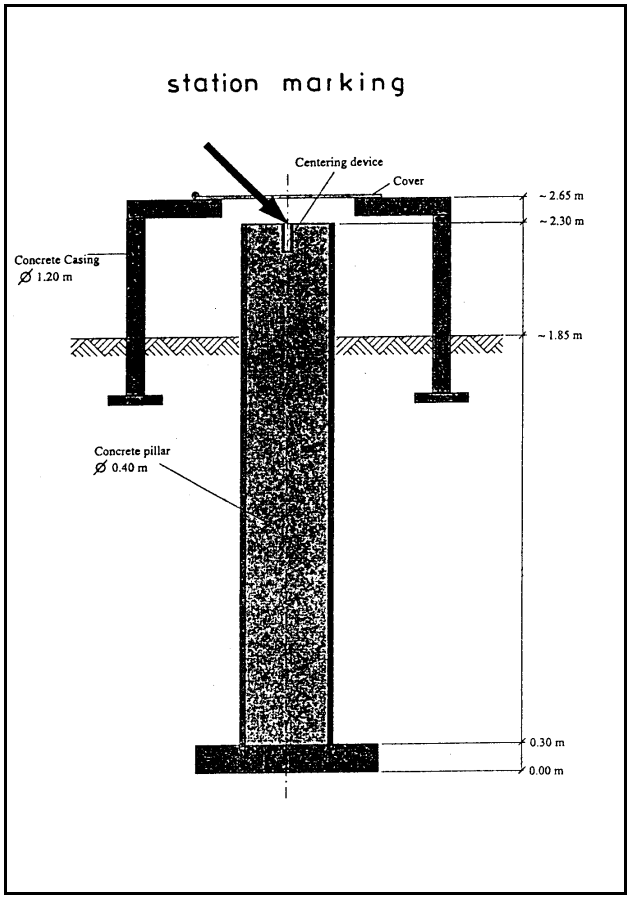
Site Location Information	
City or Town	Borowiec
State or Province	
Country	Poland
Responsible Agency (Full Address)	Astrogeodynamical Observatory PL-62-035 Kornik, Borowiec Poland
Contact Agency Information	Department of Planetary Geodesy ul. Bartycka 18A PL-00-716 Warsaw Poland
Coordinates in ETRS89, Epoch 97.4	X = 3738358.778 m Y = 1148173.499 m Z = 5021815.584 m
Height in UELN-95/98	89.027m
Gravity in IGSN71	

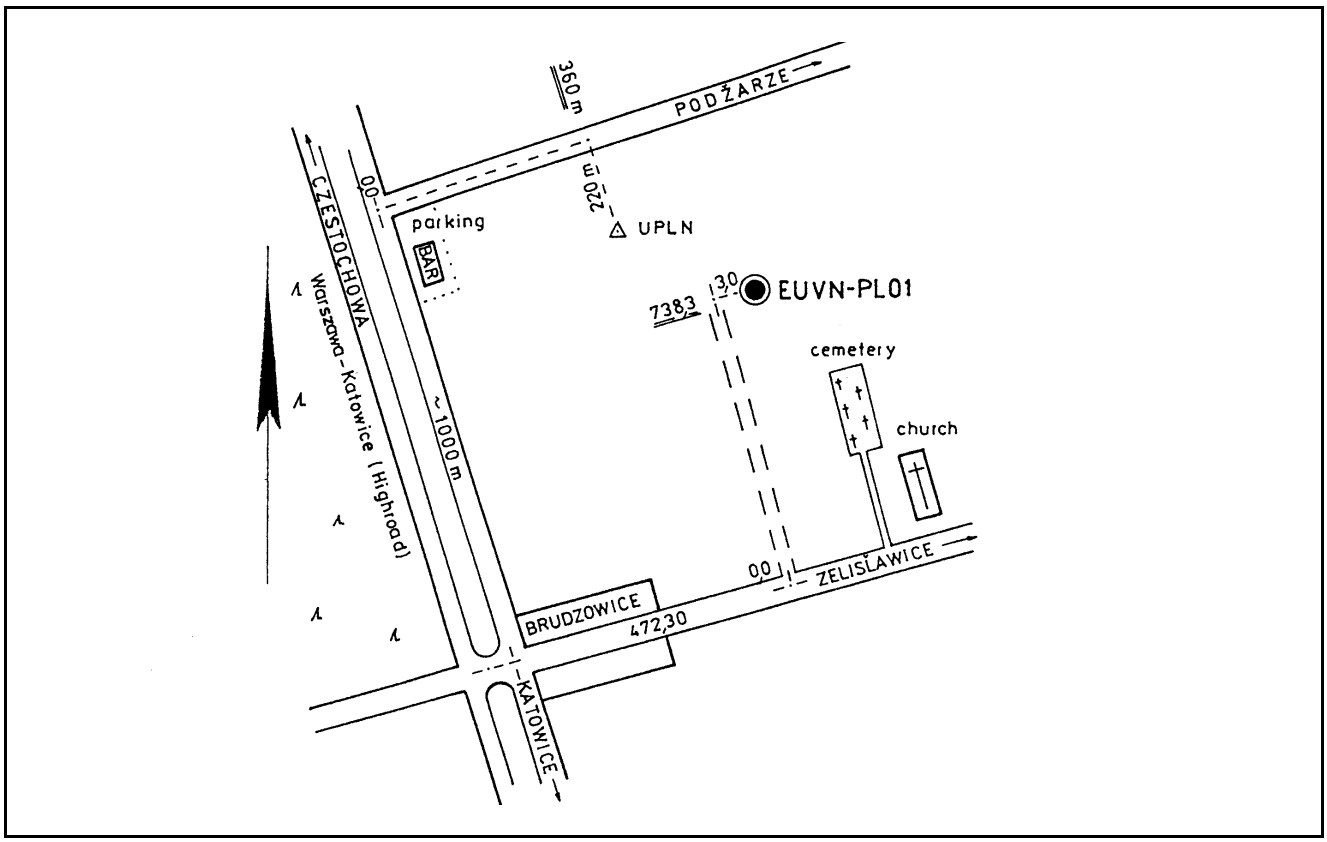
European Vertical GPS Reference Network (EUVN)

Station Brudzowice

Site Identification of the GPS Monument	
4-Char. EUVN ID	PL01
DOMES Number	
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Concrete pillar with centring device and concrete casing with cover
Mark dot of coordinates	Centre and top of the centring device

Site Location Information	
City or Town	Siewierz
State or Province	
Country	Poland
Responsible Agency (Full Address)	Head Office of Geodesy and Cartography ul. Wspolna 2 PL-00-926 Warsaw Poland
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3838174.722 m Y = 1336729.734 m Z = 4899501.163 m
Height in UELN-95/98	327.338 m
Gravity in IGSN71	981 060.9 mgal



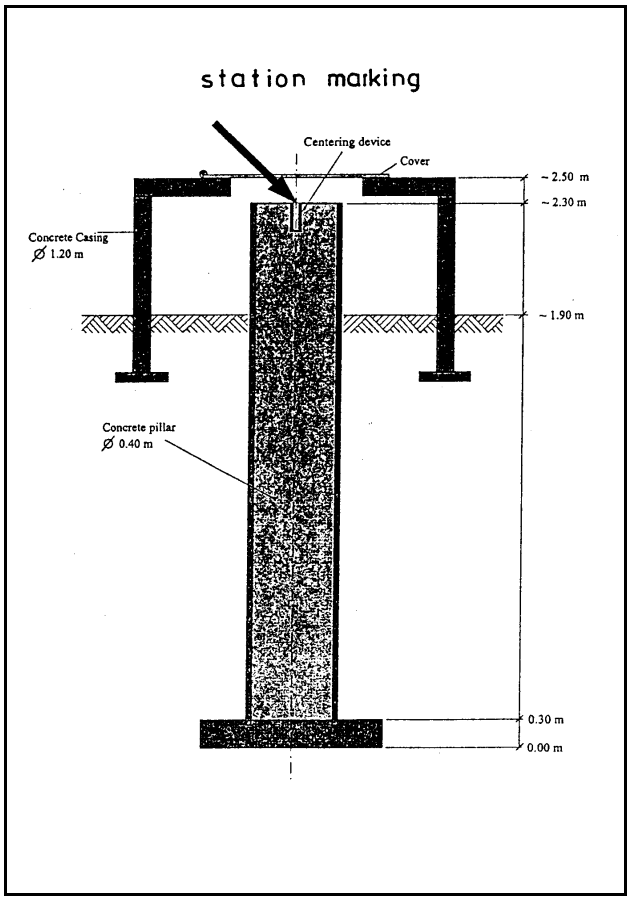


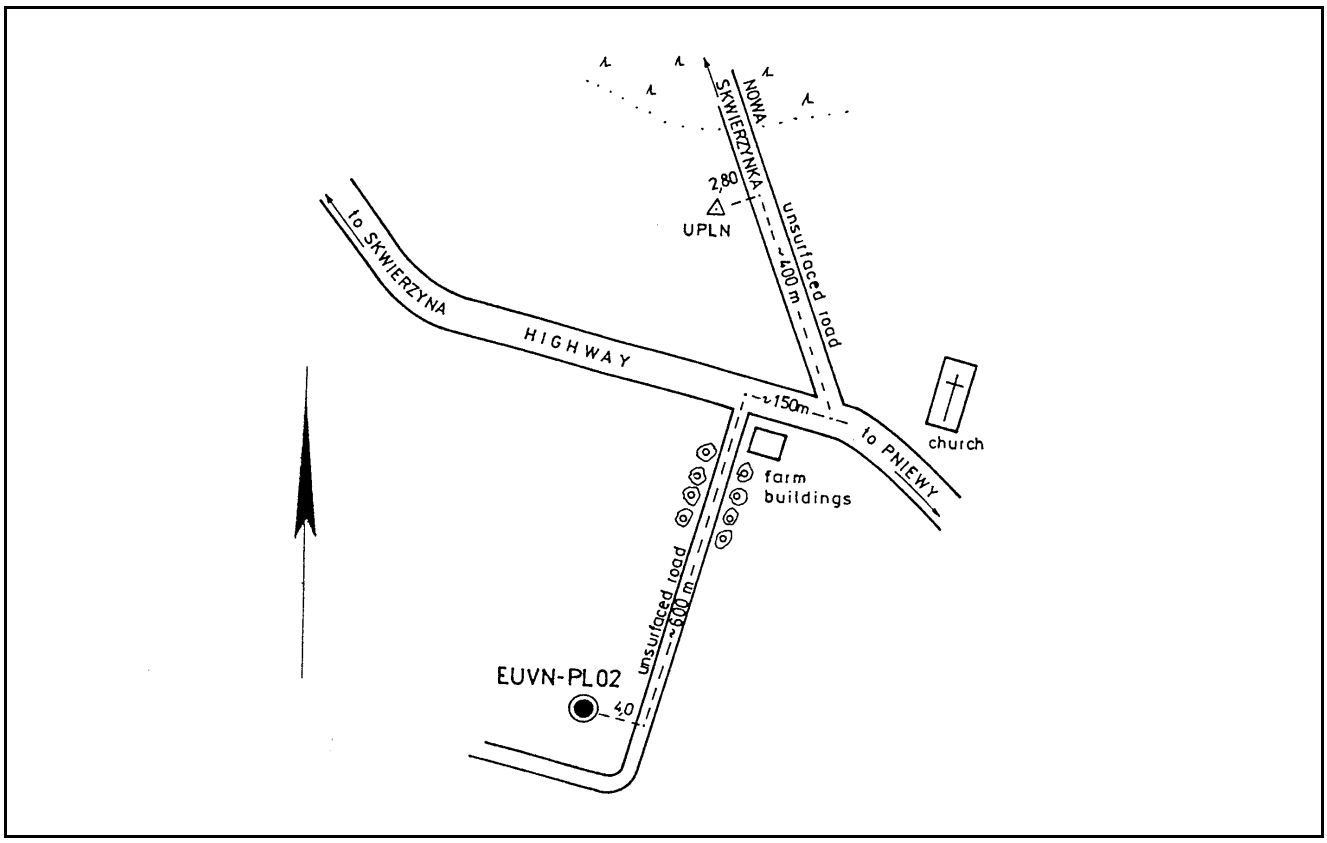
European Vertical GPS Reference Network (EUVN)

Station Chelmsko

Site Identification of the GPS Monument	
4-Char. EUVN ID	PL02
DOMES Number	
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Concrete pillar with centring device and concrete casing with cover
Mark dot of coordinates	Centre and top of the centring device

Site Location Information	
City or Town	Skwierzyna
State or Province	
Country	Poland
Responsible Agency (Full Address)	Head Office of Geodesy and Cartography ul. Wspolna 2 PL-00-926 Warsaw Poland
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3741888.547 m Y = 1041415.297 m Z = 5042252.034 m
Height in UELN-95/98	65.098 m
Gravity in IGSN71	981 272.2 mgal



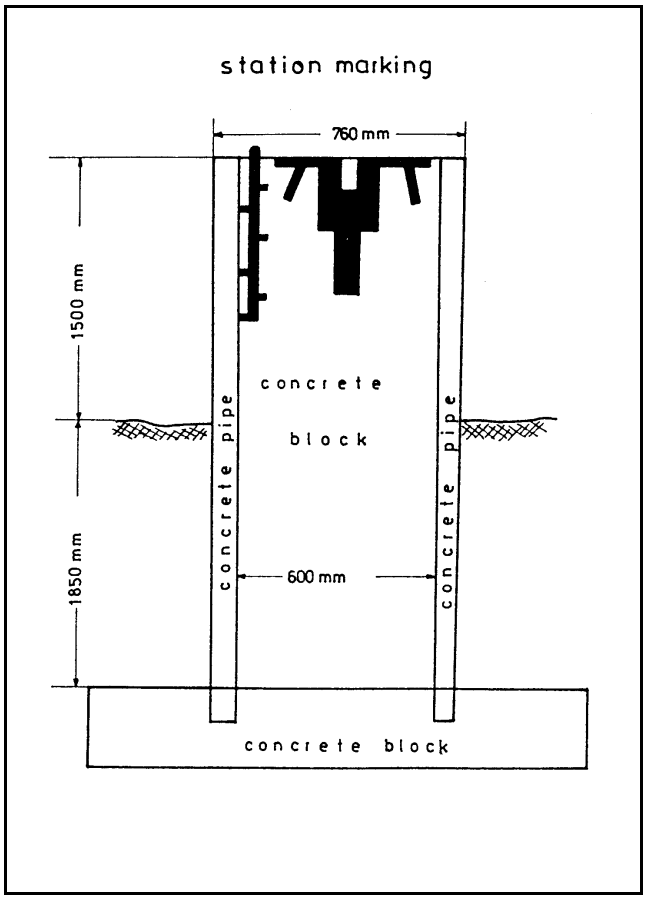


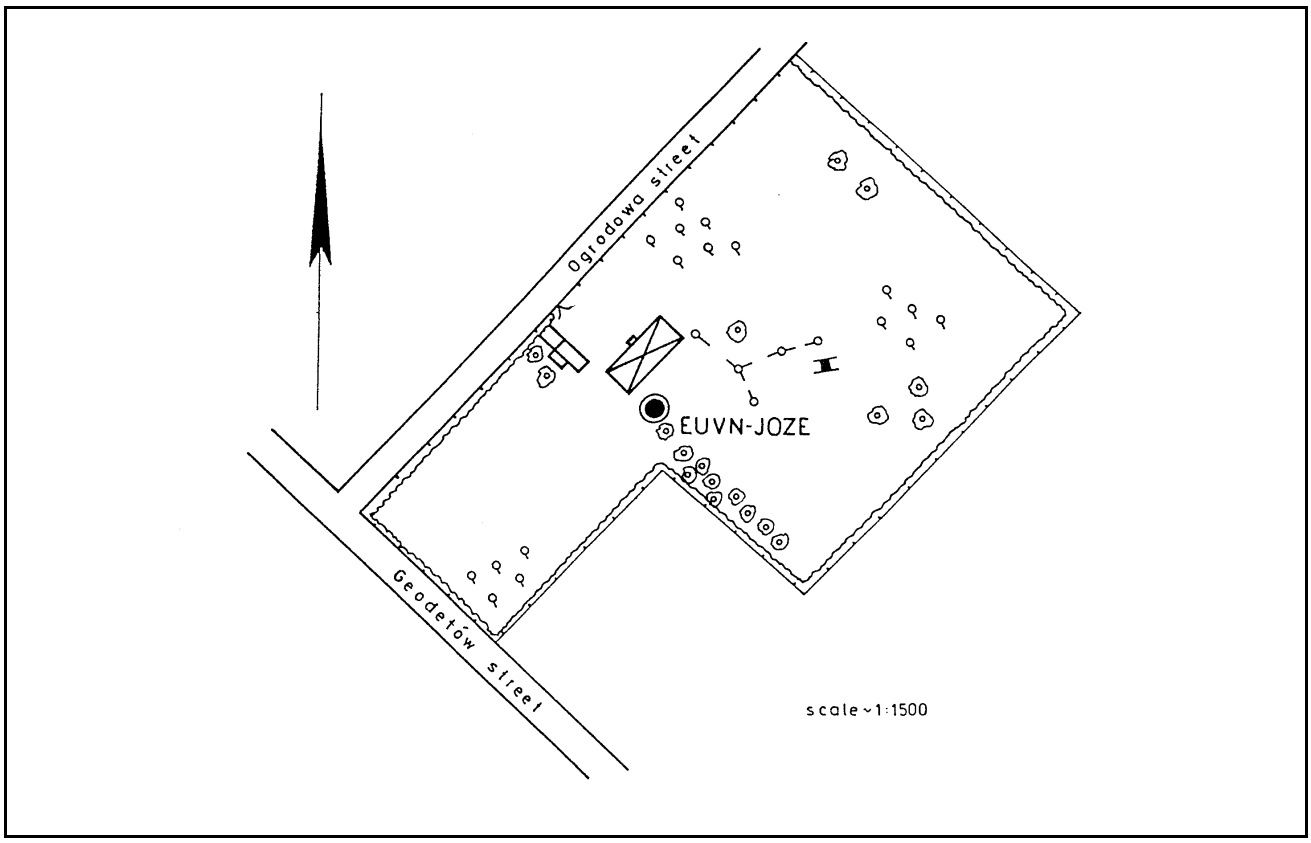
European Vertical GPS Reference Network (EUVN)

Station Jozefoslaw

Site Identification of the GPS Monument	
4-Char. EUVN ID	JOZE
DOMES Number	12204 M 001
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	
Mark dot of coordinates	

Site Location Information	
City or Town	Jozefoslaw
State or Province	
Country	Poland
Responsible Agency (Full Address)	Institute of Geodesy and Geodetical Astronomy Warsaw University of Technology Politechniki Sq. PL-00-661 Warsaw 1 Poland
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3664940.506 m Y = 1409153.661 m Z = 5009571.207 m
Height in UELN-95/98	110.244 m
Gravity in ISGN71	





European Vertical GPS Reference Network (EUVN)

Station Lamkowko

Site Identification of the GPS Monument	
4-Char. EUVN ID	LAMA
DOMES Number	12209 M 001
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	
Mark dot of coordinates	

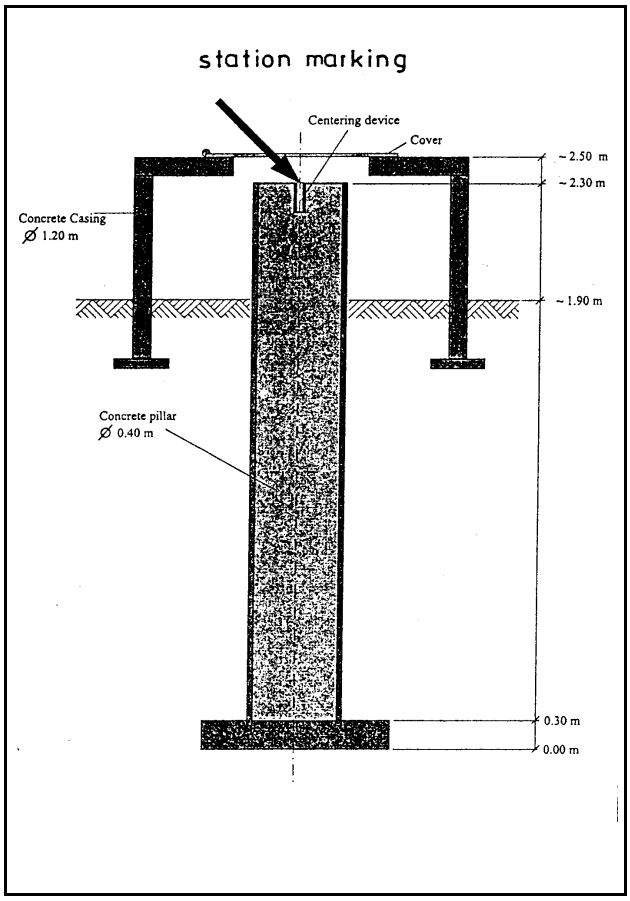
Site Location Information	
City or Town	Olsztyn
State or Province	
Country	Poland
Responsible Agency (Full Address)	
Contact Agency Information	Olsztyn University of Agriculture and Technology (OUAT) Oczapowski Street 1 PL-10957 Olsztyn Poland
Coordinates in ETRS89, Epoch 97.4	X = 3524523.261 m Y = 1329693.439 m Z = 5129846.176 m
Height in UELN-95/98	
Gravity in ISGN71	

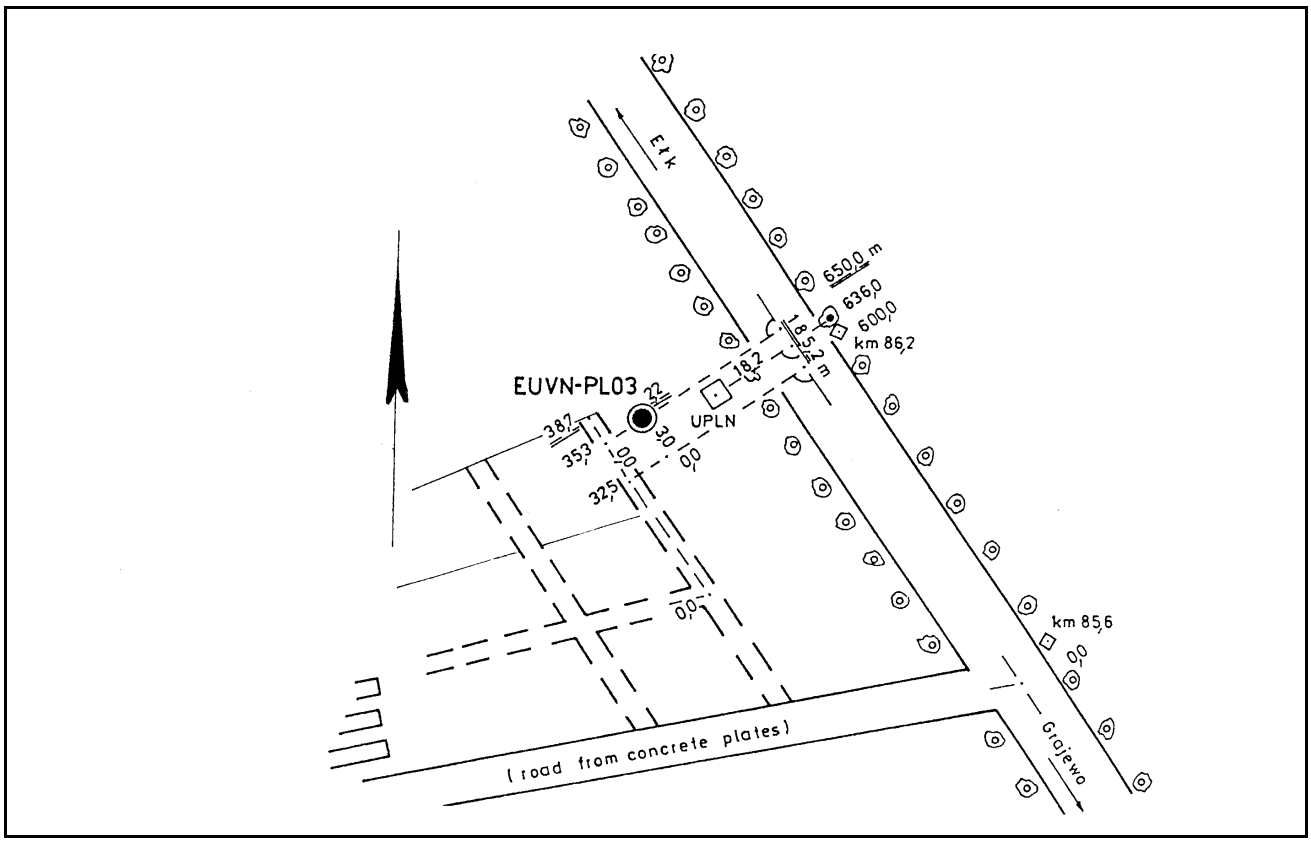
European Vertical GPS Reference Network (EUVN)

Station Prostki

Site Identification of the GPS Monument	
4-Char. EUVN ID	PL03
DOMES Number	
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Concrete pillar with centring device and concrete casing with cover
Mark dot of coordinates	Centre and top of the centring device

Site Location Information	
City or Town	Prostki
State or Province	
Country	Poland
Responsible Agency (Full Address)	Head Office of Geodesy and Cartography ul. Wspolna 2 PL-00-926 Warsaw Poland
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3496922.936 m Y = 1438440.806 m Z = 5119413.512 m
Height in UELN-95/98	126.367 m
Gravity in IGSN71	981 394.3 mgal



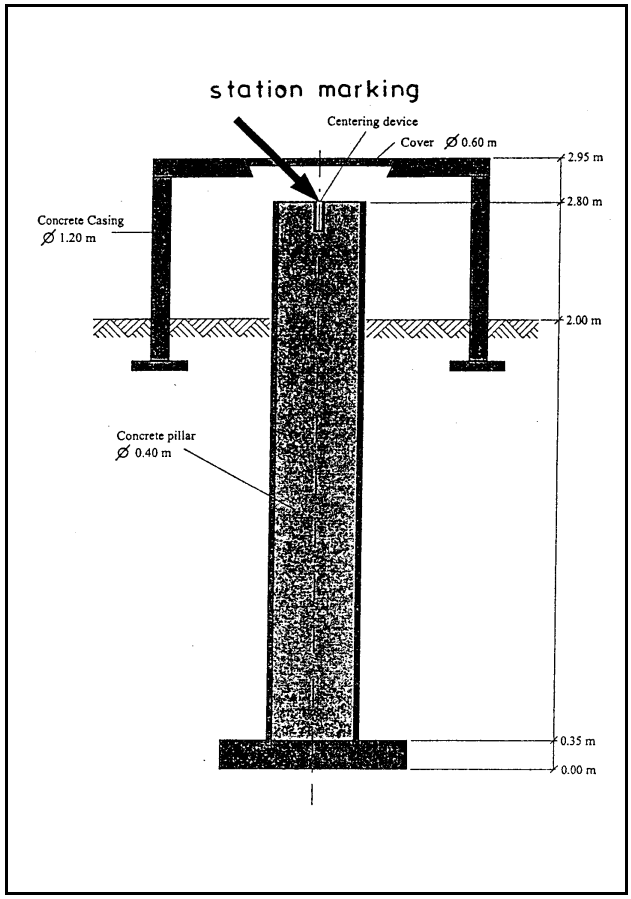


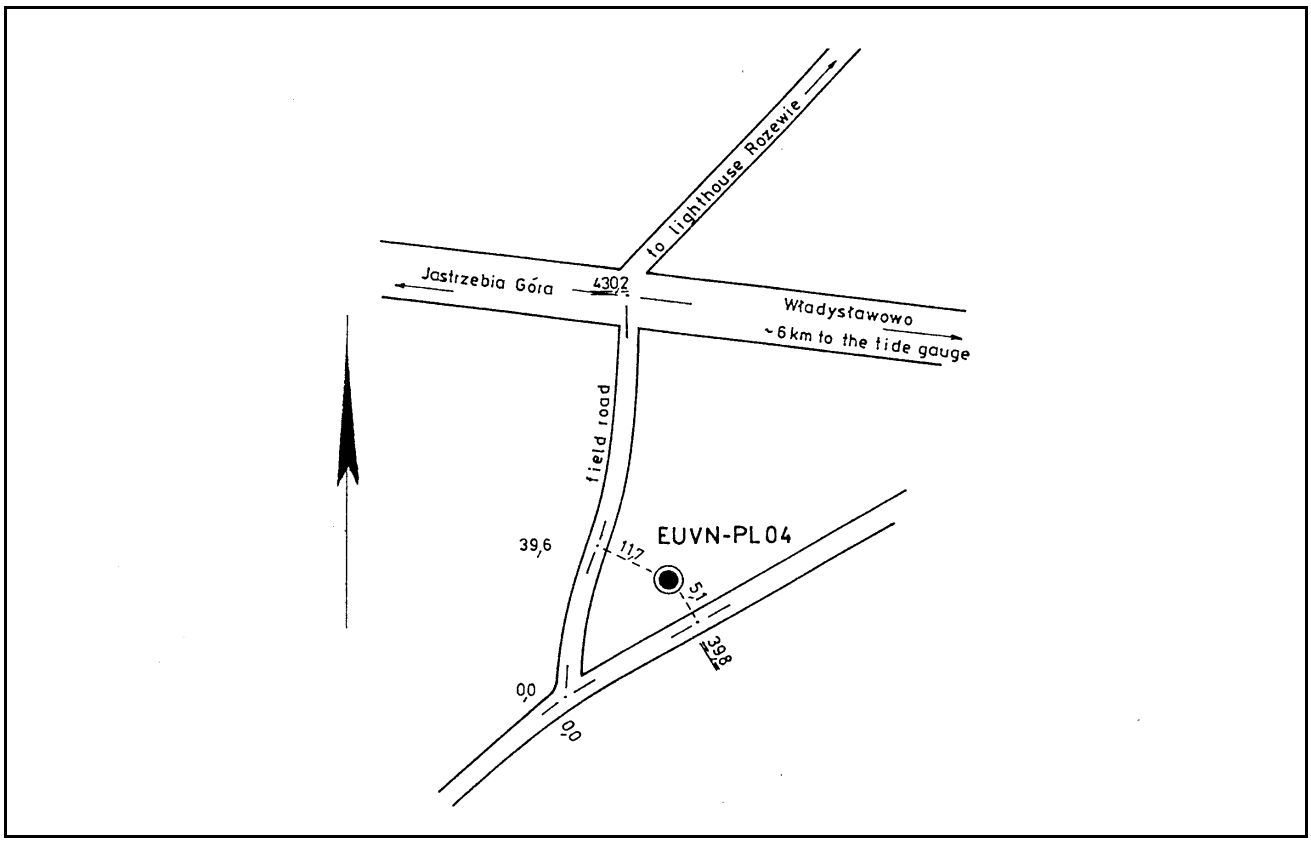
European Vertical GPS Reference Network (EUVN)

Station Rozewie

Site Identification of the GPS Monument	
4-Char. EUVN ID	PL04
DOMES Number	
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Concrete pillar with centring device covered by concrete casing with cover
Mark dot of coordinates	Centre and top of the centring device

Site Location Information	
City or Town	Jastrzebia Gora
State or Province	
Country	Poland
Responsible Agency (Full Address)	Head Office of Geodesy and Cartography ul. Wspolna 2 PL-00-926 Warsaw Poland
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3495579.623 m Y = 1157845.520 m Z = 5190403.604 m
Height in UELN-95/98	41.668 m
Gravity in ISGN71	981 467.5 mgal



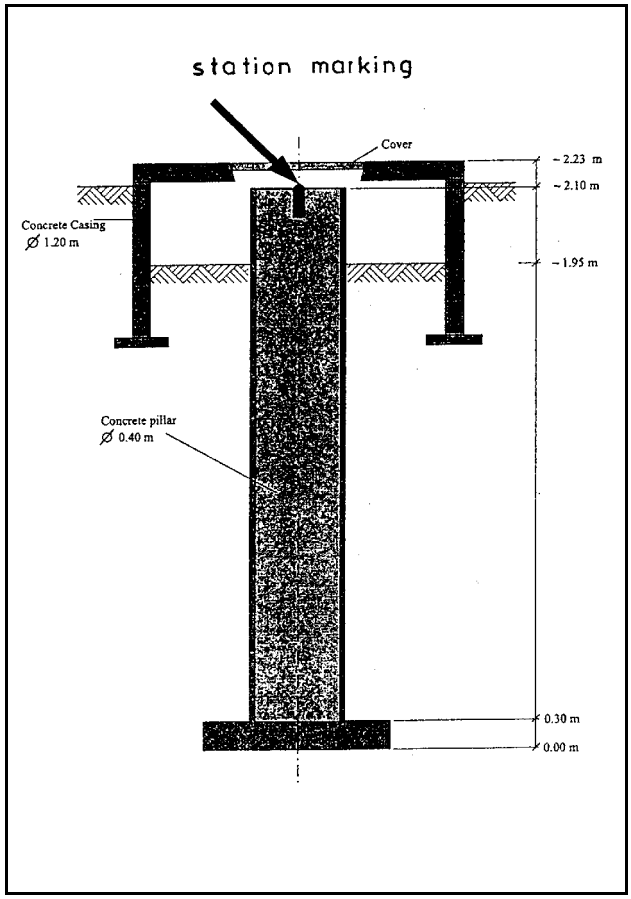


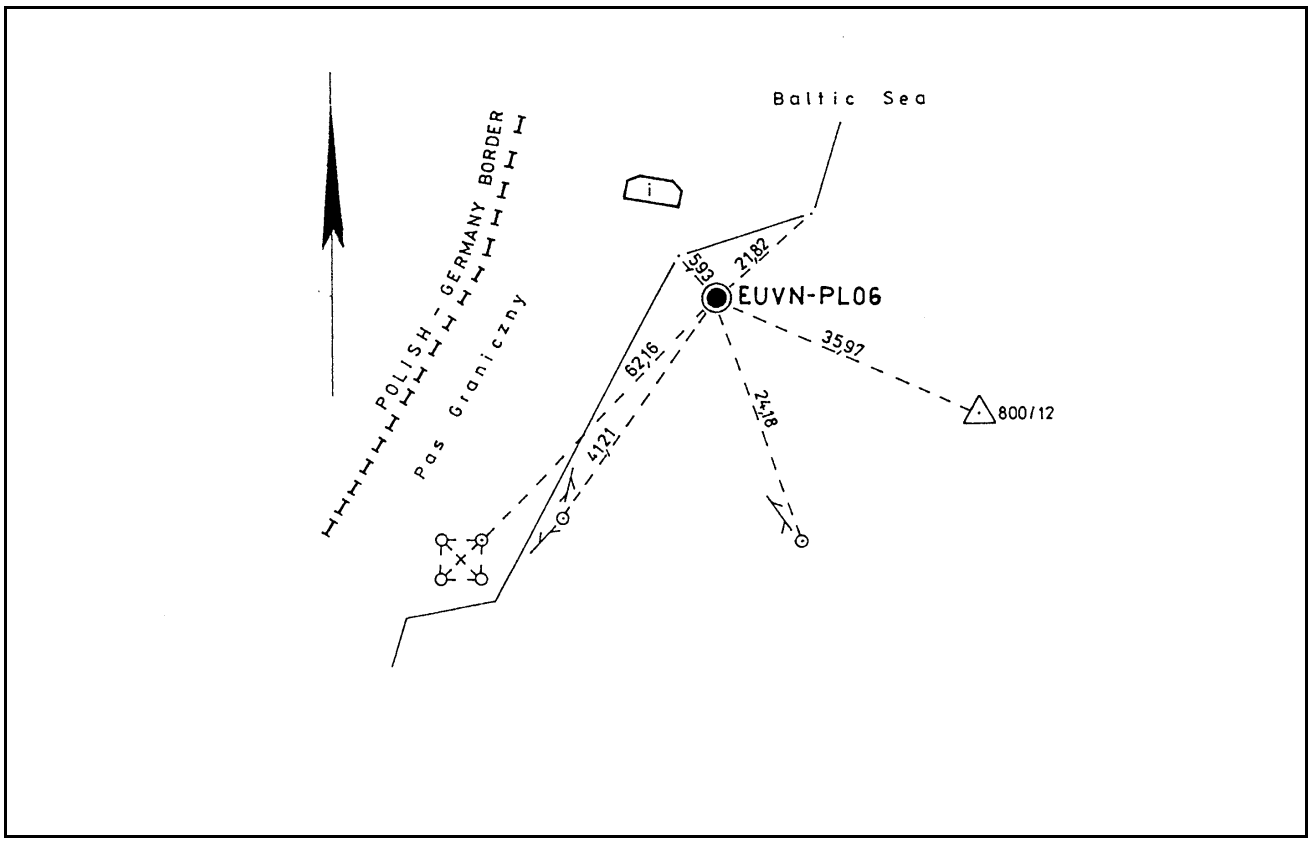
European Vertical GPS Reference Network (EUVN)

