University of Southern Queensland

Faculty of Engineering & Surveying

Investigation into Reliability of AUSPOS Coordinate Data (Specifically Height)

A dissertation submitted by

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In fulfilment of the requirements of

Courses ENG4111 and ENG4112 Research Project

Towards the degree of

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Abstract

As found in remote areas of Australia is limited or no availability survey control infrastructure holding datum coordinate values such as Map Grid Australia (MGA) and Australian Height Datum (AHD). Surveyors utilise such datum's to connect a consistent coordinate reference frame for projects and to maintain a regular project position. In areas of unknown coordinates, GPS observations can be made and data can be sent to a free online processing service called AUSPOS

The subject project topic has come about from observing there are discrepancies in values that have been processed by AUSPOS from use in the past. Inconsistency is common in vertical height values and has triggered an investigation into the reliability of the processed data.

The project investigates the reliability of coordinate data reduced by the AUSLIG Online GPS Processing Service, "AUSPOS", specifically in relation to height. Testing has been carried out by observing GPS data for a number permanent survey marks that have known coordinates and height. Observed data was submitted to AUSPOS and processed coordinates determined. Analysis was then made in relation to the differences obtained in coordinate values and time frames observed and conclusions made with respect to results obtained.

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ENG4111 Research Project Part 1 & ENG4112 Research Project Part 2

Limitations of Use

Certification

I certify that the ideas, designs and experimental work, results, analyses and conclusions set out in this dissertation are entirely my own effort, except where otherwise indicated and acknowledged.

I further certify that the work is original and has not been previously submitted for assessment in any other course or institution, except where specifically stated.

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Chapter 1

Introduction

1.1 Background

Survey control marks and information is a major component of building, infrastructure and mining projects, cadastral and control databases and state and national control networks. Survey control marks provide a reference framework which enables the position of global related information to be expressed in a coordinate system to be utilised by an end user. Typically control information is determined and used by professionals such as surveyors who deal with fixed positions and geographically related information.

A generic requirement of projects surveyors work on or are associated with is a requirement that survey control information be connected into a common and controlled horizontal and vertical datum such as Map Grid Australia (MGA) and Australian Height Datum (AHD) respectively. These requirements provide consistency and common management for survey control coordinate information between job sites either local or distant apart.

In remote areas such as western Queensland and central Australia survey control information with accurate and known coordinate data that is local or nearby a subject site can be minimal or some cases not available. Commonly survey control marks if found nearby can occasionally not hold reliable horizontal and vertical control coordinate values as required.

In the instance where survey control is not suitable or valid, coordinates can be determined by observing data using the Global Positioning System (GPS) and processing that data to obtain desired coordinates. Processing of data can be achieved by reductions and adjustment by post processing program software or by a free service available from Geoscience Australia called The AUSLIG Online Processing System (AUSPOS).

1.2 AUSPOS Background

Geoscience Australia is an Australian Government agency who is the provider of the Australian Surveying and Land Information Group's (AUSLIG) Online GPS Processing Service, "AUSPOS". AUSPOS is a free government service that provides users with a capacity to submit via the internet, observed GPS data and in turn receive relatively accurate processed geodetic coordinates in prompt turnaround timeframes.

Static GPS data is observed by the user and is then submitted online to the AUSPOS in RINEX format. The data is then processed and coordinate data is returned to the user by way of a detailed GPS processing report summary providing the user with required coordinates and processing results in both ITRF and GDA94 coordinates.

AUSPOS expect results from a generic 24 hours of GPS data to result in horizontal accuracy of approximately 10mm and between 10mm to 20mm in vertical accuracy. Two hours of observed data may result in horizontal accuracy approximately 20mm and between up to 50mm in vertical accuracy. The accuracy obtained is deemed to be dependent on quality of GPS receiver, length of observation time and distance to GPS reference stations. Suggested is a minimum observation of six hours.

In order to determine reliability of coordinate data derived independent testing is needed to be undertaken to verify accuracy claims made by AUSPOS and result in optimal timeframes and methods/techniques of observation.

1.3 Research Aim

The aim of this project is to determine the optimum observation timeframes so as to overcome the ambiguities and inconsistency that can occur between differing values in height reduced by AUSPOS.

1.4 Research Objectives

1. Review techniques used to obtain static GPS data.

2. Use a sample of suitable previously coordinated survey marks so as to have controlled comparison between known and reduced AUSPOS data for investigation.

3. Evaluate different timeframes and processes in regard to GPS observations and determining reliable coordinate data

4. Analyse coordinate data variations and factors affecting coordinate differences.

5. Research publications on the processing methods and accuracies claimed by using AUSPOS to coordinate GPS static data.

6. Result in report on results and findings achieved from research

1.5 Justification

Currently found by surveyors working on projects in regional areas is the limitation and availability of coordinated survey control marks that meet quality, order and class requirements. This is predominately found in remote areas where development has not yet evolved or geodetic control networks have not been required or established. For surveyors to be able to have access to accurate coordinate values AUPOS is a very efficient and economical means of coordinating survey position. The restraining factor is the reliability of results obtained from a service that can provide surveyors with both horizontal and vertical coordinates. As a result it is beneficial to identify the reliability of the processed coordinated to determine the value that AUSPOS processed coordinates can add to a survey.

1.6 Scope of Research

Trimble R8 Model 2 GNSS receivers will be utilised to observe static data from logging sessions over known permanent survey marks. The permanent survey marks will be those registered in The Department of Environment and Resource Management (DERM), Survey Control Database (SCDB) and will be chosen by having suitable known order in horizontal and vertical coordinates. These marks will be the means of control of the testing of the reliability of AUSPOS processed coordinates from observed static GNSS data.

Logging of data will be made in time intervals that represent a real world survey project and will incorporate observations ranging from one to twelve hours of static GNSS data logging. Data collected will be converted to RINEX format and submitted to AUSPOS for coordinate processing.

Resulting coordinates will be assessed and a the data will be then analysed to determine the best suitable observation time to obtain reliable coordinates relative to a typical survey project and real world situation.

1.7 Conclusion

This dissertation is aimed at comparing the coordinate differences from known permanent survey marks to that of AUPOS derived coordinates and also to determine reliability and consistency of precise processed coordinates.

As part of understanding the project a literature review will be undertaken in the following chapter to investigate and understand the origin and capabilities of AUSPOS. The research in this project aims to highlight the benefits of AUSPOS and ultimately derive conclusions of the reliability of AUPOS processed coordinates.

Chapter 2

Literature Review

2.1 Introduction

This chapter will present a review of literature in relation to the background and methods of geodetic surveying and provide insight as to why investigation is required to be made into reliability of coordinate data derived by AUSPOS, specifically the vertical component. The aim of this chapter is to review a selection of previously documented literature, methods, and techniques used in the observation, collection and reduction of geodetic survey information to determine coordinates from AUSPOS generation.

2.2 Geodesy & Geodetic Surveying

As defined by Geoscience Australia (2008) Geodesy is the study of ‘the size and shape of the earth; the measurement of the position and motion of points on the earth’s surface; and the configuration and area of large portions of the earth’s surface.

Directly related to the project, a geodetic survey/s will be undertaken to determine the three dimensional coordinates of measure and position unknown survey control marks. Geodetic Surveying can be defined as the precise measurement of the positions on the earth’s surface of a system of widely separated points. The positions of these points located within the network system are determined both relatively, in terms of the length and azimuths of the lines adjoining them, and absolutely, in terms of the co-ordinates, latitude, longitude and elevation above mean sea level (Clark II, 1966, p.157). These points measured within a geodetic network form what is known as survey control stations to which cadastral, topographical, hydrographic, engineering and other specific surveys can be referred to and connected into.

2.3 History & Methods of Geodetic Surveying

Historically there was one reliable method of obtaining accurate primary horizontal control of which was by means of ordinary triangulation. As simplified by its name, triangulation utilises geometric figures composed of triangles. Horizontal angles and a limited number of sides called base lines are measured. By using the observed angles and measured base line lengths, the triangles are able to be trigonometrically solved and positions of the stations measured to be calculated resulting in horizontal coordinate position (Wolf & Ghilani 2002, p.560).

As time passed the introduction of Electronic Distance Measurement Equipment (EDME) came to be used. In 1949, a Swedish physicist, E. Bergstrand, developed an instrument, the Geodimeter. This instrument was able to measure direct distances from about 10 to 30 miles in length in suitable conditions (Clark II 1966, p.159).

With the introduction of EDME the geodetic method of triangulation was traded for a similar means of observation and calculation called Trilateration. Trilateration is a method which is based on the same principle of triangulation, however is typically concentrated on the measurement of horizontal distances.

In order to determine accurate vertical height components similar methods of geodetic triangular calculation methods were used. Commonly known as trigonometric heighting. Alternatively the use of conventional methods of level traversing were utilised to also obtain accurate height transfer and determination.

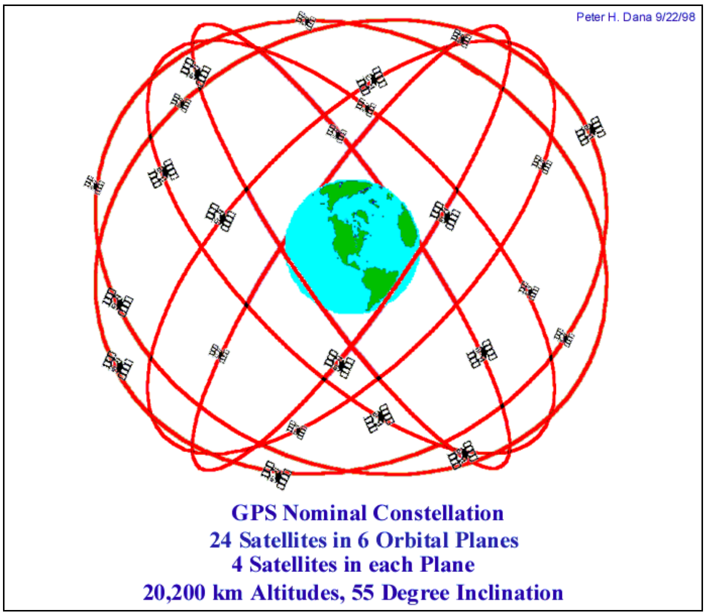
Today the use of such methods of conventional terrestrial surveying by means of triangulation, trilateration and traverse networks has been replaced by the now common and technologically advanced Global Positioning System (GPS).

2.4 Global Positioning System (GPS)

The Global Positioning System is a satellite based technology developed and by the U.S. Department of Defence (DOD) which can be used in all weather conditions, worldwide by both the military and civilian users. The GPS system is based on a constellation of 24 satellites orbiting the earth, arranged in 6 orbital planes with four satellites in each plane.

Used by many civil users worldwide it was originally designed for use and operation by the U.S. Military. The information provided from the satellites enables users to obtain three-dimensional position and velocity with the appropriate receiving equipment.

Figure 2.1 – GPS Satellite Constellation (USQ 2002, Geodetic B SB – 8.2)



GPS provides specially coded satellite signals that can be processed by a GPS receiver enabling the computation of position, velocity and time. GPS point positioning is based on a means called satellite ranging where by an accurate distance can be measured from a satellite and position can then be calculated. To enable a unique point position to be calculated on the earth a minimum of four satellites is required. The principal of point positioning works by timing how long it takes for a radio signal to travel from a satellite to a ground based receiver and in turn a distance can then be calculated. There are also other methods of measuring techniques that are based on the measurement of the phase angle of the signal carrier wave that is produced from satellites. This method of GPS signal measurement is commonly used by surveyors and other spatial science related professionals utilising both GPS & GNSS.

2.5 Professional Organisations & Related Governing Bodies

There are a number of professional organisations that publish information and govern standard practices and procedures that are to be adhered to in relation to GPS and geodetic surveys. These organisations promote a professional approach to the spatial science industry to provide up to date, accurate and specific requirements.

2.6 Intergovernmental Committee on Surveying and Mapping (ICSM)

The Intergovernmental Committee on Surveying and Mapping (ICSM) was established by the Prime Minister, State Premiers, and the Chief Minister of the Northern Territory in 1988. Since that time the Australian Capital Territory and New Zealand have joined ICSM and contribute as a professional group. The objective of the ICSM is to provide leadership, coordination and cooperation in surveying mapping and charting to the spatial science industry and promote the development and maintenance of key national spatial data (ICSM 2006).

Revised publication in November 2007 by the ICSM was 'Standards and Practices for Control Surveys, Special Publication One (SP1)' Version 1.7. This documentation contains information relating directly to a national set of accepted standards and specifications for horizontal and vertical control surveys and information.

2.7 Australian Surveying and Land Information Group (AUSLIG) and Geoscience Australia

The Australian Surveying and Land Information Group (AUSLIG) were formed in September 2001 by a merger of previous departments such as the Australian Survey Office (ASO) and the Department of National Mapping (DNM). In November 2001 a combination of agencies adopted the name Geoscience Australia which it is currently known as today. Commonly Geoscience Australia (GA) is referred to as AUSLIG in publications and documentation in common regard.

2.8 History of AUSPOS

As high precision global geodetic GPS technology has evolved, processing and analysis software has become more sophisticated and in general more automated (GA). The development of automated and simpler processing system has pushed the need for web based processing services for geodetic GPS data.

The first online processing service being NASA Jet Propulsion Laboratory's Auto-Gipsy Service (JPL, 2001) and later the Scrippts Orbit and Permanent Array Centre (SOPAC) coordinate generator (SOPAC, 2001).

As online services were found to be available wide use of such became common with reduction and processing of static GPS observed data. Due to the increased use from unexperienced users there was the potential for misunderstanding with the International

Terrestrial Reference Frame (ITRF) provided by the international service providers. This then led to the recognition of the Australian National Datum, GDA94 and the observation of a need to be cautious in deciphering and producing coordinates due to magnitude offsets and moving reference frames that were not locally appropriate.

Followed by this was the increasing demand for a service that provided Australian specific data and the development of an online processing service that could provide data on request.

Development requirements included (Geoscience Australia);

- Simple to use design for easy online access;
- Capable of processing dual frequency geodetic GPS data;
- High quality processing standards;
- 24 hour, 7 days a week service;
- Rapid processing turnaround;
- Useable internationally;
- Precise coordinate output
- Coordinate output in GDA94 and additionally ITRF geometry for international use.

AUSLIG went in to research and development and derived a number of versions of processing software suitable to requirements were generated. Officially released on the 11th of November 2000 (GA) was the generic version of software that is utilised today. Software is accessible though the Geoscience Australia website (GA).

2.9 AUSPOS Computations

AUSPOS computations are made by utilisation of MicroCosm Software System. MicroCosm is a software system that is designed to have high precision orbit and geodetic parameter product determination. To enable global integration, MicroCosm is entirely International GNSS Services (IGS) compatible. The IGS product range is used to generate coordinates through MicroCosm with the used of attributes such as precise orbit, earth orientation and coordinate solution IGS products.

Processing Steps (AUSPOS):

1. The user submits data in RINEX format to AUSPOS though the online submission system;
2. Determination of nearest IGS stations is made;
3. Data is retrieved from the IGS data centre about IGS stations;

4. A precise solution using a 'double difference' technique is computed;
5. Coordinate of the IGS stations are held fixed and computation of the users observation station computed at the value of the cumulative IGS SSC (coordinate solution). Basically resulting in ITRF 2000 Coordinates

Australian users obtain both ITRF and Geocentric Datum of Australia (GDA) 94 coordinates. Notable the determination of GDA coordinates from ITRF is done by a transformation model with resultant sub-centimeter accuracy.

2.10 International GNSS Service (IGS) and the Australian Regional GPS Network (ARGN)

The International GNSS (IGS) Service formerly known as the International GPS Service is a voluntary association with over 200 worldwide agencies that provide a network of permanent GPS and GNSS reference stations that have precise geodetic attributes and can provide defined product data (IGS).

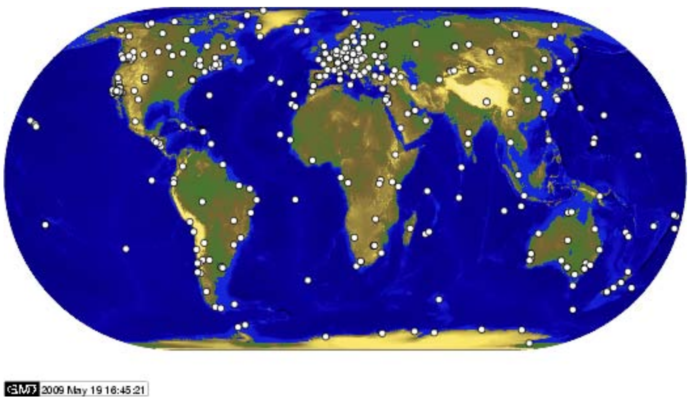


Figure 2.2: International GNSS Tracking Network

The Australian Regional GPS Network (ARGN) is built up of a network of permanent geodetic GPS receivers that continually log data positioned on geologically stable control marks throughout Australia. Within the ARGN, consists of a minor network of eight (8) control stations known as the Australian Fiducial Network (AFN). These geodetic control stations are the structural frame of the geodetic framework for Australian spatial data communications and contribute to the IGS for a global solution.