Station Swinoujscie

Site Identification of the GPS Monument	
4-Char. EUVN ID	PL06
DOMES Number	
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Concrete pillar with bolt and covered by concrete casing with cover
Mark dot of coordinates	Centre and top of the bolt

Site Location Information	
City or Town	Swinoujscie
State or Province	
Country	Poland
Responsible Agency (Full Address)	Head Office of Geodesy and Cartography ul. Wspolna 2 PL-00-926 Warsaw Poland
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3648326.687 m Y = 924983.934 m Z = 5132035.156 m
Height in UELN-95/98	6.655 m
Gravity in ISGN71	981 405.1 mgal



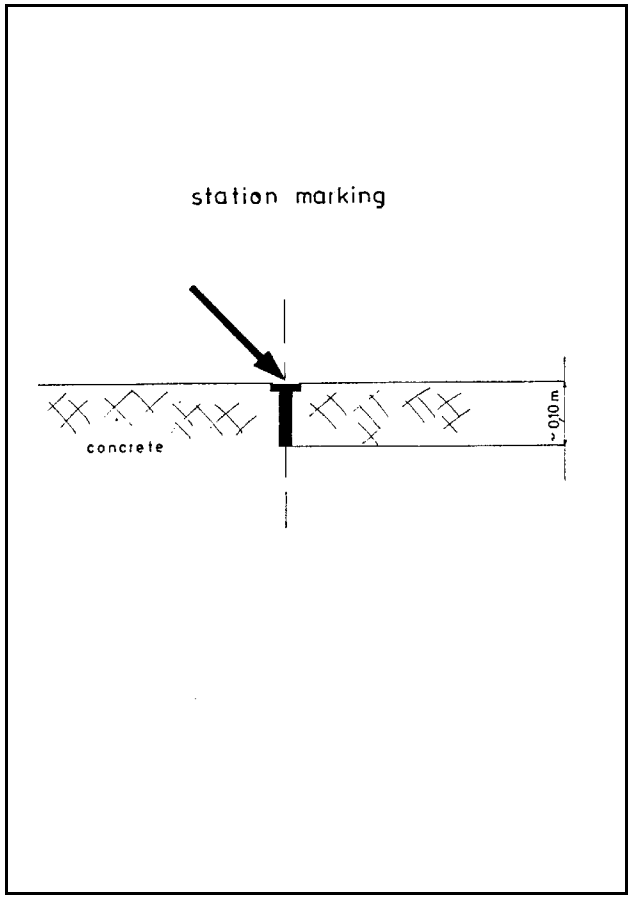


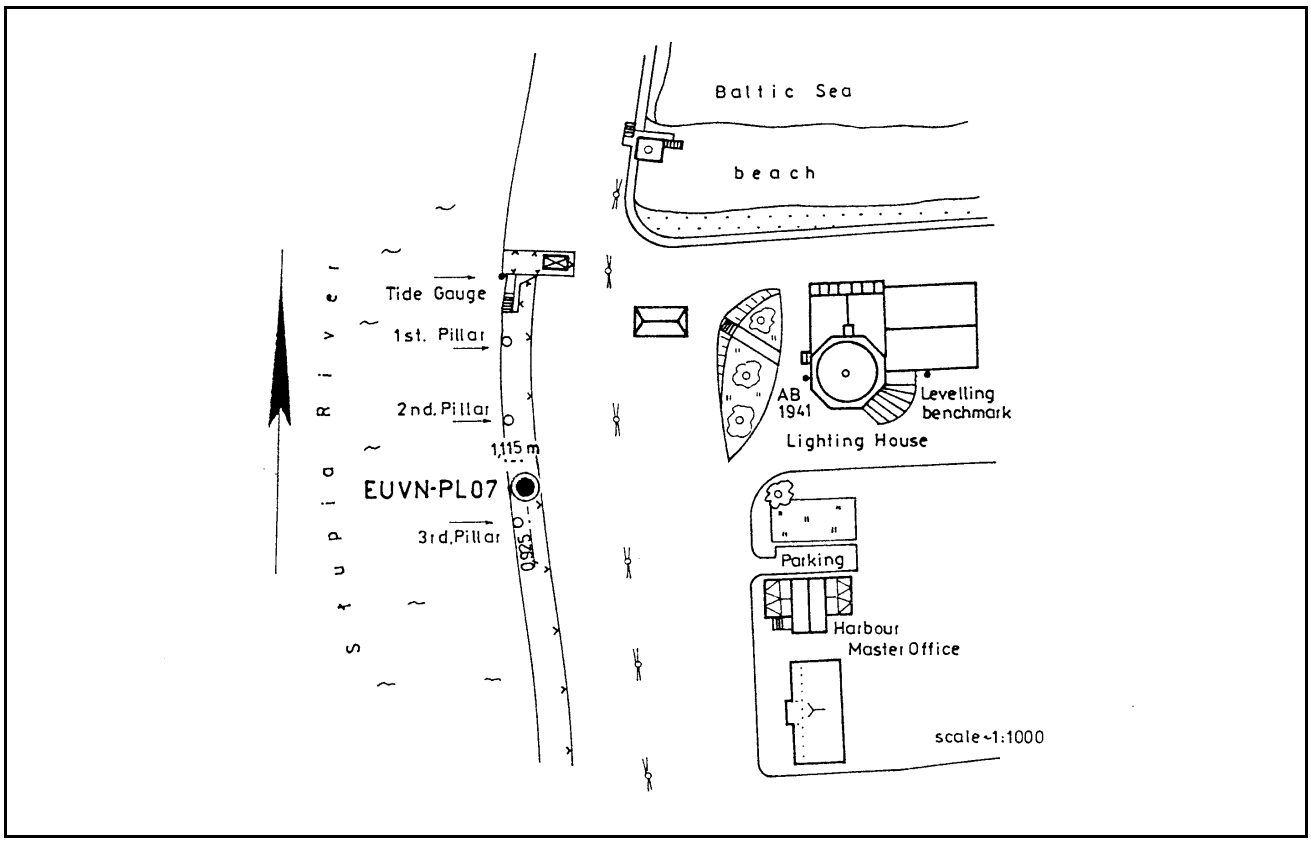
European Vertical GPS Reference Network (EUVN)

Station Ustka

Site Identification of the GPS Monument	
4-Char. EUVN ID	PL07
DOMES Number	
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	
Mark dot of coordinates	

Site Location Information	
City or Town	Ustka
State or Province	
Country	Poland
Responsible Agency (Full Address)	Space Research Centre P.A.S. ul. Bartycka 18A PL-00-716 Warsaw Poland
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3545014.505 m Y = 1073939.677 m Z = 5174949.834 m
Height in UELN-95/98	1.603 m
Gravity in ISGN71	



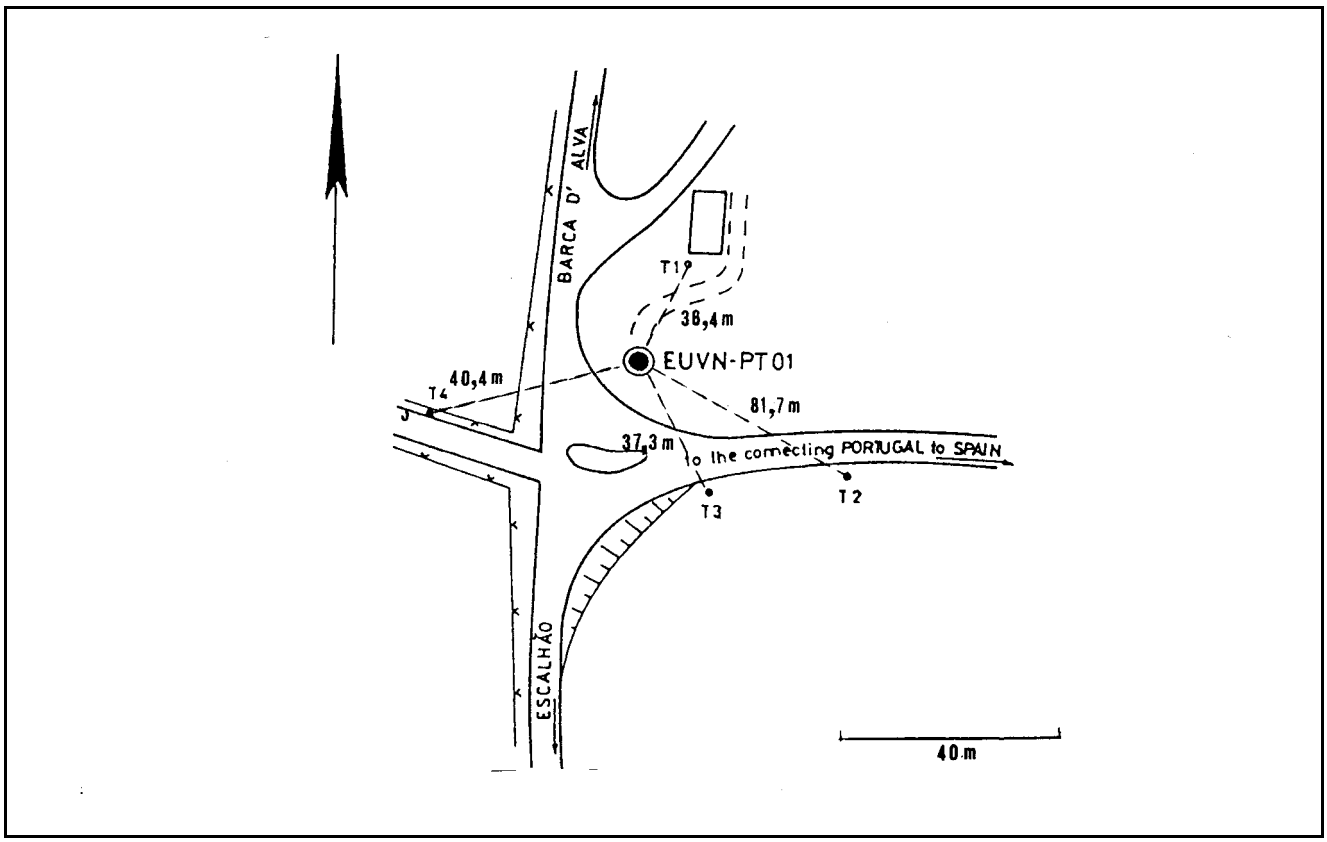


European Vertical GPS Reference Network (EUVN)

Station Barca d'Alva

Site Identification of the GPS Monument	
4-Char. EUVN ID	PT01
DOMES Number	
Monument Inscription/National Site Number	1
Marker Type, Monumentation Type, Foundation	Concrete pillar with screw bolt for forced centring device
Mark dot of coordinates	Centre of the screw bolt and bolt for the height, set in at the side of the pillar surface

Site Location Information	
City or Town	Pinhel
State or Province	
Country	Portugal
Responsible Agency (Full Address)	Instituto Portugues de Cartografia e Cadastro Rua Artilharia 1, 107 P-1070 Lisboa Portugal
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4783826.362 m Y = -582394.815 m Z = 4164421.566 m
Height in UELN-95/98	165.953 m
Gravity in IGSN71	980 188.17 mgal

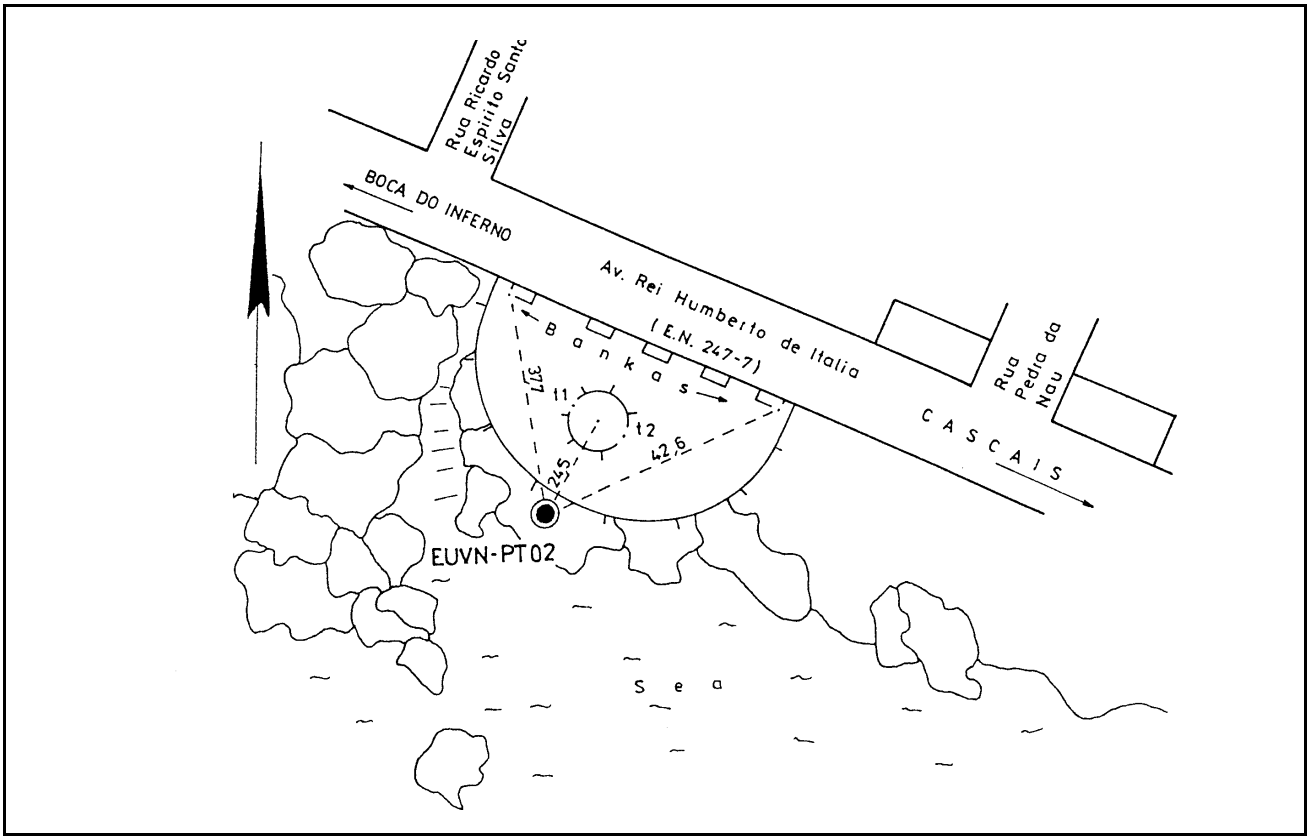


European Vertical GPS Reference Network (EUVN)

Station Cascais

Site Identification of the GPS Monument	
4-Char. EUVN ID	PT02
DOMES Number	
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Metal plate with screw bolt on concrete block, covered with iron plate on grade
Mark dot of coordinates	Centre and top of the screw bolt

Site Location Information	
City or Town	Cascais
State or Province	
Country	Portugal
Responsible Agency (Full Address)	Instituto Portugues de Cartografia e Cadastro Rua Artilharia 1, 107 P-1070 Lisboa Portugal
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4917648.295 m Y = -816415.119 m Z = 3965563.078 m
Height in UELN-95/98	12.147 m
Gravity in IGSN71	980 128.96 mgal

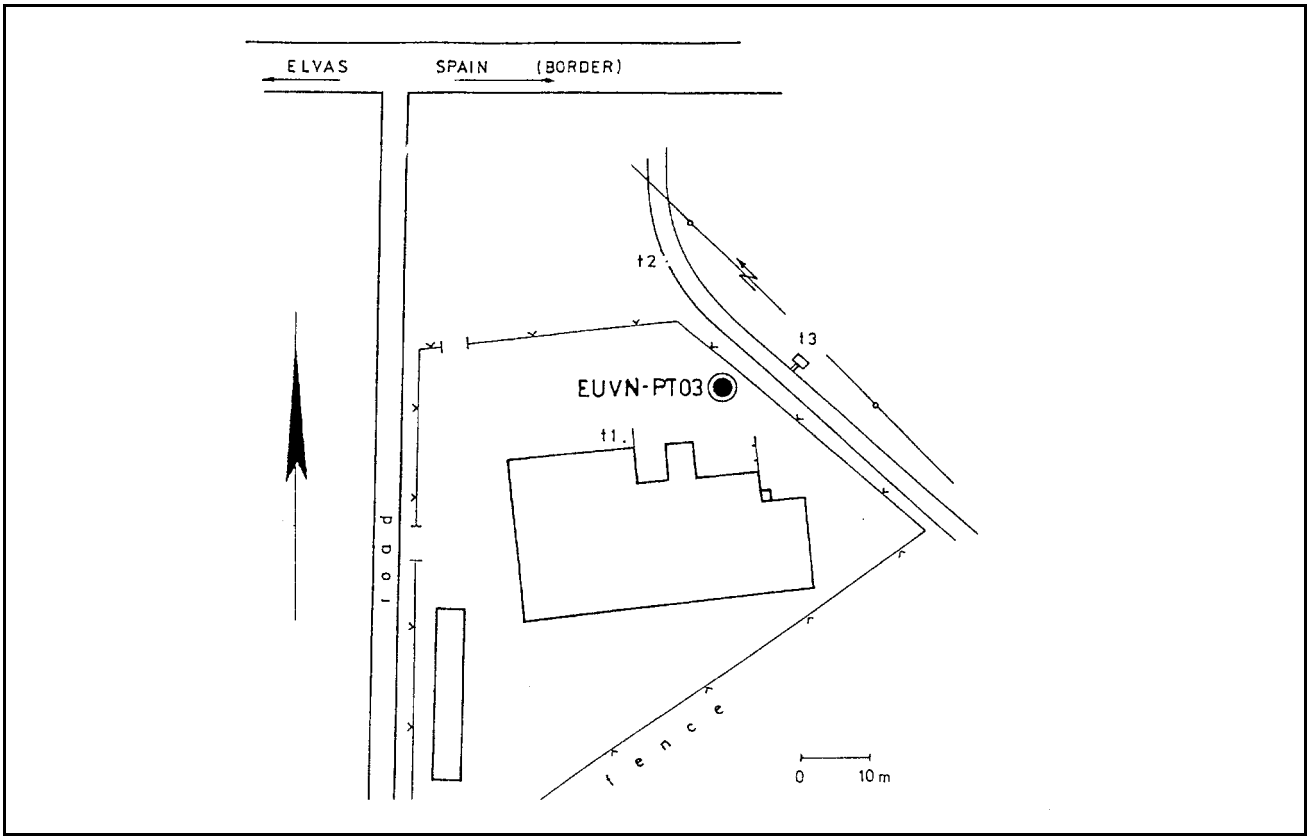


European Vertical GPS Reference Network (EUVN)

Station Elvas

Site Identification of the GPS Monument	
4-Char. EUVN ID	PT03
DOMES Number	
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Concrete pillar with screw bolt for forced centring device
Mark dot of coordinates	Centre of the screw bolt, bolt for the height, set in at the side of the pillar surface

Site Location Information	
City or Town	Elvas
State or Province	
Country	Portugal
Responsible Agency (Full Address)	Instituto Portugues de Cartografia e Cadastro Rua Artilharia 1, 107 P-1070 Lisboa Portugal
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4934349.212 m Y = -610382.526 m Z = 3982001.498 m
Height in UELN-95/98	174.931 m
Gravity in IGSN71	980 033.51 mgal

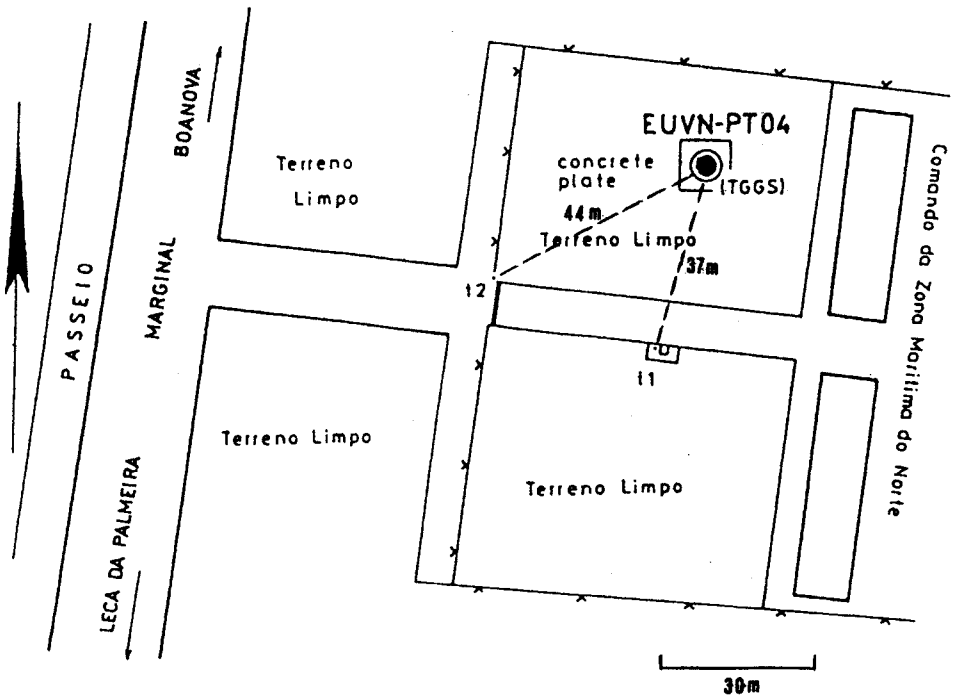


European Vertical GPS Reference Network (EUVN)

Station Leixoes

Site Identification of the GPS Monument	
4-Char. EUVN ID	PT04
DOMES Number	
Monument Inscription/National Site Number	IGC
Marker Type, Monumentation Type, Foundation	Metal plate with screw bolt, mounted in concrete case, covered with iron plate
Mark dot of coordinates	Centre and top of the screw bolt

Site Location Information	
City or Town	Leca da Palmeira
State or Province	
Country	Portugal
Responsible Agency (Full Address)	Instituto Portugues de Cartografia e Cadastro Rua Artilharia 1, 107 P-1070 Lisboa Portugal
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4750917.584 m Y = -727587.803 m Z = 4178903.138 m
Height in UELN-95/98	14.866 m
Gravity in IGSN71	980 300.80 mgal

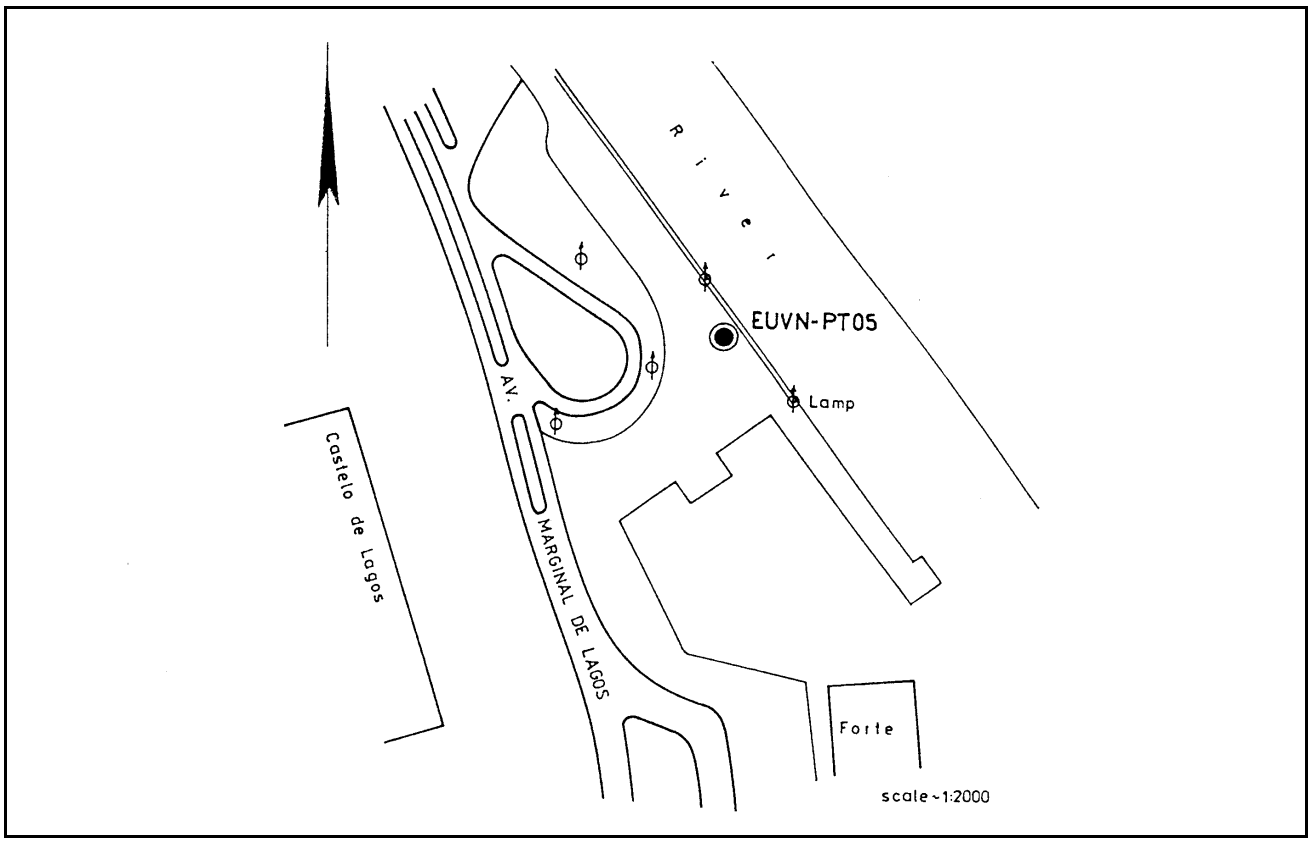


European Vertical GPS Reference Network (EUVN)

Station Lagos

Site Identification of the GPS Monument	
4-Char. EUVN ID	PT05
DOMES Number	
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Metal plate with screw bolt on the mole, mounted in concrete case, covered with iron plate
Mark dot of coordinates	Centre and top of the screw bolt

Site Location Information	
City or Town	Lagos
State or Province	
Country	Portugal
Responsible Agency (Full Address)	Instituto Portugues de Cartografia e Cadastro Rua Artilharia 1, 107 P-1070 Lisboa Portugal
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 5035163.496 m Y = -767677.296 m Z = 3826286.610 m
Height in UELN-95/98	2.597 m
Gravity in IGSN71	979 986.18 mgal

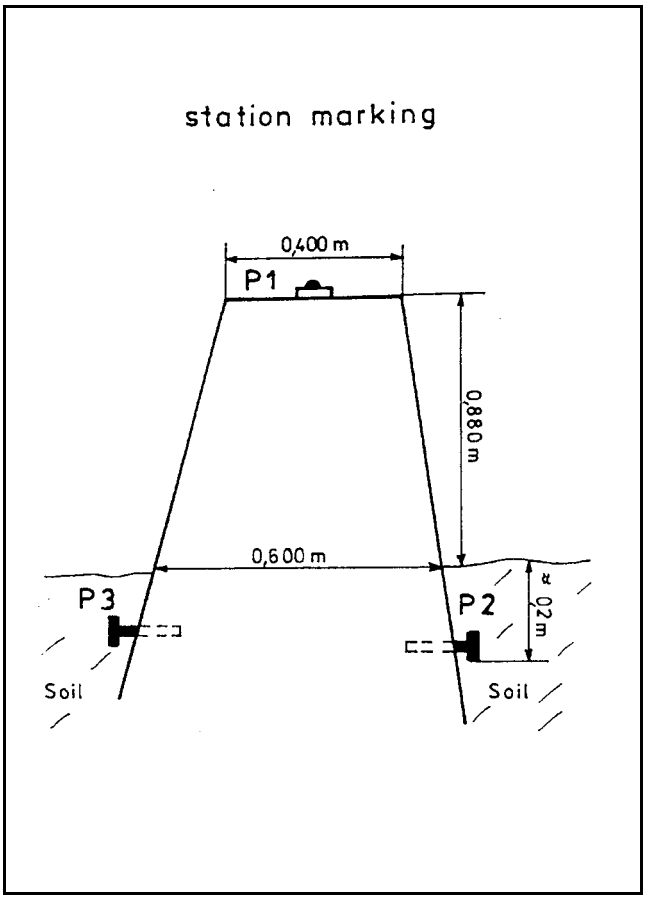


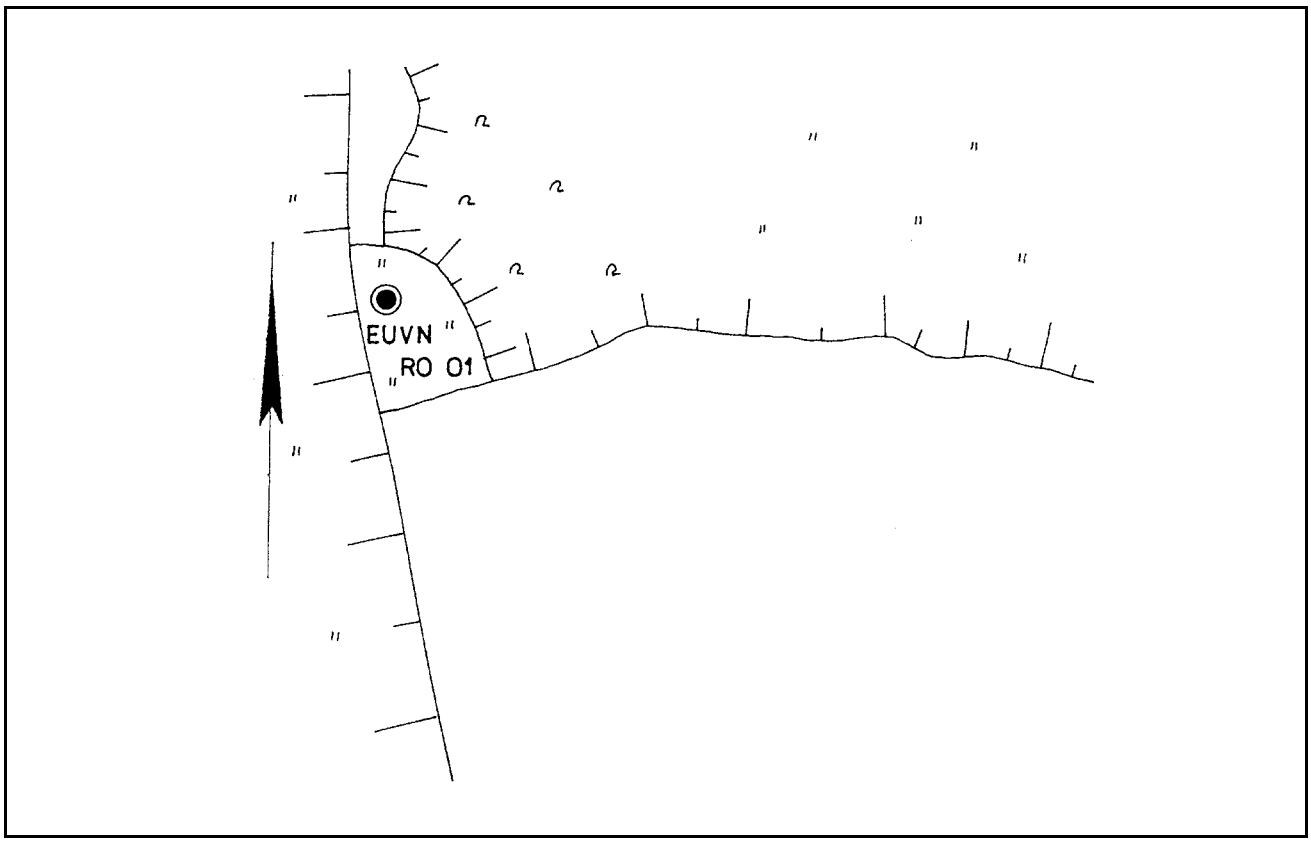
European Vertical GPS Reference Network (EUVN)

Station Sirca (Iasi)

Site Identification of the GPS Monument	
4-Char. EUVN ID	RO01
DOMES Number	
Monument Inscription/National Site Number	D.T.M. 1963
Marker Type, Monumentation Type, Foundation	Concrete pillar and iron marker with bolt on the top
Mark dot of coordinates	Centre and top of the bolt

Site Location Information	
City or Town	Iasi
State or Province	
Country	Romania
Responsible Agency (Full Address)	Government of Romania National Office of Cadastre, Geodesy and Cartography Splaiul Independentei nr.202A RO-Bucuresti 6 Romania
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3858208.888 m Y = 1983192.011 m Z = 4660287.978 m
Height in UELN-95/98	190.136 m
Gravity in ISGN71	



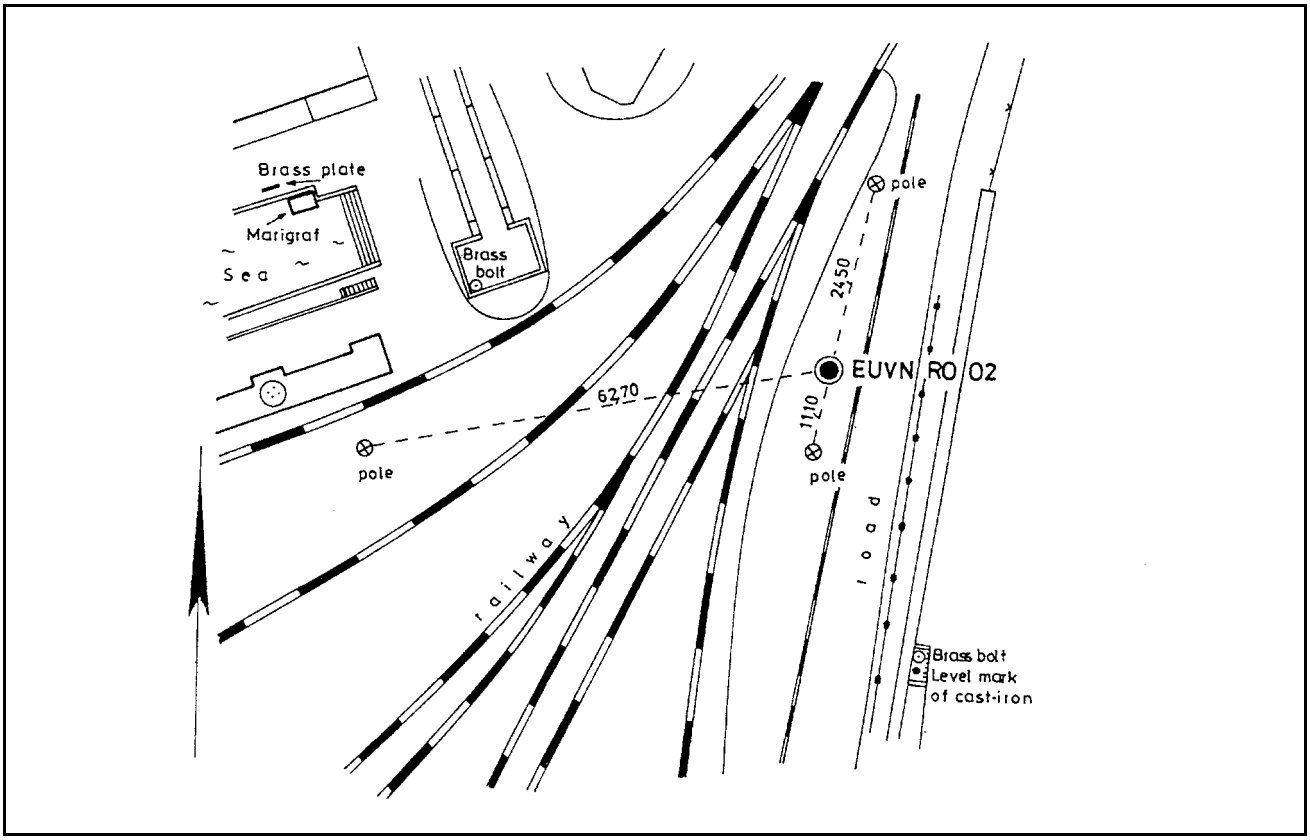


European Vertical GPS Reference Network (EUVN)

Station Constanta

Site Identification of the GPS Monument	
4-Char. EUVN ID	RO02
DOMES Number	
Monument Inscription/National Site Number	D.T.M. 1983
Marker Type, Monumentation Type, Foundation	Concrete pillar with iron marker with bolt on top (with filed cross)
Mark dot of coordinates	Centre and top of the bolt