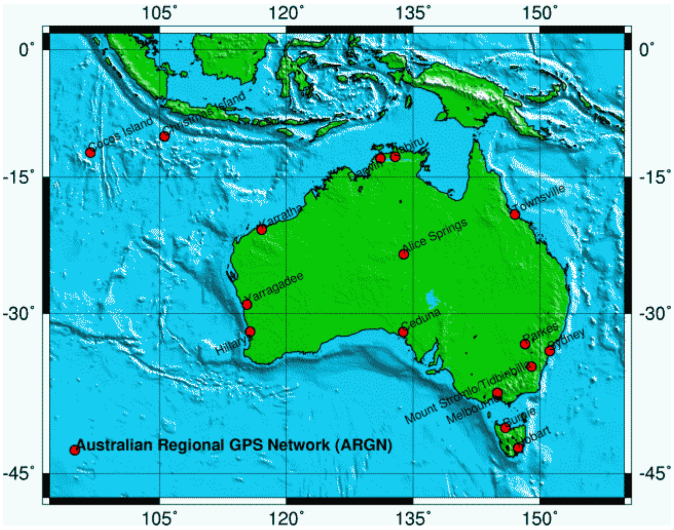


Figure 2.3: The Australian Regional GPS Network (ARGN)

2.11 Quality of Computed AUSPOS Coordinates

It is declared by Geoscience Australia (GA) that the quality of computed coordinates will be dependent upon the following:

- The proximity of International GPS Service (IGS) Stations;
- The quality of the IGS orbit product used;
- The quantity of submitted data

Determined by GA that a if utilising a quality geodetic receiver and antenna observing twenty four (24) hours of data using the IGS final orbit product, should give results to better than 10mm horizontally and 10-20mm in the vertical (GA). In some cases a minimum of two (2) hours of data can give horizontal position to +/- 20mm and anticipated vertical of +/-50 mm. This however does not confirm reliable vertical accuracy as required by this project. To be determined is reliability and consistency and not large variations in resulting values.

Notably the height value derived from AUSPOS will not be precisely that described on controlled marks as Australian Height Datum (AHD). It has been noted by GA that when data is processed and reports are issued there will be a difference between the computed height by AUSPOS and AHD.

AUSPOS computes height values by taking the ellipsoidal height of the position processed and subtracting the AUSGeoid98 value for that site position. To this end this is a reasonable approximation of AHD however is not near exact. This is also due to a slope that ranges from approximately +0.4m in the northern region of Australia to approximately -0.4m in the southern region of Australia between AUSGeoid98 and AHD. Figure 2.4 depicts AUSGeoid98 contours as mentioned.

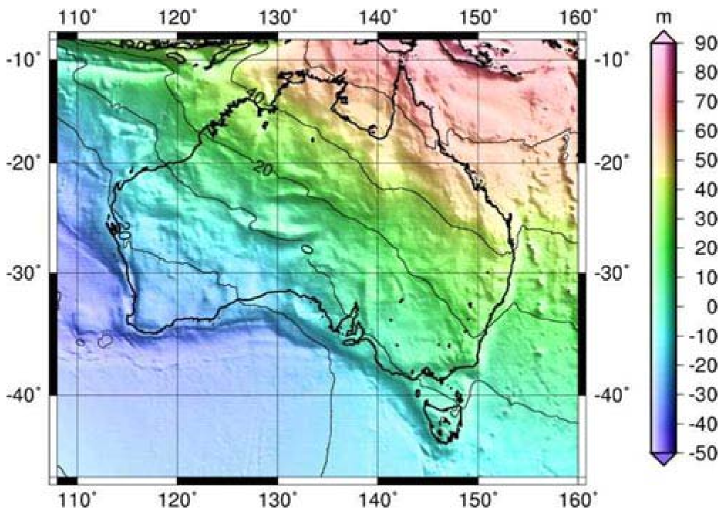


Figure 2.4: AUSGeoid98 Contour Map (Geoscience Australia)

In this instance we could expect that the AHD derived value from AUPOS to be up to 0.5m different from the true AHD height value. The slope mentioned between AHD and AUSGeoid98 became evident by a geodetic GPS survey conducted of the original defining AHD tide gauge benchmarks throughout Australia. No formal conclusion has been derived and further investigation is currently in progress to determine a resolution.

To increase accuracy, Geoscience Australia suggests if the GPS observation station is greater than 100km from the nearest IGS station the estimated positional accuracy in three dimensions (3D) will be a function of session length as shown in the following figure 2.5.

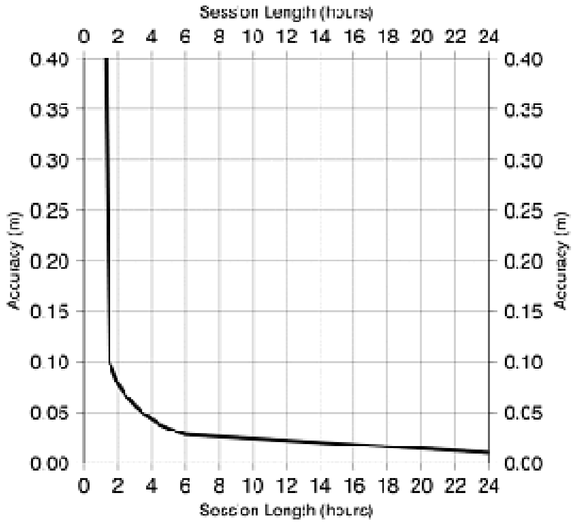


Figure 2.5: Session Length related to Accuracy expected.

When processing data AUSPOS will determine and use the most recent coordinate and attribute data from IGS stations utilized in resulting coordinates. The quality of the IGS data can be related to impact of orbit error.

Orbit Type	**Orbit Error**	**Baseline Error (1000km)**
Broadcast	±10.00m	±400mm
IGS Ultra-Rapid	±0.50m	±20mm
IGS Rapid	±0.10m	±4mm
IGS Final	±0.05m	±2mm

Figure 2.6: Impact of Orbit Error on a 1000km baseline (GA)

Commonly poor coordinate data will be a result of;

- Short observation session times
- Cycle Slips in data & Bad Pseudo-range data
- Observations in bad Multipath environments
- Incorrect antenna heights
- Incorrect antenna types

2.12 Accuracy Assessment Review

A review titled, 'How Accurately Can We Determine Orthometric Height Differences from GPS and Geoid Data?' by Fotopoluos, Kotsakis & Sideris made investigation into the combined relative accuracy of GPS and Geoid data in conjunction with a number of parametric corrector surface models. It was found by their review that the final achievable accuracy of orthometric height differences derived from GPS was dependant on a number of factors relating to the surface corrector parameters and GPS geoid information.

Noted by their review was that the accuracy of the parametric model used did not significantly affect the accuracy from the GPS levelling data however was considerable. As a key result, testing showed that relative GPS/geoid levelling can result in sub-centimetre accuracy over 10km baselines regardless of parametric model chosen. The main factor found attributable to accuracy is directly related to baseline length and regard to observation accuracy of the GPS and geoid height data utilised.

2.13 Conclusions

Conclusive of this chapter is that historical methods of geodetic surveying have in recent times, largely been replaced by GPS. Methods of surveying technique previously developed and used however remain a common and standard practice and are utilised to date. This literature review has looked upon documentation that has been conducted in relation Geodesy and the AUPOS processing Service. It was establish that there is restraining factors in determining accurate coordinate data from observed static GPS data. These factors limit the accuracy and reliability of data obtained.

Chapter 3

Methodology

3.1 Introduction

This chapter will provide a detailed outline of the testing methods, field and office procedures used to acquire and test the projects observed GPS data.

The testing will involve setting up GPS receivers over permanent survey marks (PSM) with known coordinates and then logging data for various time periods. Marks utilised as control PSM's will be those established in the local Toowoomba area and will consist of marks that hold suitable order coordinates horizontally and vertically.

Additionally this chapter will provide the reader with a better understanding of the connection of this research and testing to real world practices and applications in a generic surveying environment where relatively accurate coordinates are required.

3.2 Testing Criteria

To accommodate analysis of test data a suitable sample sized is to be established. A selection of ten (10) registered Permanent Survey Marks (PSM) with known horizontal and vertical coordinates was chosen for use as the controlled testing marks. The known mark coordinates will allow us to determine differences between AUSPOS processed and known coordinates for the subject marks.

The Control Marks have been determined by the following criteria;

- To have First (1st) Order Horizontal Coordinates
- To have at least Fourth (4th) Order Vertical Levels
- Are to be existing registered marks in the Department of Environment and Resource Management Survey Control Database (SCDB).
- Sites chosen are to have minimal multipath and obstruction to the sky where possible for GPS observations
- Marks are to be located within similar proximity (1 to 5km) to each other so as to maintain use of the same reference stations at AUPOS processing time. Within a 15km radius of Toowoomba CBD.

- Marks are to be easily accessible and in good condition

- Marks are to be of a secure nature due to leaving GPS surveying equipment on site unattended for long periods of time.

3.3 Reconnaissance

As part of any survey reconnaissance is a valuable tool in the design and implementation of any project. As per the criteria mentioned in section 3.2, a search was undertaken to obtain suitable mark locations within the specified area.

A filtered SCDB search was undertaken by DERM service centre staff as per a special request for project specific data. The filter was able to determine all PSM's within a 15km radius of Toowoomba CBD that held 1st Order Horizontal Coordinates and a minimum of 4th Order Vertical level values. Output was a listing of marks with coordinates and level information. The search resulted in over forty suitable marks that could be possibly utilised.

In order to find the location of the PSM's, coordinate values were entered into Google Earth so as to allow for a visual display of the location of the marks combined with aerial imagery to determine best possible locations and suitability of marks available.

From the listing of marks a selection of fifteen 15 marks were chosen to have a site visit undertaken to determine mark condition and suitability. Mark latitude and longitude values were entered into Garmin Nuvi 260w personal navigation device. This enabled field inspection to be a simplified task with navigation made easy.

Figure 3.1 – GARMIN Nuvi 260w

(Source: Garmin Limited - https://buy.garmin.com/shop/shop.do?pID=37418)

Field reconnaissance allowed for the ten suitable marks to be chosen and provided opportunity to assess suitability, obstruction issues and possible access and security issues of mark positions.

A brief listing of the selected marks is depicted in table 3.1 below. A map of the chosen survey marks overlayed in Google Earth can be seen in Appendix B. A copy of Survey Search Detail Report Form 6 mark details can be also seen in appendix C.

Table 3.1: Project Permanent Survey Marks & Respective Order

Permanent Mark	Locality	Horizontal Order	Vertical Order
51858	Wesbrook	1st Order	4th Order
91269	Costwold Hills	1st Order	4th Order
112802	Westbrook	1st Order	4th Order
112805	Westbrook	1st Order	4th Order
112809	Charlton	1st Order	4th Order
112810	Charlton	1st Order	4th Order
112922	Costwold Hills	1st Order	4th Order
112929	Wesbrook	1st Order	4th Order
112930	Wesbrook	1st Order	4th Order
178770	Centenery Heights	1st Order	4th Order

3.4 Field Survey - Equipment

The following equipment is available for use as part of this research project field survey data collection:

- 4 x Trimble R8 Model 2 GNSS Receivers (with onboard memory)

  Note: Two receivers were not available for the entire period as had to be utilised around other work commitments.

- 2 x Trimble TSC2 Data Collectors – Software: Trimble Survey Controller v12.42
- 4 x Trimble Tripods (Heavy Duty Timber)
- 4 x Trimble Tribrachs (complete with adaptors and optical plummets)
- 4 x Trimble Base Receiver - Long Life dry cell Batteries (last 24 hours)
- 2 x Offset Tapes
- 2 x Motor Vehicles

3.5 Trimble GNSS Receivers

Trimble R8 Model 2 GNSS receivers were chosen for observing the data as were made available by Minstaff Survey Pty Ltd as part of their GPS survey equipment fleet.

Figure 3.2: Trimble R8 GNSS receiver

(Source: Trimble Navigation Limited 2006 and 2007a)

Trimble R8 Model 2 GNSS Featured features:

- Onboard internal data storage memory of 57MB
- Trimble R-Track technology
- Very low noise GNSS carrier phase measurements with <1mm precision in a 1 Hz Bandwidth
- Low elevation tracking technology
- Small and compact design
- Bluetooth data communication

3.6 Data Observation and Acquisition Plan

As project marks have been selected and GPS receivers established a data acquisition plan is to now be designed. Due to submission of static data to AUSPOS no controlling network factor has to be incorporated or designed as would be done in a geodetic post processed network survey.

In order to have controlled sample data of the ten chosen marks a series of data observations on each mark was to be carried out. It was decided that it would be best to keep observations as close to real world practice as possible. Generically when a surveyor attends to a survey in a remote are with no control they may only be present on site for the period of one (1) day. In this instance equipment is not usually left onsite overnight or for prolonged periods of time due to security reasons and the need to continue utilising the equipment for other jobs or projects as such.

As a result is was expected that a generic day for a surveyor on site would be up to 12 hours. As derived in Chapter 2, the longer data is observed, the more accurate the processed coordinates. Each of the ten marks would be observed for a period of 12, 10, 8, 6, 4, 2 and 1 hour observation sessions respectively.

Data acquired from observations would be individually submitted to AUPOS for processing. In this instance it was possible to have as many or a few receivers running at the same time as possible as they would not conflict results.

An observation schedule was not necessary to be constrained and a freely designed list of marks to be observed was made so as to allow for all marks to be observed with convenience and efficiency. The main constraint was that all marks had to be observed though the time logging range from 1 to 12 hours as mentioned earlier. The intention was to undertake 12 hour observations on each mark and work down in timeframe to 1 hour observations.

3.7 Field Survey

The field survey commenced on 23rd September 2009 and receivers were utilised intermittently between work commitments logging data daily until 5th of October 2009. Two field parties were utilised to acquire the observation data. Notably most of the data was acquired by one person only as the long logging sessions only required attendance early in the morning, to start the receiver and then again late in the evening to stop the receiver. Each personnel were given a brief on the operation of the receiver and the steps to start and stop the receivers logging and method of booking the logging schedule.

Data Observation Procedure was generically as follows:

1. Mobilise to PSM site and confirm mark is still in good condition

2. Setup R8 GNSS receiver over mark and confirm level

3. Measure the height of the receiver antenna to ARP.

   The height of antenna was measured to the centre of Bumper of the receiver. This is depicted on an R8 receiver as the black rubber ring around the centre of the receiver unit. This point was also known as the Antenna Reference Point (ARP) for the known receiver. A copy of the NGS Trimble R8 GNSS calibration sheet can be found in Appendix D.

4. The field surveyor measured the height of the receiver three times and recorded the average height.

5. Session data was booked to Observation Log sheets. Information from sheets was then input into spreadsheet of observation information.

6. The receiver was then started and observation logging was confirmed.

7. After logging period required, return to receiver and end survey.

8. Data was then downloaded from receiver to Survey Controller. (Data was backed up at the end of each day)

9. Receiver re-started or moved to next PSM and started again.

A graphic representation of two of the control marks utilised can be seen in the following figures.

Figure 3.3 – R8 GNSS Receiver logging data at PM112805

Figure 3.4 – R8 GNSS Receiver logging data at PM112810

Four R8 GNSS receivers were placed on selected marks and were initiated to observe and log static for a period of twelve hours. These revivers were stopped from logging, data removed, height checked and re-started again for the next 10 hour session. Due to the time taken to observe data, the collection of observations was a time consuming task.

As the time to observe data was becoming time consuming it became evident the need to expedite the collection so as the receivers could be included back into Minstaff Surveys field schedule.

The first five of the chosen control marks were observed for all observation sessions time lengths for 1, 2, 4, 6, 8, 10 and12 hour sessions. This equated to approximately 43 hours of logging time per control mark. As this was a very tedious task a more efficient method of data acquisition had to be determined.

From trial and error it was found achievable and successful to extract required logging sessions form long observation datasets that had been converted to RINEX format. As a result the remaining five control marks had only 12 hour observation sessions logged and sessions below this time period were extracted from the converted RINEX file for required observation time period.

This expedited data collection and also allowed for further investigation into the history, format and requirements of a RINEX file.

Figure 3.5 depicts a table of the observation sessions undertaken to acquire the project data. Observation log sheets can be found in Appendix E depicting observation all recorded observation details relevant to each mark and session.