Site Location Information	
City or Town	Constanta
State or Province	
Country	Romania
Responsible Agency (Full Address)	Government of Romania National Office of Cadastre, Geodesy and Cartography Splaiul Independentei nr.202A RO-Bucuresti 6 Romania
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4021069.447 m Y = 2197733.092 m Z = 4421574.104 m
Height in UELN-95/98	3.561 m
Gravity in ISGN71	

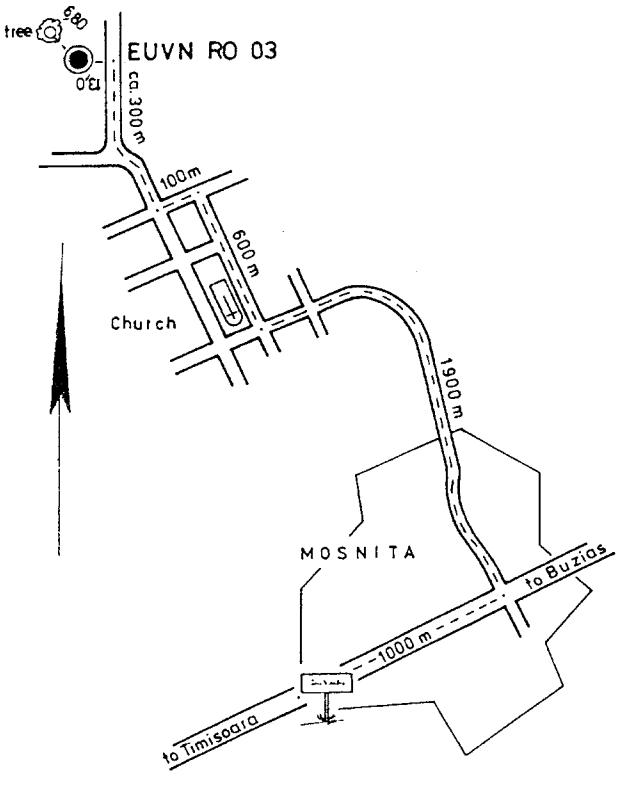


European Vertical GPS Reference Network (EUVN)

Station Timisoara

Site Identification of the GPS Monument	
4-Char. EUVN ID	RO03
DOMES Number	
Monument Inscription/National Site Number	D.T.M. 4145
Marker Type, Monumentation Type, Foundation	Concrete pillar and iron marker with bolt on the top
Mark dot of coordinates	Centre and top of the bolt

Site Location Information	
City or Town	Timisoara
State or Province	
Country	Romania
Responsible Agency (Full Address)	Government of Romania National Office of Cadastre, Geodesy and Cartography Splaiul Independentei nr.202A RO-Bucuresti 6 Romania
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4153382.581 m Y = 1623172.928 m Z = 4545098.606 m
Height in UELN-95/98	96.980 m
Gravity in ISGN71	

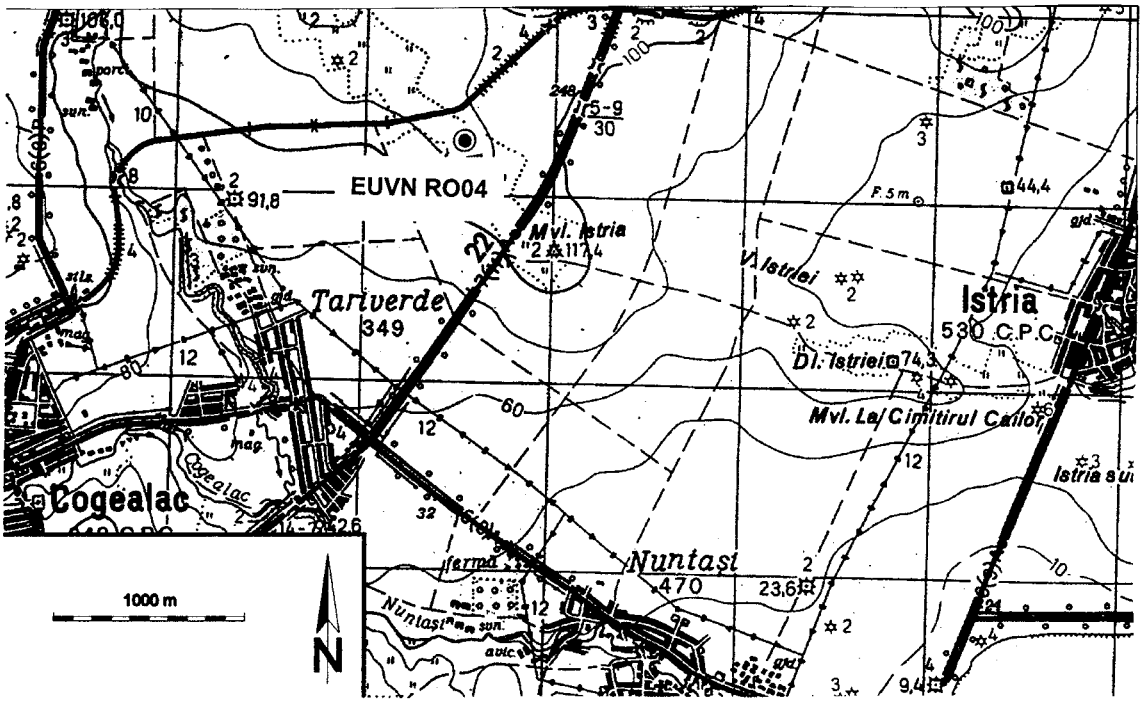


European Vertical GPS Reference Network (EUVN)

Station Height Zero Point

Site Identification of the GPS Monument	
4-Char. EUVN ID	RO04
DOMES Number	
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Brass pin in the rock
Mark dot of coordinates	Centre and top of the brass pin

Site Location Information	
City or Town	Constanta
State or Province	
Country	Romania
Responsible Agency (Full Address)	Government of Romania National Office of Cadastre, Geodesy and Cartography Splaiul Independentei nr.202A RO-Bucuresti 6 Romania
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3993862.509 m Y = 2179699.438 m Z = 4454979.769 m
Height in UELN-95/98	122.777 m
Gravity in ISGN71	



European Vertical GPS Reference Network (EUVN)

Station Zwenigorod

Site Identification of the GPS Monument	
4-Char. EUVN ID	ZWEN
DOMES Number	12330 M 001
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Stable pillar on the roof of the main building
Mark dot of coordinates	

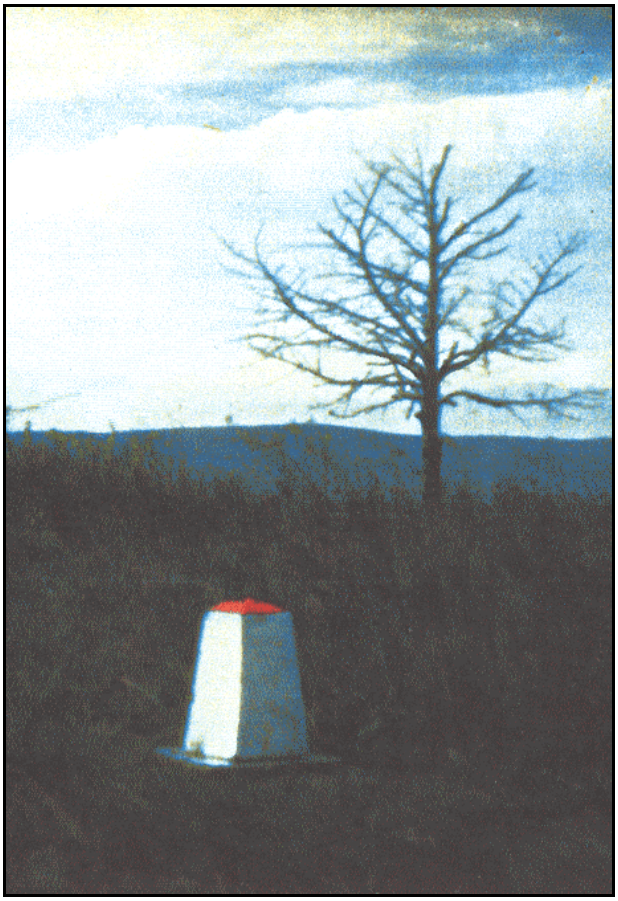
Site Location Information	
City or Town	Zwenigorod
State or Province	
Country	Russia
Responsible Agency (Full Address)	Geoforschungszentrum Potsdam Telegraphenberg A17 D-14473 Potsdam Germany
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 2886325.752 m Y = 2155998.333 m Z = 5245816.047 m
Height in UELN-95/98	
Gravity in ISGN71	

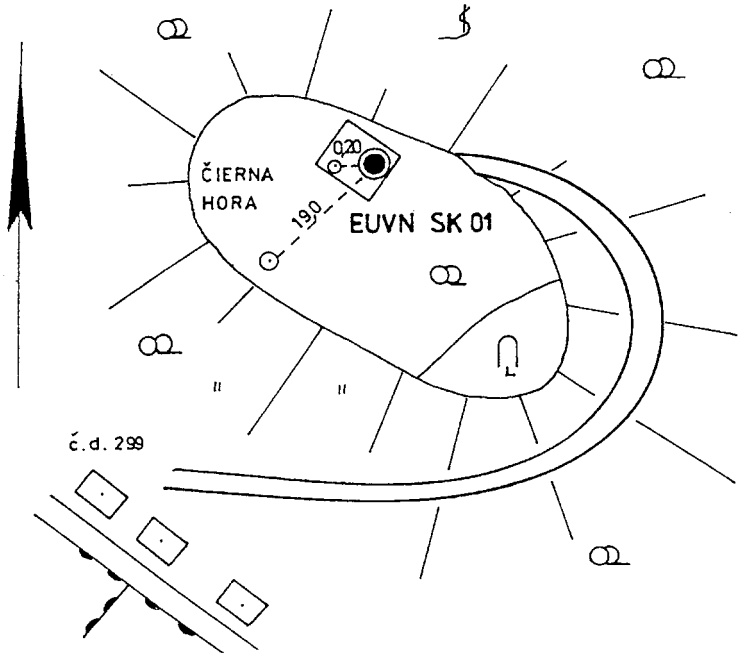
European Vertical GPS Reference Network (EUVN)

Station Kamenica

Site Identification of the GPS Monument	
4-Char. EUVN ID	SK01
DOMES Number	
Monument Inscription/National Site Number	33
Marker Type, Monumentation Type, Foundation	Brass survey marker on steel rod driven into ground 2,2 m deep
Mark dot of coordinates	Centre and top of the brass survey marker

Site Location Information	
City or Town	Nové Zámky
State or Province	
Country	Slovakia
Responsible Agency (Full Address)	Geodetic and Cartographic Institute Chlumeckého 4 SK-82745 Bratislava Slovakia
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4062233.403 m Y = 1377316.074 m Z = 4704896.483 m
Height in UELN-95/98	218.047 m
Gravity in ISGN71	980 838.664 mgal



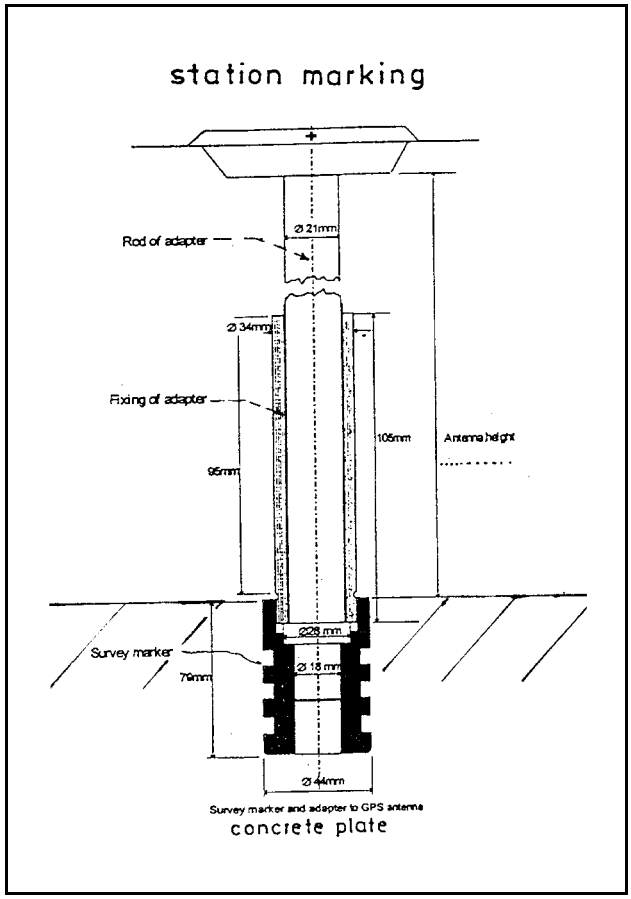


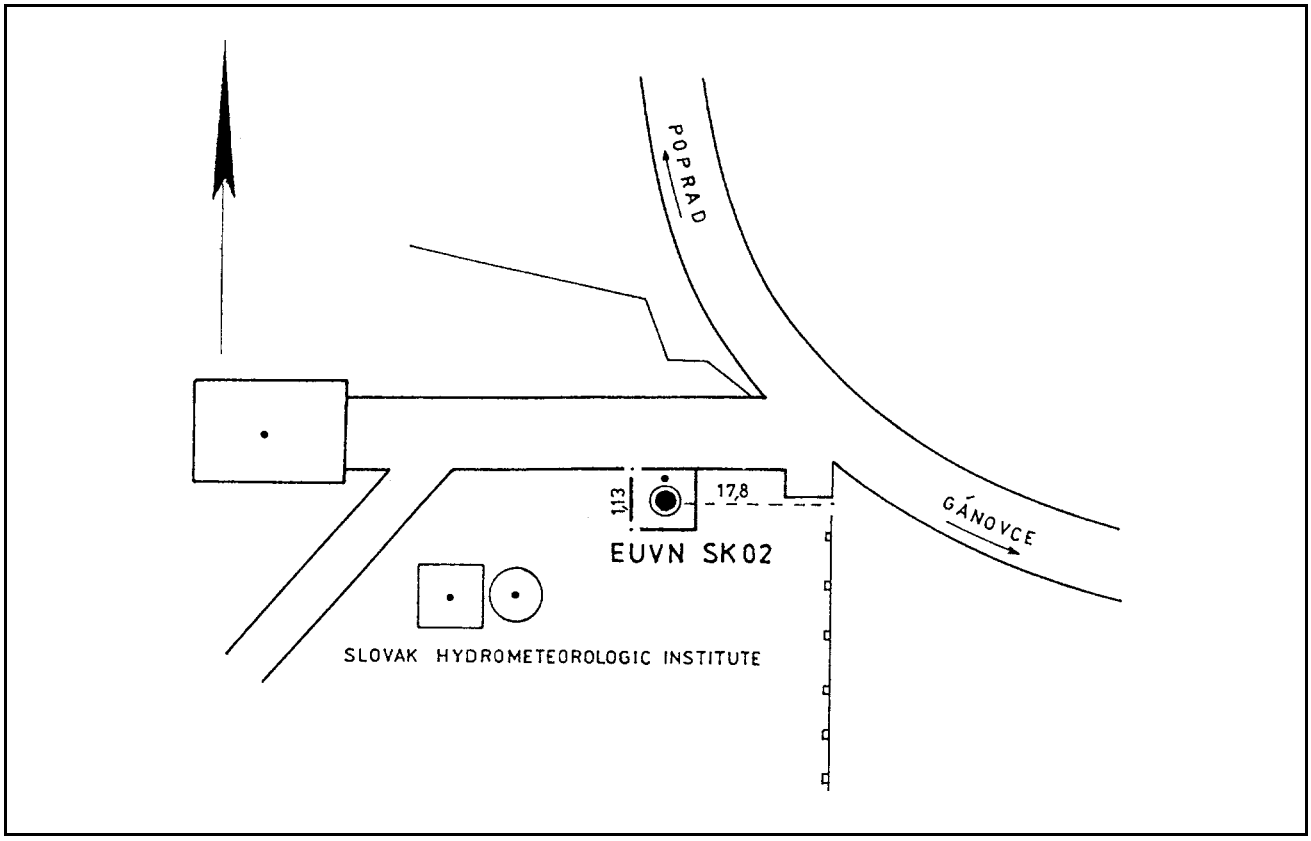
European Vertical GPS Reference Network (EUVN)

Station Ganovce

Site Identification of the GPS Monument	
4-Char. EUVN ID	SK02
DOMES Number	
Monument Inscription/National Site Number	50
Marker Type, Monumentation Type, Foundation	Brass survey marker mounted in concrete plate
Mark dot of coordinates	Centre and top of the brass survey marker

Site Location Information	
City or Town	Poprad
State or Province	
Country	Slovakia
Responsible Agency (Full Address)	Geodetic and Cartographic Institute Chlumeckého 4 SK-82745 Bratislava Slovakia
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3929173.045 m Y = 1455278.647 m Z = 4793644.401 m
Height in UELN-95/98	701.273 m
Gravity in ISGN71	980 980.050 mgal





European Vertical GPS Reference Network (EUVN)

Station Strecno

Site Identification of the GPS Monument	
4-Char. EUVN ID	SK03
DOMES Number	
Monument Inscription/National Site Number	6
Marker Type, Monumentation Type, Foundation	Brass survey marker mounted in bedrock
Mark dot of coordinates	Centre and top of the brass survey marker

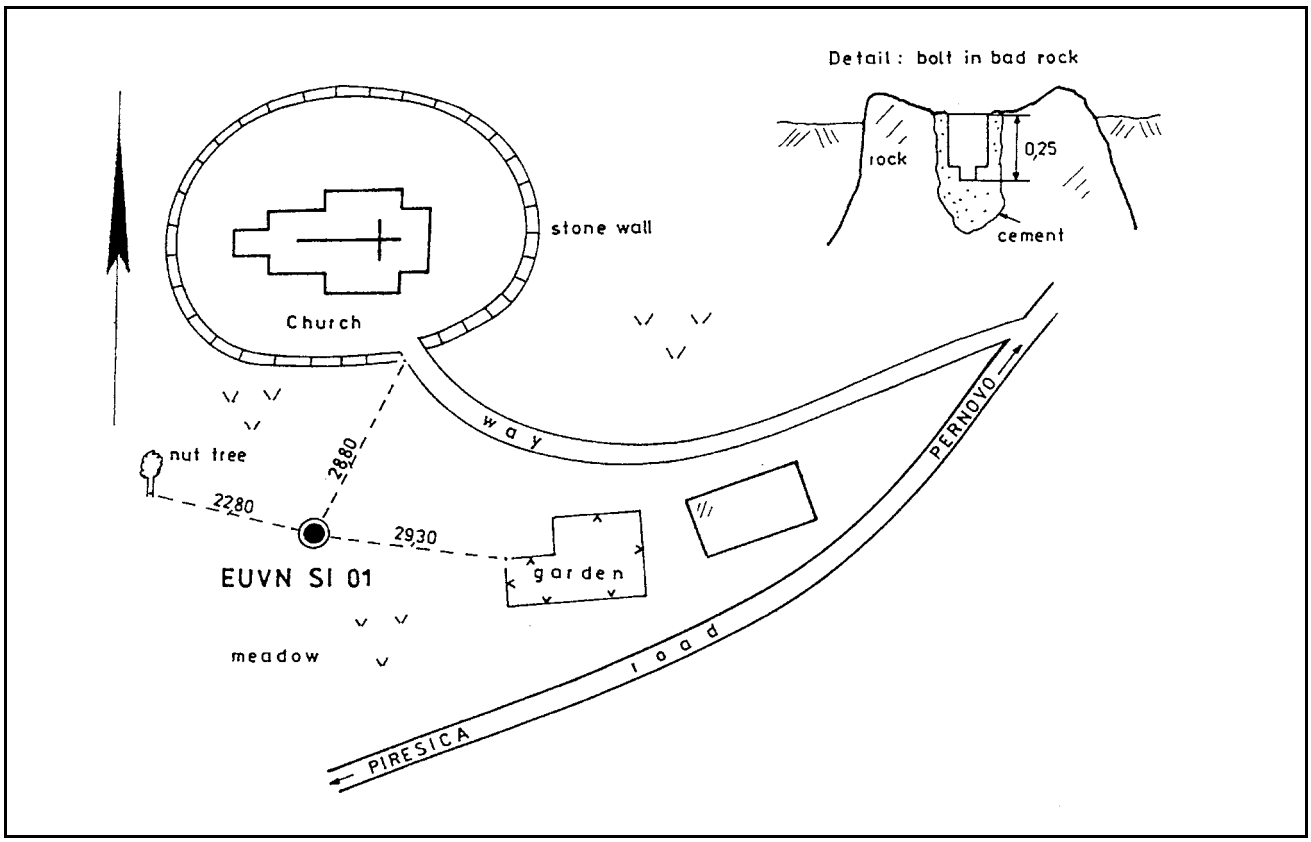
Site Location Information	
City or Town	Zilina
State or Province	
Country	Slovakia
Responsible Agency (Full Address)	Geodetic and Cartographic Institute Chlumeckého 4 SK-82745 Bratislava Slovakia
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3953831.927 m Y = 1352503.780 m Z = 4802958.838 m
Height in UELN-95/98	372.356 m
Gravity in ISGN71	980 871.478 mgal

European Vertical GPS Reference Network (EUVN)

Station Velika Piresica

Site Identification of the GPS Monument	
4-Char. EUVN ID	SI01
DOMES Number	
Monument Inscription/National Site Number	1
Marker Type, Monumentation Type, Foundation	Bolt in bedrock
Mark dot of coordinates	Centre and top of GPS marker

Site Location Information	
City or Town	Zalec
State or Province	
Country	Slovenia
Responsible Agency (Full Address)	Surveying and Mapping Authority of the Republic of Slovenia Zemljemerska 12 SI-1000 Ljubljana Slovenia
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4261425.194 m Y = 1156639.292 m Z = 4587549.265 m
Height in UELN-95/98	295.255 m
Gravity in ISGN71	980 641.819 mgal

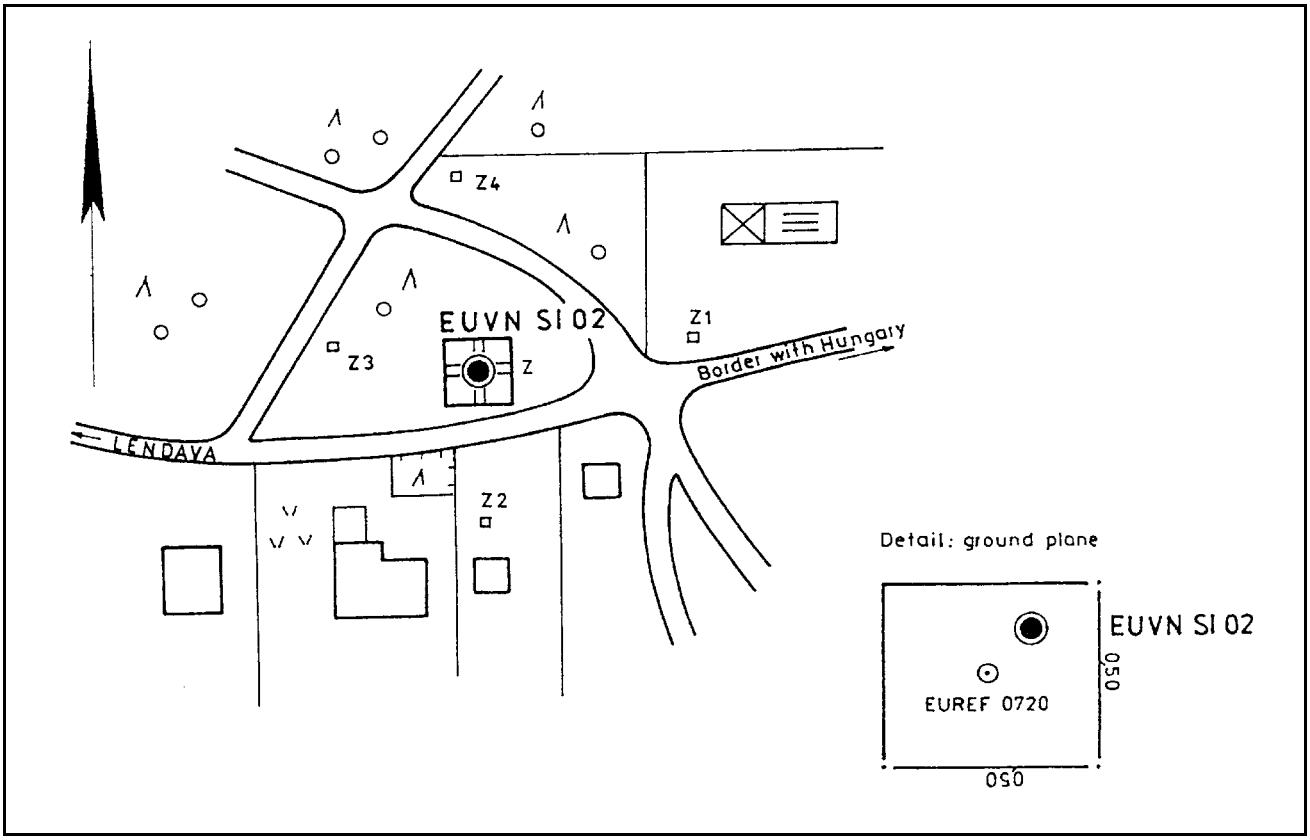


European Vertical GPS Reference Network (EUVN)

Station Lendavske Gorice

Site Identification of the GPS Monument	
4-Char. EUVN ID	SI02
DOMES Number	
Monument Inscription/National Site Number	388
Marker Type, Monumentation Type, Foundation	12 m high pillar with 2 GPS markers on the top, GPS marker (SI02) is eccentric bolt
Mark dot of coordinates	Centre and top of GPS marker

Site Location Information	
City or Town	Lendava
State or Province	
Country	Slovenia
Responsible Agency (Full Address)	Surveying and Mapping Authority of the Republic of Slovenia Zemljemerska 12 SI-1000 Ljubljana Slovenia
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4212714.763 m Y = 1246015.968 m Z = 4608998.410 m
Height in UELN-95/98	339.820 m
Gravity in ISGN71	980 675.576 mgal

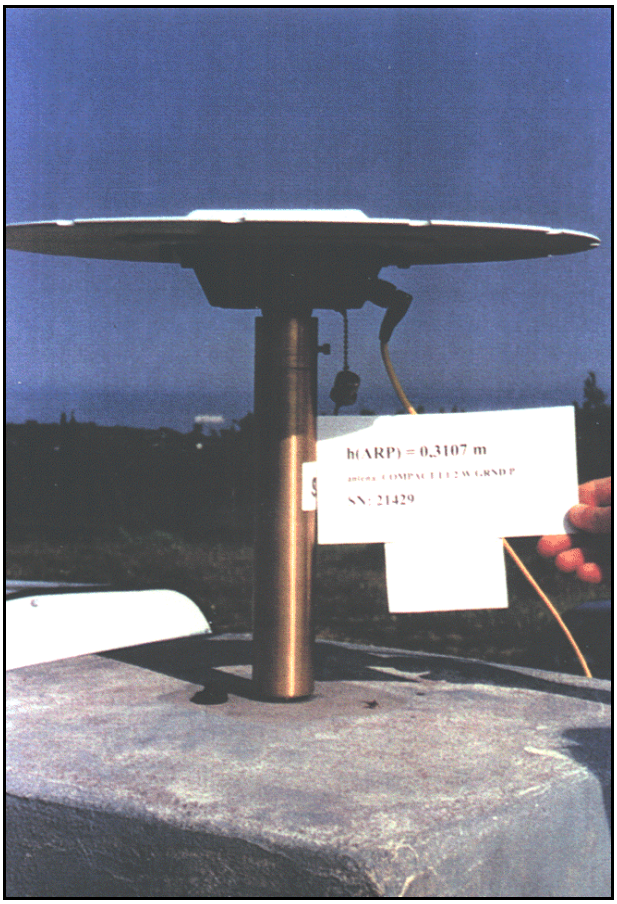


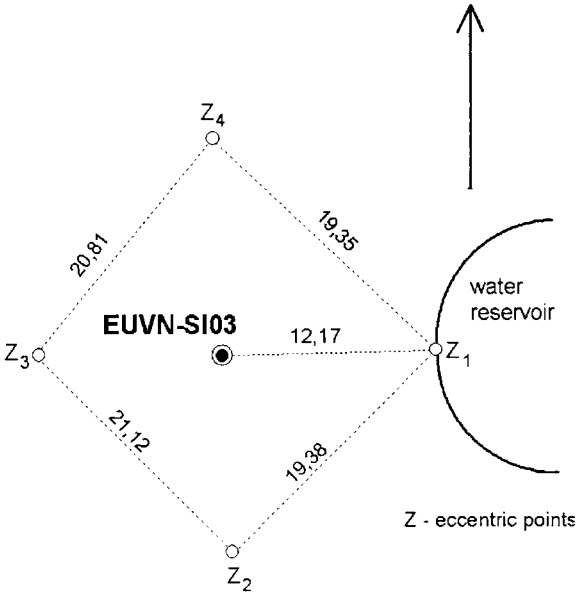
European Vertical GPS Reference Network (EUVN)

Station Malija

Site Identification of the GPS Monument	
4-Char. EUVN ID	SI03
DOMES Number	
Monument Inscription/National Site Number	180
Marker Type, Monumentation Type, Foundation	Reinforced concrete pillar with bolt on the top
Mark dot of coordinates	Centre and top of GPS marker

Site Location Information	
City or Town	Izola
State or Province	
Country	Slovenia
Responsible Agency (Full Address)	Surveying and Mapping Authority of the Republic of Slovenia Zemljemerska 12 SI-1000 Ljubljana Slovenia
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4351694.762 m Y = 1056274.718 m Z = 4526994.584 m
Height in UELN-95/98	276.186 m
Gravity in ISGN71	980 609.205 mgal



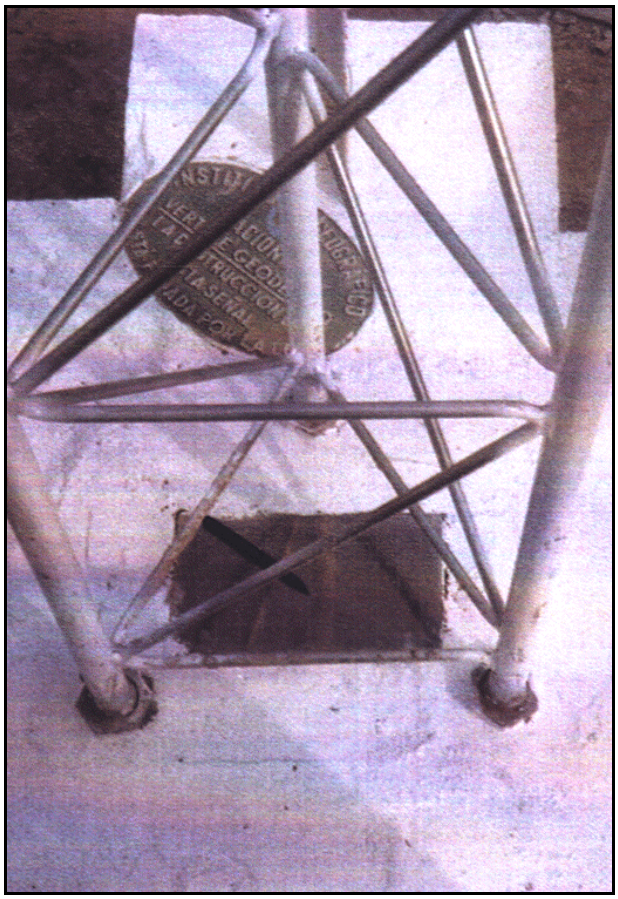


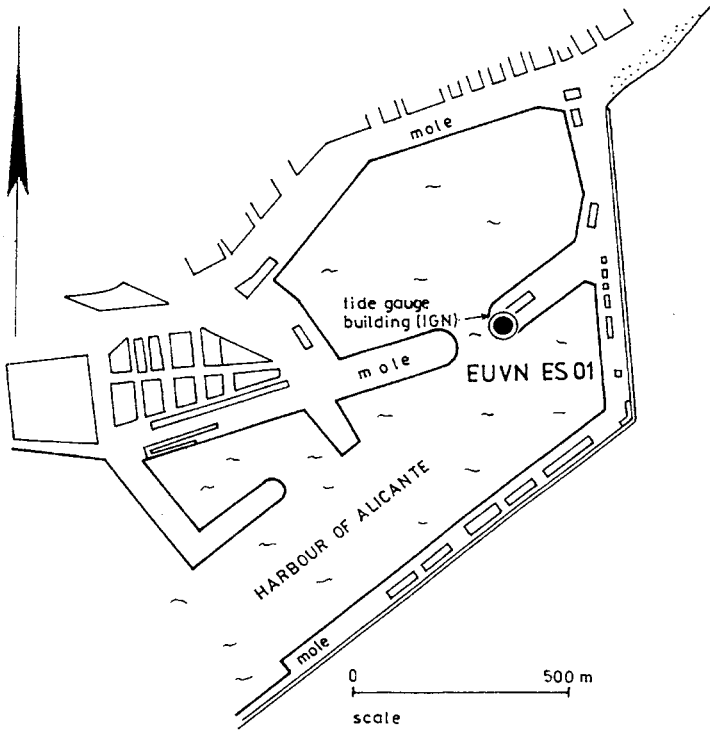
European Vertical GPS Reference Network (EUVN)

Station Alicante

Site Identification of the GPS Monument	
4-Char. EUVN ID	ES01
DOMES Number	
Monument Inscription/National Site Number	87201
Marker Type, Monumentation Type, Foundation	Horizontal metal plate with GPS marker on a concrete pillar on the tower of the IGN tide gauge building, over the point a 3 m high steel lattice mast with antenna
Mark dot of coordinates	

Site Location Information	
City or Town	Alicante
State or Province	
Country	Spain
Responsible Agency (Full Address)	Instituto Geógrafico Nacional Avda. General Ibañez de Ibero, 3 ES-28003 Madrid Spain
Contact Agency Information	Observatorio Geofísico Plaza de San Juan de Dios, 3 ES-03010 Alicante Spain
Coordinates in ETRS89, Epoch 97.4	X = 5009051.410 m Y = -42072.467 m Z = 3935057.475 m
Height in UELN-95/98	9.998 m
Gravity in ISGN71	980030.99 mgal



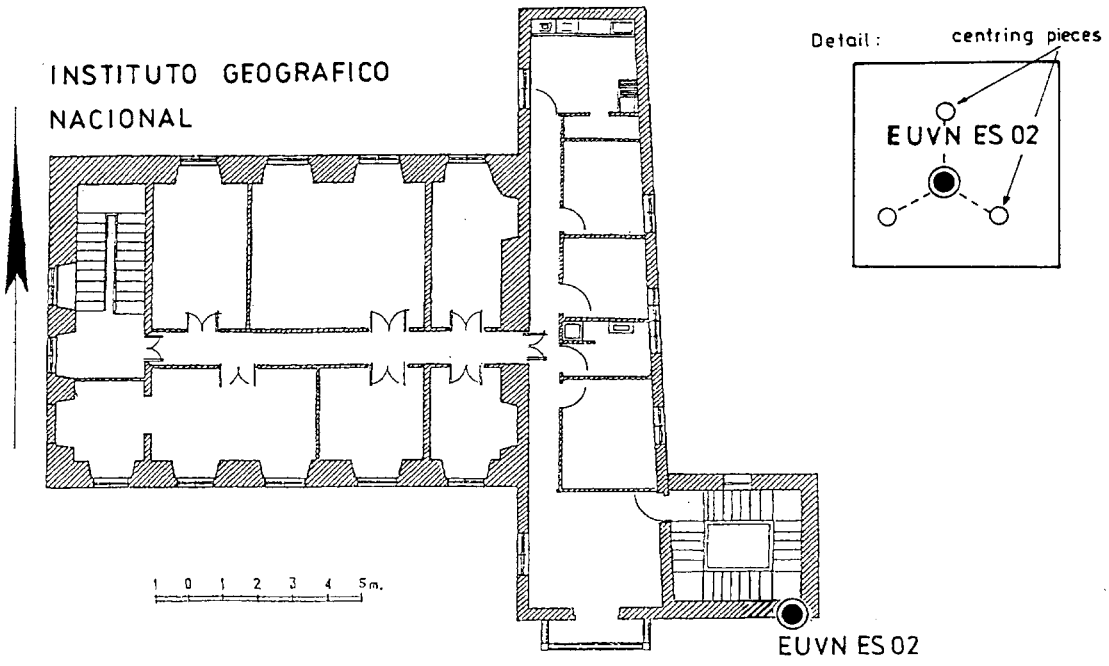


European Vertical GPS Reference Network (EUVN)