Table 3.2 – Observation Sessions

Mark Information	**Hours Logged & Date Observed(date)**						
PSM	**1**	**2**	**4**	**6**	**8**	**10**	**12**
51858	29/09/2009	29/09/2009	*Edit RINEX*	25/09/2009	30/09/2009	1/10/2009	30/09/2009
91269	*Edit RINEX*	*Edit RINEX*	*Edit RINEX*	*Edit RINEX*	*Edit RINEX*	*Edit RINEX*	3/10/2009
112802	*Edit RINEX*	*Edit RINEX*	*Edit RINEX*	*Edit RINEX*	*Edit RINEX*	*Edit RINEX*	5/10/2009
112805	*Edit RINEX*	*Edit RINEX*	*Edit RINEX*	*Edit RINEX*	*Edit RINEX*	*Edit RINEX*	5/10/2009
112809	29/09/2009	1/10/2009	1/10/2009	29/09/2009	26/09/2009	27/09/2009	28/09/2009
112810	*Edit RINEX*	*Edit RINEX*	*Edit RINEX*	*Edit RINEX*	*Edit RINEX*	*Edit RINEX*	3/10/2009
112922	29/09/2009	30/09/2009	28/09/2009	28/09/2009	25/09/2009	27/09/2009	24/09/2009
112929	*Edit RINEX*	*Edit RINEX*	*Edit RINEX*	*Edit RINEX*	*Edit RINEX*	*Edit RINEX*	5/10/2009
112930	29/09/2009	29/09/2009	30/09/2009	29/09/2009	26/09/2009	27/09/2009	28/09/2009
178770	1/10/2009	27/09/2009	28/09/2009	28/09/2009	30/09/2009	*Edit RINEX*	25/09/2009

Edit RINEX : RINEX file edited from 12hour data observation file to required logging period

3.8 Data Conversion to RINEX

Field data observed was recorded and stored in Trimble '.T01' file format. For data to be submitted to ASUPOS the field data had to be converted to a RINEX file.

The Receiver Independent Exchange Format is otherwise known as RINEX and is typically an ASCII type format file. ASCII, an acronym for American Standard Code for Information Interchange is a type of format that is widely used for standard data exchange between differing programs and systems alike (Ghoddousi-Fard 2008).

The program used to convert T01 files to RINEX was a Trimble Business Centre Utility – Convert to RINEX Version 2.0.0.8. The program is designed to read in a T01 or similar file and verify the information observed. The data can then be converted and exported as a RINEX file. The RINEX format exported was compatible to RINEX Version 2.10

3.9 Cutting RINEX Data

In undertaking some external research it was found that cutting RINEX data had been successful by other users in the past. In order to reduce observation times in the field it was considered that a single twelve hour observation could be made on each of the five remaining marks and then the data for 10, 8, 6, 4, 2, and 1 hour logging could be cut and extracted from the RINEX file without removing critical information.

Several trial and error submissions were made to AUSPOS before concluding a successful means to extract a period of data form a RINEX file to submit to AUSPOS. It was found that data had to be removed from the end of the RINEX file without effecting the header and start of the data. Also found critical was the removal of any line spaces or erroneous lines that could confuse AUSPOS at processing time.

3.10 Submission to AUSPOS

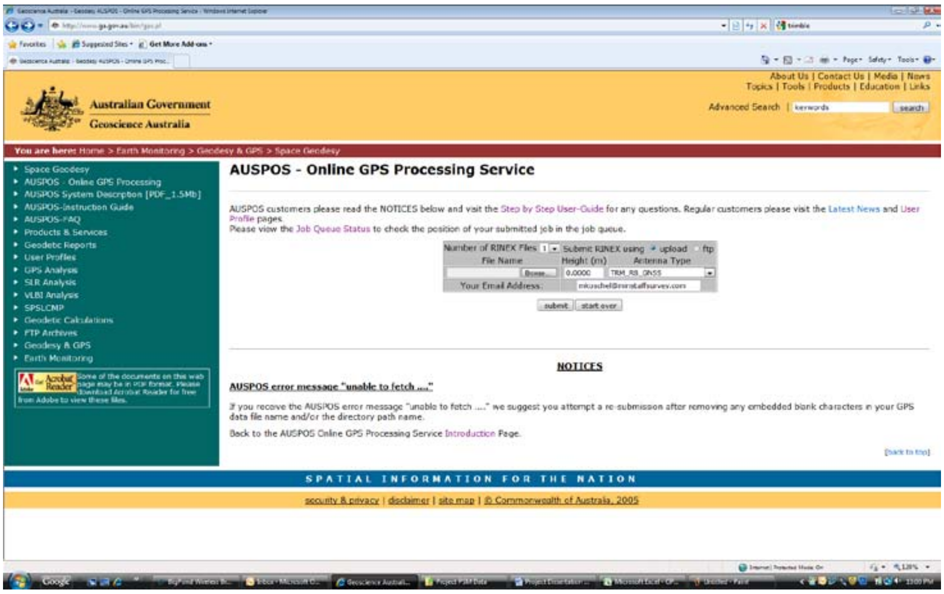
Data was submitted to AUPOS via the free online processing service though the Geoscience Australia website. This service can be found at web URL: http://www.ga.gov.au/bin/gps.pl.

For AUSPOS to process the larger RINEX files data had to be packaged into compressed '.zip' file folders to accelerate data transfer to the AUSPOS web service.

Figure 3.14 depicts a typical screen capture of data about to be submitted to the AUSPOS online processing service.

As part of processing an automated wakeup call is sent to the AUSPOS processing system and a screen notification is displayed to confirm data has been submitted and is in the system queue for processing.

Figure 3.5 – AUSPOS-Online GPS Processing Service Submission Screen



(Source: Geoscience Australia - http://www.ga.gov.au/bin/gps.pl)

Once AUSPOS has received the RINEX file a number of the nearest International GPS Service (IGS) reference stations are determined and the relevant data is retrieved from the IGS data server so as can be use to produce solution. Using a ‘double difference’ technique the position of the unknown site is post processed by holding the IGS reference stations as fixed positions and then determining coordinate geometry for the submitted data.

Computations are made by AUSPOS using the MicroCosm Software System. This system is a highly accurate precision orbit and geodetic parameter determination system *(Geoscience Australia).*

3.11 Receipt of Data from AUSPOS

Upon AUSPOS processing the submitted observation data a detailed report is forwarded to the users email address. The report containing information relating to length of data observed, the reference stations used and computed coordinate data and solution information is depicted.

AUSPOS Online GPS Processing Report’s for each of the observations can be seen in Appendix F.

3.12 Conclusion

By utilising PSM’s that have known coordinate values I will be able to compare the differences form the data I have obtained by means of AUSPOS to that of the known values. As a result I aim to be able to determine a recommendation in regards to the reliability of AUSPOS (specifically height) in relation to a real world surveying project situation

Chapter 4

Results

4.1 Introduction

Procedures and methods outlined in Chapter 3 have produced the required project test data. As all data and results are obtained, graphical representation needs to be completed so as analogies can be identified and assessment made. This chapter depicts a number of graphs and tables and discusses the results that were obtained from AUPSOS. The graphs and tables shown will allow the reader to observe the differences between known coordinates and AUSPOS processed coordinates. The aim of this chapter is to also allow the reader to also understand the differences obtained between coordinate values with respect to different observation time periods.

4.2 Explanation of Results Shown

Graphs and tables shown in this chapter depict and make reference to known coordinate values. The known coordinate value is the value that is published in the DERM Survey Control Database (SCDB). The difference from the known coordinate value has been calculated and depicts three vectors. These vectors are difference in easting (Delta E) and northing (Delta N) and difference in height (Delta H). The delta value has been calculated by subtracting the AUSPOS derived coordinate value from the respective known coordinate.

4.3 Expected Height Difference from AHD

It is expected that the value obtained from ASUPOS for height will be different to that of the known AHD value for each mark. As mentioned in Chapters 2 and 3 there is an apparent slope difference between AUSGeoid98 and the ellipsoid that will in turn only provide for an approximation of AHD height. It is anticipated that due to location of the test site relative to the AUSGeoid98 contour map in figure 2.4 it would be expected that the AUPOS height may be approximately +200mm above the known AHD value. This will be reflected in the following graphs and tables of results.

4.4 Known PSM Coordinates

As per Chapter 3 ten (10) permanent survey marks were used in the project controlled data sample. Table 4.1 depicts the known values as held in the SCDB. For more information see Appendix C for complete PSM survey search detailed reports for each control mark.

PSM	Easting	Northing	Zone	Datum	Height	Datum
178770	397282.255	6948350.636	56	GDA94	683.516	AHD
51858	387699.883	6945962.222	56	GDA94	566.658	AHD
91269	392375.985	6957742.635	56	GDA94	517.864	AHD
112802	387524.588	6948262.002	56	GDA94	500.174	AHD
112805	387972.385	6946929.158	56	GDA94	530.462	AHD
112809	387677.487	6954009.474	56	GDA94	505.819	AHD
112810	389533.708	6956540.111	56	GDA94	523.095	AHD
112922	390917.440	6956382.722	56	GDA94	560.173	AHD
112929	388386.877	6948156.343	56	GDA94	525.702	AHD
112930	389075.304	6948059.159	56	GDA94	535.220	AHD

Table 4.1: Known PSM Coordinate Values

4.5 Results and Comparisons between Known and AUPOS computed coordinates

In this section results will be compared between observation time periods per individual mark. Notably each PSM has results from seven sessions of data from the 1 to 12 hour periods as mentioned in chapter 3.

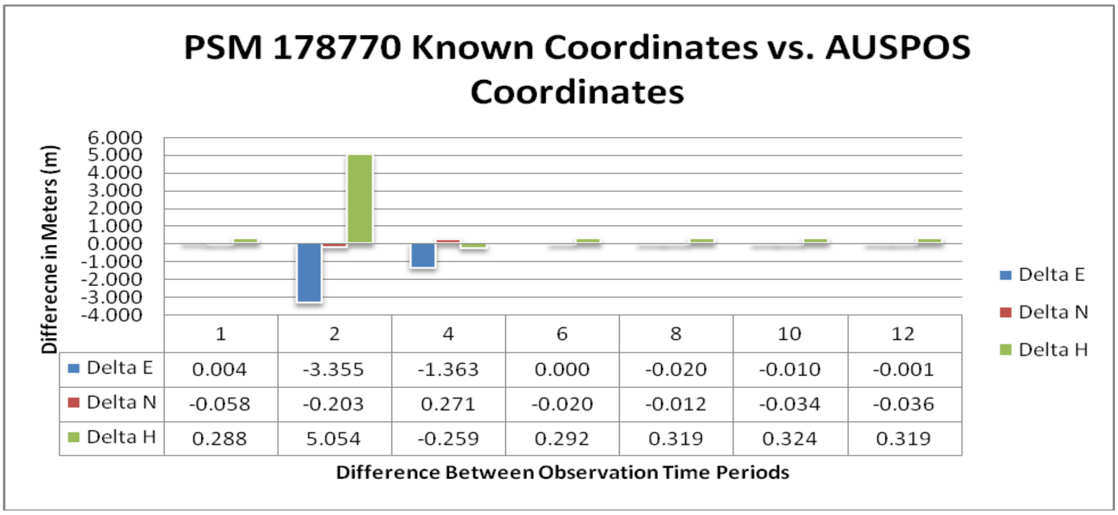
4.5.1 PSM 178770

Table 4.2 shows a comparison table made between AUSPOS results and known coordinates for PSM 178770. Noticed was that there was a considerable spike in the data during the two and four hours observations at this mark. For the two hour observation the delta easting spiked by -3.355m horizontally and +5.054m in height. Respectively one hour and six to twelve hours of data was fairly consistent.

178770 - Known PSM Coordinates						
PSM Number	**Easting**	**Northing**	**Zone**	**Datum**	**Height**	**Datum**
178770	**397282.255**	**6948350.636**	**56**	**GDA94**	**683.516**	**AHD**
AUSPOS PROCESSED COORDINATES						
Obs. Time (hrs)	**Easting**	**Northing**	**Height**	**Delta E**	**Delta N**	**Delta H**
1	397282.259	6948350.578	683.804	0.004	-0.058	0.288
2	397278.900	6948350.433	688.570	-3.355	-0.203	5.054
4	397280.892	6948350.907	683.257	-1.363	0.271	-0.259
6	397282.255	6948350.616	683.808	0.000	-0.020	0.292
8	397282.235	6948350.624	683.835	-0.020	-0.012	0.319
10	397282.245	6948350.602	683.840	-0.010	-0.034	0.324
12	397282.254	6948350.600	683.835	-0.001	-0.036	0.319

Table 4.2: PSM 178770 Known vs. AUSPOS Coordinates

Figure 4.1 depicts a graph of the differences with respect to the data in table 4.2.



	1	2	4	6	8	10	12
Delta E	0.004	-3.355	-1.363	0.000	-0.020	-0.010	-0.001
Delta N	-0.058	-0.203	0.271	-0.020	-0.012	-0.034	-0.036
Delta H	0.288	5.054	-0.259	0.292	0.319	0.324	0.319

Figure 4.1: PSM 178770 Known vs. AUSPOS Coordinates Graph

4.5.2 PSM 51858

Table 4.3 shows a comparison made between AUSPOS results and known coordinates for PSM 51858. Data over the periods of observation sessions generally only ranged by +/- 55mm horizontally. Vertical however did range by 198mm and would not be considered to be reliable.

Known Control Mark Coordinates						
PSM Number	**Easting**	**Northing**	**Zone**	**Datum**	**Height**	**Datum**
51858	**387699.883**	**6945962.222**	**56**	**GDA94**	**566.658**	**AHD**
AUSPOS PROCESSED COORDINATES						
Obs. Time (hrs)	**Easting**	**Northing**	**Height**	**Delta E**	**Delta N**	**Delta H**
1.000	387699.908	6945962.171	566.885	0.025	-0.051	0.227
2.000	387699.891	6945962.200	566.917	0.008	-0.022	0.259
4.000	387699.899	6945962.187	566.800	0.016	-0.035	0.142
6.000	387699.909	6945962.191	566.832	0.026	-0.031	0.174
8.000	387699.901	6945962.192	566.908	0.018	-0.030	0.250
10.000	387699.864	6945962.202	566.924	-0.019	-0.020	0.266
12.000	387699.938	6945962.176	566.998	0.055	-0.046	0.340

Table 4.3: PSM 51858 Known vs. AUSPOS Coordinates

Figure 4.2 depicts a graph of the differences with respect to the data in table 4.3.

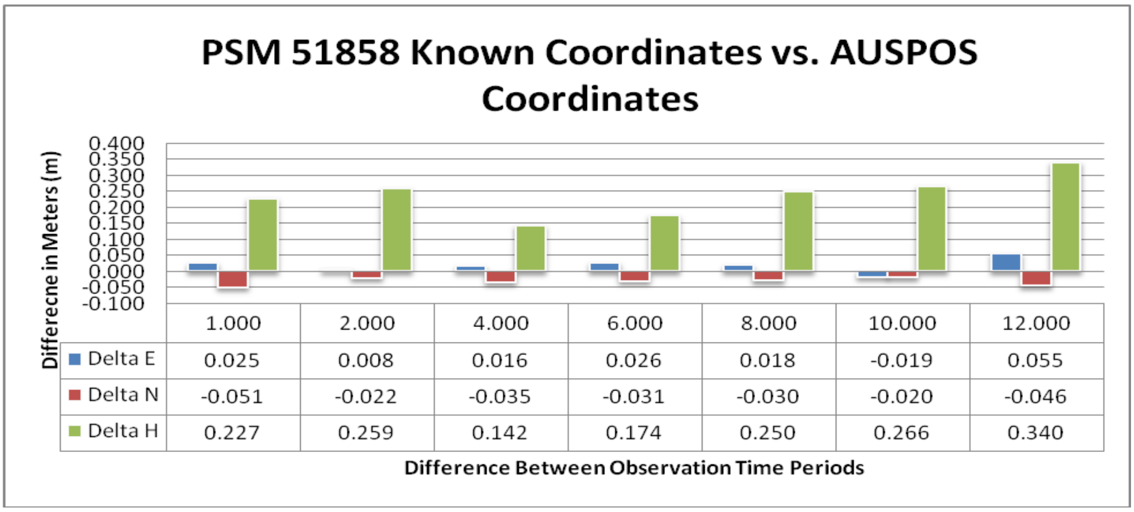


Figure 4.2: PSM 51858 Known vs. AUSPOS Coordinates Graph

4.4.3 PSM 91269

Table 4.4 shows a comparison made between AUSPOS results and known coordinates for PSM 91269. Data for this PSM seems to be steady and does represent consistent values for longer observation periods. Depicted is the consistent height difference above known AHD height which was expected.

Known Control Mark Coordinates						
PSM Number	**Easting**	**Northing**	**Zone**	**Datum**	**Height**	**Datum**
91269	**392375.985**	**6957742.635**	**56**	**GDA94**	**517.864**	**AHD**
AUSPOS PROCESSED COORDINATES						
Obs. Time (hrs)	**Easting**	**Northing**	**Height**	**Delta E**	**Delta N**	**Delta H**
1.000	392375.908	6957742.579	518.167	-0.077	-0.056	0.303
2.000	392375.960	6957742.603	518.086	-0.025	-0.032	0.222
4.000	392375.977	6957742.612	518.150	-0.008	-0.023	0.286
6.000	392375.970	6957742.615	518.189	-0.015	-0.020	0.325
8.000	392375.979	6957742.616	518.170	-0.006	-0.019	0.306
10.000	392375.976	6957742.618	518.167	-0.009	-0.017	0.303
12.000	392375.974	6957742.616	518.173	-0.011	-0.019	0.309

Table 4.4: PSM 91269 Known vs. AUSPOS Coordinates

Figure 4.3 depicts a graph of the differences with respect to the data in table 4.4.

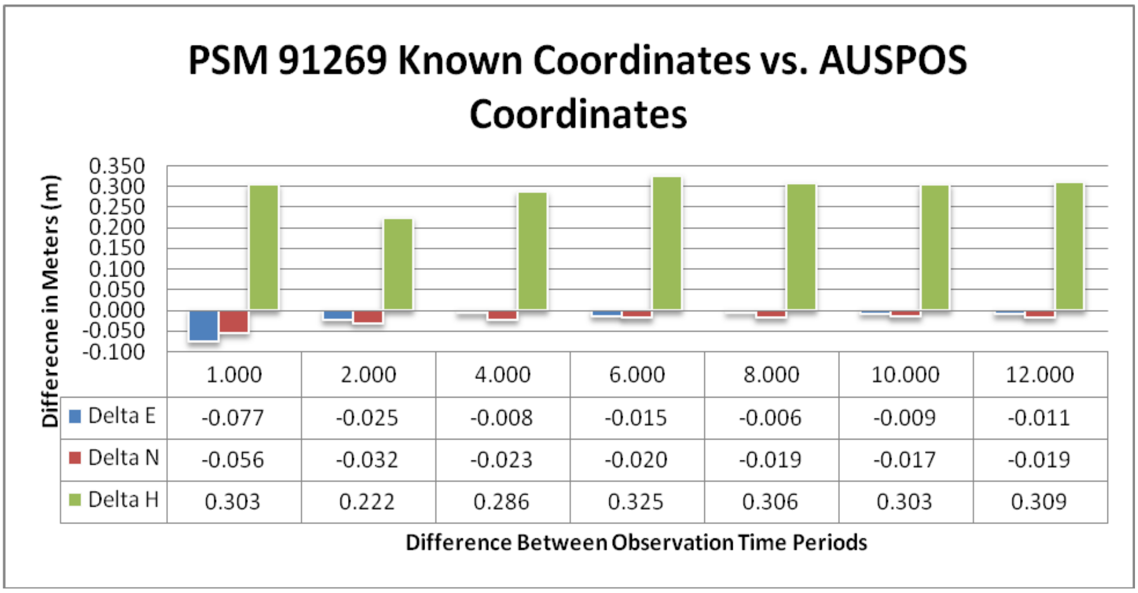


Figure 4.3: PSM 91269 Known vs. AUSPOS Coordinates Graph

4.5.3 PSM 112802

Table 4.5 shows a comparison made between AUSPOS results and known coordinates for PSM 112802. Again data is stabilising as the observation periods lengthen. Consistency is also present with values above the AHD known value.

Known Control Mark Coordinates						
PSM Number	**Easting**	**Northing**	**Zone**	**Datum**	**Height**	**Datum**
112802	**387524.588**	**6948262.002**	**56**	**GDA94**	**500.174**	**AHD**
AUSPOS PROCESSED COORDINATES						
Obs. Time (hrs)	**Easting**	**Northing**	**Height**	**Delta E**	**Delta N**	**Delta H**
1.000	387524.548	6948261.940	500.482	-0.040	-0.062	0.308
2.000	387524.550	6948261.978	500.444	-0.038	-0.024	0.270
4.000	387524.540	6948261.968	500.399	-0.048	-0.034	0.225
6.000	387524.541	6948261.978	500.388	-0.047	-0.024	0.214
8.000	387524.540	6948261.974	500.393	-0.048	-0.028	0.219
10.000	387524.541	6948261.972	500.391	-0.047	-0.030	0.217
12.000	387524.546	6948261.976	500.395	-0.042	-0.026	0.221

Table 4.5: PSM 112802 Known vs. AUSPOS Coordinates

Figure 4.4 depicts a graph of the differences with respect to the data in table 4.5.

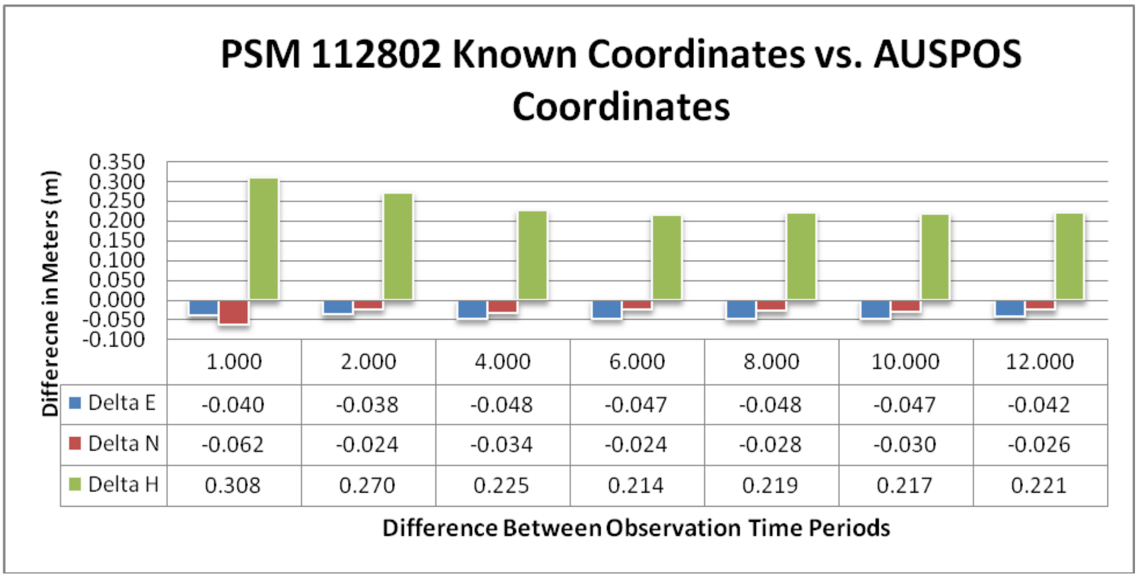


Figure 4.4: PSM 112802 Known vs. AUSPOS Coordinates Graph

4.5.4 PSM 112805

Table 4.6 shows a comparison made between AUSPOS results and known coordinates for PSM 112805. Again typical of that observed at previous PSM locations and observations sessions.

Known Control Mark Coordinates						
PSM Number	**Easting**	**Northing**	**Zone**	**Datum**	**Height**	**Datum**
112805	**387972.385**	**6946929.158**	**56**	**GDA94**	**530.462**	**AHD**
AUSPOS PROCESSED COORDINATES						
Obs. Time (hrs)	**Easting**	**Northing**	**Height**	**Delta E**	**Delta N**	**Delta H**
1.000	387972.329	6946929.106	530.709	-0.056	-0.052	0.247
2.000	387972.339	6946929.136	530.763	-0.046	-0.022	0.301
4.000	387972.354	6946929.146	530.676	-0.031	-0.012	0.214
6.000	387972.353	6946929.135	530.701	-0.032	-0.023	0.239
8.000	387972.358	6946929.128	530.699	-0.027	-0.030	0.237
10.000	387972.361	6946929.128	530.696	-0.024	-0.030	0.234
12.000	387972.369	6946929.127	530.705	-0.016	-0.031	0.243

Table 4.6: PSM 112805 Known vs. AUSPOS Coordinates

Figure 4.5 depicts a graph of the differences with respect to the data in table 4.6.

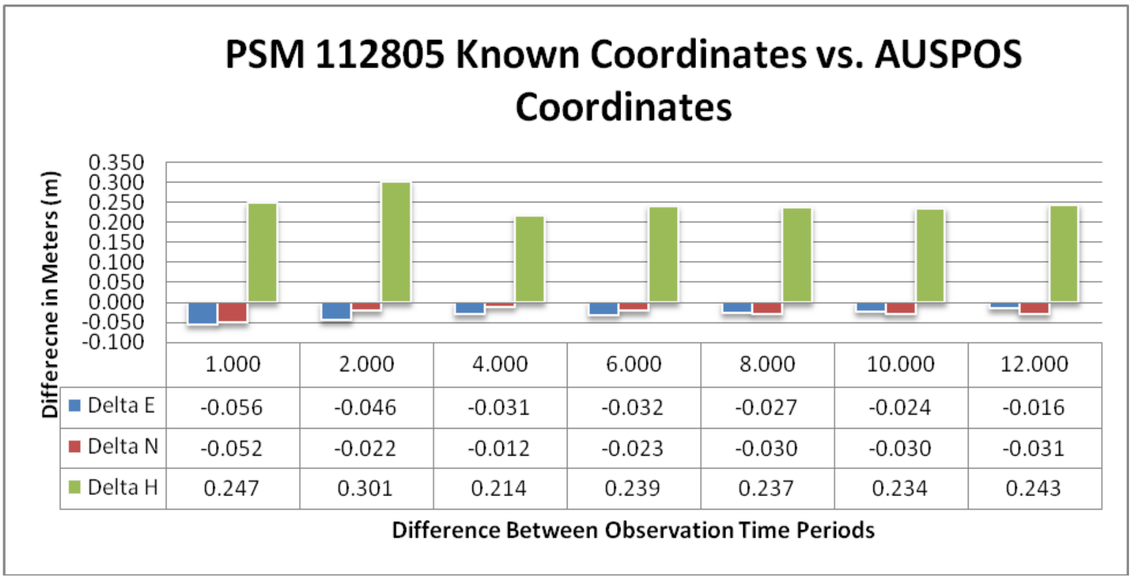


Figure 4.5: PSM 112805 Known vs. AUSPOS Coordinates Graph

4.5.5 PSM 112809

Table 4.7 shows a comparison made between AUSPOS results and known coordinates for PSM 112809. Again height is consistently high however did range by 194mm.

Known Control Mark Coordinates						
PSM Number	**Easting**	**Northing**	**Zone**	**Datum**	**Height**	**Datum**
112809	**387677.487**	**6954009.474**	**56**	**GDA94**	**505.819**	**AHD**
AUSPOS PROCESSED COORDINATES						
Obs. Time (hrs)	**Easting**	**Northing**	**Height**	**Delta E**	**Delta N**	**Delta H**
1.000	387677.624	6954009.418	505.908	0.137	-0.056	0.089
2.000	387677.486	6954009.439	506.069	-0.001	-0.035	0.250
4.000	387677.503	6954009.449	506.076	0.016	-0.025	0.257
6.000	387677.513	6954009.430	506.072	0.026	-0.044	0.253
8.000	387677.483	6954009.450	506.102	-0.004	-0.024	0.283
10.000	387677.503	6954009.432	506.091	0.016	-0.042	0.272
12.000	387677.493	6954009.424	506.083	0.006	-0.050	0.264

Table 4.7: PSM 112809 Known vs. AUSPOS Coordinates

Figure 4.6 depicts a graph of the differences with respect to the data in table 4.7

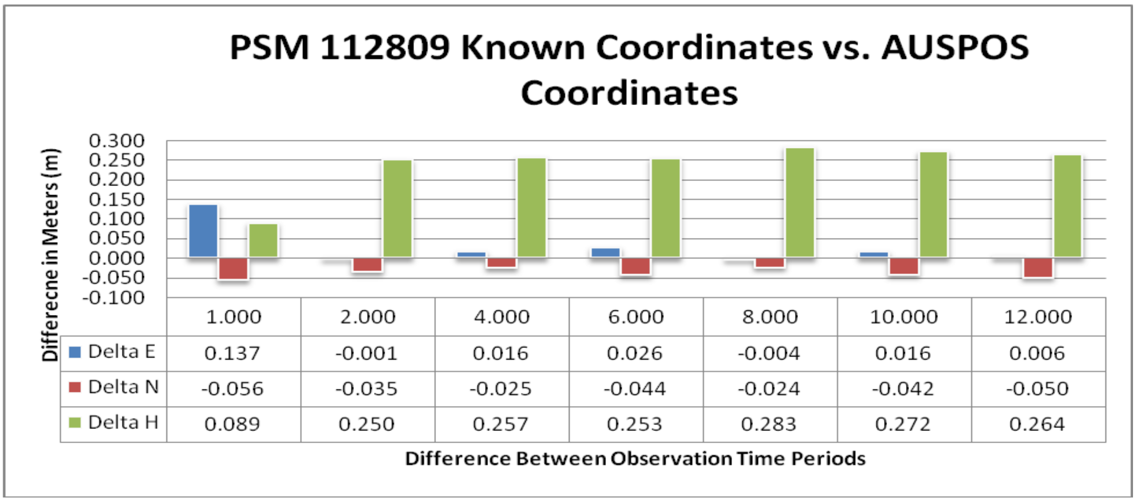


Figure 4.6: PSM 112809 Known vs. AUSPOS Coordinates Graph

4.5.7 PSM 112810

Table 4.8 shows a comparison made between AUSPOS results and known coordinates for PSM 112810. This PSM seemed to be a very consistent mark with results in horizontal ranging by up to -60mm. There did not seem to be any horizontal values above the known coordinate. Height at this mark ranged by 40mm.

Known Control Mark Coordinates						
PSM Number	**Easting**	**Northing**	**Zone**	**Datum**	**Height**	**Datum**
112810	**389533.708**	**6956540.111**	**56**	**GDA94**	**523.095**	**AHD**
AUSPOS PROCESSED COORDINATES						
Obs. Time (hrs)	**Easting**	**Northing**	**Height**	**Delta E**	**Delta N**	**Delta H**
1.000	389533.661	6956540.050	523.389	-0.047	-0.061	0.294
2.000	389533.680	6956540.086	523.353	-0.028	-0.025	0.258
4.000	389533.694	6956540.085	523.366	-0.014	-0.026	0.271
6.000	389533.687	6956540.088	523.393	-0.021	-0.023	0.298
8.000	389533.697	6956540.088	523.386	-0.011	-0.023	0.291
10.000	389533.696	6956540.088	523.387	-0.012	-0.023	0.292
12.000	389533.693	6956540.085	523.386	-0.015	-0.026	0.291

Table 4.8: PSM 112810 Known vs. AUSPOS Coordinates

Figure 4.7 depicts a graph of the differences with respect to the data in table 4.8.

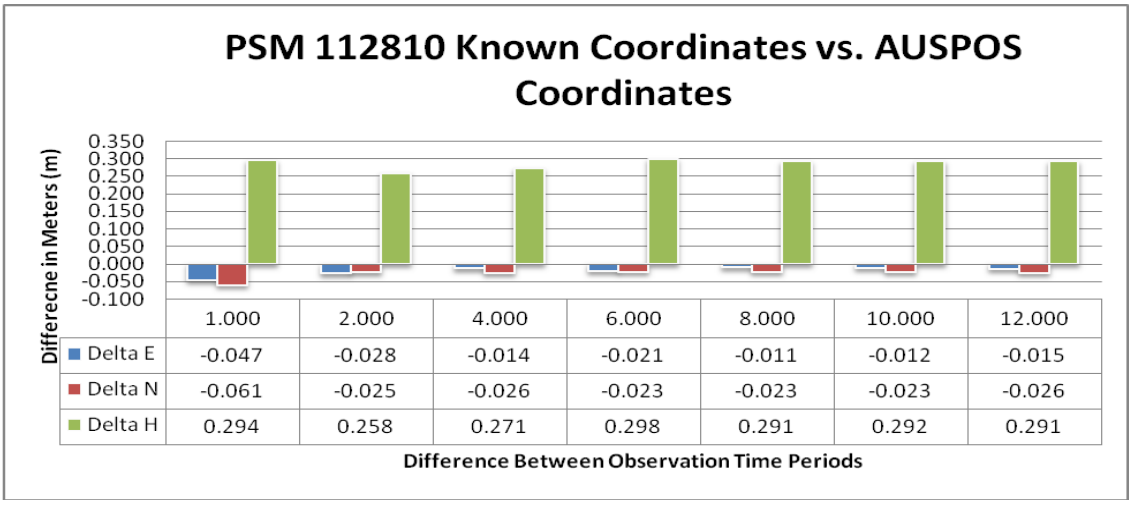


Figure 4.7: PSM 112810 Known vs. AUSPOS Coordinates Graph

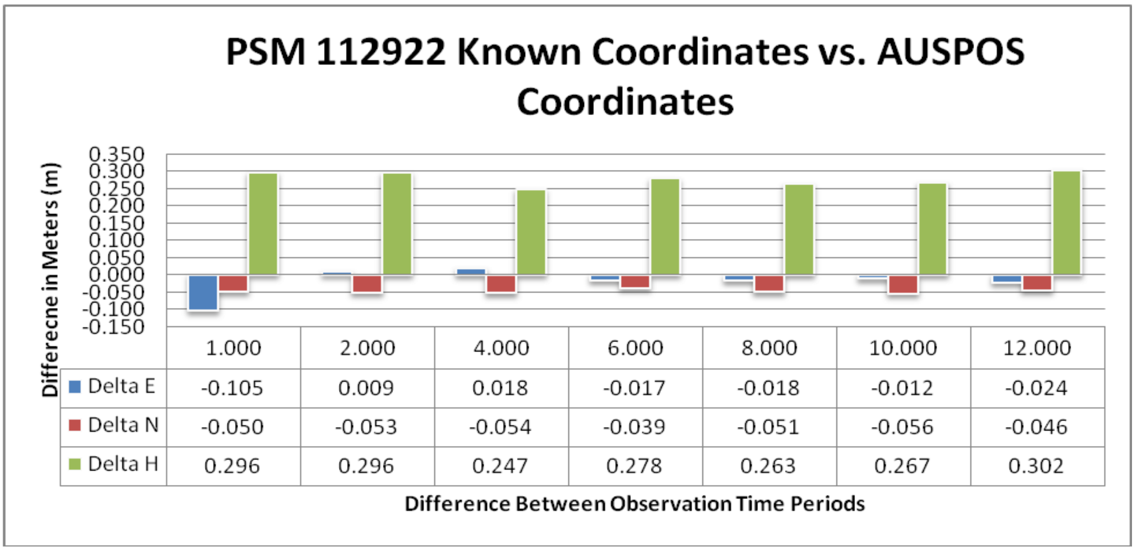
4.5.8 PSM 112922

Table 4.9 shows a comparison made between AUSPOS results and known coordinates for PSM 112922.