Station Almeria

Site Identification of the GPS Monument	
4-Char. EUVN ID	ES02
DOMES Number	
Monument Inscription/National Site Number	104550
Marker Type, Monumentation Type, Foundation	Brass centring pieces on top of building pillar of the upper roof
Mark dot of coordinates	Centre of the centring device and top of the wall

Site Location Information	
City or Town	Almeria
State or Province	
Country	Spain
Responsible Agency (Full Address)	Instituto Geógrafico Nacional Avda. General Ibañez de Ibero, 3 ES-28003 Madrid Spain
Contact Agency Information	Observatorio Geofisico y Sismologico Calle Camino de la Sismologica, 26 ES-04008 Almeria Spain
Coordinates in ETRS89, Epoch 97.4	X = 5105223.356 m Y = -219258.250 m Z = 3804379.868 m
Height in UELN-95/98	74.251 m
Gravity in ISGN71	979888.46 mgal

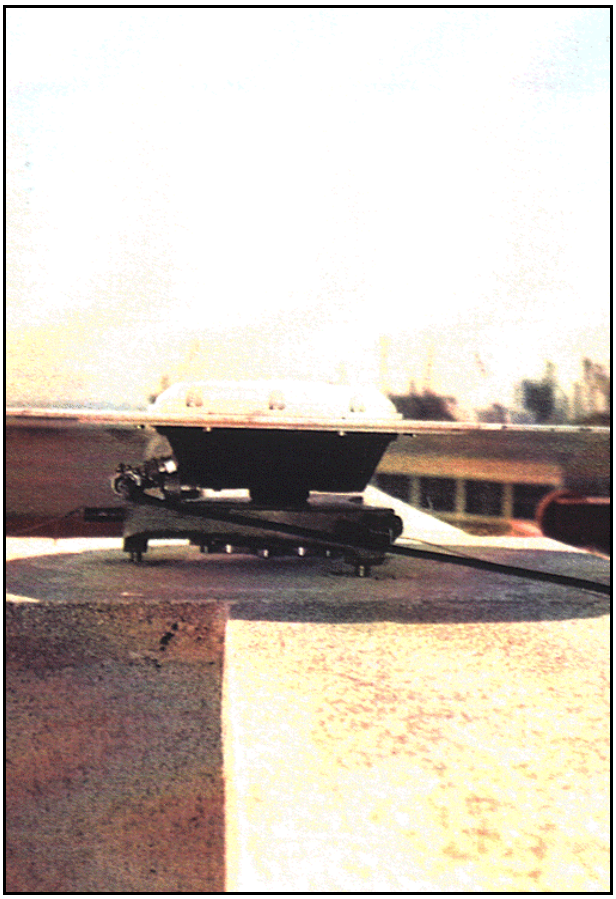


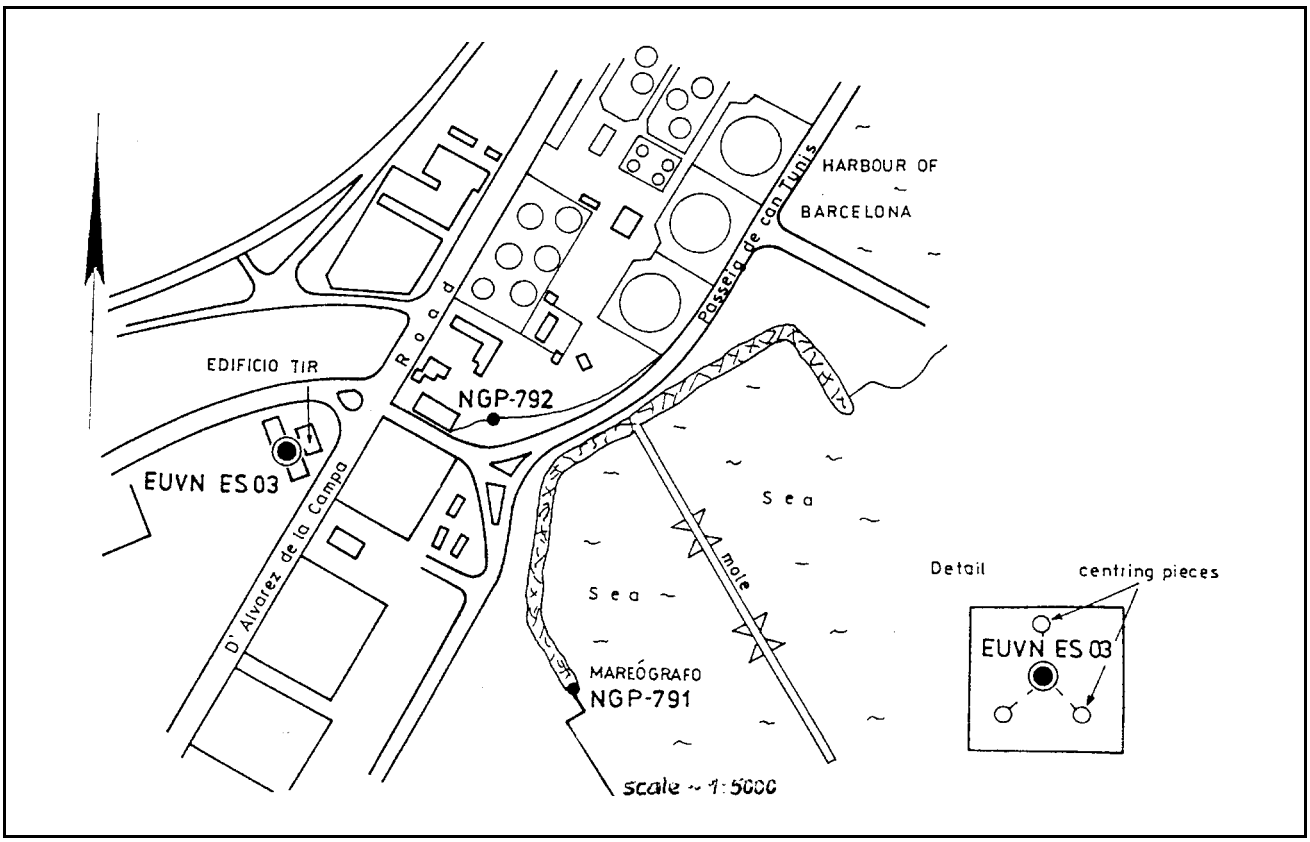
European Vertical GPS Reference Network (EUVN)

Station Barcelona

Site Identification of the GPS Monument	
4-Char. EUVN ID	ES03
DOMES Number	
Monument Inscription/National Site Number	42120
Marker Type, Monumentation Type, Foundation	Brass centring pieces on top of building pillar of the upper roof
Mark dot of coordinates	Centre of the centring device and top of the wall

Site Location Information	
City or Town	Barcelona
State or Province	
Country	Spain
Responsible Agency (Full Address)	Instituto Geógrafico Nacional Avda. General Ibañez de Ibero, 3 ES-28003 Madrid Spain
Contact Agency Information	D. Francese Pros Llavador. Jefe Gabinede Topografia des Puerto Autoridad Portuaria de Barcelona ES - Barcelona Spain
Coordinates in ETRS89, Epoch 97.4	X = 4791585.286 m Y = 180506.193 m Z = 4191801.862 m
Height in UELN-95/98	18.170 m
Gravity in ISGN71	980309.94 mgal



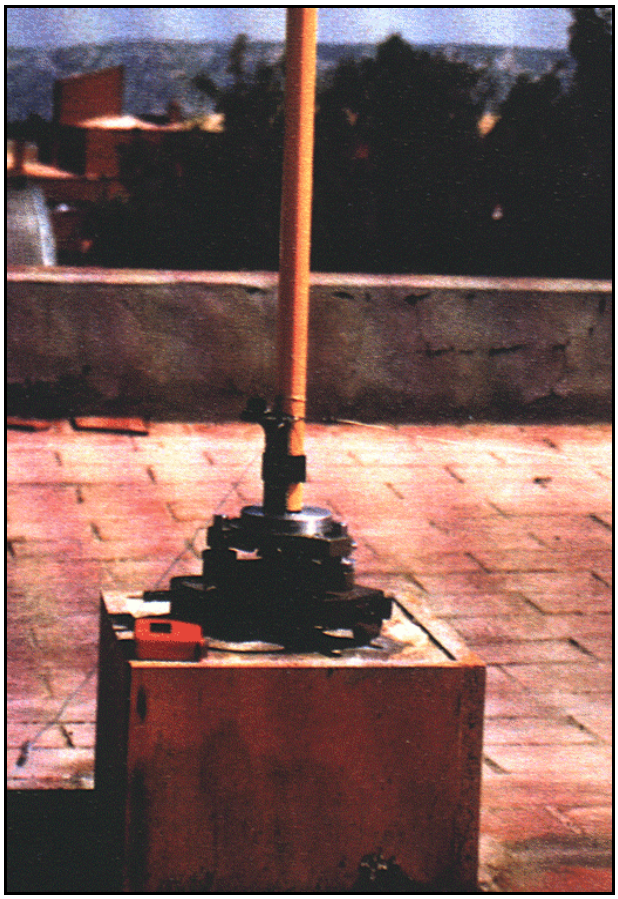


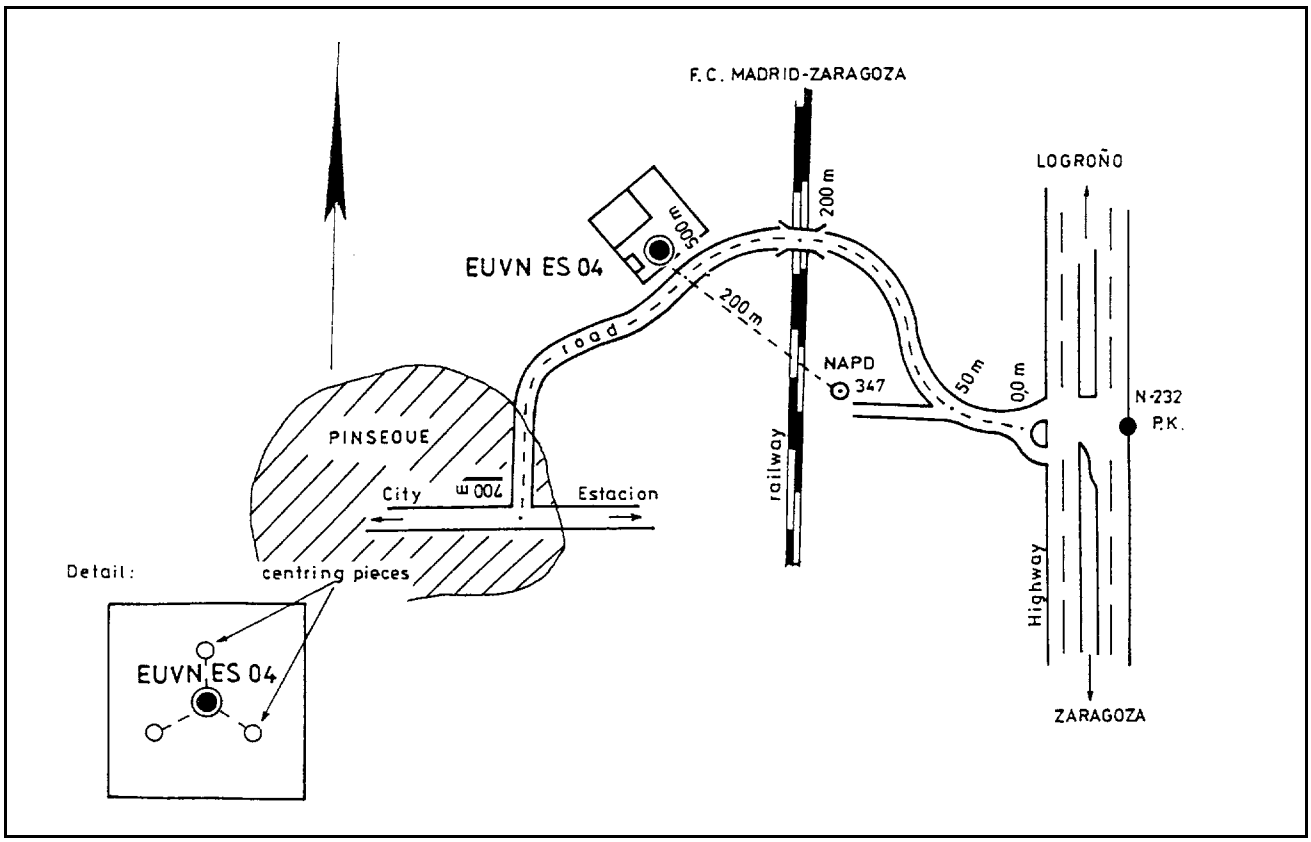
European Vertical GPS Reference Network (EUVN)

Station Casetas

Site Identification of the GPS Monument	
4-Char. EUVN ID	ES04
DOMES Number	
Monument Inscription/National Site Number	35401
Marker Type, Monumentation Type, Foundation	GPS marker on concrete cube with brass centring pieces on the top of the lift roof
Mark dot of coordinates	Centre of the centring device and top of the concrete cube

Site Location Information	
City or Town	Zaragoza
State or Province	
Country	Spain
Responsible Agency (Full Address)	Instituto Geógrafico Nacional Avda. General Ibañez de Ibero, 3 ES-28003 Madrid Spain
Contact Agency Information	José Mur Bernal Calle de la Reina no 3 ES - Pinseque (Zaragoza) Spain
Coordinates in ETRS89, Epoch 97.4	X = 4767076.908 m Y = -85259.785 m Z = 4222748.957 m
Height in UELN-95/98	219.285 m
Gravity in ISGN71	980228.28 mgal



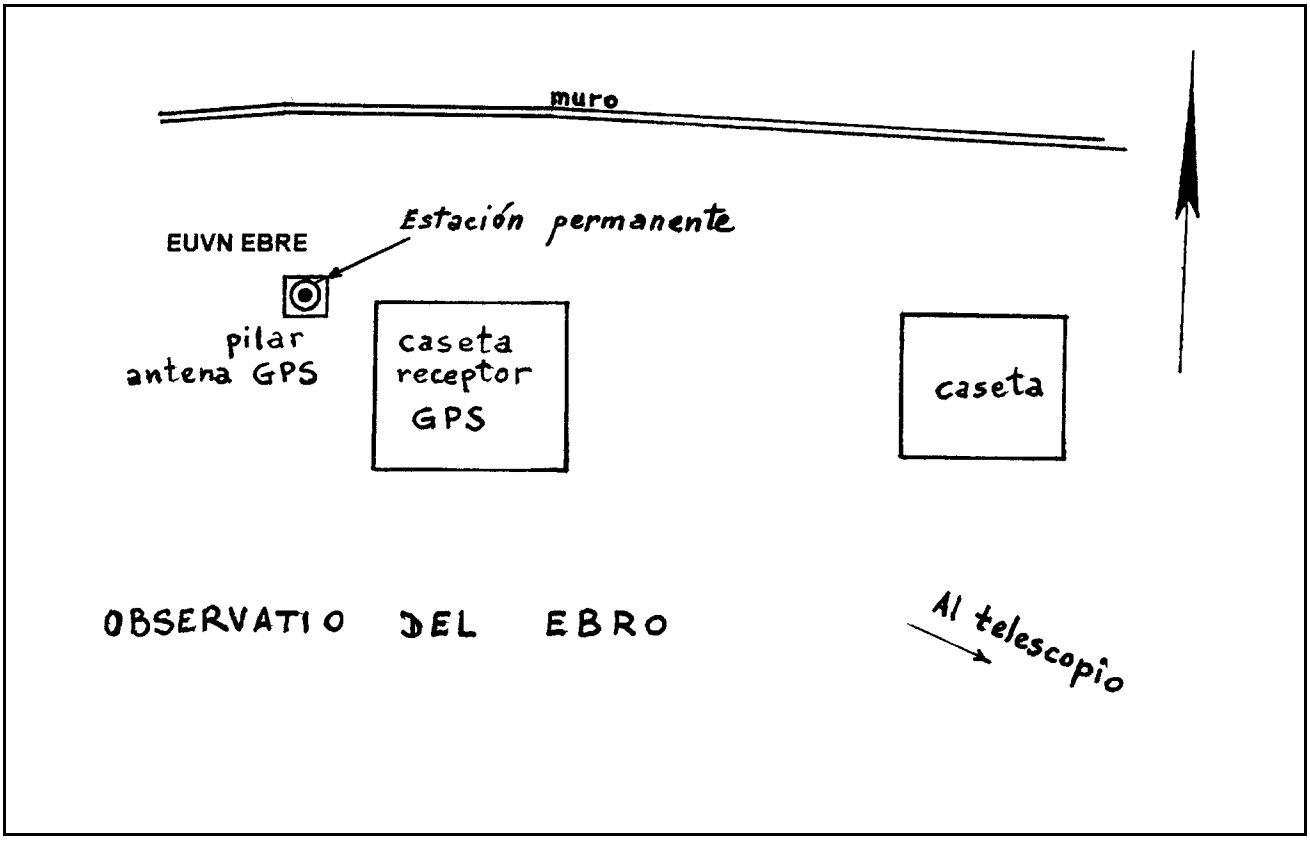


European Vertical GPS Reference Network (EUVN)

Station Ebre

Site Identification of the GPS Monument	
4-Char. EUVN ID	EBRE
DOMES Number	13410 M 001
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Concrete pillar, 4.20 m high, with forced centring
Mark dot of coordinates	

Site Location Information	
City or Town	Roquetes
State or Province	Tarragona
Country	Spain
Responsible Agency (Full Address)	Institut Cartografia de Catalunya Parc de Montjuic ES-08038 Barcelona Spain
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4833520.380 m Y = 41536.837 m Z = 4147461.301 m
Height in UELN-95/98	57.708 m
Gravity in ISGN71	980199.47 mgal

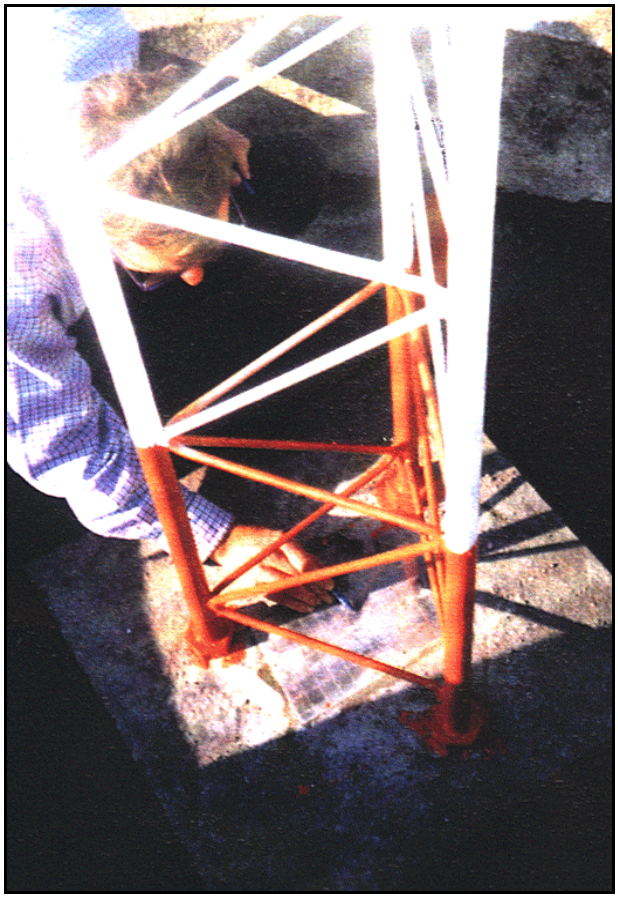


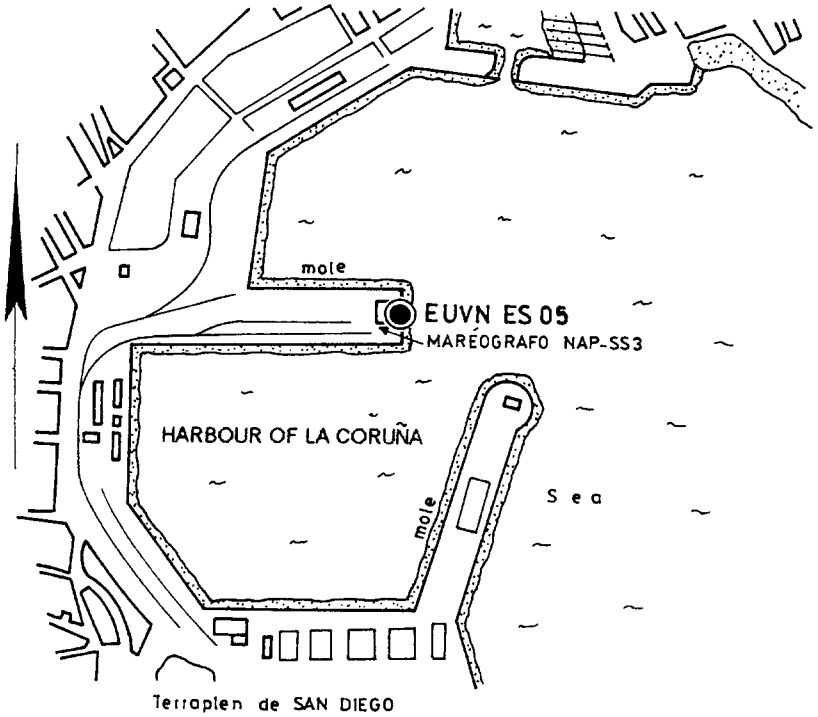
European Vertical GPS Reference Network (EUVN)

Station La Coruña

Site Identification of the GPS Monument	
4-Char. EUVN ID	ES05
DOMES Number	
Monument Inscription/National Site Number	2101
Marker Type, Monumentation Type, Foundation	Metal plate with GPS marker on a concrete pillar on the tower of the IGN tide gauge building, over the point a 3 m high steel lattice mast with antenna
Mark dot of coordinates	

Site Location Information	
City or Town	La Coruña
State or Province	
Country	Spain
Responsible Agency (Full Address)	Instituto Geógrafico Nacional Avda. General Ibañez de Ibero, 3 ES-28003 Madrid Spain
Contact Agency Information	Servicio Regional del Instituto Geografico Nacional Edificio Servicios Multiples Poligono de Elviña. s/n -9ª Norte ES-15008 La Coruña
Coordinates in ETRS89, Epoch 97.4	X = 4594489.939 m Y = -678368.073 m Z = 4357065.900 m
Height in UELN-95/98	12.123 m
Gravity in ISGN71	980482.44 mgal



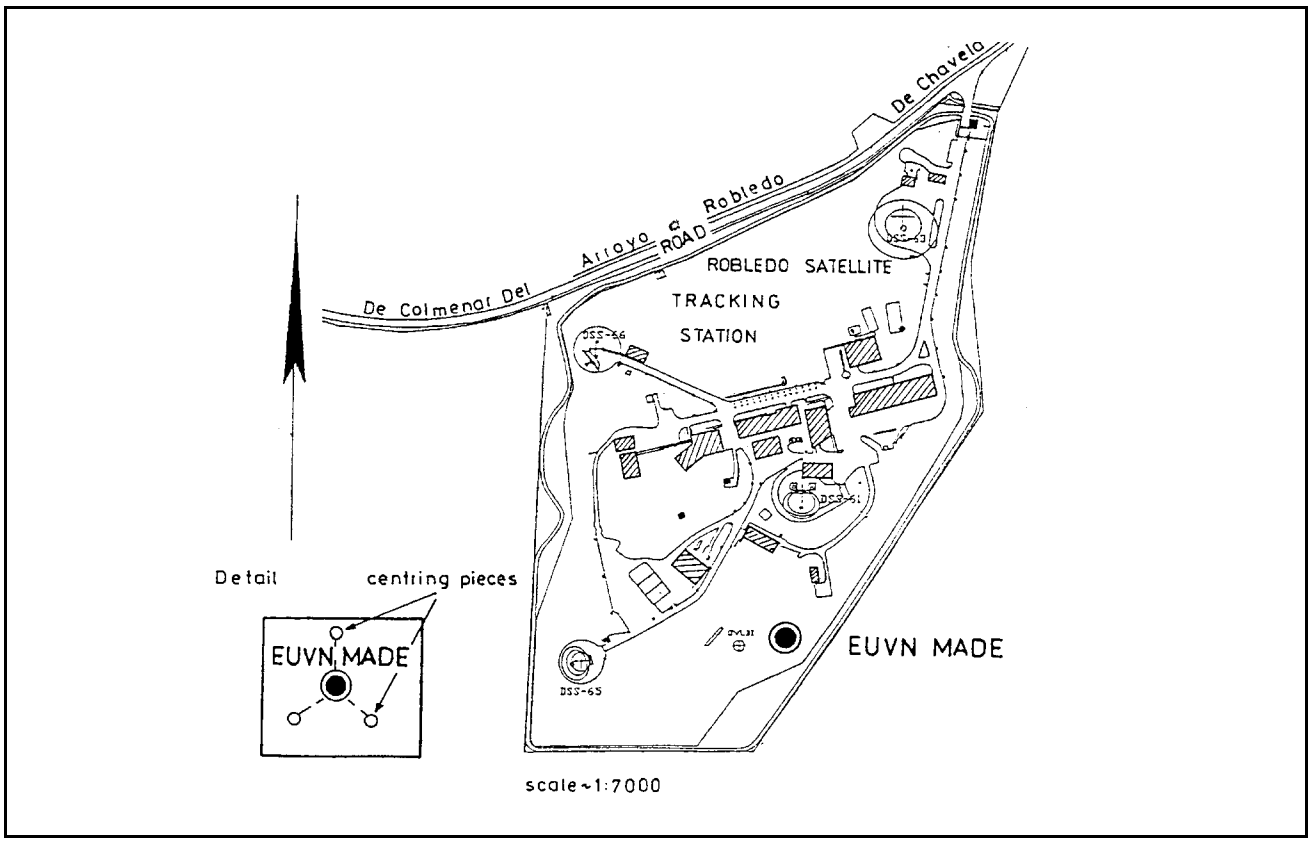


European Vertical GPS Reference Network (EUVN)

Station Madrid/Robledo T

Site Identification of the GPS Monument	
4-Char. EUVN ID	MADE
DOMES Number	
Monument Inscription/National Site Number	55702
Marker Type, Monumentation Type, Foundation	Brass centring pieces on top of concrete pillar on a concrete plate
Mark dot of coordinates	Centre of the centring device and top of the pillar

Site Location Information	
City or Town	Madrid
State or Province	
Country	Spain
Responsible Agency (Full Address)	Instituto Geógrafico Nacional Avda. General Ibañez de Ibero, 3 ES-28003 Madrid Spain
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4849333.209 m Y = -360298.691 m Z = 4114740.535 m
Height in UELN-95/98	762.103 m
Gravity in ISGN71	979 972.47 mgal

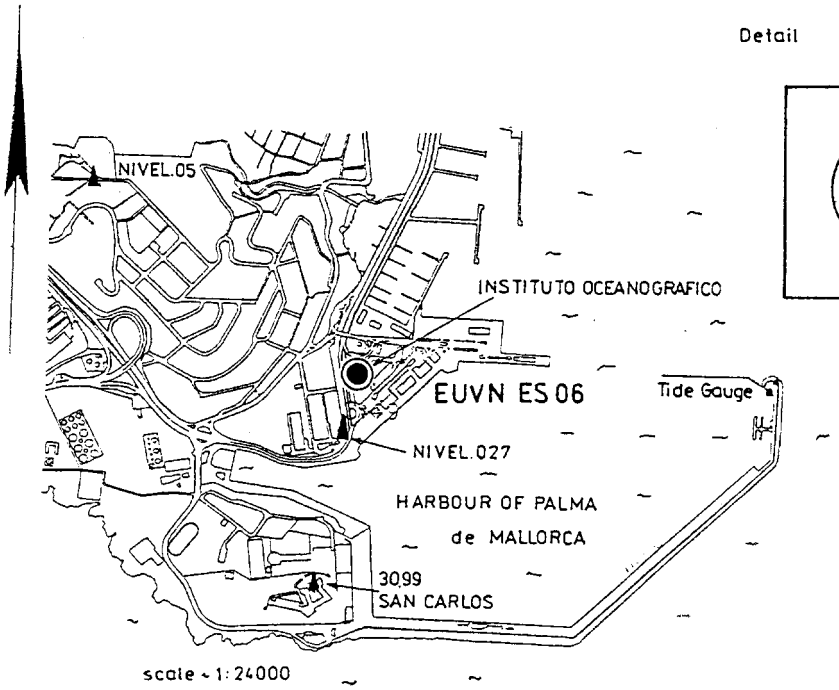


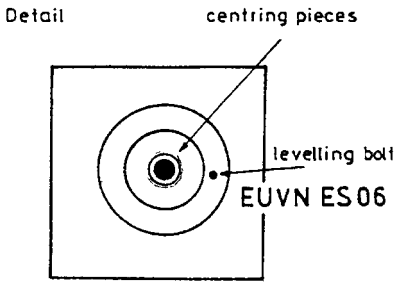
European Vertical GPS Reference Network (EUVN)

Station Palma de Mallorca

Site Identification of the GPS Monument	
4-Char. EUVN ID	ES06
DOMES Number	
Monument Inscription/National Site Number	69801
Marker Type, Monumentation Type, Foundation	Concrete pillar with metal plate and brass bolt for centring mask on the roof of the laboratory
Mark dot of coordinates	Centre of the brass bolt and for the height a height bolt on the side on a metal plate

Site Location Information	
City or Town	Palma de Mallorca
State or Province	
Country	Spain
Responsible Agency (Full Address)	Instituto Geógrafico Nacional Avda. General Ibañez de Ibero, 3 ES-28003 Madrid Spain
Contact Agency Information	D. José Luis Lopez Jurado Pasco Maritimo Ingeniero G. Roca. S/n ES - Palma de Mallorca Spain
Coordinates in ETRS89, Epoch 97.4	X = 4919369.167 m Y = 225504.688 m Z = 4039845.295 m
Height in UELN-95/98	10.083 m
Gravity in ISGN71	980166.36 mgal



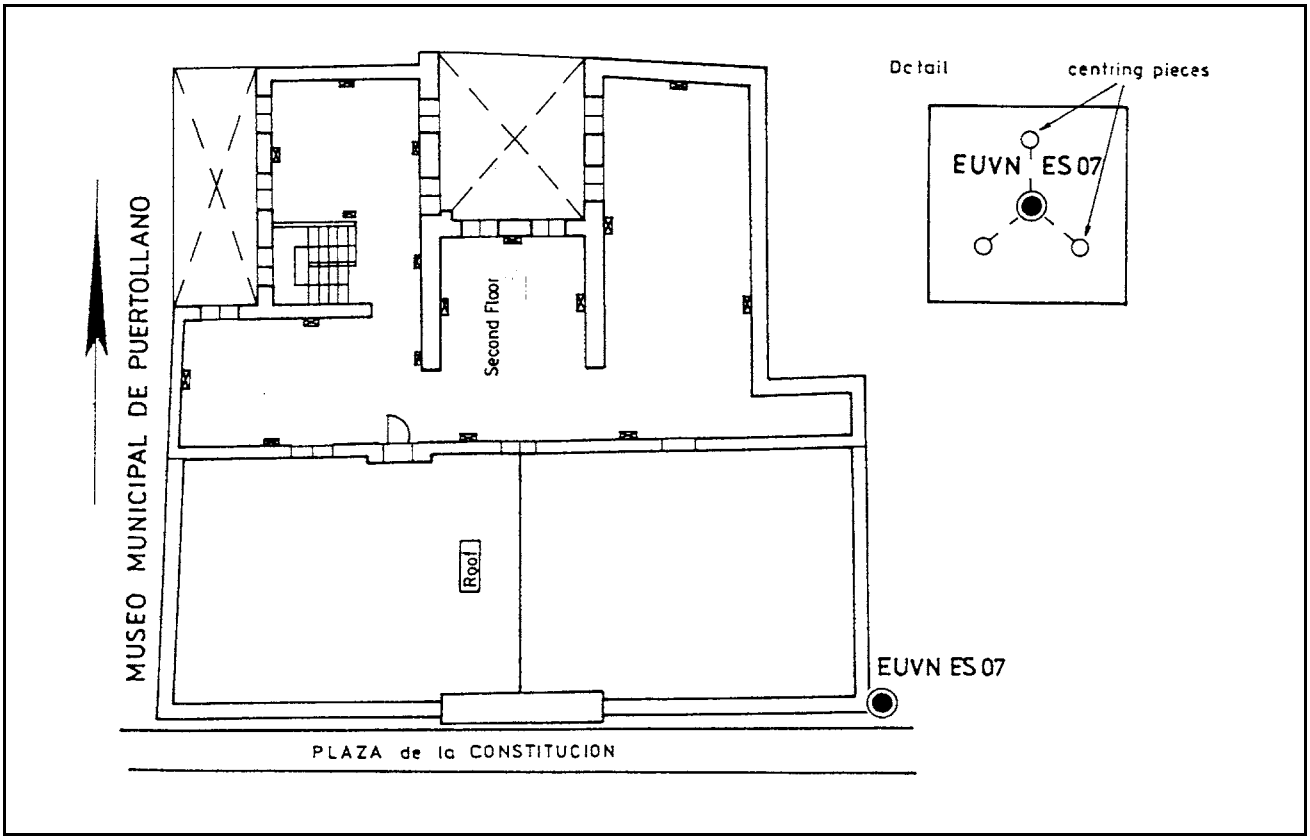


European Vertical GPS Reference Network (EUVN)

Station Puertollano

Site Identification of the GPS Monument	
4-Char. EUVN ID	ES07
DOMES Number	
Monument Inscription/National Site Number	81002
Marker Type, Monumentation Type, Foundation	Brass centring pieces on the top of a building pillar on the roof of the Museo Municipal
Mark dot of coordinates	Centre of the centring device and top of the wall

Site Location Information	
City or Town	Ciudad Real
State or Province	
Country	Spain
Responsible Agency (Full Address)	Instituto Geógrafico Nacional Avda. General Ibañez de Ibero, 3 ES-28003 Madrid Spain
Contact Agency Information	D. Raul Menazalvas Valderas Museo Municipal Plaza de la Constitucion. 3 ES - Puertollano (Ciudad Real) Spain
Coordinates in ETRS89, Epoch 97.4	X = 4972908.318 m Y = -357377.704 m Z = 3965709.728 m
Height in UELN-95/98	709.871 m
Gravity in ISGN71	979874.40 mgal

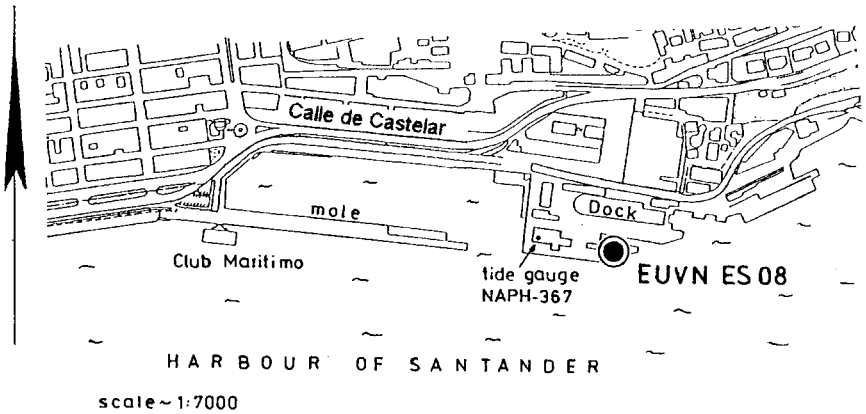


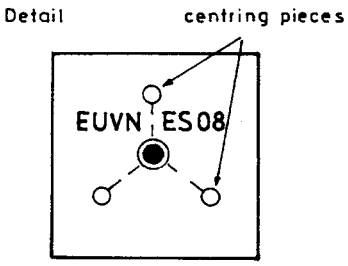
European Vertical GPS Reference Network (EUVN)

Station Santander

Site Identification of the GPS Monument	
4-Char. EUVN ID	ES08
DOMES Number	
Monument Inscription/National Site Number	3501
Marker Type, Monumentation Type, Foundation	Brass centring pieces on the top of a building pillar on the roof of the workshop building
Mark dot of coordinates	Centre of the centring device and top of the wall

Site Location Information	
City or Town	Santander
State or Province	
Country	Spain
Responsible Agency (Full Address)	Instituto Geógrafico Nacional Avda. General Ibañez de Ibero, 3 ES-28003 Madrid Spain
Contact Agency Information	D. Albino Pardo Rodriguez Autoridad Portuaria de Santander Paseo de Pereda. 33-1° ES-39071 Santander Spain
Coordinates in ETRS89, Epoch 97.4	X = 4626748.424 m Y = -306451.383 m Z = 4364890.931 m
Height in UELN-95/98	8.968 m
Gravity in ISGN71	980482.44 mgal