Known Control Mark Coordinates						
PSM Number	**Easting**	**Northing**	**Zone**	**Datum**	**Height**	**Datum**
112922	**390917.440**	**6956382.722**	**56**	**GDA94**	**560.173**	**AHD**
AUSPOS PROCESSED COORDINATES						
Obs. Time (hrs)	**Easting**	**Northing**	**Height**	**Delta E**	**Delta N**	**Delta H**
1.000	390917.335	6956382.672	560.469	-0.105	-0.050	0.296
2.000	390917.449	6956382.669	560.399	0.009	-0.053	0.296
4.000	390917.458	6956382.668	560.420	0.018	-0.054	0.247
6.000	390917.423	6956382.683	560.451	-0.017	-0.039	0.278
8.000	390917.422	6956382.671	560.436	-0.018	-0.051	0.263
10.000	390917.428	6956382.666	560.440	-0.012	-0.056	0.267
12.000	390917.416	6956382.676	560.475	-0.024	-0.046	0.302

Table 4.9: PSM 112922 Known vs. AUSPOS Coordinates

Figure 4.8 depicts a graph of the differences with respect to the data in table 4.9.



	1.000	2.000	4.000	6.000	8.000	10.000	12.000
Delta E	-0.105	0.009	0.018	-0.017	-0.018	-0.012	-0.024
Delta N	-0.050	-0.053	-0.054	-0.039	-0.051	-0.056	-0.046
Delta H	0.296	0.296	0.247	0.278	0.263	0.267	0.302

Figure 4.8: PSM 112922 Known vs. AUSPOS Coordinates Graph

4.5.9 PSM 112929

Table 4.10 shows a comparison made between AUSPOS results and known coordinates for PSM 112929. Again this mark was consistent with regards to horizontal coordinates and also vertically.

Known Control Mark Coordinates						
PSM Number	**Easting**	**Northing**	**Zone**	**Datum**	**Height**	**Datum**
112929	**388386.877**	**6948156.343**	**56**	**GDA94**	**525.702**	**AHD**
AUSPOS PROCESSED COORDINATES						
Obs. Time (hrs)	**Easting**	**Northing**	**Height**	**Delta E**	**Delta N**	**Delta H**
1.000	388386.847	6948156.286	526.045	-0.030	-0.057	0.343
2.000	388386.873	6948156.309	526.001	-0.004	-0.034	0.299
4.000	388386.871	6948156.309	525.986	-0.006	-0.034	0.284
6.000	388386.864	6948156.309	525.986	-0.013	-0.034	0.284
8.000	388386.865	6948156.311	525.987	-0.012	-0.032	0.285
10.000	388386.868	6948156.311	525.988	-0.009	-0.032	0.286
12.000	388386.876	6948156.313	525.983	-0.001	-0.030	0.281

Table 4.10: PSM 112929 Known vs. AUSPOS Coordinates

Figure 4.9 depicts a graph of the differences with respect to the data in table 4.10.

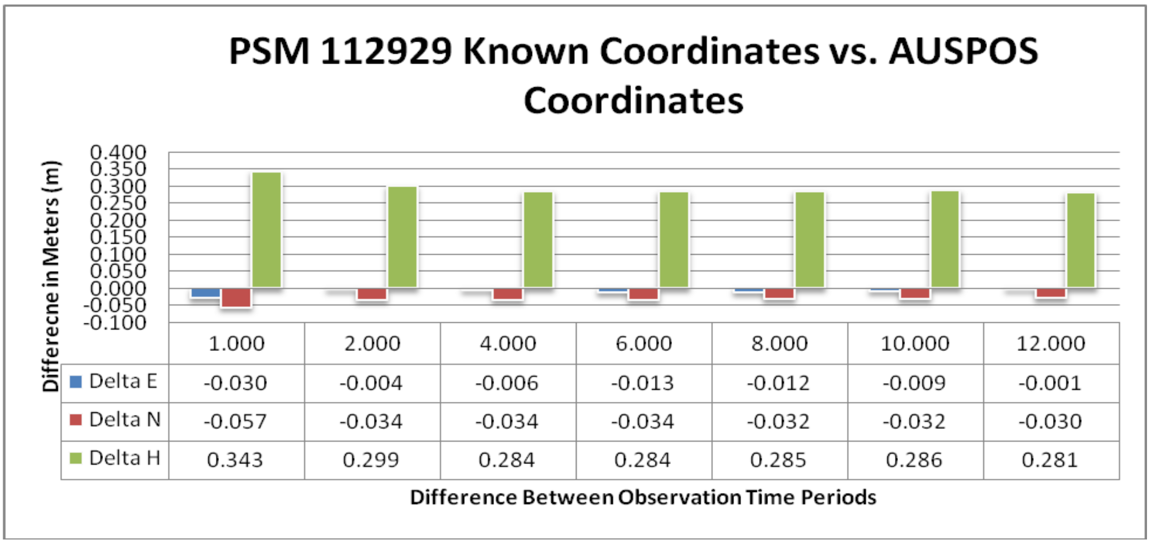


Figure 4.9: PSM 112929 Known vs. AUSPOS Coordinates Graph

4.5.10 PSM 112930

Table 4.11 shows a comparison made between AUSPOS results and known coordinates for PSM 112930. This mark seemed to betray consistency in horizontal geometry however vertical did range by 246mm.

Known Control Mark Coordinates						
PSM Number	**Easting**	**Northing**	**Zone**	**Datum**	**Height**	**Datum**
112930	**389075.304**	**6948059.159**	**56**	**GDA94**	**535.220**	**AHD**
AUSPOS PROCESSED COORDINATES						
Obs. Time (hrs)	**Easting**	**Northing**	**Height**	**Delta E**	**Delta N**	**Delta H**
1.000	389075.262	6948059.190	535.714	-0.042	0.031	0.494
2.000	389075.296	6948059.141	535.525	-0.008	-0.018	0.305
4.000	389075.282	6948059.143	535.468	-0.022	-0.016	0.248
6.000	389075.267	6948059.150	535.488	-0.037	-0.009	0.268
8.000	389075.256	6948059.134	535.499	-0.048	-0.025	0.279
10.000	389075.281	6948059.138	535.514	-0.023	-0.021	0.294
12.000	389075.283	6948059.142	535.506	-0.021	-0.017	0.286

Table 4.11: PSM 112930 Known vs. AUSPOS Coordinates

Figure 4.10 depicts a graph of the differences with respect to the data in table 4.11.

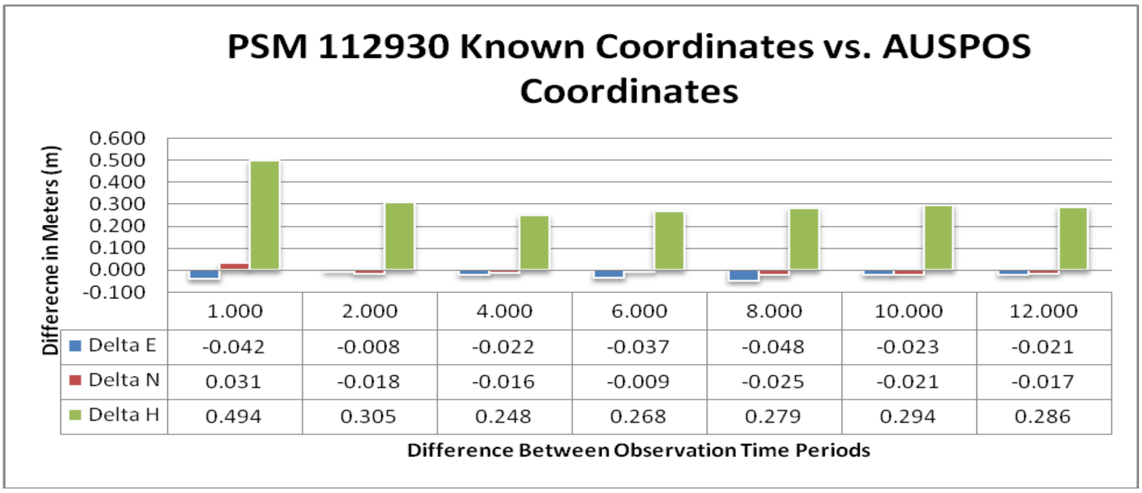


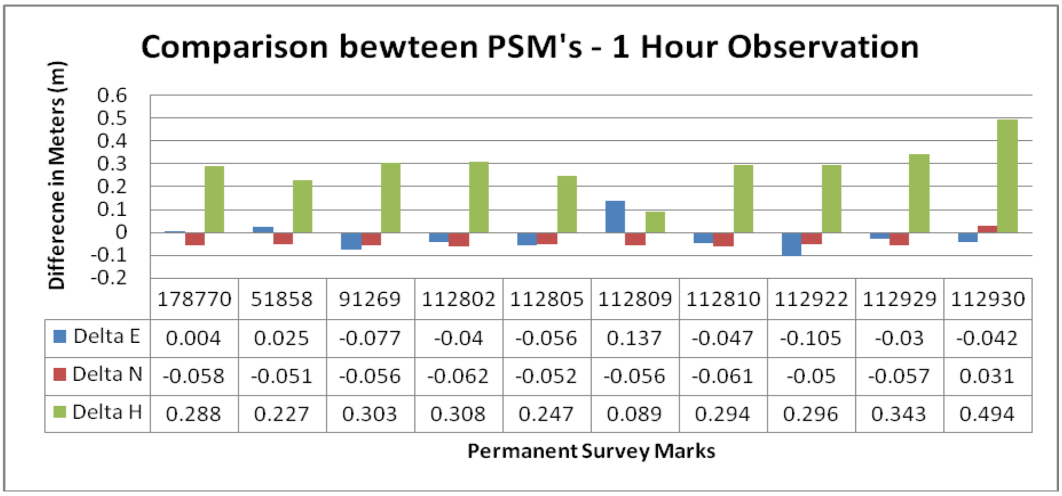
Figure 4.10: PSM 112930 Known vs. AUSPOS Coordinates Graph

4.6 Results per PSM Relative to Observation Time Period

This part of the project depicts results obtained when directly related to observation time periods over the ten control PSM's and the observed differences between them.

4.6.1 Observation Period – 1 Hour

The one (1) hour observation was the shortest time period logged. Figure 4.11 reflects the differences in coordinate values that were obtained from the results. Notably the differences in data were fairly consistent horizontally. There was however considerable fluctuation in height as expected.



	178770	51858	91269	112802	112805	112809	112810	112922	112929	112930
Delta E	0.004	0.025	-0.077	-0.04	-0.056	0.137	-0.047	-0.105	-0.03	-0.042
Delta N	-0.058	-0.051	-0.056	-0.062	-0.052	-0.056	-0.061	-0.05	-0.057	0.031
Delta H	0.288	0.227	0.303	0.308	0.247	0.089	0.294	0.296	0.343	0.494

Figure 4.11: 1 Hour Observation Comparisons

4.6.2 Observation Period – 2 Hours

The two hour observation period seemed to be consistent between nine of the project marks. PSM 178770 did however reflect a large spike in data that presented a difference in horizontal coordinates of -3.355m E and -0.203m N. Height also at this mark spiked by a massive difference of +5.054m in height difference.

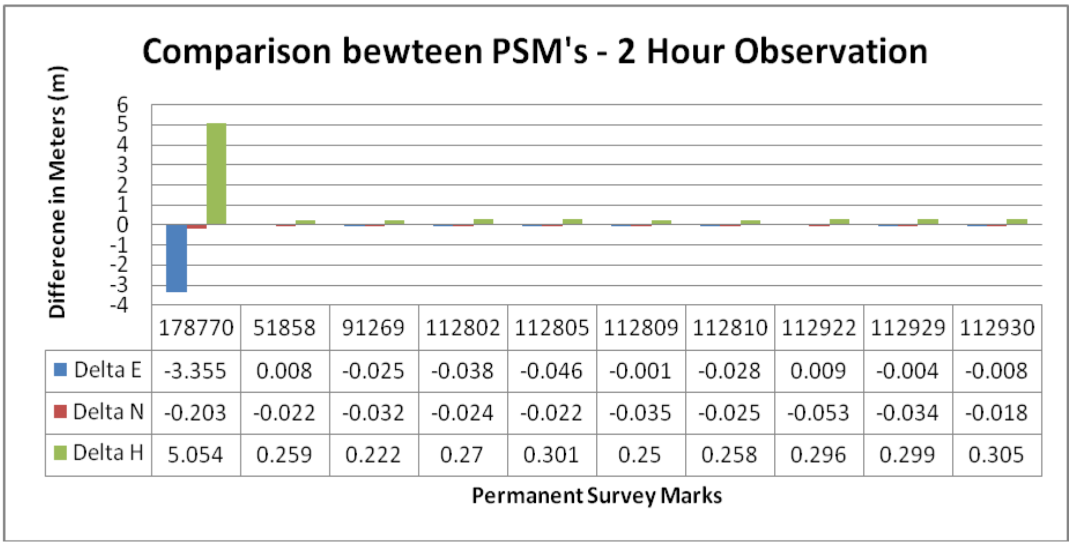


Figure 4.12: 2 Hour Observation Comparisons

4.6.3 Observation Period – 4 Hours

Again as represented in the two hour session was that a spike in deltas at PSM 178770- was reviled. Data throughout the other marks did trend towards consistent horizontally but did fluctuate vertically.

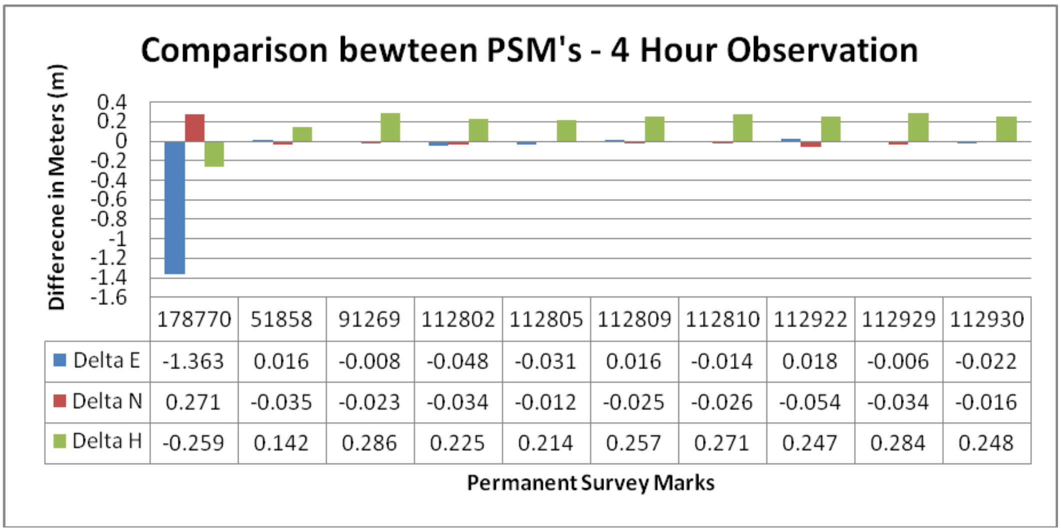


Figure 4.13: 4 Hour Observation Comparisons

4.6.4 Observation Period – 6 Hours

Data in the six hour period was starting to replicate as expected by AUSPOS claimed accuracies horizontally. The range in vertical did reflect a difference between other marks of 151mm. Noticeably there is a considerable wave pattern in the data.