European Vertical GPS Reference Network (EUVN)

Station San Fernando

Site Identification of the GPS Monument	
4-Char. EUVN ID	SFER
DOMES Number	13402 M 004
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	
Mark dot of coordinates	

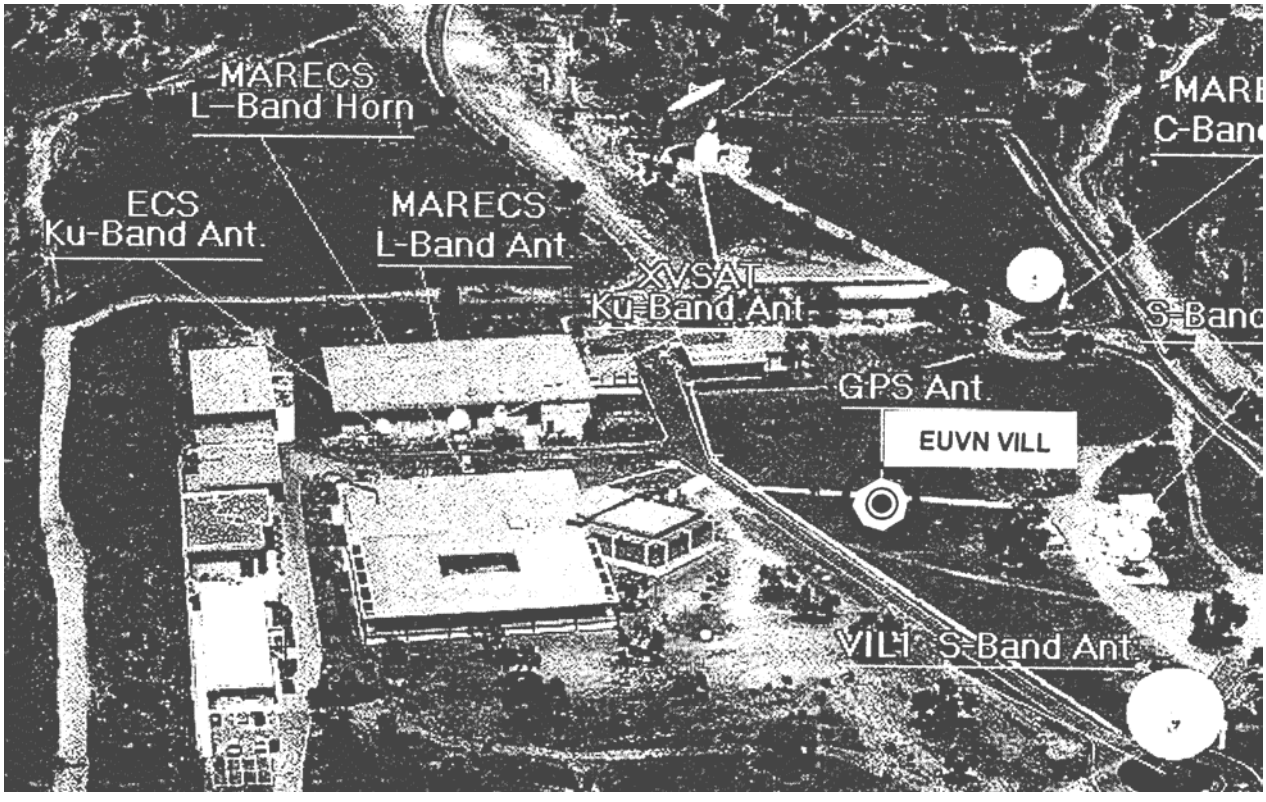
Site Location Information	
City or Town	San Fernando
State or Province	Cádiz
Country	Spain
Responsible Agency (Full Address)	Real Instituto y Observatorio de la Armada Cecilio Pujazon, s/n ES-11110 San Fernando (Cádiz) Spain
Contact Agency Information	Real Instituto y Observatorio de la Armada (ROA) Spain
Coordinates in ETRS89, Epoch 97.4	X = 5105519.198 m Y = -555146.114 m Z = 3769803.100 m
Height in UELN-95/98	38.939 m
Gravity in ISGN71	979820.64 mgal

European Vertical GPS Reference Network (EUVN)

Station Villafranca

Site Identification of the GPS Monument	
4-Char. EUVN ID	VILL
DOMES Number	13406 M 001
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	
Mark dot of coordinates	

Site Location Information	
City or Town	Villafranca
State or Province	Madrid
Country	Spain
Responsible Agency (Full Address)	ESA/ESOC Robert-Bosch-Str. 5 D-64293 Darmstadt Germany
Contact Agency Information	ESA Villafranca Satellite Station Apatado P.O. Box 50727 ES-28080 Madrid Spain
Coordinates in ETRS89, Epoch 97.4	X = 4849833.912 m Y = -335049.291 m Z = 4116014.685 m
Height in UELN-95/98	
Gravity in ISGN71	980199.47 mgal

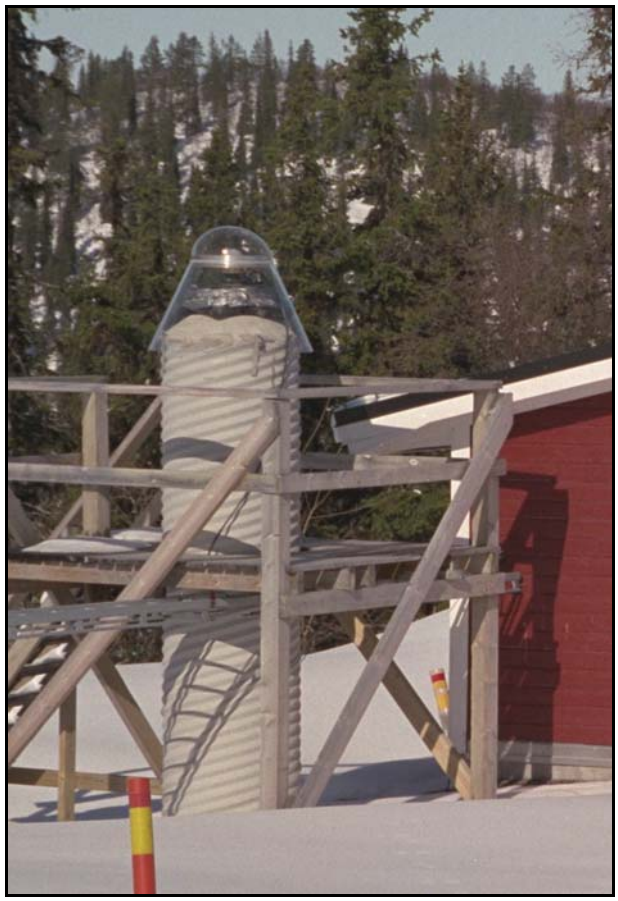


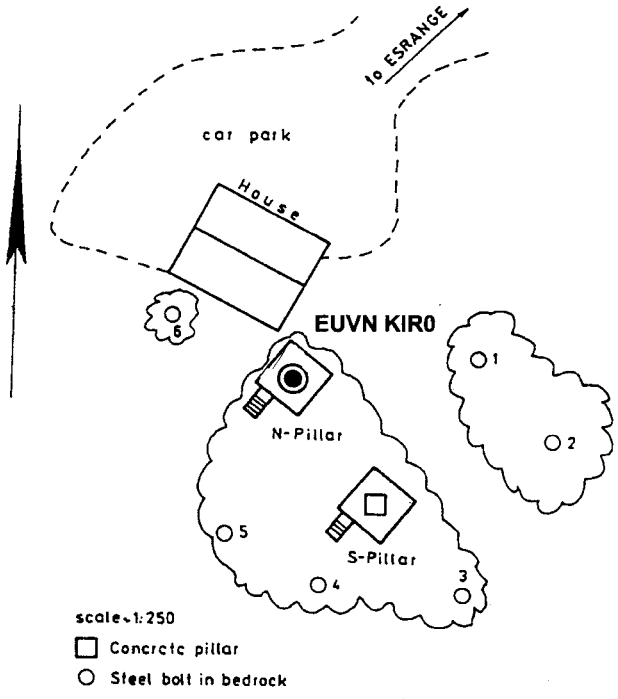
European Vertical GPS Reference Network (EUVN)

Station Kiruna

Site Identification of the GPS Monument	
4-Char. EUVN ID	KIR0
DOMES Number	10422 M 001
Monument Inscription/National Site Number	Kiruna SWEPOS 1993
Marker Type, Monumentation Type, Foundation	3 m high pillar with steel support and plate, north pillar
Mark dot of coordinates	Centre hole of the plate and top of the plate

Site Location Information	
City or Town	Kiruna
State or Province	
Country	Sweden
Responsible Agency (Full Address)	National Land Survey Landmäterigatan 2 S-80182 Gävle Sweden
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 2248123.511 m Y = 865686.532 m Z = 5886425.595 m
Height in UELN-95/98	469.314 m
Gravity in ISGN71	



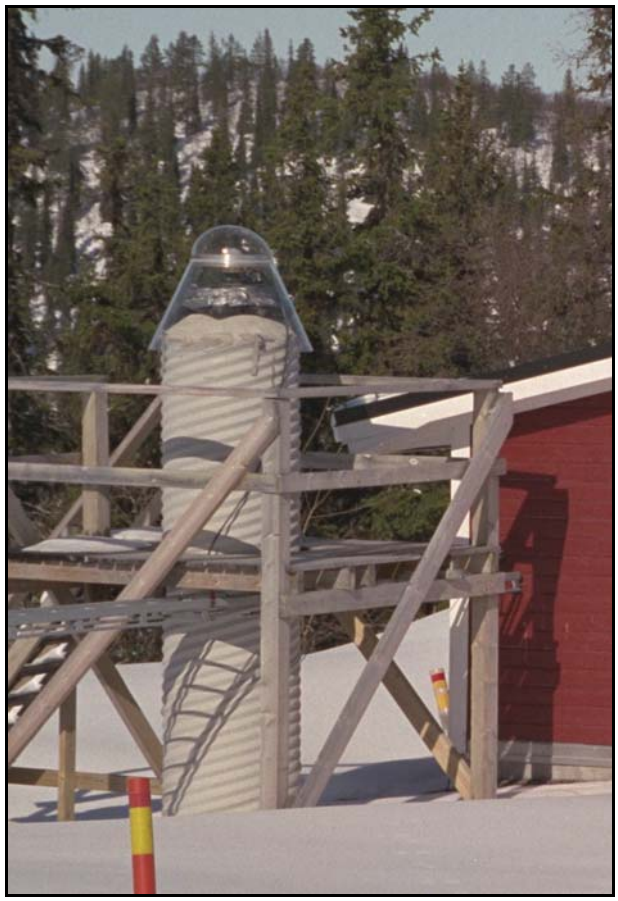


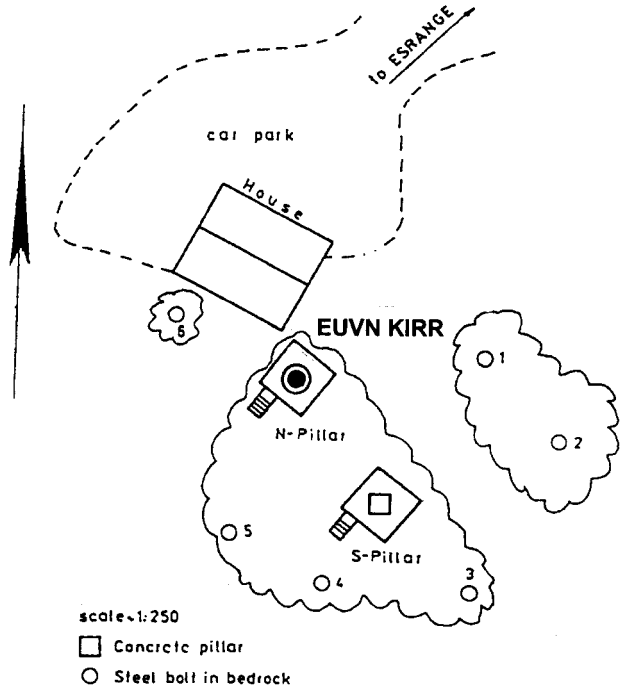
European Vertical GPS Reference Network (EUVN)

Station Kiruna R

Site Identification of the GPS Monument	
4-Char. EUVN ID	KIRR
DOMES Number	
Monument Inscription/National Site Number	Kiruna SWEPOS 1993
Marker Type, Monumentation Type, Foundation	3 m high pillar with steel support and plate, north pillar
Mark dot of coordinates	Centre hole of the plate and top of the plate

Site Location Information	
City or Town	Kiruna
State or Province	
Country	Sweden
Responsible Agency (Full Address)	National Land Survey Landmäterigatan 2 S-80182 Gävle Sweden
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 2248123.509 m Y = 865686.535 m Z = 5886425.590 m
Height in UELN-95/98	
Gravity in ISGN71	



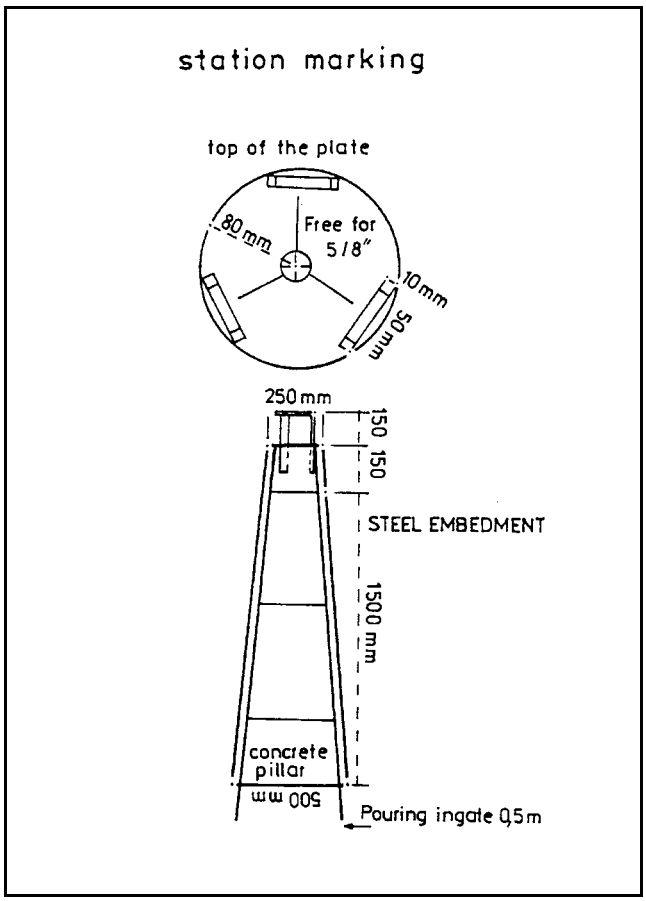


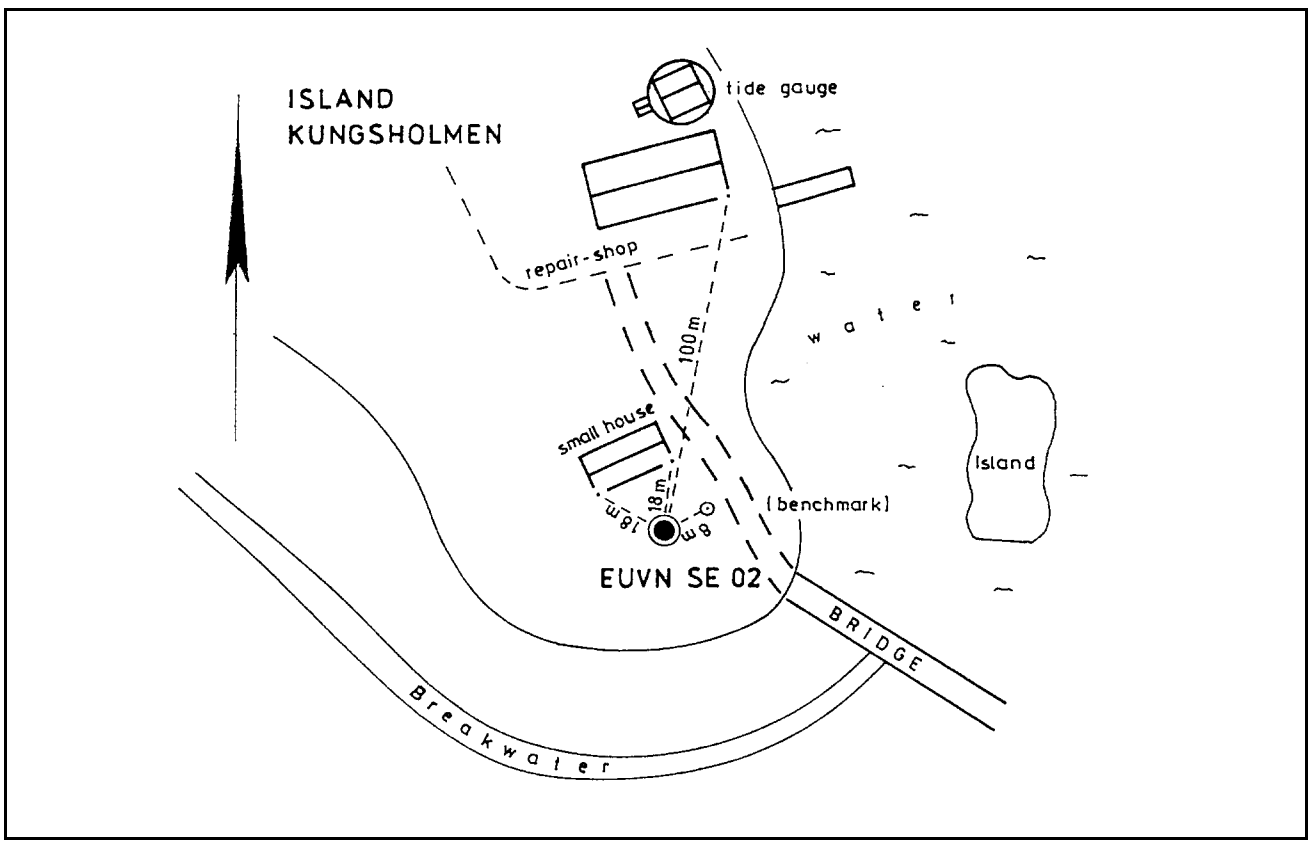
European Vertical GPS Reference Network (EUVN)

Station Kungsholmsfort

Site Identification of the GPS Monument	
4-Char. EUVN ID	SE02
DOMES Number	
Monument Inscription/National Site Number	0353710
Marker Type, Monumentation Type, Foundation	Pillar with steel support and plate with hole, on bedrock
Mark dot of coordinates	Centre hole of the plate and top of the plate

Site Location Information	
City or Town	Karlskrona
State or Province	
Country	Sweden
Responsible Agency (Full Address)	National Land Survey Landmäterigatan 2 S-80182 Gävle Sweden
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3434083.638 m Y = 958104.678 m Z = 5270952.803 m
Height in UELN-95/98	2.415 m
Gravity in ISGN71	



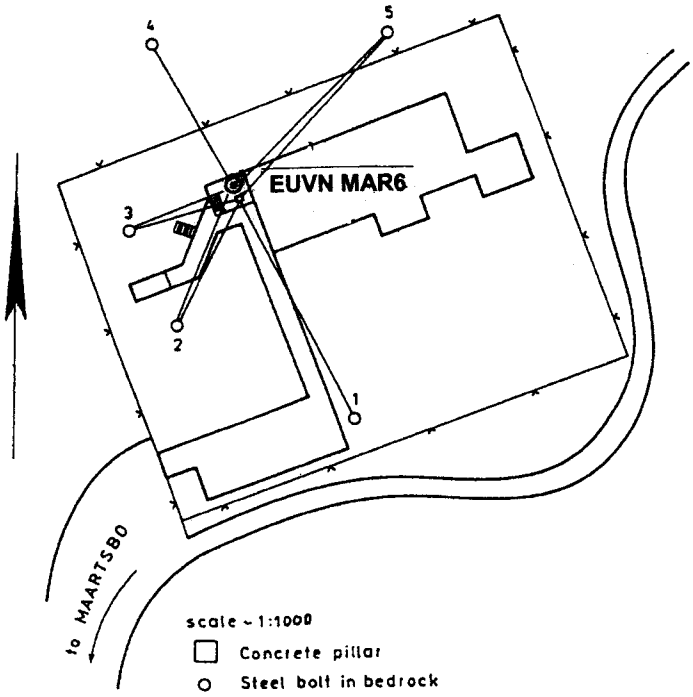


European Vertical GPS Reference Network (EUVN)

Station Maartsbo

Site Identification of the GPS Monument	
4-Char. EUVN ID	MAR6
DOMES Number	10405 M 002
Monument Inscription/National Site Number	Maartsbo SWEPOS 1993
Marker Type, Monumentation Type, Foundation	3 m high pillar with steel support and plate, north pillar
Mark dot of coordinates	

Site Location Information	
City or Town	Maartsbo
State or Province	
Country	Sweden
Responsible Agency (Full Address)	National Land Survey Landmäterigatan 2 S-80182 Gävle Sweden
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 2998189.712 m Y = 931451.587 m Z = 5533398.470 m
Height in UELN-95/98	50.485 m
Gravity in ISGN71	

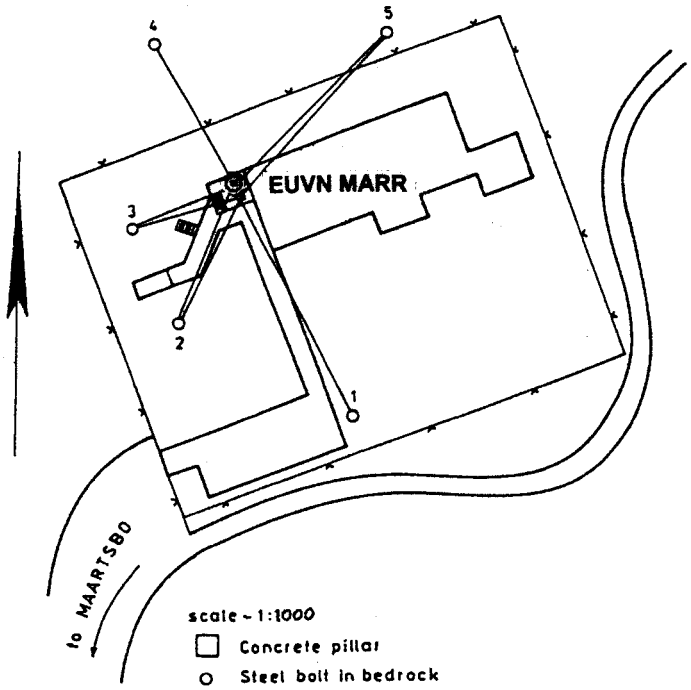


European Vertical GPS Reference Network (EUVN)

Station Maartsbo R

Site Identification of the GPS Monument	
4-Char. EUVN ID	MARR
DOMES Number	
Monument Inscription/National Site Number	Maartsbo SWEPOS 1993
Marker Type, Monumentation Type, Foundation	3 m high pillar with steel support and plate, north pillar
Mark dot of coordinates	

Site Location Information	
City or Town	Gaevle
State or Province	
Country	Sweden
Responsible Agency (Full Address)	National Land Survey Landmäterigatan 2 S-80182 Gävle Sweden
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 2998189.715 m Y = 931451.590 m Z = 5533398.476 m
Height in UELN-95/98	
Gravity in ISGN71	

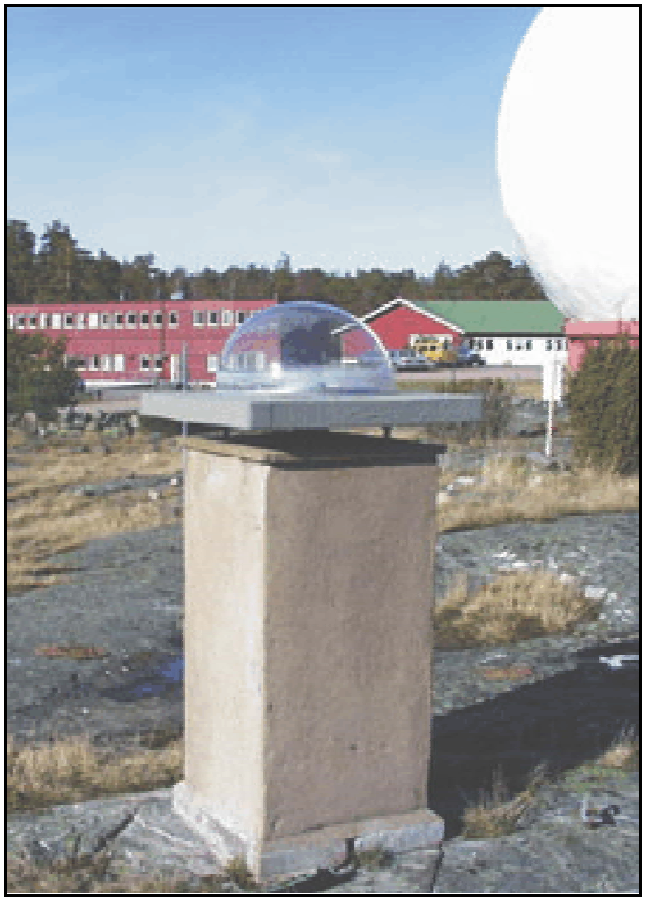


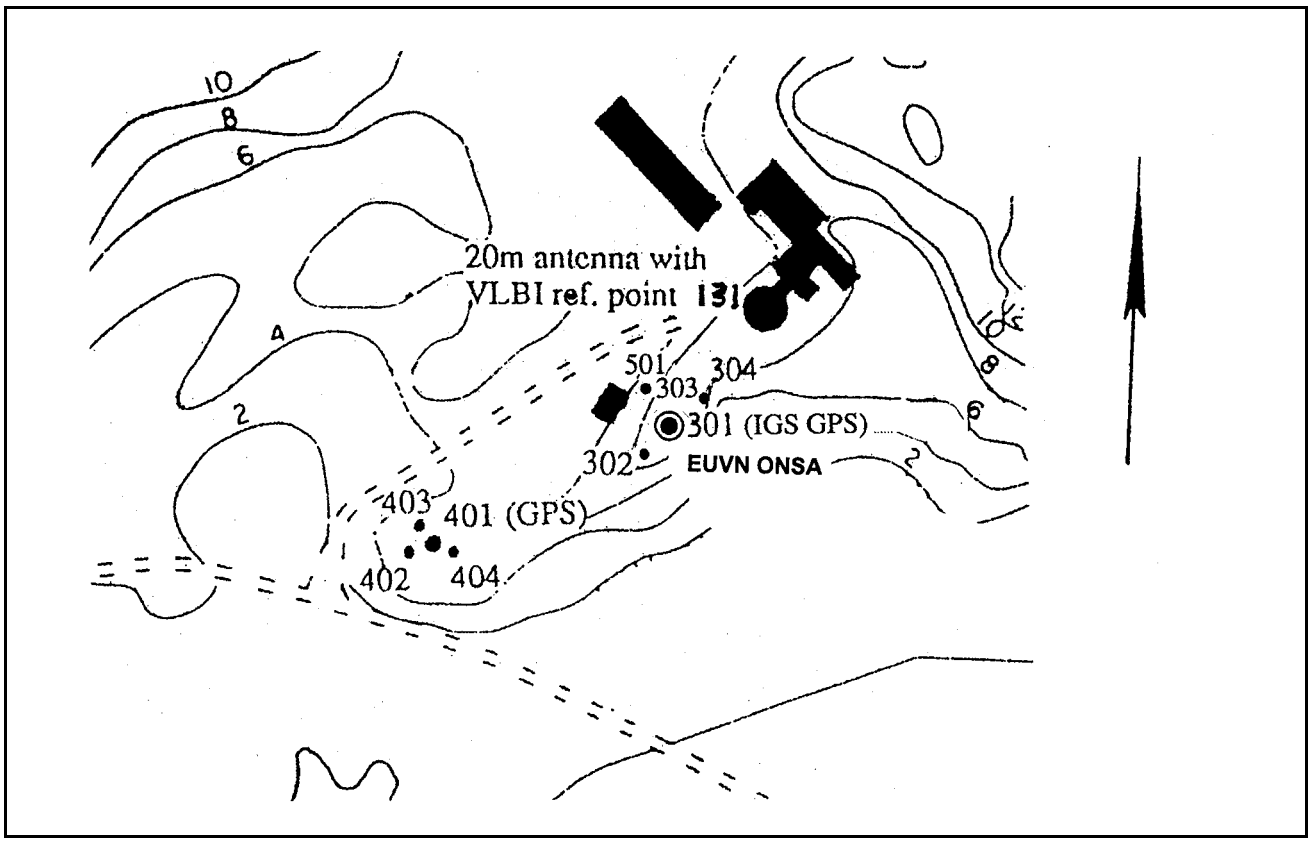
European Vertical GPS Reference Network (EUVN)

Station Onsala

Site Identification of the GPS Monument	
4-Char. EUVN ID	ONSA
DOMES Number	10402 M 004
Monument Inscription/National Site Number	Onsala 301
Marker Type, Monumentation Type, Foundation	Bolt in rock, in the foot within the pillar, over that antenna on pillar head
Mark dot of coordinates	Centre and top of the bolt

Site Location Information	
City or Town	Onsala
State or Province	
Country	Sweden
Responsible Agency (Full Address)	National Land Survey Landmäterigatan 2 S-80182 Gävle Sweden
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3370658.837 m Y = 711876.946 m Z = 5349786.756 m
Height in UELN-95/98	9.099 m
Gravity in ISGN71	



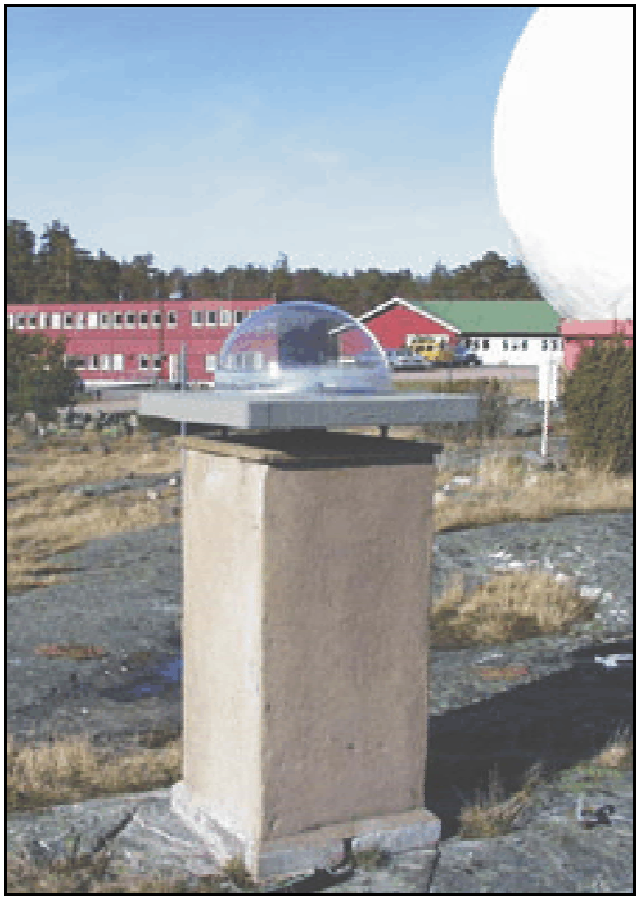


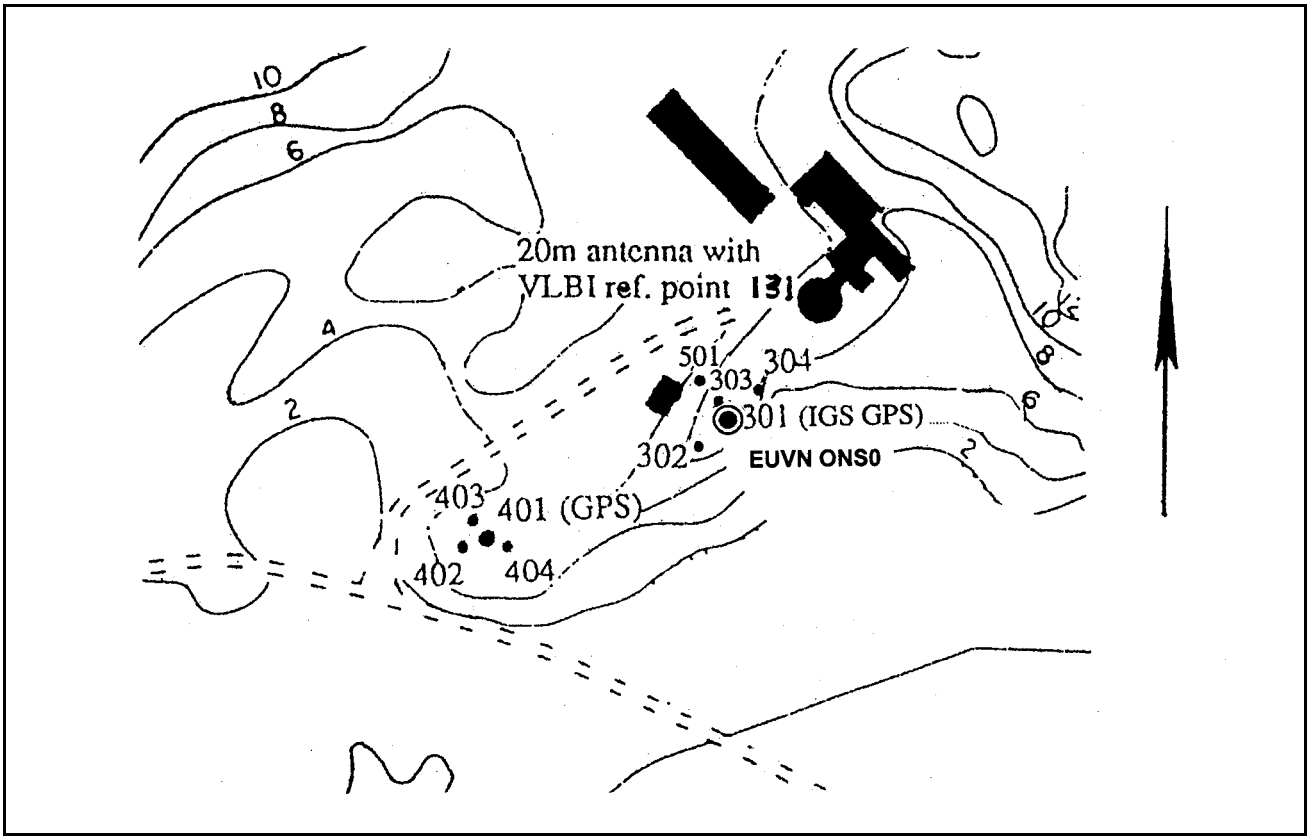
European Vertical GPS Reference Network (EUVN)

Station Onsala 0

Site Identification of the GPS Monument	
4-Char. EUVN ID	ONS0
DOMES Number	10402 M 004
Monument Inscription/National Site Number	Onsala 301
Marker Type, Monumentation Type, Foundation	Bolt in rock, in the foot within the pillar, over that antenna on pillar head
Mark dot of coordinates	Centre and top of the bolt

Site Location Information	
City or Town	Onsala
State or Province	
Country	Sweden
Responsible Agency (Full Address)	National Land Survey Landmäterigatan 2 S-80182 Gävle Sweden
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3370658.844 m Y = 711876.944 m Z = 5349786.765 m
Height in UELN-95/98	
Gravity in ISGN71	