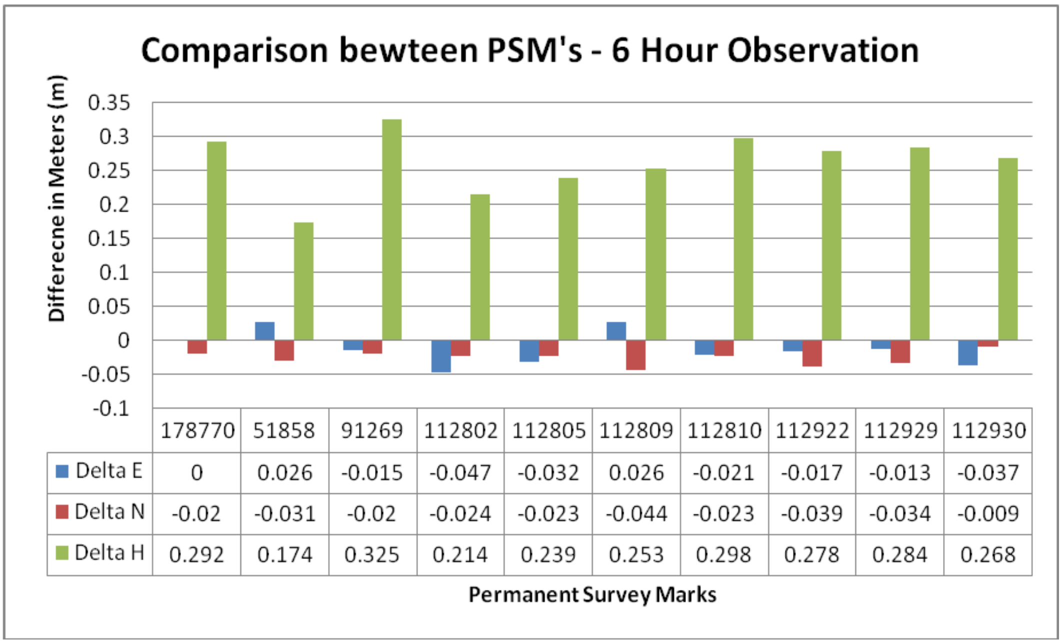
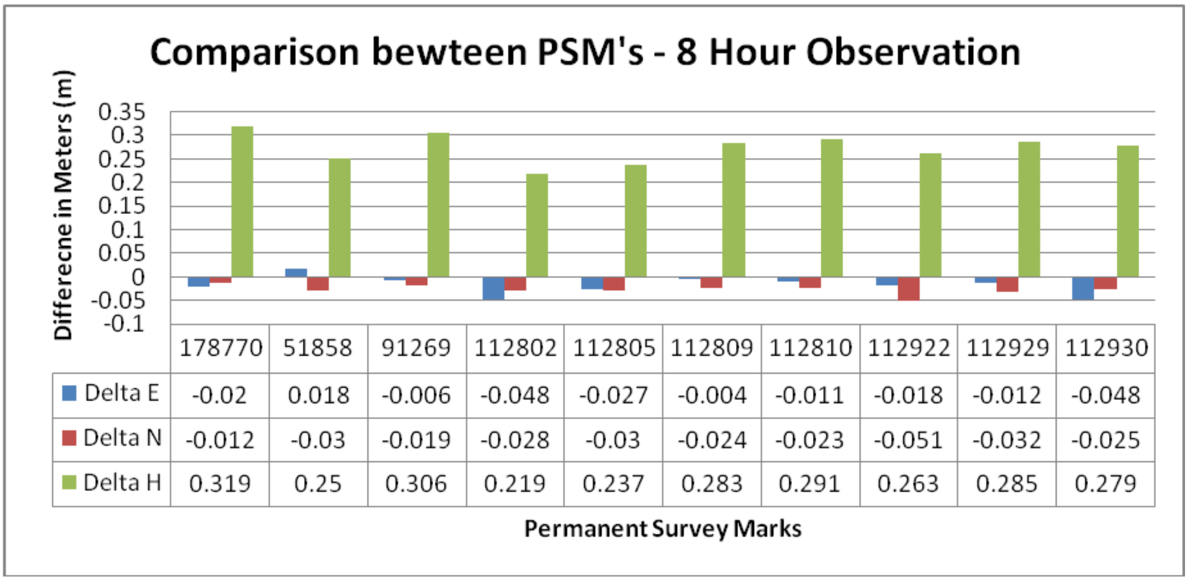


Figure 4.14: 6 Hour Observation Comparisons

4.6.5 Observation Period – 8 Hours

Again horizontal coordinates did seem relatively consistent with ranges not exceeding +/-51mm. Vertical components did however seem to fluctuate irregularly between marks. This is represented graphically in figure 4.16 by the wave of inconsistent height.

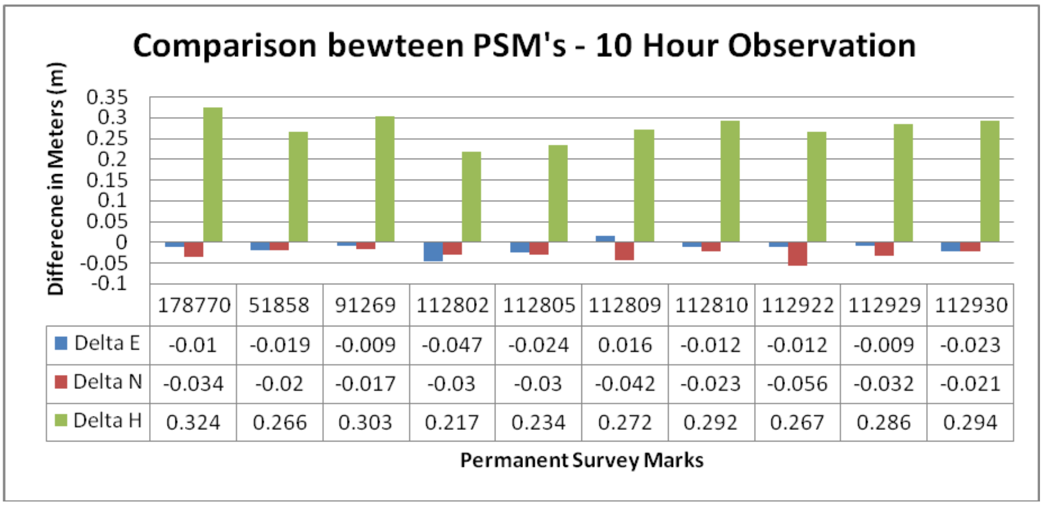


	178770	51858	91269	112802	112805	112809	112810	112922	112929	112930
Delta E	-0.02	0.018	-0.006	-0.048	-0.027	-0.004	-0.011	-0.018	-0.012	-0.048
Delta N	-0.012	-0.03	-0.019	-0.028	-0.03	-0.024	-0.023	-0.051	-0.032	-0.025
Delta H	0.319	0.25	0.306	0.219	0.237	0.283	0.291	0.263	0.285	0.279

Figure 4.15: 8 Hour Observation Comparisons

4.6.6 Observation Period – 10 Hours

Again as observations periods extend horizontal coordinates seem to settle and the range of differences seems to be steady. Vertical however does appear to have an inconsistent wave again that was present during eight hour observations.



	178770	51858	91269	112802	112805	112809	112810	112922	112929	112930
Delta E	-0.01	-0.019	-0.009	-0.047	-0.024	0.016	-0.012	-0.012	-0.009	-0.023
Delta N	-0.034	-0.02	-0.017	-0.03	-0.03	-0.042	-0.023	-0.056	-0.032	-0.021
Delta H	0.324	0.266	0.303	0.217	0.234	0.272	0.292	0.267	0.286	0.294

Figure 4.16: 10 Hour Observation Comparisons

4.6.7 Observation Period –12 Hours

As the data observations sessions have betrayed, the longer the observation, the more accurate the data is to be. Low range values are typical at the twelve hour observation session respectively to horizontal geometry. The range horizontally has been noted as 97mm in easting and 29mm in northing. Notable however there is still a range of 119mm between heights of differing marks.

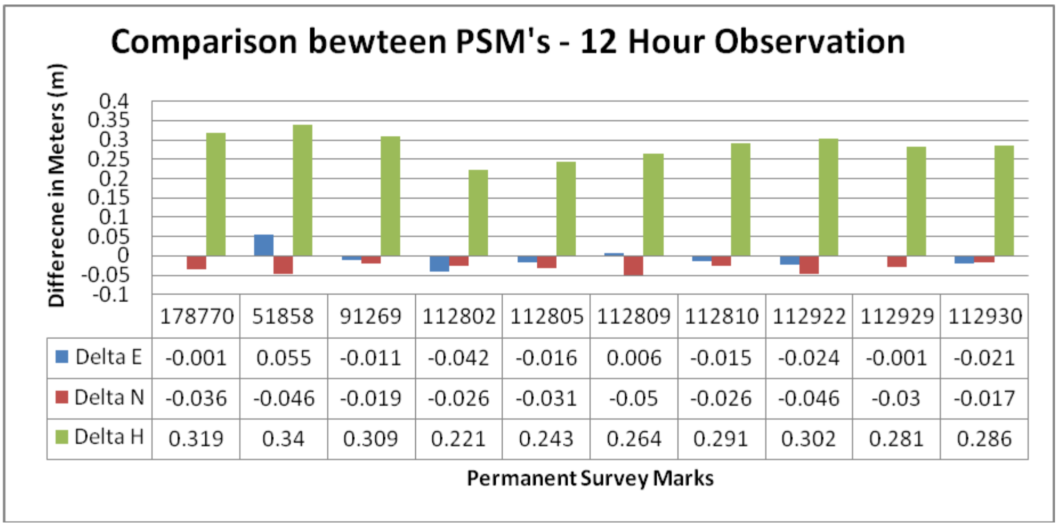


Figure 4.17: 12 Hour Observation Comparisons

4.7 Conclusion

The tables and figures shown within Chapter 4 will be analysed in further detail in Chapter 5 so as to give insight and greater understanding of results obtained.

Results from this chapter can be briefly summarised prior to analysis. As expected the longer the observation period logged, the more accurate the coordinate. It was found that observations longer than six hours tended to give results fairly consistent in horizontal and relative in vertical. We were able to note that the AHD height derived by AUSPOS was consistently higher than that of the known value. Also noted was that height did vary and did not tend to maintain a consistence matched with that of the horizontal coordinates.

Chapter 5

Analysis and Discussion

5.1 Introduction

This chapter is a link to the previous chapter and discusses and analyses the tables and results derived from Chapter 4. The discussion and analysis is this chapter is based on results, figures and tables presented as part of the previous chapter.

The area of analysis focus will be aimed at the following;

- Coordinated differences determined between known coordinates and AUSPOS processed coordinates,

- Differences obtained between observation time periods, and

- The reliability of the coordinate results determined, specifically height.

Discussions accordingly in this chapter will revolve around these key issues.

The aim of this chapter is to interpret, explain and allow the reader to gain further understanding of the results obtained and the findings accordingly. The result of the assessment will aim to determine the optimum observation time needed to obtain reliable and accurate horizontal and specifically vertical coordinates. Upon reading this chapter the reader should be able to understand the differences obtained between observation sessions and the reliability of data with respect to the time frame observed. Ultimately the reader should be able to assess the reliability of AUSPOS for height consistency.

Accordingly this chapter will be broken up into each observation time period; 1, 2, 4, 6, 8, 10 and 12 hour observation sessions.

5.2 One (1) Hour Observation Period.

The first and shortest of the observation sessions was a one hour observation session. The ten PSM's all had observations for a one hour period and data collected accordingly. Table 5.1 depicts the differences in coordinates and statistics that were obtained from the one hour session. A visual analysis of this data can be seen in figure 4.11.

1 HOUR SESSION

PSM Number	Delta E	Delta N	Delta H
178770	0.004	-0.058	0.288
51858	0.025	-0.051	0.227
91269	-0.077	-0.056	0.303
112802	-0.040	-0.062	0.308
112805	-0.056	-0.052	0.247
112809	0.137	-0.056	0.089
112810	-0.047	-0.061	0.294
112922	-0.105	-0.050	0.296
112929	-0.030	-0.057	0.343
112930	-0.042	0.031	0.494
Min	**0.004**	**0.031**	**0.089**
Max	**0.137**	**0.062**	**0.494**
Range	**0.242**	**0.093**	**0.405**
Average	**-0.023**	**-0.047**	**0.289**
Standard Deviation	**0.067**	**0.028**	**0.101**

Table 5.1: One Hour Observation Statistics

From the data in table 5.1 it can be seen that there is a considerable range between the data collected for each PSM over all three fields being easting, nothing and height. Horizontal components range up to 242mm in easting and 93mm in northing.

Height differences ranged a considerable 405mm between each of the PSM's used as control marks. The standard deviation is noticeably different to the average differences due to the large range in data differences. It would be noted that a one hour observation does give expectation of unreliable data from all geometric differences.

5.3 Two (2) Hour Observation Period

The second observation period was a two hour session. AUPOS expect data from two hours of data to generally provide coordinates to results better than 20mm horizontally and 50mm vertically. Table 5.2 depicts the differences in coordinates and statistics that were obtained from the two hour session. Figure 4.12 in the previous chapter allows a visual analysis of the data.

2 HOUR SESSION

PSM Number	Delta E	Delta N	Delta H
178770	-3.355	-0.203	5.054
51858	0.008	-0.022	0.259
91269	-0.025	-0.032	0.222
112802	-0.038	-0.024	0.270
112805	-0.046	-0.022	0.301
112809	-0.001	-0.035	0.250
112810	-0.028	-0.025	0.258
112922	0.009	-0.053	0.296
112929	-0.004	-0.034	0.299
112930	-0.008	-0.018	0.305
Min	**0.001**	**0.018**	**0.222**
Max	**3.355**	**0.203**	**5.054**
Range	**3.364**	**0.185**	**4.832**
Average	**-0.349**	**-0.047**	**0.751**
Standard Deviation	**1.056**	**0.056**	**1.512**

Table 5.2: Two Hour Observation Statistics

From the above data it can be seen again that there is a considerable range between the horizontal and vertical data. PSM 178770 has resulted in a spike in the data and has made a considerable effect on that of the other values. This outlier makes effect in the results of the range of easting to be 3.355m and northing to be 0.203m. The northing difference could be considered to be expected however is not as claimed by AUPSOS. Height at this station also has a very ordinary value and reflects a range in the data of 5.054m. Respectively the standard deviation is rather large. If this marks differences were removed from the data the horizontal differences would still remain around the +/-50mm value. Height however would be around the +/-83mm value.

It is noted that PSM 178770 was located in a location where it had very open sky and would have been considered to be a reasonable mark for GPS observations. Noted also was that the PSM was located nearby a large town water reservoir that has a large metal roof. This large metal area is expected could have made impact on the results. This will be further investigated in longer observations. This mark was coordinated during a ‘Class A’ Static GPS network survey. For information regarding this see Appendix C. Figure 5.1 is a site photo that visually depicts PSM178770.

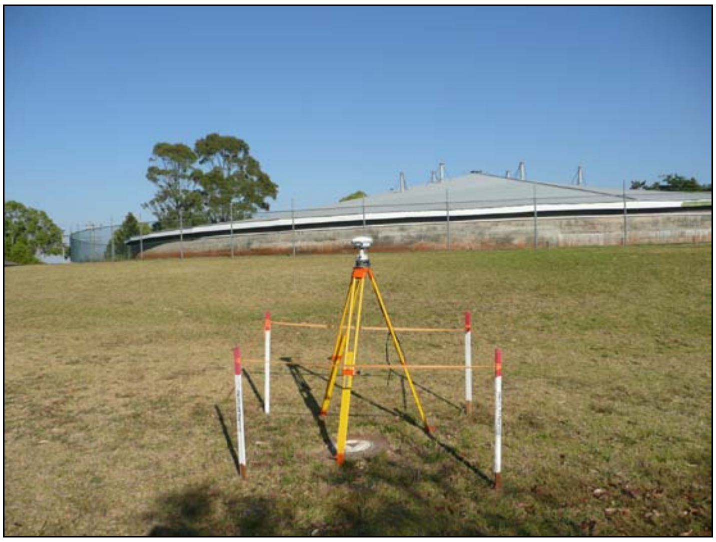


Figure 5.1: PSM 178770 Site Photograph

It would be noted that a two hour observation does again give expectation of unreliable data due to its short observation timeframe. Found was that the accuracy claim by AUSPOS was not consistent with the data obtained.

5.4 Four (4) Hour Observation Period

The third observation period was a four hour session. A four hour session would be typically the very minim observation time that would be expected for a real world example on a surveying project.

4 HOUR SESSION

PSM Number	Delta E	Delta N	Delta H
178770	-1.363	0.271	-0.259
51858	0.016	-0.035	0.142
91269	-0.008	-0.023	0.286
112802	-0.048	-0.034	0.225
112805	-0.031	-0.012	0.214
112809	0.016	-0.025	0.257
112810	-0.014	-0.026	0.271
112922	0.018	-0.054	0.247
112929	-0.006	-0.034	0.284
112930	-0.022	-0.016	0.248
Min	**0.006**	**0.012**	**0.142**
Max	**1.363**	**0.271**	**0.286**
Range	**1.397**	**0.238**	**0.545**
Average	**-0.144**	**0.001**	**0.191**
Standard Deviation	**0.429**	**0.096**	**0.164**

Table 5.3: Four Hour Observation Statistics

Table 5.3 depicts the differences in coordinates and statistics that were obtained from the four hour session. Figure 4.13 in the previous chapter allows a visual analysis of the data. Found from this session was that there was again a spike in the data at station PSM 178770. The spike consisted on a jump in easting difference to that of the other stations by some 1.3m. Northing and height tended to have a range of 238mm and 545mm respectively. Again if data from PSM 178770 was removed there would still remain considerably variations in difference values.

5.5 Six (6) Hour Observation Period

The observation period was for a six hour session seemed to start delivering consistent data for analysis. AUSPOS recommend users that a six hour session be the minimum observation session utilised. Table 5.4 below represents data and statistic results from the six hour session. Figure 4.14 in chapter 4 depicts the values graphically.

6 HOUR SESSION

PSM Number	Delta E	Delta N	Delta H
178770	0.000	-0.020	0.292
51858	0.026	-0.031	0.174
91269	-0.015	-0.020	0.325
112802	-0.047	-0.024	0.214
112805	-0.032	-0.023	0.239
112809	0.026	-0.044	0.253
112810	-0.021	-0.023	0.298
112922	-0.017	-0.039	0.278
112929	-0.013	-0.034	0.284
112930	-0.037	-0.009	0.268
Min	**0.000**	**0.009**	**0.174**
Max	**0.047**	**0.044**	**0.325**
Range	**0.073**	**0.035**	**0.151**
Average	**-0.013**	**-0.027**	**0.263**
Standard Deviation	**0.024**	**0.010**	**0.044**

Table 5.4: Six Hour Observation Statistics

Found from the six hour session is that data stabilised considerably. The range of the easting differences was 73mm having a mean of -0.013mm and a respective standard deviation of 24mm. 50% of data was below the standard deviation value. The differences found in northing were that involving a range of 35mm and having an average of -27mm. With such low differences between data compared to known coordinates the standard deviation resulted in 10mm. This value is expected by AUSPOS for such a time frame.

The height vales of this session reflected the anticipated consistency that there would be a common difference from known AHD. Height ranged by 151mm having an average difference in coordinates of 263mm. This range in data could be considered to be far too large to be precise. The standard deviation resulted in a value of 44mm which is generally good considering the range of the data.

5.6 Eight (8) Hour Observation Period

The eight hour observation session brought difference values from known coordinates to around the 50mm difference value in horizontal and 319mm in vertical. During the observation stage of the project receivers were generally started around 06:00 hours EST in and where then stopped form logging again at 14:00 hours EST. This time period allowed for an overlap of approximately four hours of data to fall into two GPS days. At time of observation, the GPS day resolved around 10:00 hours EST each day.

Table 5.4 below represents data and statistic results from the eight hour session.

8 HOUR SESSION

PSM Number	Delta E	Delta N	Delta H
178770	-0.020	-0.012	0.319
51858	0.018	-0.030	0.250
91269	-0.006	-0.019	0.306
112802	-0.048	-0.028	0.219
112805	-0.027	-0.030	0.237
112809	-0.004	-0.024	0.283
112810	-0.011	-0.023	0.291
112922	-0.018	-0.051	0.263
112929	-0.012	-0.032	0.285
112930	-0.048	-0.025	0.279
Min	**0.004**	**0.012**	**0.219**
Max	**0.048**	**0.051**	**0.319**
Range	**0.066**	**0.039**	**0.100**
Average	**-0.018**	**-0.027**	**0.273**
Standard Deviation	**0.020**	**0.010**	**0.031**

Table 5.5: Eight Hour Observation Statistics

Easting differences ranged 66mm while northings ranged 39mm. Horizontal easting and northing mean values were -0.018m and -0.027m respectively. The horizontal standard deviations also were low and respectively 20mm and 10mm. These statistics are what was expected by AUSPOS and reflect consistency in relation to accuracy claimed.

Height difference from an eight hour session ranged by 100mm. AUSPOS claim that results should be +/-50mm in height value. This variance in height values does not depict consistent height determination. Again data provided height values to a mean of 0.273m above that of the known AHD value. Expected was a value of approximately 200m to 300mm above AHD. The standard deviation of the height was that of 31mm.

5.7 Ten (10) Hour Observation Period

Ten hours of observation data was very similar to that of the eight hour observation session. Table 5.6 depicts statistics and differences calculated from known values compared to

AUSPOS computed values. Figure 4.17 in the previous chapter shows graphically the consistent representation of low horizontal differences and inconsistent height values above AHD. This figure is shown below also for easy reference as figure 5.2.

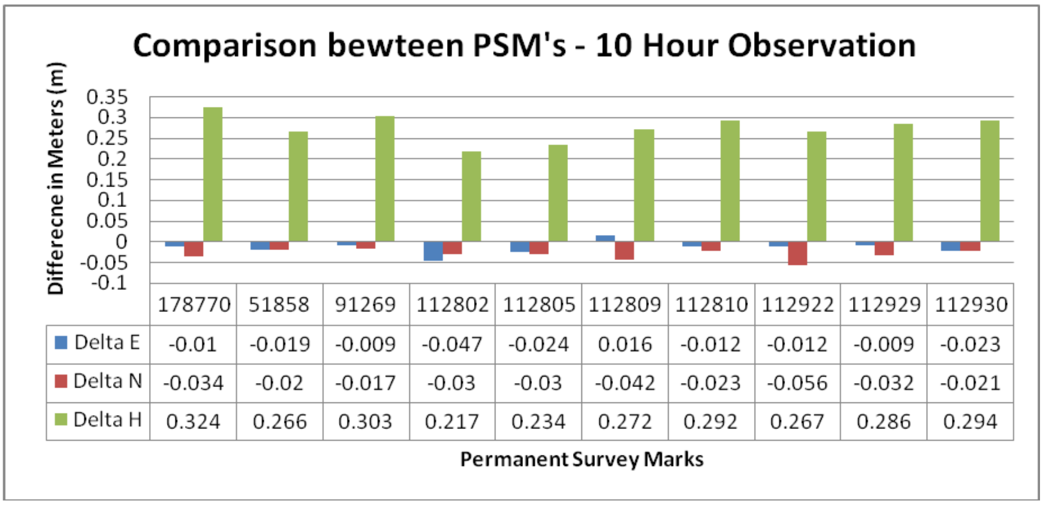


Figure 5.2: 10 Hour Observation Comparisons

10 HOUR SESSION

PSM Number	Delta E	Delta N	Delta H
178770	-0.010	-0.034	0.324
51858	-0.019	-0.020	0.266
91269	-0.009	-0.017	0.303
112802	-0.047	-0.030	0.217
112805	-0.024	-0.030	0.234
112809	0.016	-0.042	0.272
112810	-0.012	-0.023	0.292
112922	-0.012	-0.056	0.267
112929	-0.009	-0.032	0.286
112930	-0.023	-0.021	0.294
Min	**0.009**	**0.017**	**0.217**
Max	**0.047**	**0.056**	**0.324**
Range	**0.038**	**0.039**	**0.107**
Average	**-0.015**	**-0.031**	**0.276**
Standard Deviation	**0.016**	**0.012**	**0.032**

Table 5.6: Ten Hour Observation Statistics

Horizontal geometry derived from ten hour observation session was consistent in easting and northing. A range of 38mm in easting and 39mm in northing reflects consistent variation horizontally. The easting difference averaged 15mm below the known value while northings averaged 31mm below. Approximately 50% of differences fell below the average horizontal known value. The standard deviations of easting and northing were 16mm and 12mm respectively which reflects claims made by AUSPOS as generally true.

The height variances ranged by 107mm between known PSM's. The mean value for height was 276mm which was very similar to six and eight hour observations. The standard deviation of 32mm was very similar to eight hours being 31mm. Noted is that the variations in height value are greater than that of the horizontal coordinates. This is graphically evident in figure 5.2 as the data does not depict a consistent difference.

5.8 Twelve (12) Hour Observation Period

The last of the observation sessions was the twelve hour period. Expected is that the longer the observation period the more accurate and consistent the data. Due to time restrictions and the idea of representing real world example, twelve hours was the longest session observed.

Table 5.7 reflects statistics and differences calculated from known values compared to AUSPOS computed values. Figure 5.3 below is again an extract duplication of figure 4.18 in Chapter 4. Reflected once more are the low horizontal differences and varying height values above AHD.

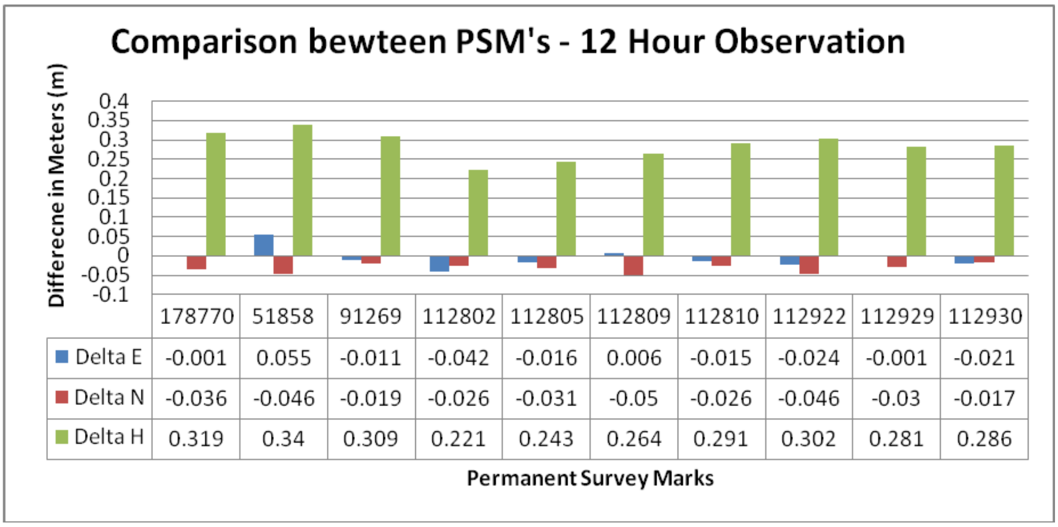


Figure 5.3: 12 Hour Observation Comparisons

12 HOUR SESSION

PSM Number	Delta E	Delta N	Delta H
178770	-0.001	-0.036	0.319
51858	0.055	-0.046	0.340
91269	-0.011	-0.019	0.309
112802	-0.042	-0.026	0.221
112805	-0.016	-0.031	0.243
112809	0.006	-0.050	0.264
112810	-0.015	-0.026	0.291
112922	-0.024	-0.046	0.302
112929	-0.001	-0.030	0.281
112930	-0.021	-0.017	0.286
Min	**0.001**	**0.017**	**0.221**
Max	**0.055**	**0.050**	**0.340**
Range	**0.097**	**0.033**	**0.119**
Average	**-0.007**	**-0.033**	**0.286**
Standard Deviation	**0.026**	**0.012**	**0.036**

Table 5.7: Twelve Hour Observation Statistics

Twelve hours of data depicted a larger range in data than that of ten hours. A range of 97mm in easting and 33mm in northing demonstrated considerable variation in horizontal coordinate differences than expected. There appeared to be a variation form consistency in the data derived from coordinates processed for PSM 51858. This PSM had a delta of +55mm above the easting value which would have been expected to be a negative value. 80% of easting values were negative values. Northing values are consistently negative and relative to the average value of -33mm.

The mean values for easting and northing were -7mm and -33mm respectively. Standard deviations of easting and northing were 26mm and 12mm correspondingly. It was anticipated that the horizontal values would have been lesser than that derived from the ten hour observation session.

Height from the twelve hour observation sessions ranged 119mm between derived values. This value is 12mm greater than that derived from the ten hour observation set. The mean value for height was 286mm which coincidently was very similar to six, eight and ten hour observations. The standard deviation of 36mm was increased compared to that of shorter sessions. Noted again as has been established from all session timeframes is that the variations in height value do not trend consistently. Figure 5.3 plots the wave type variation that has been consistent over all observation time periods and does not depict consistency as could be suggested towards horizontal coordinates.

5.9 Conclusion

Longer observation periods were able to deliver greater consistency of horizontal processed coordinate values. This was expected as claimed by AUSPOS that the longer the session the more accurate the resultant values. It was found common that horizontal values were close to known coordinates however none were ever exact.

Height defences trended higher than AHD by approximately 250mm. This was expected as discussed in earlier chapters. What was found was that height was very irregular and not as consistent as was horizontal geometry. Due to the variances in height values it would be difficult to say that AUPOS is reliable and dependable in deriving a consistent height value even though different to AHD.

As evident by the wave type patterns depicted height variations in graphs shown in chapter 4 and 5 it is conclusive that AUPSO is not reliable for determining AHD height value. Results could be expected that you may get values in height form +/-50mm reflecting a range of data of approximately 100mm.

Chapter 6

Conclusion

5.10 Introduction

This chapter will be focused on concluding results found during the course of the subject project. Results obtained relate to findings in coordinate differences from known PSM coordinate values held by the DERM Survey Control Database comparative to coordinates processed by AUSPOS over varying observation sessions. Additionally the aim of this chapter is to summarise project resultant findings and to provide the reader with understanding of the authors conclusions.

So as to provide a clearer understanding of the results of the project this chapter will be divided into two sections; conclusions and recommendations. Conclusions will summarise results and analysis from chapter five. Recommendations will discuss where future and further research and testing could be carried out to improve and verify further findings of this project.

5.11 Conclusions

5.11.1 Horizontal Coordinate Differences

This project has found and concluded as expressed by AUSPOS that the longer the observation session, the greater the accuracy that can be expected from the users observed data. It was found that horizontal coordinates can be derived relatively accurately from observation sessions greater than six hours of data. It could be expected that results from AUSPOS derived horizontal coordinates could be claimed to be within +/-50mm of that expected of coordinates derived from a geodetic network survey. As data sessions increased from six to twelve hours of data accuracy and precision became more consistent and generally reliable if required to only achieve coordinates to no better than +/50mm. It was not proved however that claims by AUSPOS were true.

5.11.2 Vertical Coordinate Differences

Conclusions found that vertical height derived by AUSPOS may not be considered to be reliable. Results in coordinate differences consistently have range variations of 100mm or greater. This large variation in derived height values make for difficult duplication of the same derived height during another session of the same time period at the same mark position

Considered would be that AUSPOS could be used for determining height for observation sessions of no less than six hours of data as recommended by AUSPOS. From testing during this project it could only be concluded that results would not be better that +/-50mm as similar to horizontal coordinate differences.

Found consistent was the height difference above that of AHD of approximately 250mm relative to the project testing area.

5.12 Recommendations

AUPSOS was found to be a very useful tool in deriving MGA and AHD coordinates for relatively minimal cost and timeframe. It is recommended through further testing and investigation be made in regard to specific areas. Suggested areas include longer observation periods, different IGS reference stations and also different GPS receivers to obtain GPS data.

Longer observation session investigation would enable determination of assessment regarding how much better coordinate difference geometry can become in relation to horizontal and vertical components.

This project has only tested AUSPOS over a small sample of data in respect to a small local site area. Further testing could be made using different reference stations and accordingly different reference station geometry made by differing site locations and proximity to reference stations.

Accordingly the subject project only made testing with regards to Trimble R8 receivers. Further testing could be made into differing types of GPS revivers to asses quality of observed data and differing results obtained.

5.13 Close

This project has been successful in achieving project aim which indented to determine the reliability of AUSPOS coordinate data, specifically in relation to height. The project aim was completed by fulfilling the project objectives as mentioned in section 1.4.

Determined was that AUSPOS is a generally good tool for horizontal and vertical coordinate determination however is not as reliable in regards to vertical component when compared to horizontal results. Conclusive is that AUSPOS is a valuable tool when used in a fit to purpose environment and should not be used if accurate coordinates are required. In the instance accurate coordinates are required a geodetic control survey would be recommended.