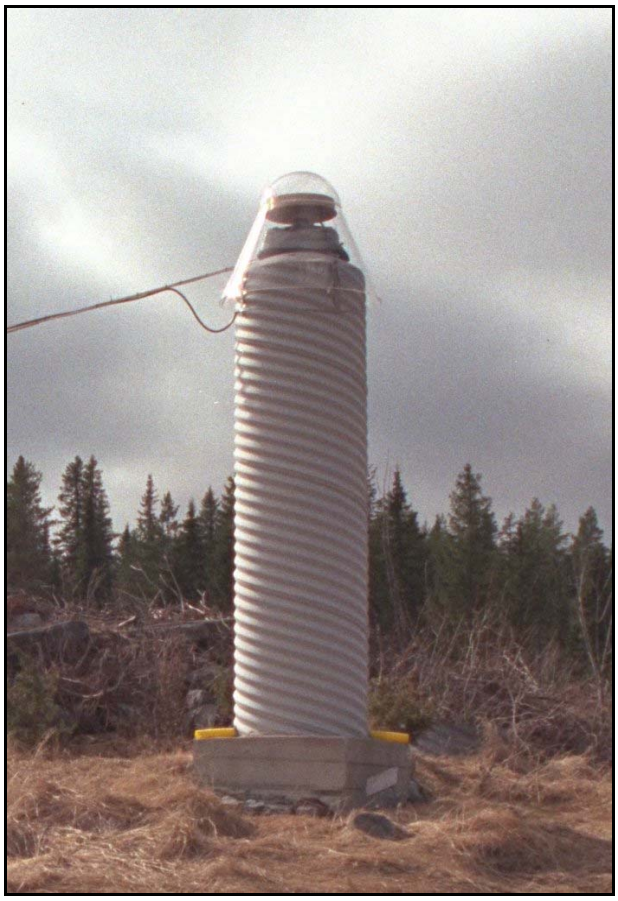


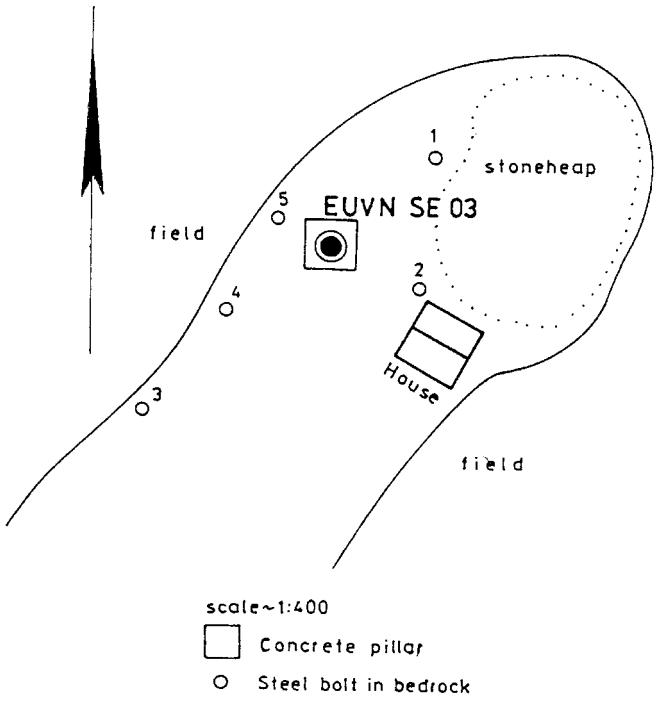
European Vertical GPS Reference Network (EUVN)

Station Oestersund

Site Identification of the GPS Monument	
4-Char. EUVN ID	SE03
DOMES Number	
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	3 m high concrete pillar with steel support and plate
Mark dot of coordinates	

Site Location Information	
City or Town	Oestersund
State or Province	
Country	Sweden
Responsible Agency (Full Address)	National Land Survey Landmäterigatan 2 S-80182 Gävle Sweden
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 2763885.517 m Y = 733247.335 m Z = 5682653.340 m
Height in UELN-95/98	458.334 m
Gravity in ISGN71	



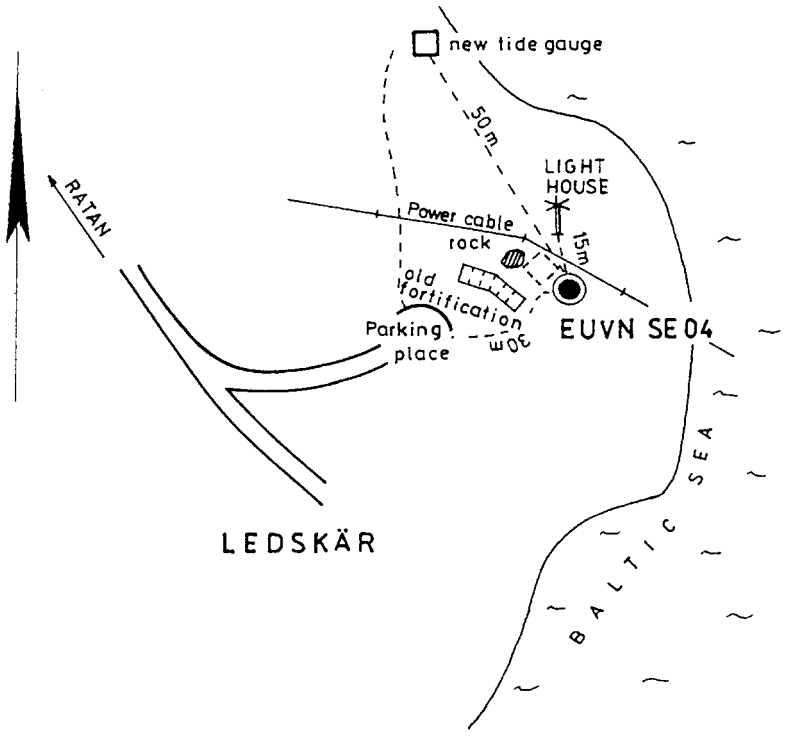


European Vertical GPS Reference Network (EUVN)

Station Ratan

Site Identification of the GPS Monument	
4-Char. EUVN ID	SE04
DOMES Number	
Monument Inscription/National Site Number	2101911
Marker Type, Monumentation Type, Foundation	Pillar with steel support and plate with hole, on bedrock
Mark dot of coordinates	Centre hole of the plate and top of the plate

Site Location Information	
City or Town	Umea
State or Province	
Country	Sweden
Responsible Agency (Full Address)	National Land Survey Landmäterigatan 2 S-80182 Gävle Sweden
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 2620558.280 m Y = 1000461.523 m Z = 5709038.623 m
Height in UELN-95/98	9.993 m
Gravity in ISGN71	

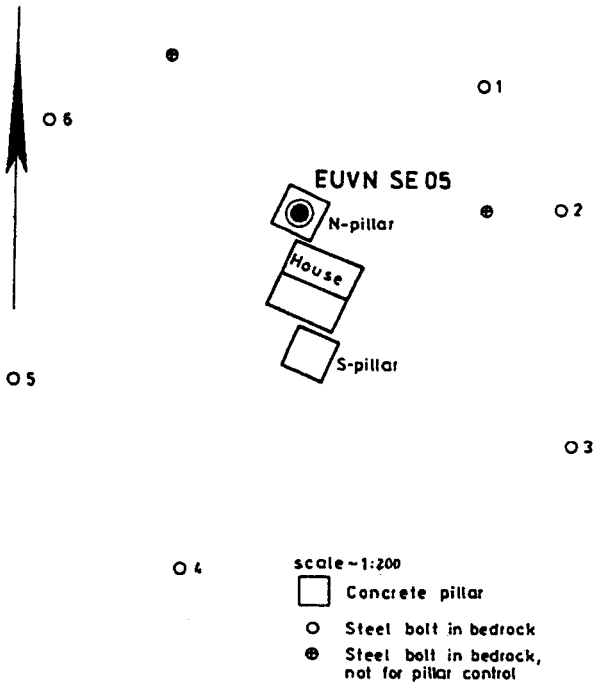


European Vertical GPS Reference Network (EUVN)

Station Skellefteaa

Site Identification of the GPS Monument	
4-Char. EUVN ID	SE05
DOMES Number	
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	3 m high concrete pillar with steel support and plate, the north pillar
Mark dot of coordinates	

Site Location Information	
City or Town	Skellefteaa
State or Province	
Country	Sweden
Responsible Agency (Full Address)	National Land Survey Landmäterigatan 2 S-80182 Gävle Sweden
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 2534031.198 m Y = 975174.404 m Z = 5752078.335 m
Height in UELN-95/98	58.850 m
Gravity in ISGN71	

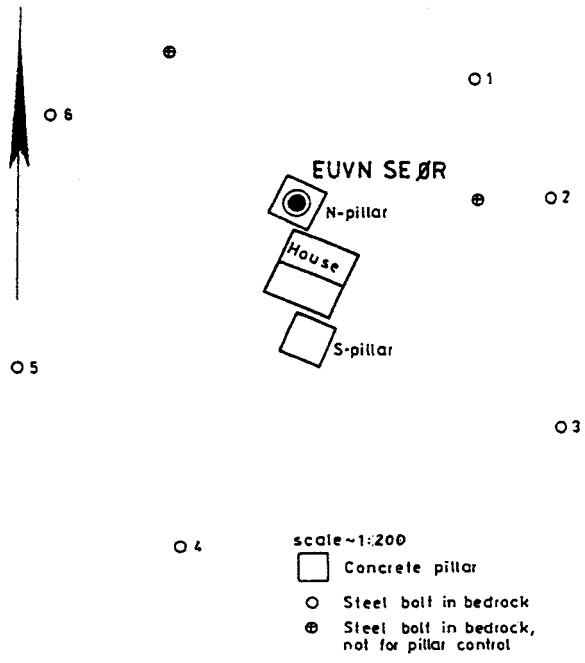


European Vertical GPS Reference Network (EUVN)

Station Skellefteaa R

Site Identification of the GPS Monument	
4-Char. EUVN ID	SE0R
DOMES Number	
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	3 m high concrete pillar with steel support and plate, the north pillar
Mark dot of coordinates	

Site Location Information	
City or Town	Skellefteaa
State or Province	
Country	Sweden
Responsible Agency (Full Address)	National Land Survey Landmäterigatan 2 S-80182 Gävle Sweden
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 2534031.198 m Y = 975174.404 m Z = 5752078.334 m
Height in UELN-95/98	
Gravity in ISGN71	

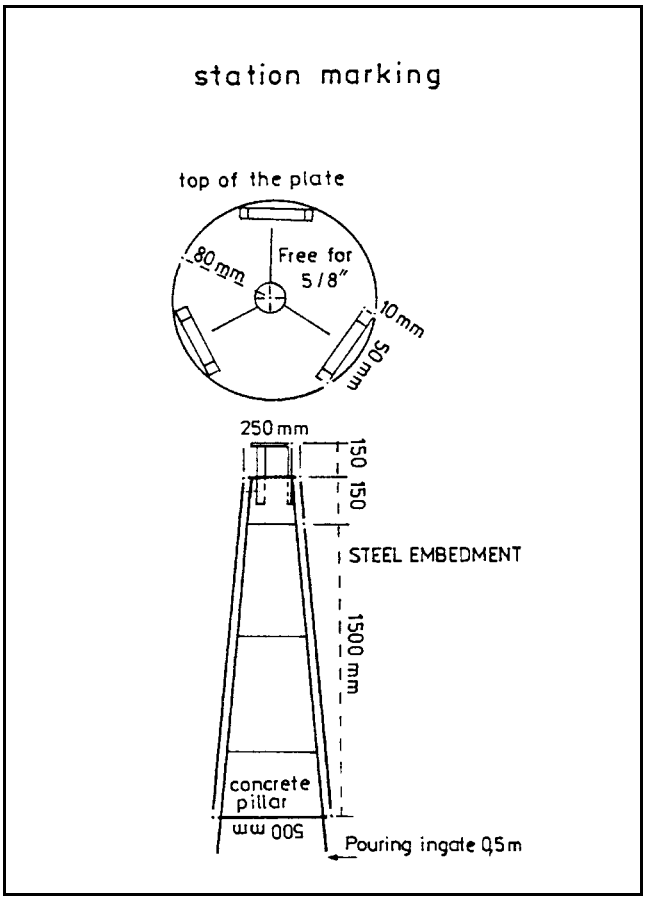


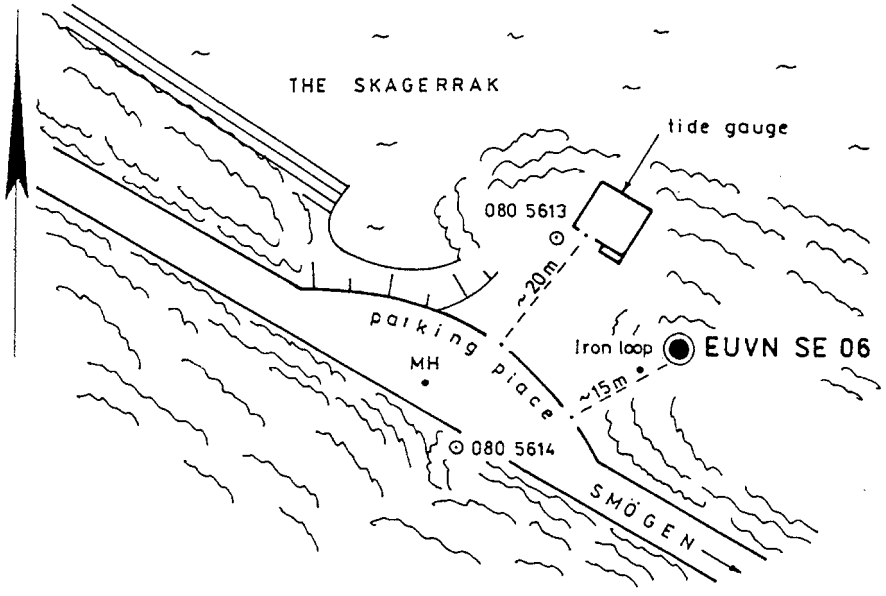
European Vertical GPS Reference Network (EUVN)

Station Smoegen

Site Identification of the GPS Monument	
4-Char. EUVN ID	SE06
DOMES Number	
Monument Inscription/National Site Number	0805615
Marker Type, Monumentation Type, Foundation	Concrete pillar with steel support and plate with hole, on bedrock
Mark dot of coordinates	Centre hole of the plate and top of the plate

Site Location Information	
City or Town	Smoegen
State or Province	
Country	Sweden
Responsible Agency (Full Address)	National Land Survey Landmäterigatan 2 S-80182 Gävle Sweden
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3290543.825 m Y = 652615.032 m Z = 5406535.377 m
Height in UELN-95/98	9.035 m
Gravity in ISGN71	



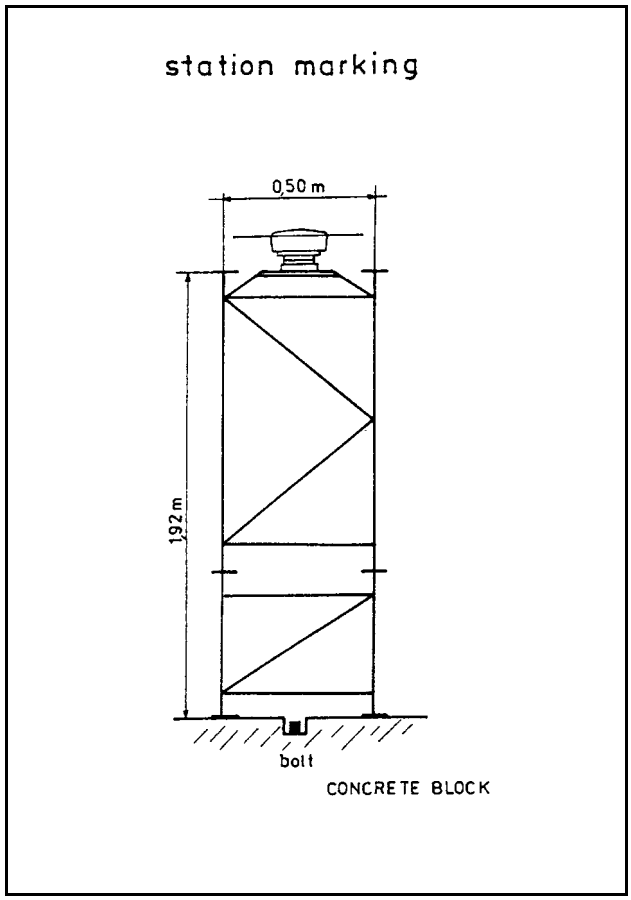


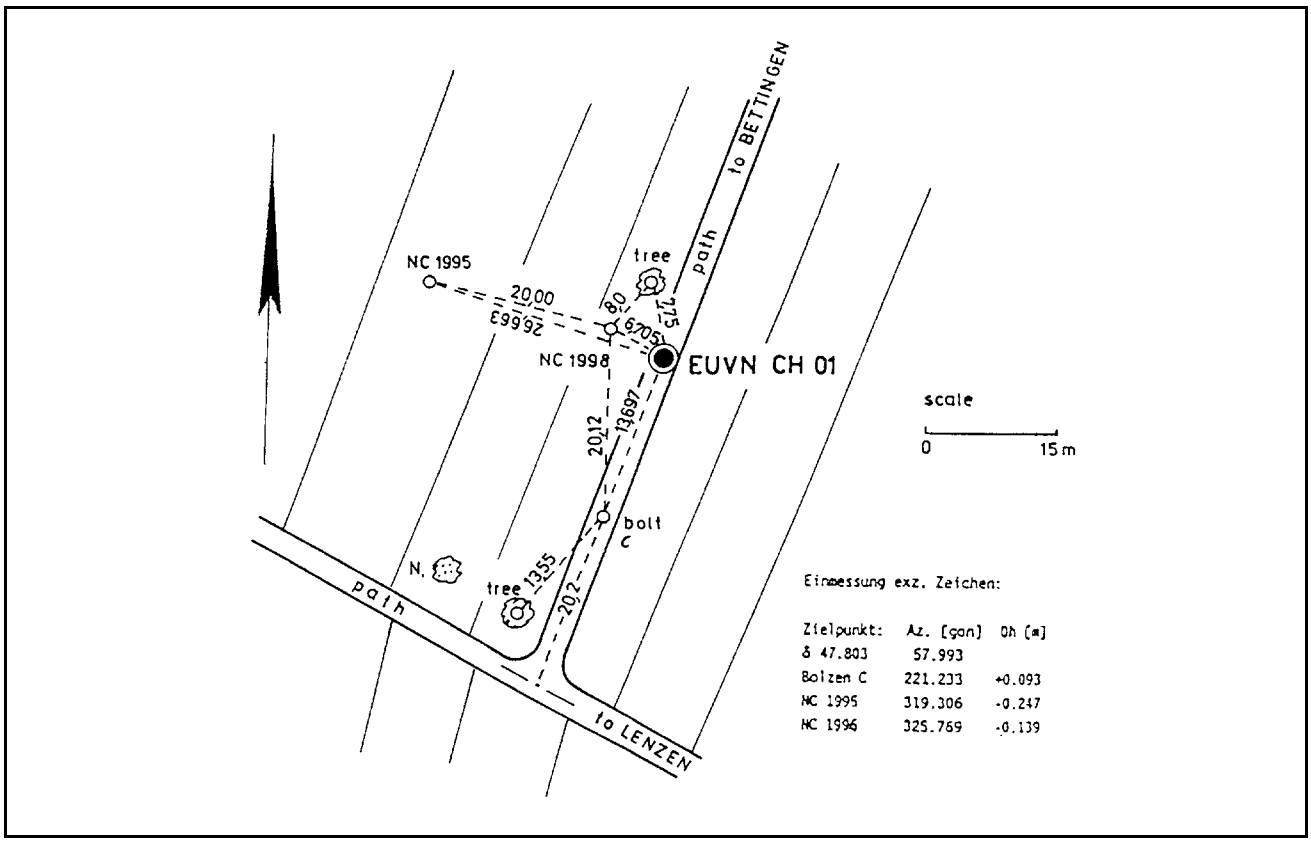
European Vertical GPS Reference Network (EUVN)

Station Chrischona

Site Identification of the GPS Monument	
4-Char. EUVN ID	CH01
DOMES Number	
Monument Inscription/National Site Number	1047.700
Marker Type, Monumentation Type, Foundation	Bolt with screw cap; 3 flanges for dismountable steel pillar; concrete block
Mark dot of coordinates	Centre and top of the bolt

Site Location Information	
City or Town	Bettingen
State or Province	Kt. BS
Country	Switzerland
Responsible Agency (Full Address)	Bundesamt für Landestopographie Seftigenstraße 264 CH-3084 Wabern Switzerland
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4273147.942 m Y = 575368.291 m Z = 4684903.632 m
Height in UELN-95/98	455.773 m
Gravity in ISGN71	980 735.4 mgal



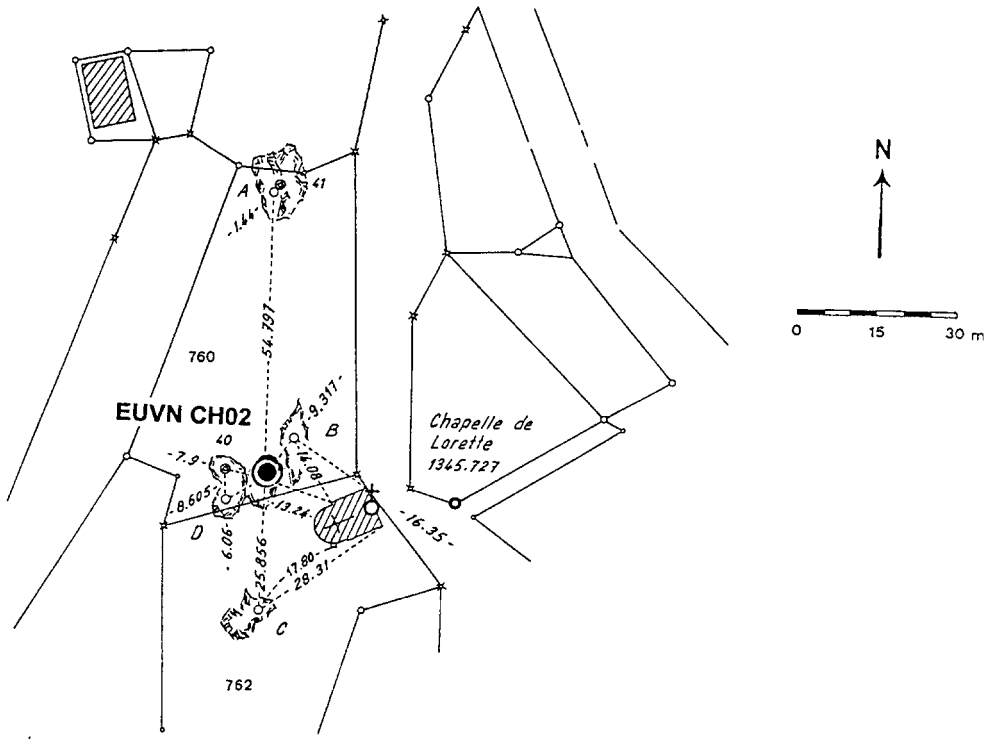


European Vertical GPS Reference Network (EUVN)

Station Bourg-St-Pierre

Site Identification of the GPS Monument	
4-Char. EUVN ID	CH02
DOMES Number	
Monument Inscription/National Site Number	1345.700
Marker Type, Monumentation Type, Foundation	Bolt with screw cap in rock
Mark dot of coordinates	Centre and top of bolt

Site Location Information	
City or Town	Bourg-St-Pierre
State or Province	Kt. VS
Country	Switzerland
Responsible Agency (Full Address)	Bundesamt für Landestopographie Seftigenstraße 264 CH-3084 Wabern Switzerland
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4407673.660 m Y = 557561.977 m Z = 4563260.328 m
Height in UELN-95/98	1629.321 m
Gravity in ISGN71	980 201.6 mgal

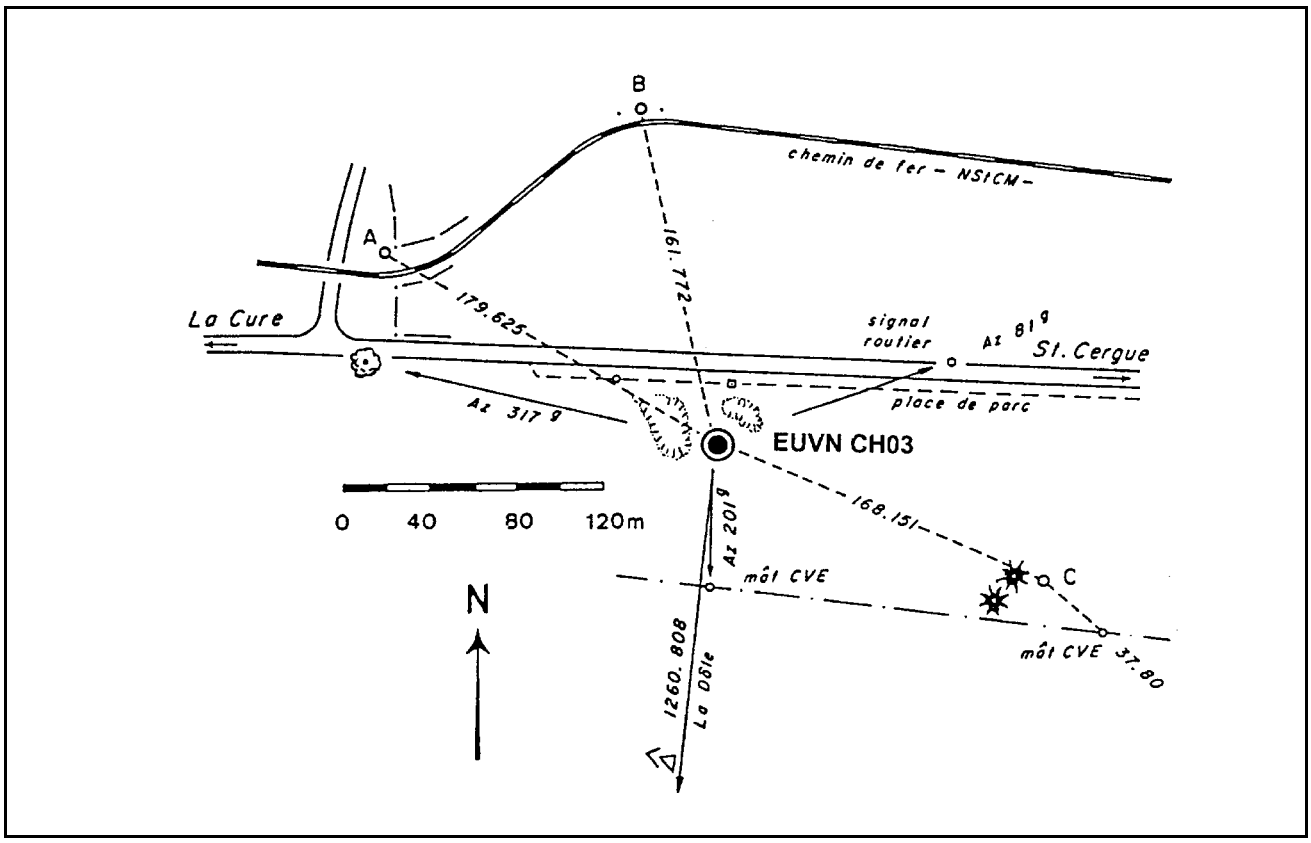


European Vertical GPS Reference Network (EUVN)

Station La Givrine

Site Identification of the GPS Monument	
4-Char. EUVN ID	CH03
DOMES Number	
Monument Inscription/National Site Number	1260.800
Marker Type, Monumentation Type, Foundation	Bolt with screw cap; 3 flanges for dismountable steel pillar; concrete block
Mark dot of coordinates	Centre and top of bolt

Site Location Information	
City or Town	St. Cergue
State or Province	Kt. VD
Country	Switzerland
Responsible Agency (Full Address)	Bundesamt für Landestopographie Seftigenstraße 264 CH-3084 Wabern Switzerland
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4377795.512 m Y = 468008.632 m Z = 4601077.264 m
Height in UELN-95/98	1207.278 m
Gravity in ISGN71	980 455.5 mgal

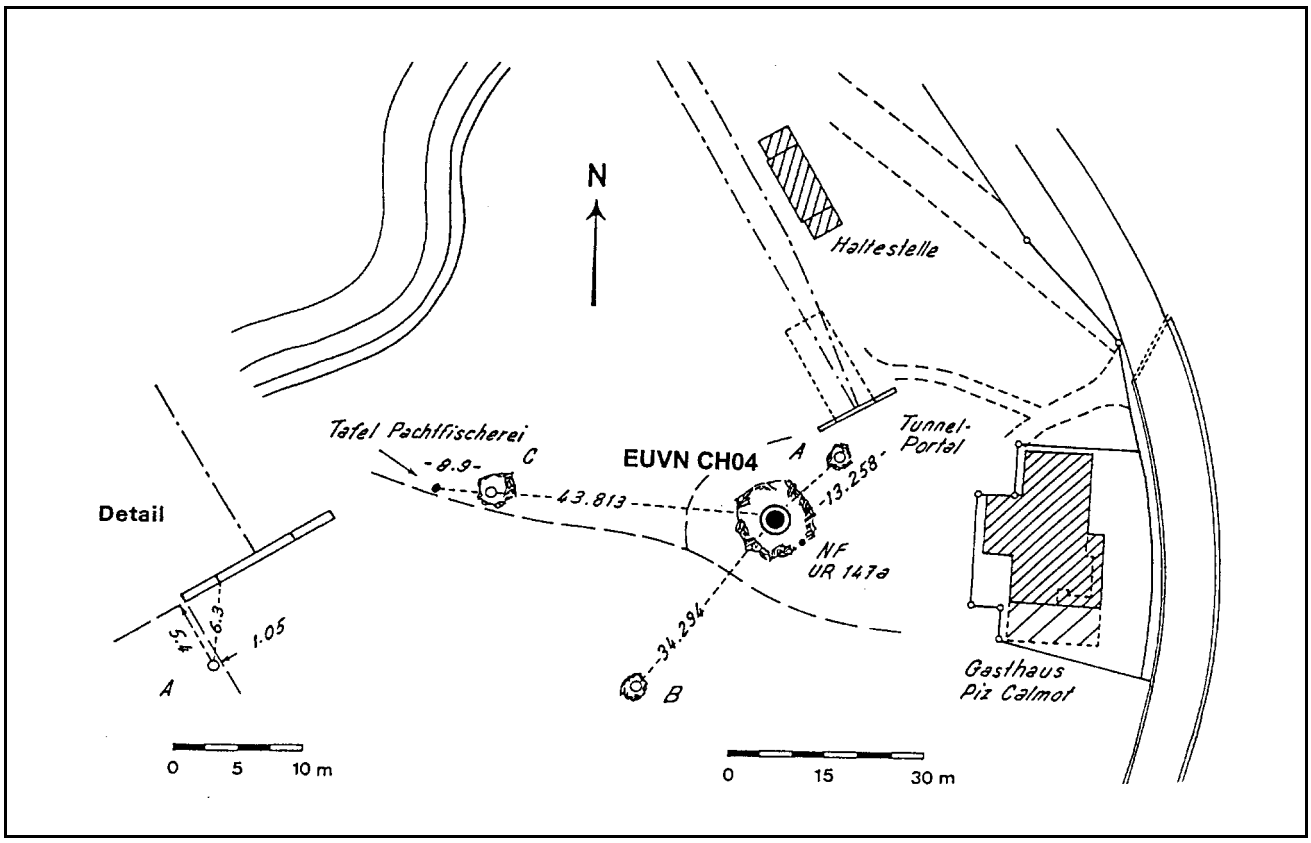


European Vertical GPS Reference Network (EUVN)

Station Oberalp

Site Identification of the GPS Monument	
4-Char. EUVN ID	CH04
DOMES Number	
Monument Inscription/National Site Number	1232.200
Marker Type, Monumentation Type, Foundation	Bolt with screw cap in rock
Mark dot of coordinates	Centre and top of bolt

Site Location Information	
City or Town	Andermatt
State or Province	Kt. UR
Country	Switzerland
Responsible Agency (Full Address)	Bundesamt für Landestopographie Seftigenstraße 264 CH-3084 Wabern Switzerland
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4336578.305 m Y = 661303.082 m Z = 4617410.033 m
Height in UELN-95/98	2042.489 m
Gravity in ISGN71	980 203.4 mgal

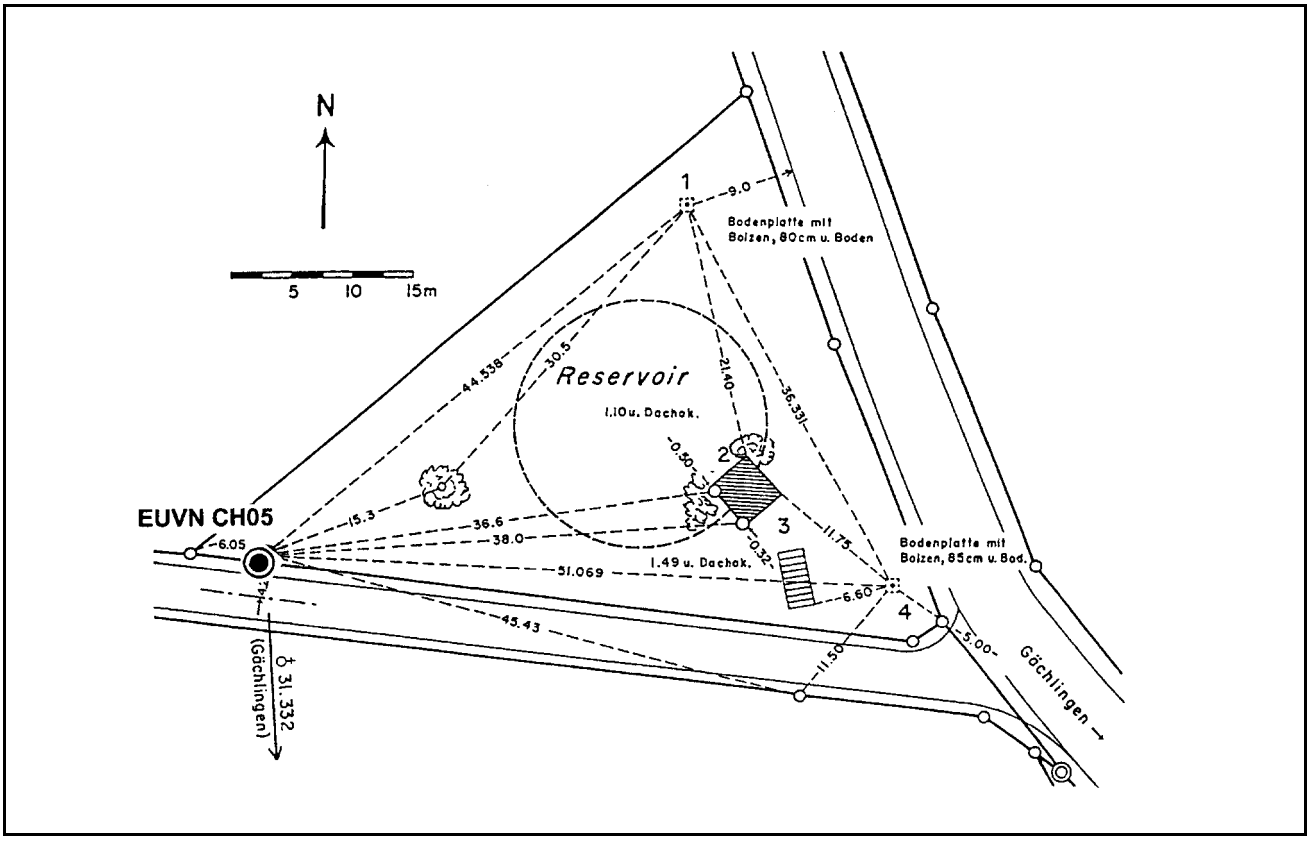


European Vertical GPS Reference Network (EUVN)

Station Siblingen

Site Identification of the GPS Monument	
4-Char. EUVN ID	CH05
DOMES Number	
Monument Inscription/National Site Number	1031.366
Marker Type, Monumentation Type, Foundation	Bolt with screw cap; 3 flanges for dismountable steel pillar; concrete block
Mark dot of coordinates	Centre and top of bolt

Site Location Information	
City or Town	Gaechlingen
State or Province	Kt. SH
Country	Switzerland
Responsible Agency (Full Address)	Bundesamt für Landestopographie Seftigenstraße 264 CH-3084 Wabern Switzerland
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4252539.462 m Y = 635461.585 m Z = 4695882.555 m
Height in UELN-95/98	514.832 m
Gravity in ISGN71	980 708.4 mgal

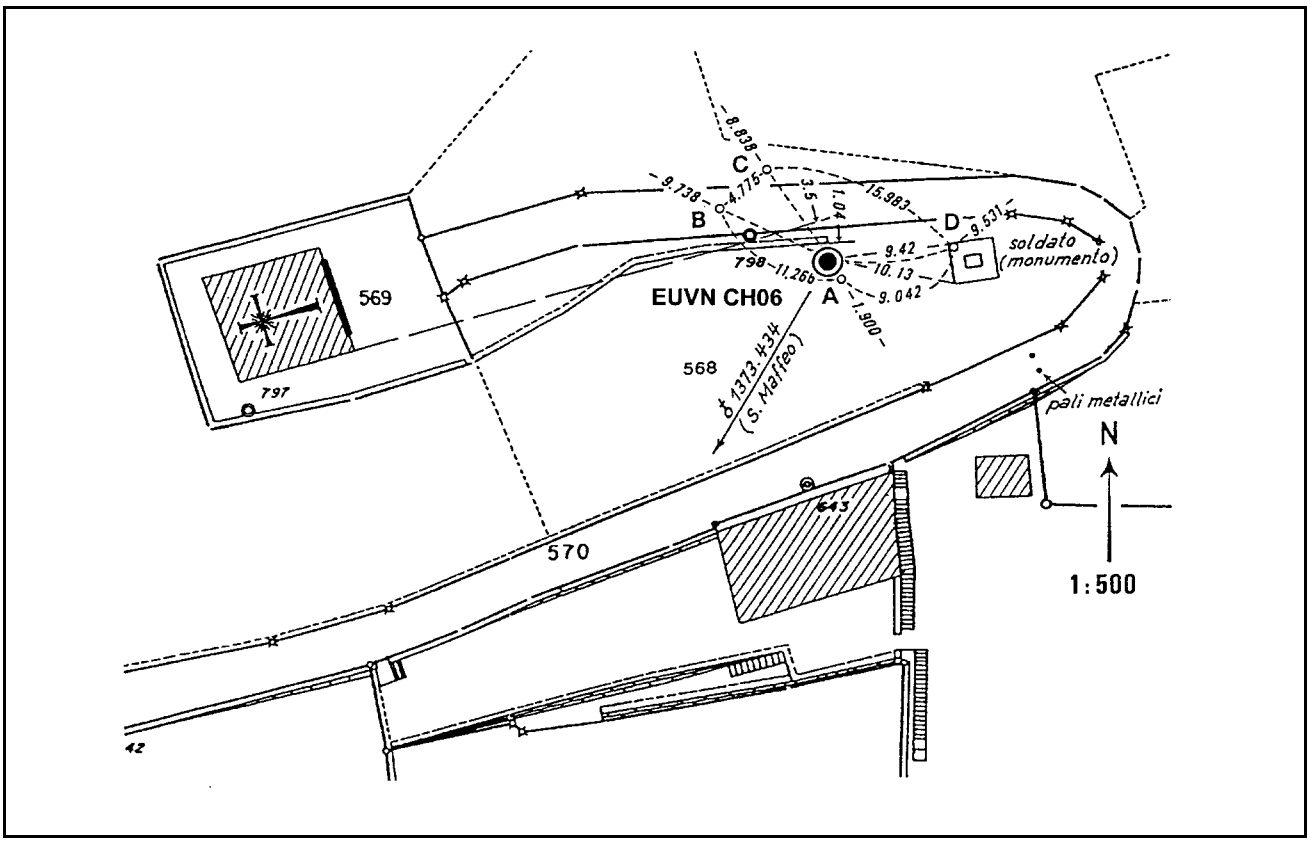


European Vertical GPS Reference Network (EUVN)

Station Stabio

Site Identification of the GPS Monument	
4-Char. EUVN ID	CH06
DOMES Number	
Monument Inscription/National Site Number	1373.425
Marker Type, Monumentation Type, Foundation	Bolt with screw cap; 3 flanges for dismountable steel pillar; rock
Mark dot of coordinates	Centre and top of the bolt

Site Location Information	
City or Town	Stabio
State or Province	Kt. Tessin
Country	Switzerland
Responsible Agency (Full Address)	Bundesamt für Landestopographie Seftigenstraße 264 CH-3084 Wabern Switzerland
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4396411.746 m Y = 691631.110 m Z = 4554070.562 m
Height in UELN-95/98	382.128 m
Gravity in ISGN71	980 556.9 mgal

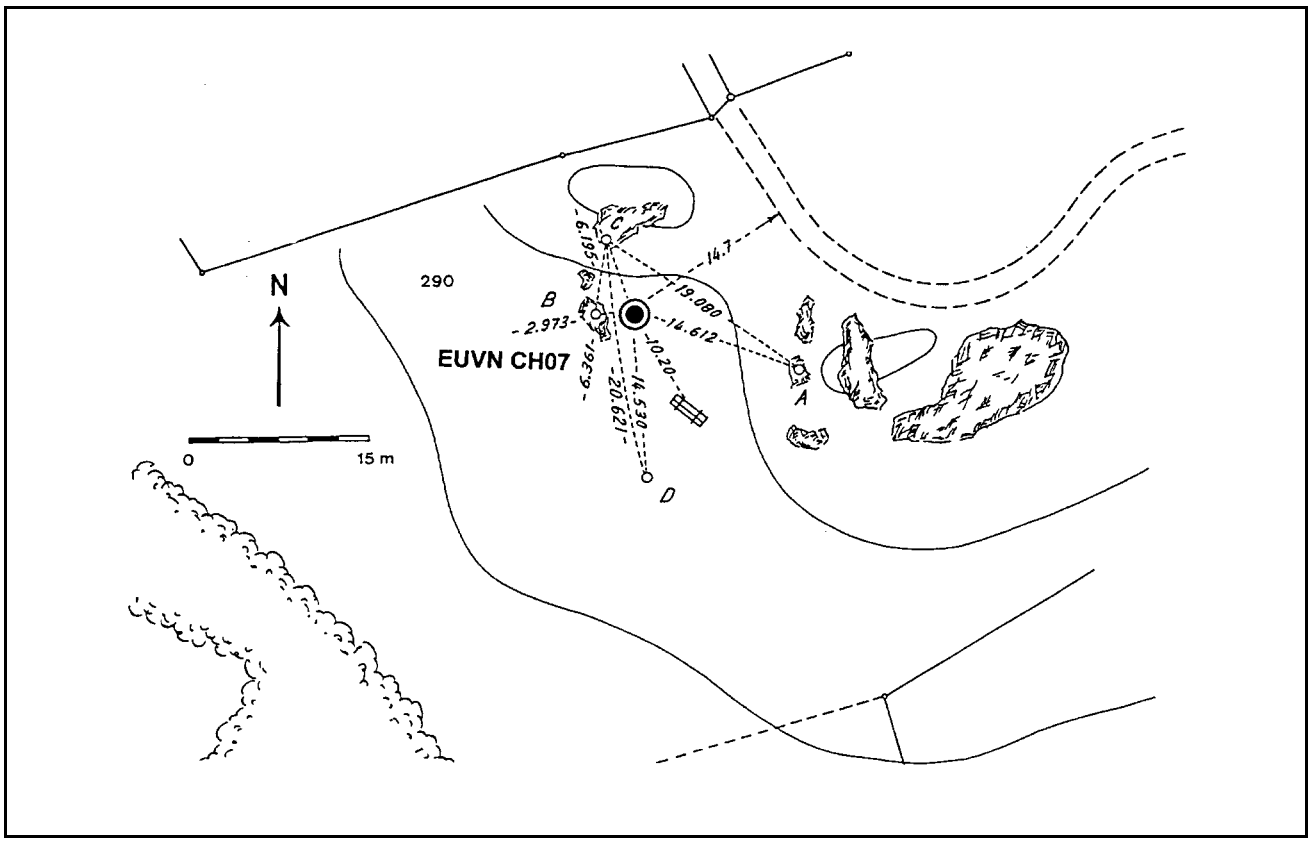


European Vertical GPS Reference Network (EUVN)

Station Zernez

Site Identification of the GPS Monument	
4-Char. EUVN ID	CH07
DOMES Number	
Monument Inscription/National Site Number	1218.400
Marker Type, Monumentation Type, Foundation	Bolt with screw cap in rock
Mark dot of coordinates	Centre and top of bolt

Site Location Information	
City or Town	Zernez
State or Province	Kt. GR
Country	Switzerland
Responsible Agency (Full Address)	Bundesamt für Landestopographie Seftigenstraße 264 CH-3084 Wabern Switzerland
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4315304.233 m Y = 768728.666 m Z = 4620021.262 m
Height in UELN-95/98	1560.915 m
Gravity in ISGN71	980 271.6 mgal

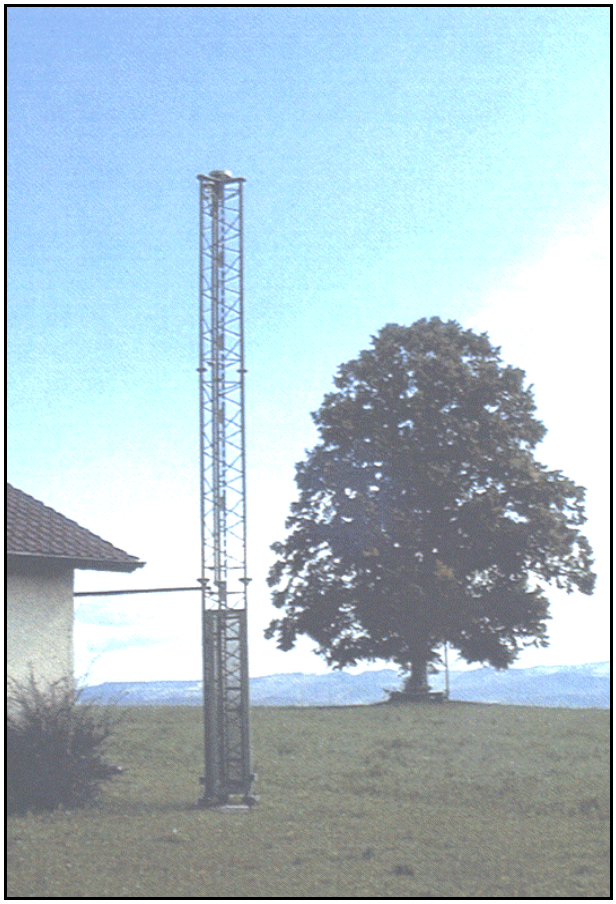


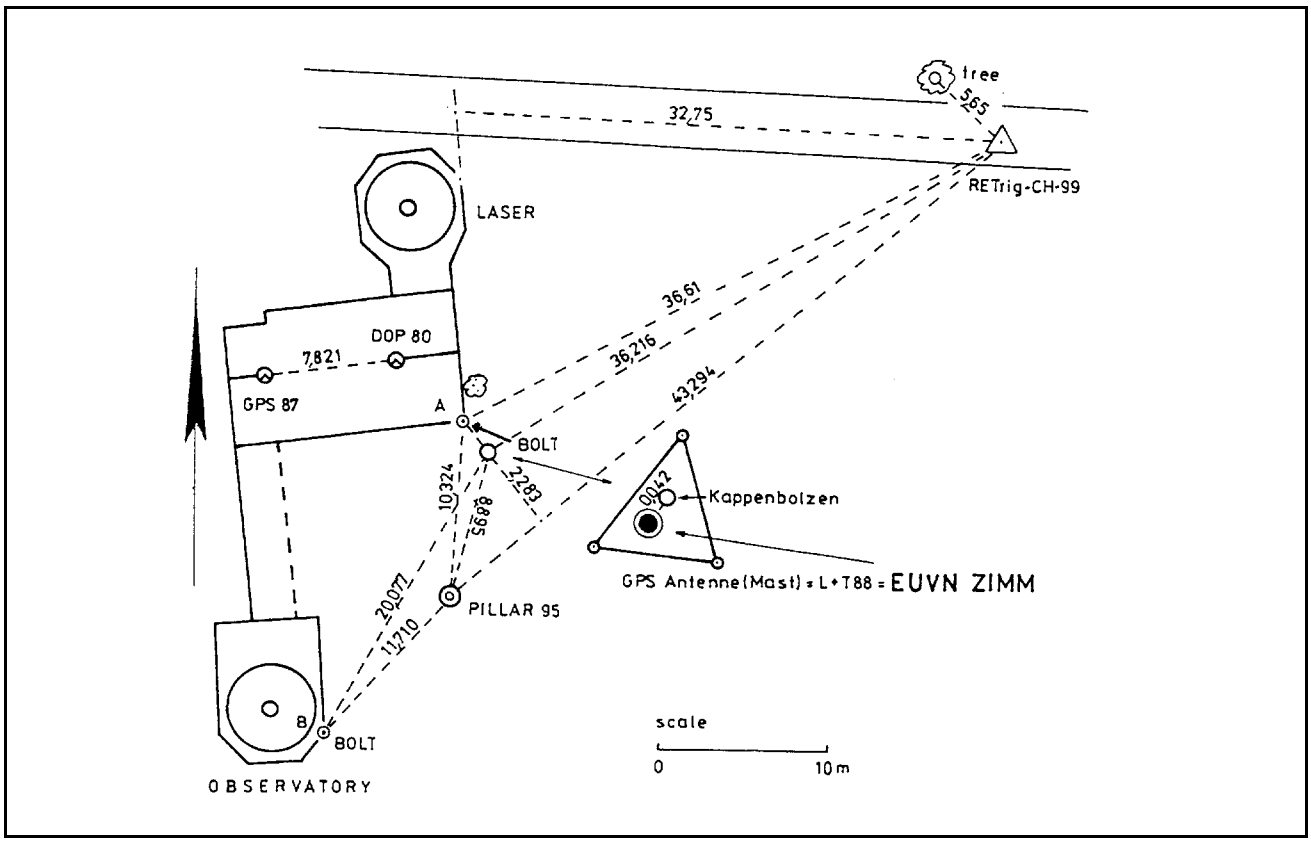
European Vertical GPS Reference Network (EUVN)

Station Zimmerwald

Site Identification of the GPS Monument	
4-Char. EUVN ID	ZIMM
DOMES Number	14001 M 004
Monument Inscription/National Site Number	1186.800
Marker Type, Monumentation Type, Foundation	5/8-inch screw; on top of 9-m steel mast; in concrete block
Mark dot of coordinates	Centre and top of mast (bottom of GPS antenna)

Site Location Information	
City or Town	Zimmerwald
State or Province	
Country	Switzerland
Responsible Agency (Full Address)	Federal Office of Topography Seftigenstraße 264 CH-3084 Wabern Switzerland
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4331297.347 m Y = 567555.635 m Z = 4633133.715 m
Height in UELN-95/98	906.877 m
Gravity in ISGN71	980 512.0 mgal



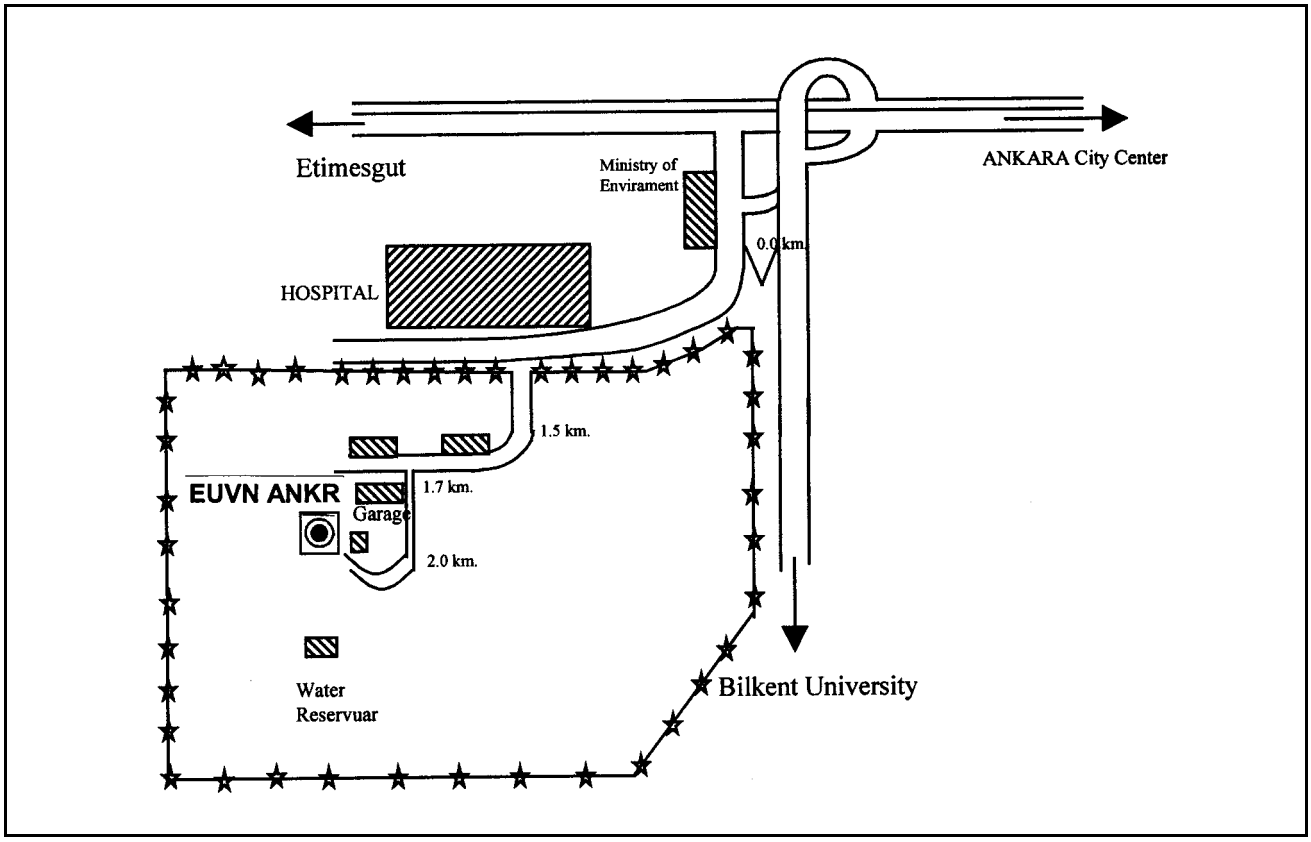


European Vertical GPS Reference Network (EUVN)

Station Ankara

Site Identification of the GPS Monument	
4-Char. EUVN ID	ANKR
DOMES Number	20805 M 002
Monument Inscription/National Site Number	ANKR 129-G004
Marker Type, Monumentation Type, Foundation	Pillar
Mark dot of coordinates	Centre and top of GPS marker

Site Location Information	
City or Town	Ankara
State or Province	
Country	Turkey
Responsible Agency (Full Address)	Bundesamt für Kartographie und Geodäsie Fundamentalstation Wettzell D-93444 Kötzting Germany
Contact Agency Information	General Command of Mapping Harita Genel Komutanligi Geodezi Dairesi TR-06100 Cebeci - Ankara Turkey
Coordinates in ETRS89, Epoch 97.4	X = 4121948.793 m Y = 2652187.856 m Z = 4069023.563 m
Norm.-orth. Height T. G. Antalya	939.301 m
Gravity in ISGN71	

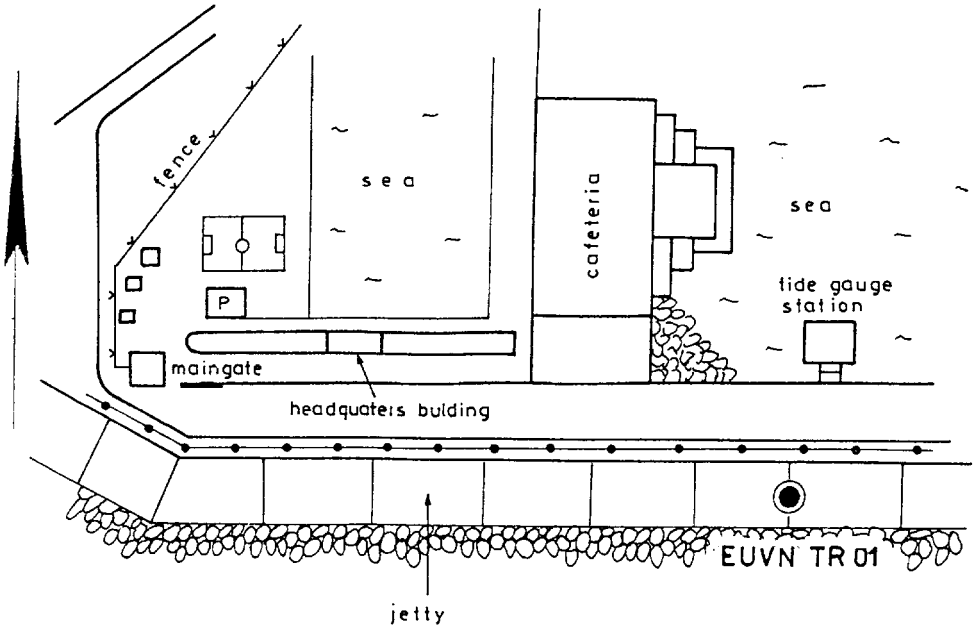


European Vertical GPS Reference Network (EUVN)

Station Antalya

Site Identification of the GPS Monument	
4-Char. EUVN ID	TR01
DOMES Number	20812 M 001
Monument Inscription/National Site Number	ANTG O250003
Marker Type, Monumentation Type, Foundation	Steel pin on SLR platform
Mark dot of coordinates	Center and top of GPS marker

Site Location Information	
City or Town	Antalya
State or Province	
Country	Turkey
Responsible Agency (Full Address)	General Command of Mapping Harita Genel Komutanligi Geodezi Dairesi TR-06100 Cebeci - Ankara Turkey
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4399214.925 m Y = 2602657.428 m Z = 3802194.912 m
Norm.-orth. Height T. G. Antalya	4.926 m
Gravity in ISGN71	

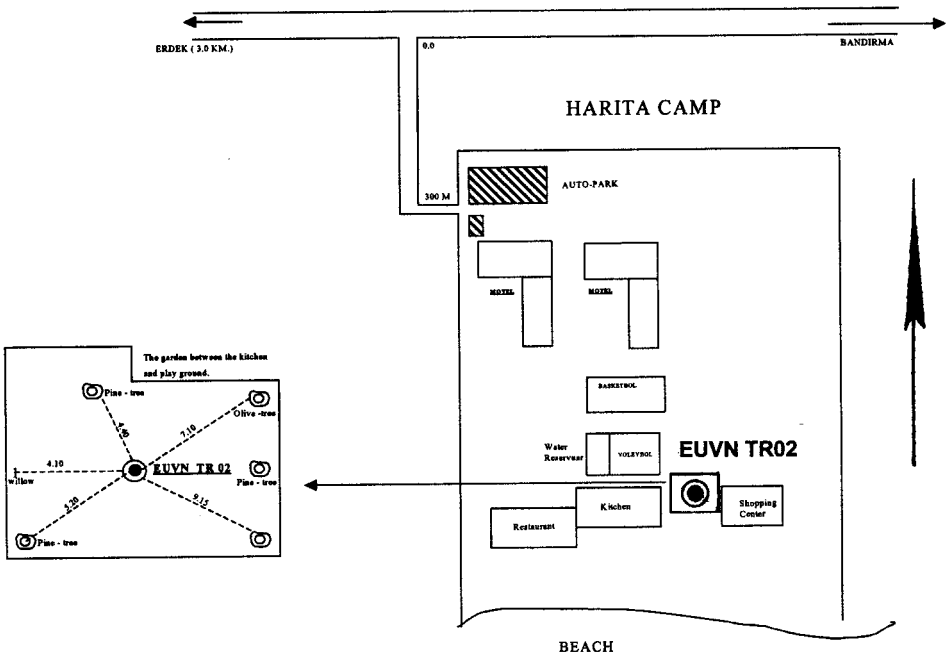


European Vertical GPS Reference Network (EUVN)

Station Erdek

Site Identification of the GPS Monument	
4-Char. EUVN ID	TR02
DOMES Number	20811 M 001
Monument Inscription/National Site Number	ERDK H190003
Marker Type, Monumentation Type, Foundation	Steel pin on SLR buried concrete
Mark dot of coordinates	Center and top of GPS marker

Site Location Information	
City or Town	Balikesir
State or Province	
Country	Turkey
Responsible Agency (Full Address)	General Command of Mapping Harita Genel Komutanligi Geodezi Dairesi TR-06100 Cebeci - Ankara Turkey
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4301484.051 m Y = 2272242.339 m Z = 4111129.469 m
Norm.-orth. Height T. G. Antalya	1.656 m
Gravity in ISGN71	

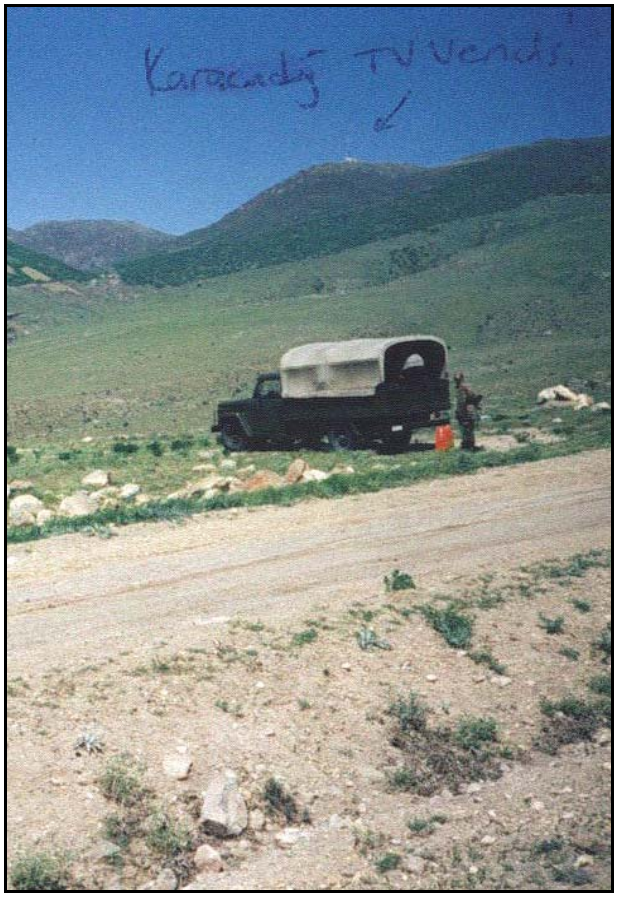


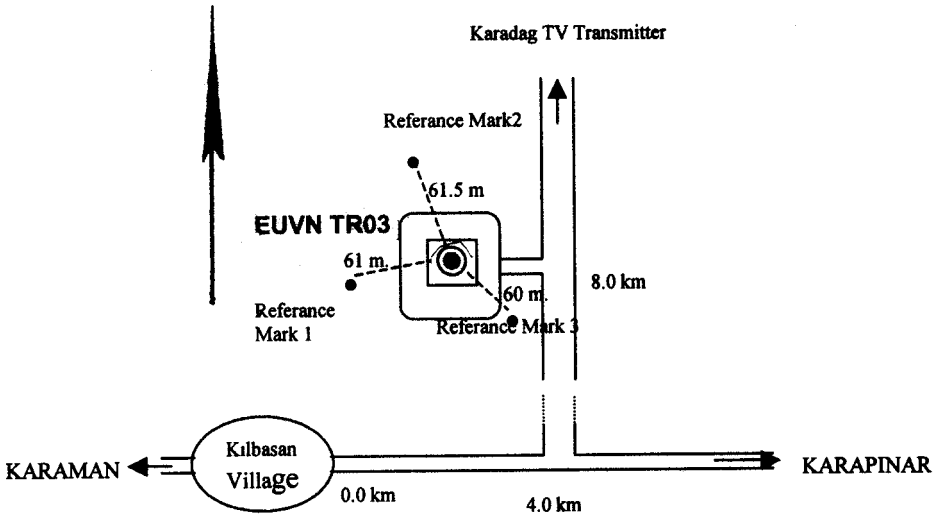
European Vertical GPS Reference Network (EUVN)

Station Melengiçlik

Site Identification of the GPS Monument	
4-Char. EUVN ID	TR03
DOMES Number	20803 M 001
Monument Inscription/National Site Number	MELE N30-G0001
Marker Type, Monumentation Type, Foundation	Steel pin on SLR platform
Mark dot of coordinates	Center and top of GPS marker

Site Location Information	
City or Town	Konya
State or Province	
Country	Turkey
Responsible Agency (Full Address)	General Command of Mapping Harita Genel Komutanligi Geodezi Dairesi TR-06100 Cebeci - Ankara Turkey
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4247620.552 m Y = 2778638.932 m Z = 3851607.519 m
Norm.-orth. Height T. G. Antalya	1323.541 m
Gravity in ISGN71	



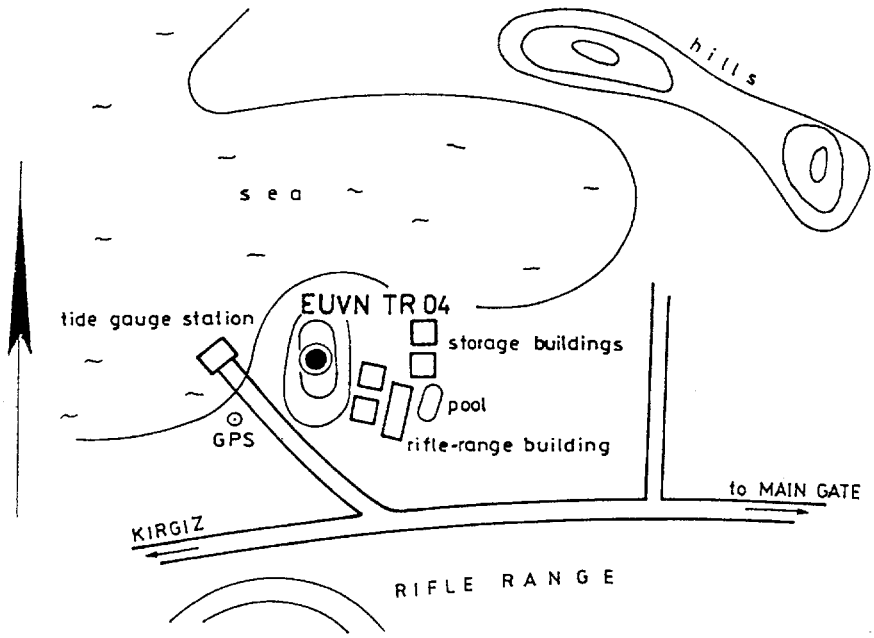


European Vertical GPS Reference Network (EUVN)

Station Mentes

Site Identification of the GPS Monument	
4-Char. EUVN ID	TR04
DOMES Number	
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Pillar
Mark dot of coordinates	Center and top of GPS marker

Site Location Information	
City or Town	Izmir
State or Province	
Country	Turkey
Responsible Agency (Full Address)	General Command of Mapping Harita Genel Komutanligi Geodezi Dairesi TR-06100 Cebeci - Ankara Turkey
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4469012.404 m Y = 2249388.127 m Z = 3942689.158 m
Norm.-orth. Height T. G. Antalya	20.348 m
Gravity in ISGN71	

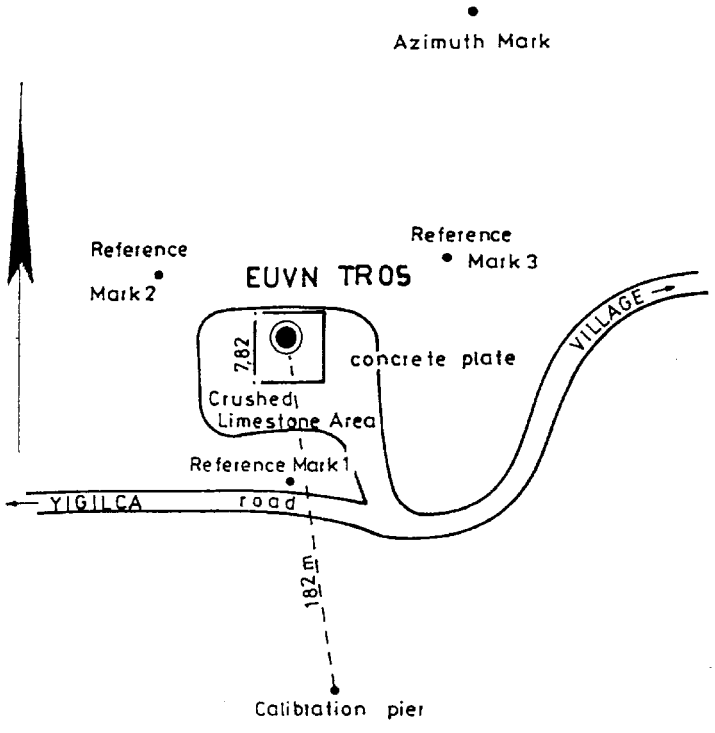


European Vertical GPS Reference Network (EUVN)

Station Yığılca

Site Identification of the GPS Monument	
4-Char. EUVN ID	TR05
DOMES Number	20804 M 001
Monument Inscription/National Site Number	YIGI G26-G001
Marker Type, Monumentation Type, Foundation	Steel pin on SLR platform
Mark dot of coordinates	Center and top of GPS marker

Site Location Information	
City or Town	Bolu
State or Province	
Country	Turkey
Responsible Agency (Full Address)	General Command of Mapping Harita Genel Komutanligi Geodezi Dairesi TR-06100 Cebeci - Ankara Turkey
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4117362.003 m Y = 2517076.872 m Z = 4157679.040 m
Norm.-orth. Height T. G. Antalya	785.624 m
Gravity in ISGN71	

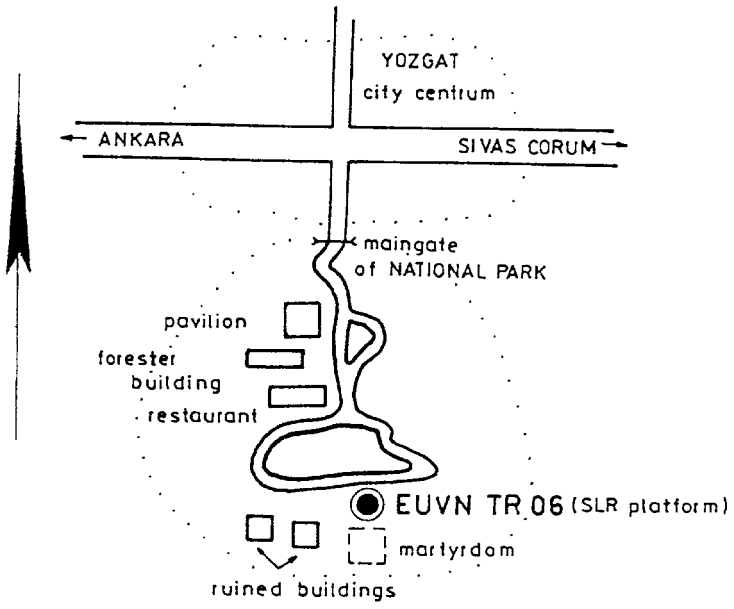


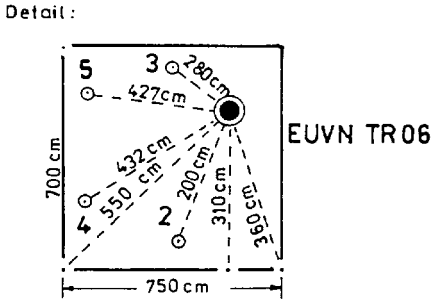
European Vertical GPS Reference Network (EUVN)

Station Yozgat

Site Identification of the GPS Monument	
4-Char. EUVN ID	TR06
DOMES Number	20802 M 001
Monument Inscription/National Site Number	YOZG I33-G001
Marker Type, Monumentation Type, Foundation	Steel pin on SLR platform
Mark dot of coordinates	Center and top of GPS marker

Site Location Information	
City or Town	Yozgat
State or Province	
Country	Turkey
Responsible Agency (Full Address)	General Command of Mapping Harita Genel Komutanligi Geodezi Dairesi TR-06100 Cebeci - Ankara Turkey
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4029730.714 m Y = 2802093.173 m Z = 4062068.030 m
Norm.-orth. Height T. G. Antalya	1641.991 m
Gravity in ISGN71	





European Vertical GPS Reference Network (EUVN)

Station Kiev

Site Identification of the GPS Monument	
4-Char. EUVN ID	UK01
DOMES Number	
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	
Mark dot of coordinates	

Site Location Information	
City or Town	
State or Province	
Country	Ukraine
Responsible Agency (Full Address)	Main Administration of Geodesy, Cartography and Cadastre of Ukraine 54 Popudrenka st. UA – 253064 Kiev Ukraine
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3512887.566 m Y = 2068982.415 m Z = 4888901.262 m
Normal Height T. G. Kronstadt	199.370 m
Gravity in ISGN71	

European Vertical GPS Reference Network (EUVN)

Station Uzhgorad

Site Identification of the GPS Monument	
4-Char. EUVN ID	UK02
DOMES Number	
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	
Mark dot of coordinates	

Site Location Information	
City or Town	
State or Province	
Country	Ukraine
Responsible Agency (Full Address)	Main Administration of Geodesy, Cartography and Cadastre of Ukraine 54 Popudrenka st. UA – 253064 Kiev Ukraine
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3908590.743 m Y = 1615205.669 m Z = 4758733.071 m
Normal Height T. G. Kronstadt	235.264 m
Gravity in ISGN71	

European Vertical GPS Reference Network (EUVN)

Station Mykolaiv

Site Identification of the GPS Monument	
4-Char. EUVN ID	UK03
DOMES Number	
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	
Mark dot of coordinates	

Site Location Information	
City or Town	
State or Province	
Country	Ukraine
Responsible Agency (Full Address)	Main Administration of Geodesy, Cartography and Cadastre of Ukraine 54 Popudrenka st. UA – 253064 Kiev Ukraine
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3698609.749 m Y = 2308760.756 m Z = 4639662.019 m
Normal Height T. G. Kronstadt	52.518 m
Gravity in ISGN71	

European Vertical GPS Reference Network (EUVN)

Station Simeiz

Site Identification of the GPS Monument	
4-Char. EUVN ID	UK04
DOMES Number	
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	
Mark dot of coordinates	

Site Location Information	
City or Town	
State or Province	
Country	Ukraine
Responsible Agency (Full Address)	Main Administration of Geodesy, Cartography and Cadastre of Ukraine 54 Popudrenka st. UA – 253064 Kiev Ukraine
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3783746.676 m Y = 2551362.568 m Z = 4441445.012 m
Normal Height T. G. Kronstadt	361.964 m
Gravity in ISGN71	

European Vertical GPS Reference Network (EUVN)

Station Morpeth

Site Identification of the GPS Monument	
4-Char. EUVN ID	GB01
DOMES Number	13299 S 001
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Pillar made of solid rock
Mark dot of coordinates	

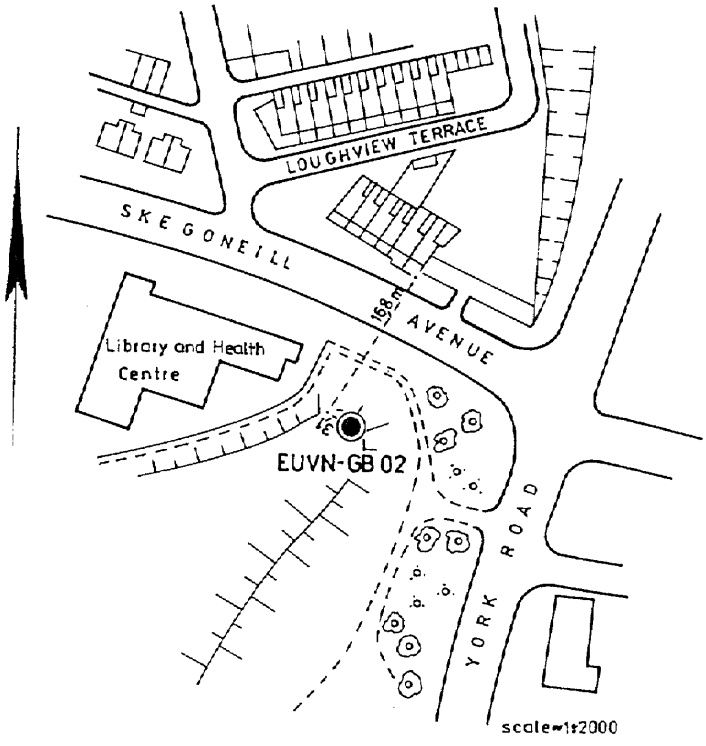
Site Location Information	
City or Town	Hebron, Morpeth
State or Province	Northumberland
Country	United Kingdom
Responsible Agency (Full Address)	Ordnance Survey Romsey Road. Maybush GB – Southampton SO16 4GU United Kingdom
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3645668.085 m Y = -107277.442 m Z = 5215053.303 m
Height in UELN-95/98	95.483 m
Gravity in IGSN71	

European Vertical GPS Reference Network (EUVN)

Station Belfast

Site Identification of the GPS Monument	
4-Char. EUVN ID	GB02
DOMES Number	
Monument Inscription/National Site Number	FBM
Marker Type, Monumentation Type, Foundation	Granite pillar with metal bolt, set in concrete on grade, with cover plate
Mark dot of coordinates	Centre and top of the bolt

Site Location Information	
City or Town	Belfast
State or Province	N-Ireland
Country	United Kingdom
Responsible Agency (Full Address)	Ordnance Survey of Northern Ireland Colby House Stranmillis Court GB-Belfast BT9 5BJ Northern Ireland
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3681235.977 m Y = -381979.425 m Z = 5177204.967 m
Height in UELN-95/98	11.813 m
Gravity in IGSN71	

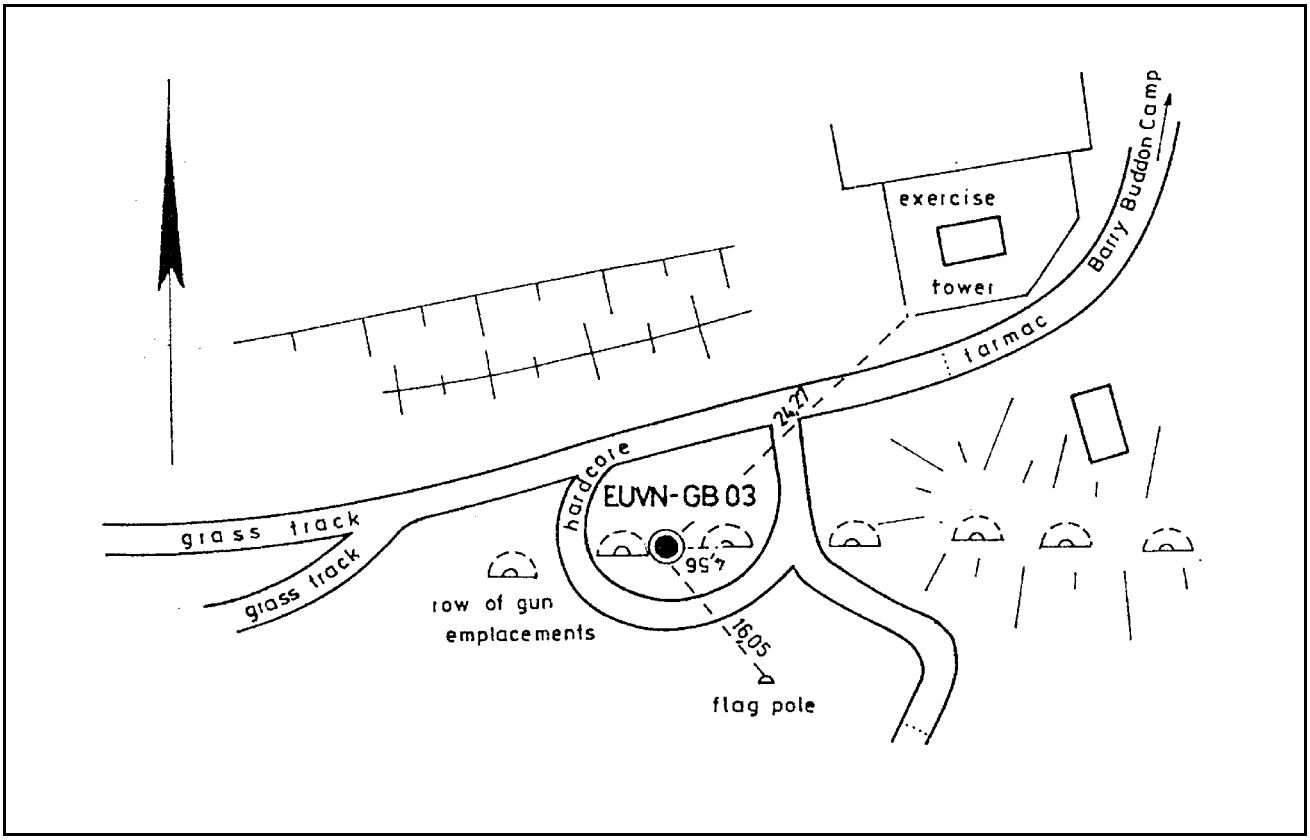


European Vertical GPS Reference Network (EUVN)

Station Buddon

Site Identification of the GPS Monument	
4-Char. EUVN ID	GB03
DOMES Number	13296 M 002
Monument Inscription/National Site Number	Ordnance Survey Triangulation Station/ 211
Marker Type, Monumentation Type, Foundation	GPS marker with bore in concrete block, covered with iron plate on grade
Mark dot of coordinates	Centre and top of the GPS marker

Site Location Information	
City or Town	Dundee
State or Province	Scotland
Country	United Kingdom
Responsible Agency (Full Address)	Ordnance Survey Romsey Road. Maybush GB – Southampton SO16 4GU United Kingdom
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3526416.486 m Y = -171421.189 m Z = 5294098.675 m
Height in UELN-95/98	6.810 m
Gravity in IGSN71	

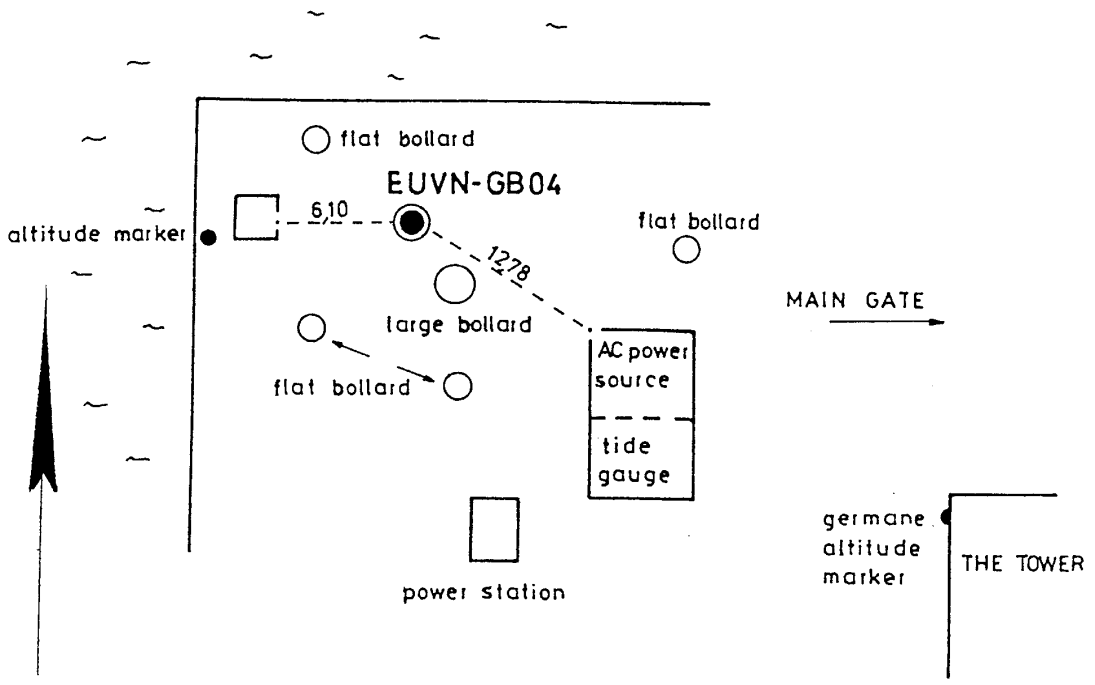


European Vertical GPS Reference Network (EUVN)

Station Gibraltar

Site Identification of the GPS Monument	
4-Char. EUVN ID	GB04
DOMES Number	
Monument Inscription/National Site Number	178
Marker Type, Monumentation Type, Foundation	Large iron GPS marker with brass bolt
Mark dot of coordinates	Centre and top of the brass bolt

Site Location Information	
City or Town	Gibraltar
State or Province	
Country	Gibraltar
Responsible Agency (Full Address)	Ordnance Survey Romsey Road. Maybush GB – Southampton SO16 4GU United Kingdom
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 5134911.148 m Y = -481396.531 m Z = 3740038.215 m
Height in UELN-95/98	2.456 m
Gravity in IGSN71	979 773.84 mgal

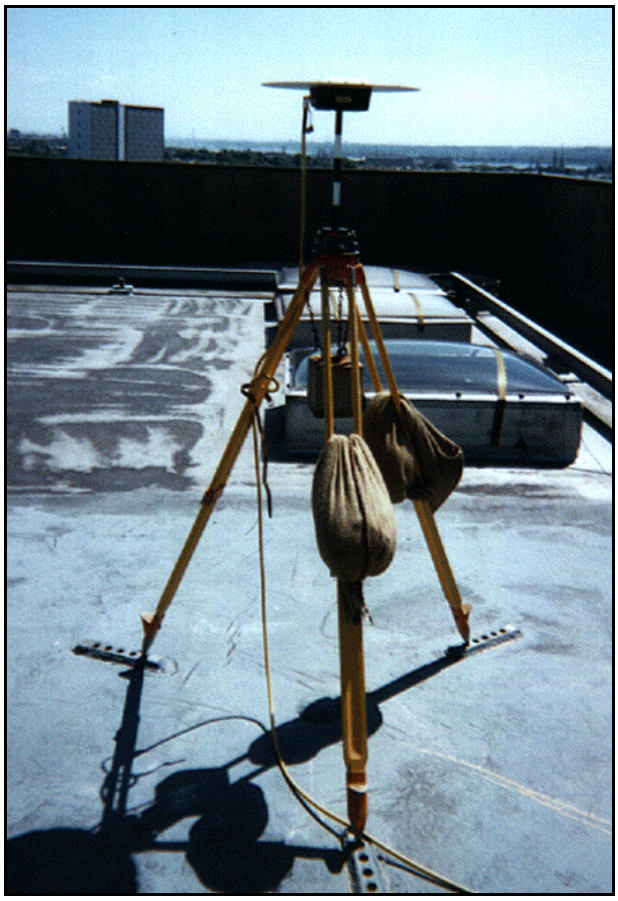


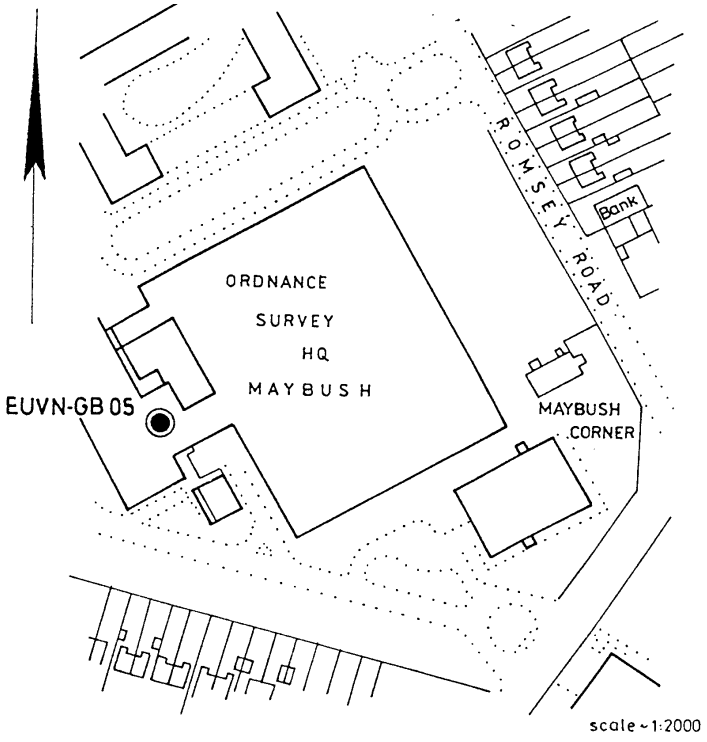
European Vertical GPS Reference Network (EUVN)

Station Southampton

Site Identification of the GPS Monument	
4-Char. EUVN ID	GB05
DOMES Number	
Monument Inscription/National Site Number	213
Marker Type, Monumentation Type, Foundation	Bolt with bore on the flat roof of a building
Mark dot of coordinates	Centre and top of the bolt

Site Location Information	
City or Town	Southampton
State or Province	
Country	United Kingdom
Responsible Agency (Full Address)	Ordnance Survey Romsay Road. Maybush GB - Southampton SO16 4GU United Kingdom
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4026784.426 m Y = -101977.507 m Z = 4928770.476 m
Height in UELN-95/98	52.185 m
Gravity in IGSN71	



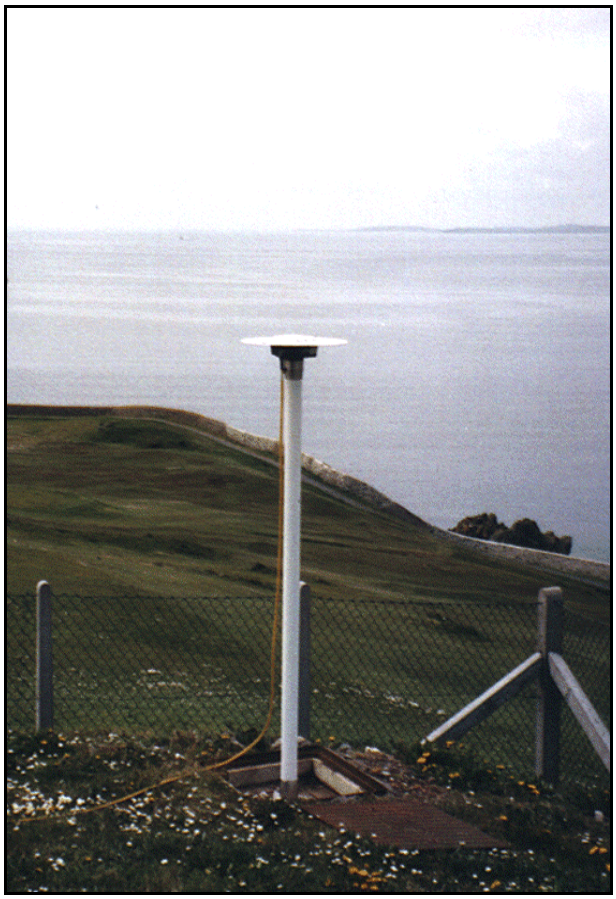


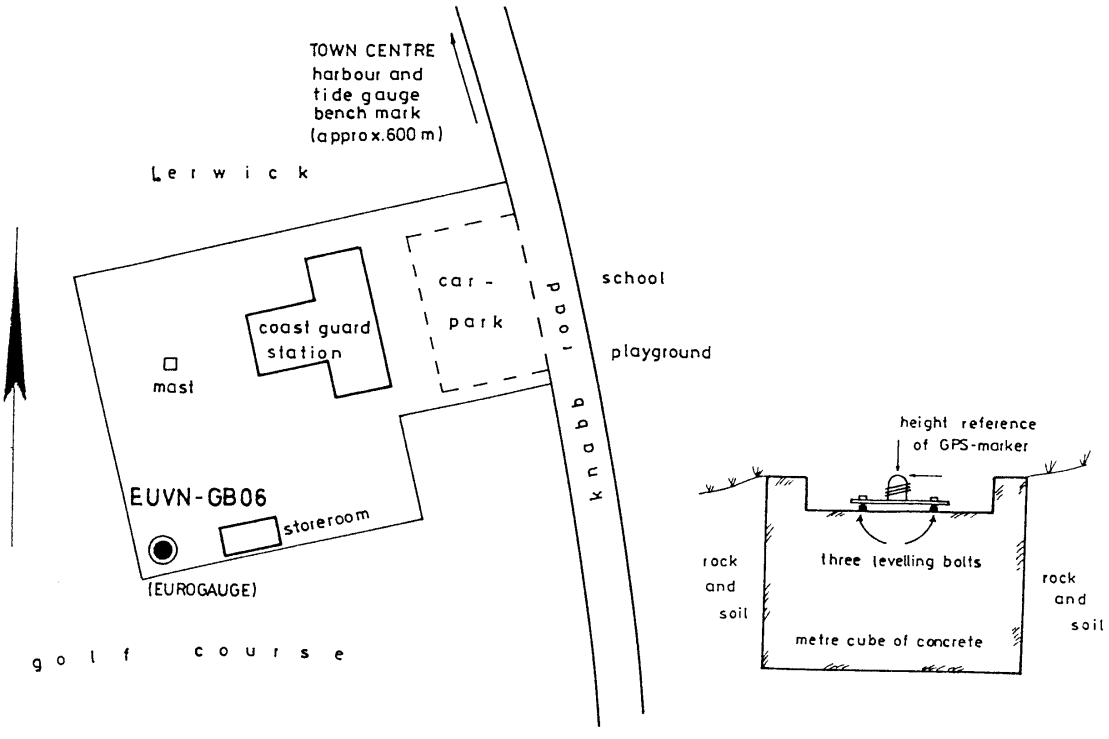
European Vertical GPS Reference Network (EUVN)

Station Lerwick

Site Identification of the GPS Monument	
4-Char. EUVN ID	GB06
DOMES Number	
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Metal plate with screw bolt on concrete block , covered with iron plate on grade
Mark dot of coordinates	Centre and top of the screw bolt

Site Location Information	
City or Town	Lerwick
State or Province	Shetland
Country	United Kingdom
Responsible Agency (Full Address)	Ordnance Survey Romsey Road. Maybush GB - Southampton SO16 4GU United Kingdom
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3182201.081 m Y = -63352.042 m Z = 5508803.934 m
Height in UELN-95/98	46.853 m
Gravity in IGSN71	



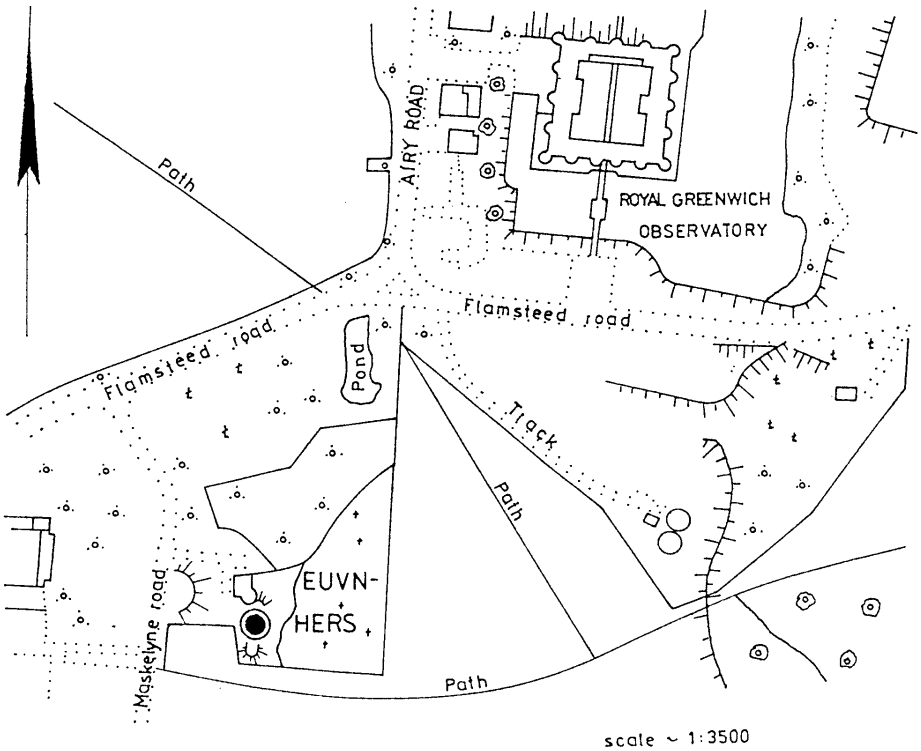


European Vertical GPS Reference Network (EUVN)

Station Herstmonceux

Site Identification of the GPS Monument	
4-Char. EUVN ID	HERS
DOMES Number	13212 M 007
Monument Inscription/National Site Number	7840
Marker Type, Monumentation Type, Foundation	
Mark dot of coordinates	

Site Location Information	
City or Town	Hailsham
State or Province	East Sussex
Country	United Kingdom
Responsible Agency (Full Address)	Royal Greenwich Observatory Medingley Road GB-Cambridge CB3 OEZ United Kingdom
Contact Agency Information	Satellite Laser Ranger Herstmonceux Castle, Hailsham GB-East Sussex BN27 1RP United Kingdom
Coordinates in ETRS89, Epoch 97.4	X = 4033470.374 m Y = 23672.663 m Z = 4924301.099 m
Height in UELN-95/98	
Gravity in IGSN71	

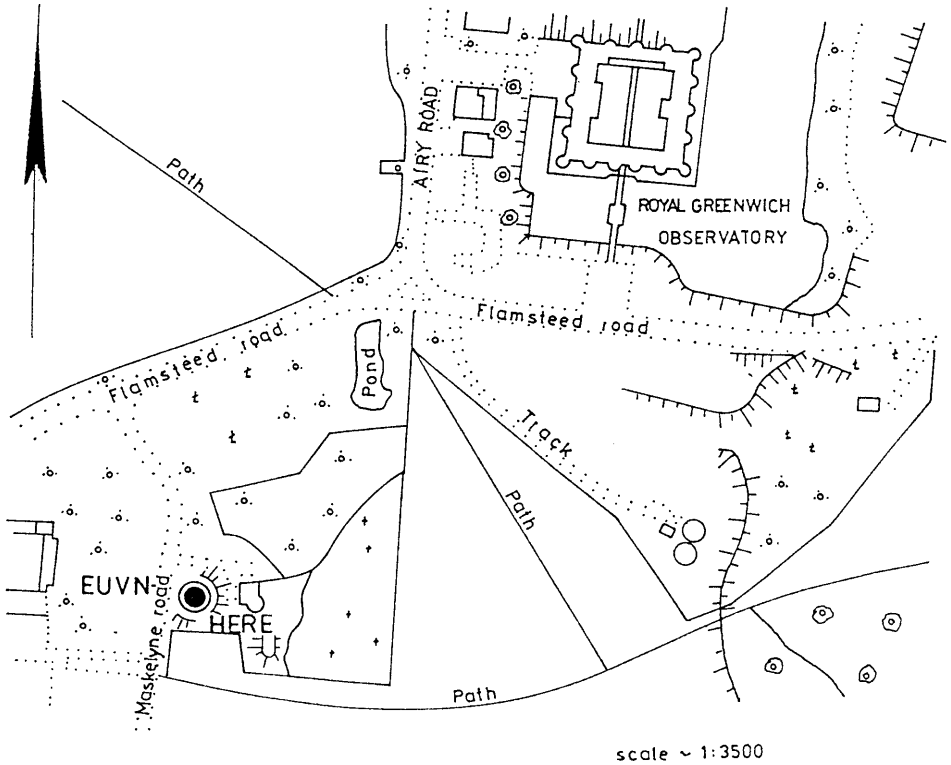


European Vertical GPS Reference Network (EUVN)

Station Herstmonceux E

Site Identification of the GPS Monument	
4-Char. EUVN ID	HERE
DOMES Number	
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Pillar with brass plate on pillar head with centring device and height mark on the side of the pillar
Mark dot of coordinates	Centre of the centring device and height reference from top of the height mark

Site Location Information	
City or Town	Herstmonceux
State or Province	
Country	United Kingdom
Responsible Agency (Full Address)	Ordnance Survey Romsey Road. Maybush GB - Southampton SO40 8AA United Kingdom
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4033459.208 m Y = 23626.316 m Z = 4924303.082 m
Height in UELN-95/98	
Gravity in IGSN71	

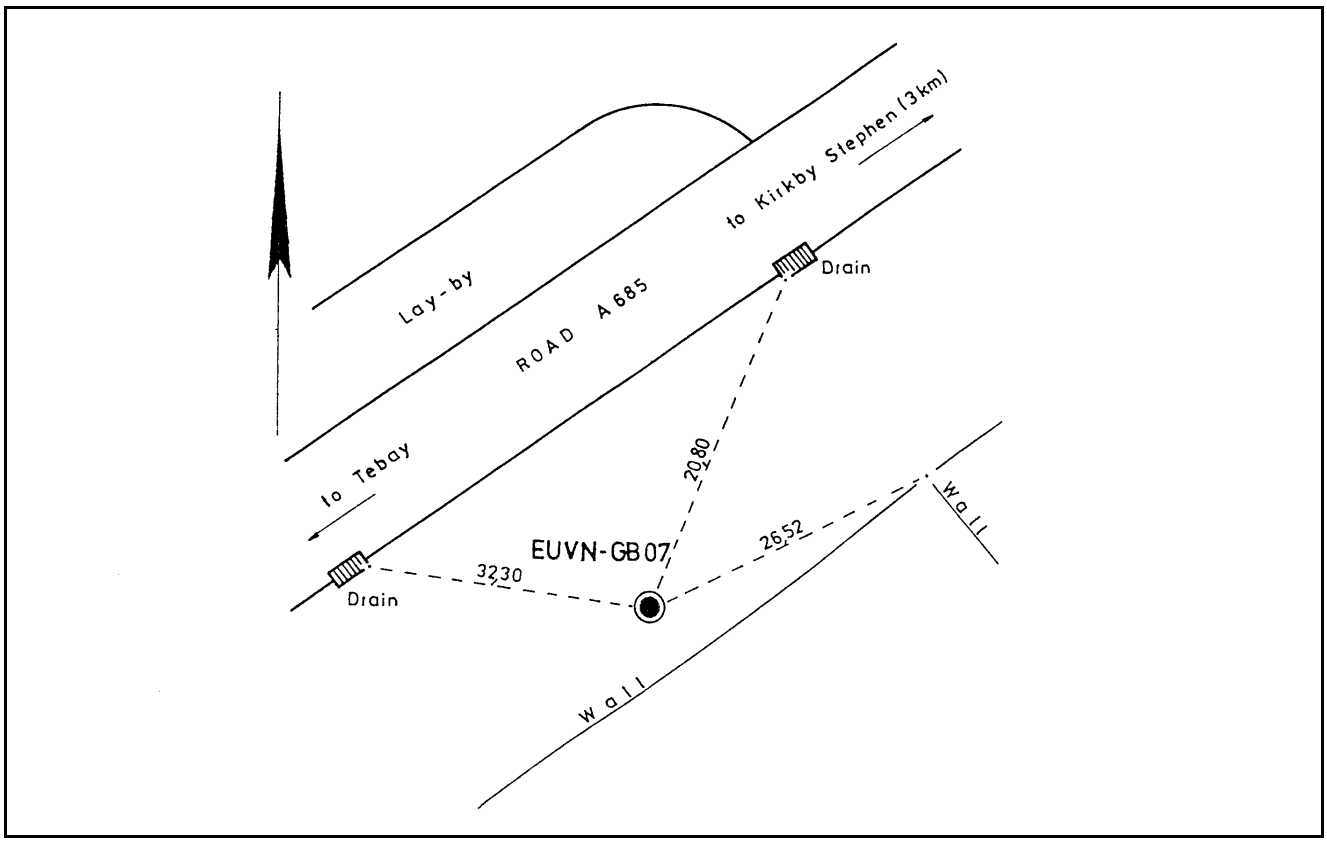


European Vertical GPS Reference Network (EUVN)

Station Kirkby Stephen

Site Identification of the GPS Monument	
4-Char. EUVN ID	GB07
DOMES Number	
Monument Inscription/National Site Number	Ordnance Survey, bench mark
Marker Type, Monumentation Type, Foundation	Concrete pillar, 0.3 m over soil surface, with brass bolt on the head of the pillar, on solid rock
Mark dot of coordinates	Centre and top of the bolt

Site Location Information	
City or Town	
State or Province	
Country	United Kingdom
Responsible Agency (Full Address)	Ordnance Survey Romsey Road. Maybush GB – Southampton SO16 4GU United Kingdom
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3713868.662 m Y = -154772.617 m Z = 5166095.444 m
Height in UELN-95/98	304.233 m
Gravity in IGSN71	

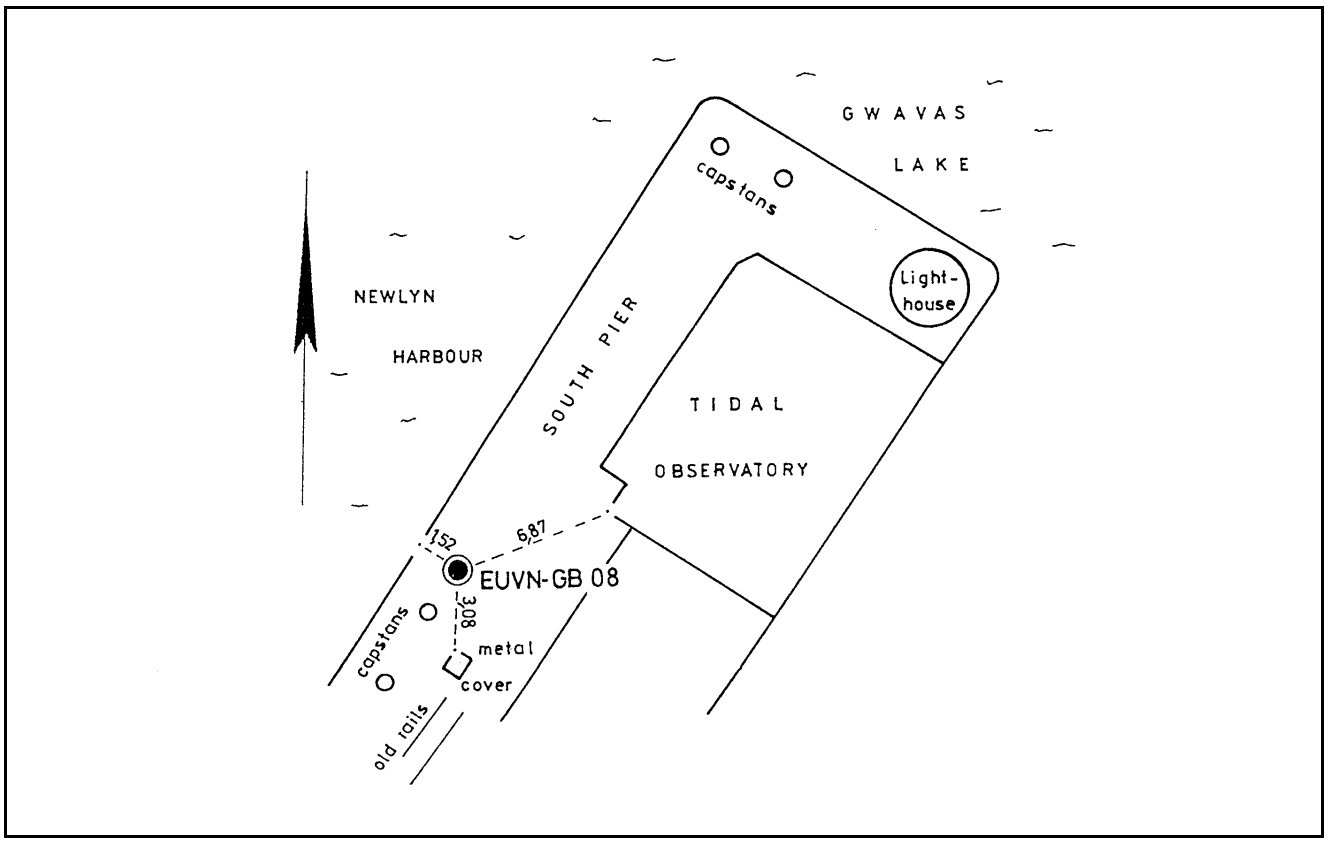


European Vertical GPS Reference Network (EUVN)

Station Newlyn

Site Identification of the GPS Monument	
4-Char. EUVN ID	GB08
DOMES Number	
Monument Inscription/National Site Number	
Marker Type, Monumentation Type, Foundation	Metal plate with screw bolt mounted on concrete block on a pier, covered with iron plate on grade
Mark dot of coordinates	Centre and top of the screw bolt

Site Location Information	
City or Town	Penzance
State or Province	
Country	United Kingdom
Responsible Agency (Full Address)	Ordnance Survey Romsey Road. Maybush GB – Southampton SO16 4GU United Kingdom
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 4079955.974 m Y = -395940.604 m Z = 4870185.292 m
Height in UELN-95/98	4.495 m
Gravity in IGSN71	



European Vertical GPS Reference Network (EUVN)

Station Nottingham

Site Identification of the GPS Monument	
4-Char. EUVN ID	GB09
DOMES Number	
Monument Inscription/National Site Number	NOTT
Marker Type, Monumentation Type, Foundation	Plate with thread, tube mounted on a round wall on the roof of the IESSG building
Mark dot of coordinates	Centre and top of the thread

Site Location Information	
City or Town	Nottingham
State or Province	
Country	United Kingdom
Responsible Agency (Full Address)	Institute of Engineering Surveying and Space Geodesy (IESSG) University of Notthingham University Park GB-Nottingham, NG7 12RD United Kingdom
Contact Agency Information	
Coordinates in ETRS89, Epoch 97.4	X = 3851174.495 m Y = -80151.850 m Z = 5066647.017 m
Height in UELN-95/98	49.923 m
Gravity in ISGN71