References

Ghoddousi-Fard 2006, *Online GPS Processing Services; an initial study*; Department of Geodesy and Geomatics Engineering, Geodetic Research Laboratory, University of New Brunswick, Canada

Bomford G. 1980, *Geodesy*, Fourth Edition

Clark D. 1966, *Plane and Geodetic Surveying*, Volume Two – Higher Surveying

Featherstone, W.E., Ebener R. 2008; *How well can online GPS PPP post-processing services be used to establish geodetic survey control networks?*, Journal of Applied Science

Paul R. Wolf & Charles D. Ghilani 2002, *Elementary Surveying*, Tenth Edition - An Introduction to Geomatics

Kuang S. 1996, Geodetic *Network Analysis and Optimal Design*, Concepts and Applications

Pound R. (Roscoe) 1953, *The lawyer from Antiquity to Modern Times*, p.5

Unit E4111/E4112 Research Project: Project Reference Book 2009, University of Southern Queensland, Toowoomba

SVY2106 Geodetic A; Study Book 1, University of Southern Queensland, Toowoomba

J.M. Dow, R.E. Neilan, G. Gendt, "*The International GPS Service (IGS): Celebrating the 10th Anniversary and Looking to the Next Decade*," Adv. Space Res. 36 vol. 36, no. 3, pp. 320-326, 2005. doi:10.1016/j.asr.2005.05.125

Journal of Surveying Engineering /February 2003, Review by; Georgia Fotopoulos, Christopher Kotsakis, and Michael G Sideris, *How Accurately Can We Determine Orthometric Height Differences from GPS and Geoid Data?*, p.1-10.

Commonwealth of Australia 2009a, Geoscience Australia, Canberra, ACT, viewed May 2009, http://www.ga.gov.au/

Commonwealth of Australia 2009b, Geoscience Australia, Geodesy and GPS homepage, Canberra, ACT, viewed May 2009, http://www.ga.gov.au/geoesy

The State of Queensland (Department of Natural Resources and Water – NRW) 2009, Department of Natural Resources and Water, Surveying, Technical Standards, viewed May 2009, http://www.nrm.qld.gov.au/property/surveying/technical_standards.html

Intergovernmental Committee on Surveying and Mapping (ICSM), viewed April 2009, http://www.icsm.gov.au/

Intergovernmental Advisory Committee on Surveying and Mapping (ISCM) 2007, *Standards and Practices for Control Surveys – Special Publication One (SP1) Version 1.7,* http://www.icsm.gov.au/icsm/publications/sp1/sp1v1-7.pdf

The Surveyors Board of Queensland, Code of Practice, viewed May 2009, http://www.surveyorsboard.com.au/about/code-of-practice.php

Surveying and Spatial Sciences Institute (SSSI), Code of ethics, viewed May 2009, http://www.spatialsciences.org.au

International GNSS Service (IGS) - Formerly International GPS Service, viewed May 2009, http://igscb.jpl.nasa.gov/

Appendix A: Project Specification

University of Southern Queensland
Faculty of Engineering and Surveying

ENG4111/4112 Research Project
PROJECT SPECIFICATION

FOR:	**MICHAEL RANDALL KOSCHEL**
TOPIC:	**INVESTIGTAION INTO RELIABILITY OF AUSPOS COORDINATE DATA**
SUPERVISORS:	Zhenyu Zhang Faculty of Engineering and Surveying, USQ
SPONSORSHIP:	Minstaff Survey Pty Ltd
PROJECT AIM:	To investigate GPS coordinate data processed AUSLIG Online GPS Processing Service, "AUSPOS" and determine the reliability of reduced coordinates in horizontal and particularly vertical accuracy.

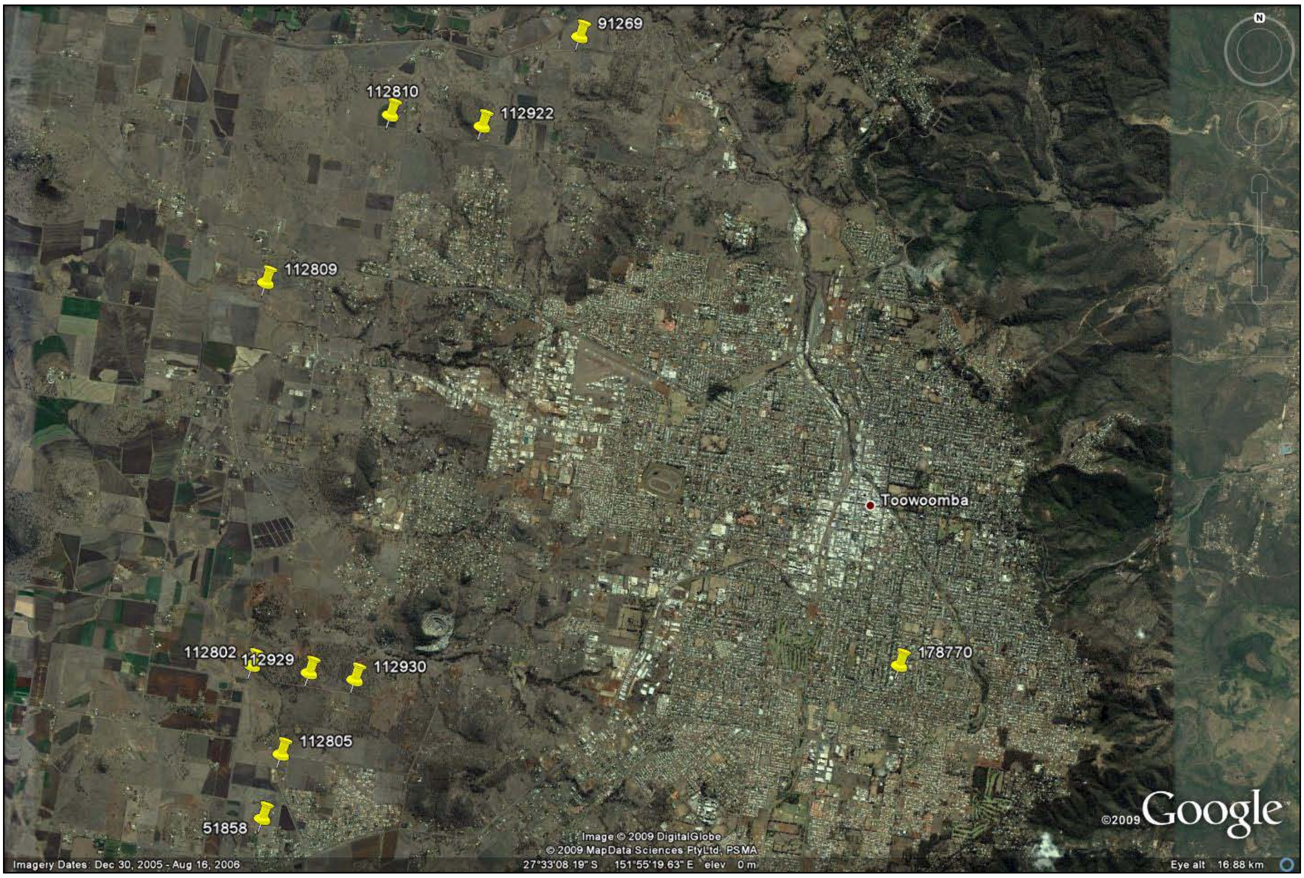
PROGRAMME: **Issue A, 22nd March 2009**

1. Research the background of Geosciences Australia and the processing service, practices and methodology used by AUSPOS to process and result in coordinate data.
2. Determine a field GPS observation schedule to collect GPS observation sessions and investigate type of equipment, techniques and survey marks used for acquisition of data.
3. Collect and Observe field GPS data as per designed plan.
4. Have data obtained, processed by AUSPOS to result in reduced coordinates.
5. Analyse coordinate data variations and factors affecting coordinate differences.
6. Evaluate different techniques, timeframes and processes in regard to GPS observations and determining reliable coordinate data.
7. Report on techniques, findings, accuracy and results achieved and submit an academic dissertation on the research undertaken.

AGREED:	[signature] (Student)	[signature] (Supervisor)
Date:	23 / 3 / 2009	01 / 04 / 2009

Examiner/Co-examiner: [signature] 01/04/09

Appendix B: Map of Project PSM Marks



(Source: Google Earth)

Appendix C: Permanent Mark Form 6's

Queensland Government

Survey Search Detail Report
Details of Registered Number: 178770

Current Information

Administrative			
Alternate Name(s)	BORE 4223 1650		
	HORNER PARK BORE		
	WILMA ST BORE		
Parish	DRAYTON		
Town	TOOWOOMBA		
Local Authority	TOOWOOMBA REGIONAL		
Locality Description	HORNER PARK CENTENARY HEIGHTS		
Related Information			
Mark Details			
Mark Type	MINI MARK	**Mark Condition**	GOOD
Installed By	GJ	**Installed Date**	05/01/2009
Last Visited	10/02/2009	**Sketch Available**	YES
Connection(s)			
Horizontal			
Datum	GDA94		
Latitude	27°35' 5.5215" S	**Longitude**	151°57' 33.4511" E
Easting	397282.255	**Northing**	6948350.636
Zone	56		
Order	1st ORDER	**Class**	CLASS A
Adjustment Name	TOOWOOMBA CITY BORES JAN2009	**Fixed By**	GPS
Prominent Feature	NO		
Vertical			
Height	683.516	**Datum**	AHD D
Order	4th ORDER	**Class**	Class D
Fixed By	2 WAY LEVELLING	**Origin**	40436
Geoid/Ellipsoid Separation(N)	0.000		
Model			

Survey Search Detail Report

Details of Registered Number: 51858

Current Information			
Administrative			
Alternate Name(s)	TW 17		
	WESTBROOK		
Parish	WESTBROOK		
Town			
Local Authority	TOOWOOMBA REGIONAL		
Locality Description			
Related Information	MARK WILL NOT BE DISTURBED BY NEW LAND OWNER-MR.ARTHUR MESKEN PH.341347		
Mark Details			
Mark Type	STAND	**Mark Condition**	GOOD
Installed By	DMS	**Installed Date**	01/01/1978
Last Visited	31/01/2003	**Sketch Available**	YES
Connection(s)	IS178119		
Horizontal			
Datum	GDA94		
Latitude	27°36' 20.3887" S	**Longitude**	151°51' 43.1938" E
Easting	387699.883	**Northing**	6945962.222
Zone	56		
Order	1st ORDER	**Class**	CLASS A
Adjustment Name	GDA - QLD SUPPLEMENTARY AREA 2 AND 3	**Fixed By**	GPS
Prominent Feature	NO		
Vertical			
Height	566.658	**Datum**	AHD
Order	4th ORDER	**Class**	Class D
Fixed By		**Origin**	44222
Geoid/Ellipsoid Separation(N)	0.000		
Model			

Survey Search Detail Report

Details of Registered Number: 91269

Current Information			
Administrative			
Alternate Name(s)	MORRIS/BOUNDARY		
	TCC2950		
Parish	TOOWOOMBA		
Town	TOOWOOMBA		
Local Authority	TOOWOOMBA REGIONAL		
Locality Description	CNR BOUNDARY/WILLIMS		
Related Information			
Mark Details			
Mark Type	S/PIC	**Mark Condition**	DISTURBED
Installed By	TCC	**Installed Date**	10/12/1993
Last Visited	12/12/2006	**Sketch Available**	YES
Connection(s)	SP198120		
	SP180260		
	SP162742		
	SP162743		
	SP162745		
Horizontal			
Datum	GDA94		
Latitude	27°29' 58.9599" S	**Longitude**	151°54' 37.5367" E
Easting	392375.985	**Northing**	6957742.635
Zone	56		
Order	1st ORDER	**Class**	CLASS A
Adjustment Name	GDA - JONDARYAN SHIRE COUNCIL CONTROL	**Fixed By**	GPS
Prominent Feature	NO		
Vertical			
Height	517.864	**Datum**	AHD
Order	4th ORDER	**Class**	Class D
Fixed By		**Origin**	44222
Geoid/Ellipsoid Separation(N)	0.000		
Model			

Queensland Government

Survey Search Detail Report

Details of Registered Number: 112802

Current Information

	Administrative		
Alternate Name(s)	FETT/DREW		
Parish	WESTBROOK		
Town			
Local Authority	TOOWOOMBA REGIONAL		
Locality Description	DREWS/FETT RD		
Related Information			
	Mark Details		
Mark Type	S/PIC	**Mark Condition**	GOOD
Installed By	LANDS	**Installed Date**	07/03/1995
Last Visited	27/07/2009	**Sketch Available**	YES
Connection(s)	IS226549		
	SP195601		
	Horizontal		
Datum	GDA94		
Latitude	27°35' 5.6078" S	**Longitude**	151°51' 37.5728" E
Easting	387524.588	**Northing**	6948262.002
Zone	56		
Order	1st ORDER	**Class**	CLASS A
Adjustment Name	GDA - JONDARYAN SHIRE COUNCIL CONTROL	**Fixed By**	GPS
Prominent Feature	NO		
	Vertical		
Height	500.174	**Datum**	AHD
Order	4th ORDER	**Class**	Class D
Fixed By		**Origin**	44222
Geoid/Ellipsoid Separation(N)	0.000		
Model			

Queensland Government

Survey Search Detail Report

Details of Registered Number: 112805

Current Information			
Administrative			
Alternate Name(s)	KEDING RD		
Parish	WESTBROOK		
Town			
Local Authority	TOOWOOMBA REGIONAL		
Locality Description	KEDING RD		
Related Information			
Mark Details			
Mark Type	S/PIC	**Mark Condition**	GOOD
Installed By	LANDS	**Installed Date**	07/03/1995
Last Visited	30/10/2007	**Sketch Available**	YES
Connection(s)	SP195600		
	SP121639		
Horizontal			
Datum	GDA94		
Latitude	27°35' 49.0507" S	**Longitude**	151°51' 53.4571" E
Easting	387972.385	**Northing**	6946929.158
Zone	56		
Order	1st ORDER	**Class**	CLASS A
Adjustment Name	GDA - JONDARYAN SHIRE COUNCIL CONTROL	**Fixed By**	GPS
Prominent Feature	NO		
Vertical			
Height	530.462	**Datum**	AHD
Order	4th ORDER	**Class**	Class D
Fixed By		**Origin**	44222
Geoid/Ellipsoid Separation(N)	0.000		
Model			

Queensland Government

Survey Search Detail Report

Details of Registered Number: 112809

Current Information

Administrative			
Alternate Name(s)	WILLETTS RD		
Parish	GOWRIE		
Town			
Local Authority	TOOWOOMBA REGIONAL		
Locality Description	WILLETS RD		
Related Information			
Mark Details			
Mark Type	S/PIC	**Mark Condition**	GOOD
Installed By	LANDS	**Installed Date**	07/03/1995
Last Visited	19/02/2008	**Sketch Available**	YES
Connection(s)	SP209445		
Horizontal			
Datum	GDA94		
Latitude	27°31' 58.8956" S	**Longitude**	151°51' 45.0742" E
Easting	387677.487	**Northing**	6954009.474
Zone	56		
Order	1st ORDER	**Class**	CLASS A
Adjustment Name	GDA - JONDARYAN SHIRE COUNCIL CONTROL	**Fixed By**	GPS
Prominent Feature	NO		
Vertical			
Height	505.819	**Datum**	AHD
Order	4th ORDER	**Class**	Class D
Fixed By		**Origin**	44222
Geoid/Ellipsoid Separation(N)	0.000		
Model			

Survey Search Detail Report

Details of Registered Number: 112810

Current Information			
	Administrative		
Alternate Name(s)	HOLMES RD		
Parish	GOWRIE		
Town			
Local Authority	TOOWOOMBA REGIONAL		
Locality Description	GOWRIE JUNC/HOLMES RD		
Related Information			
	Mark Details		
Mark Type	S/PIC	**Mark Condition**	GOOD
Installed By	LANDS	**Installed Date**	07/03/1995
Last Visited	20/10/2006	**Sketch Available**	YES
Connection(s)	SP197950		
	SP176475		
	SP179917		
	SP135001		
	Horizontal		
Datum	GDA94		
Latitude	27°30' 37.2134" S	**Longitude**	151°52' 53.5678" E
Easting	389533.708	**Northing**	6956540.111
Zone	56		
Order	1st ORDER	**Class**	CLASS A
Adjustment Name	GDA - JONDARYAN SHIRE COUNCIL CONTROL	**Fixed By**	GPS
Prominent Feature	NO		
	Vertical		
Height	523.095	**Datum**	AHD
Order	4th ORDER	**Class**	Class D
Fixed By		**Origin**	44222
Geoid/Ellipsoid Separation(N)	0.000		
Model			

Queensland Government
Natural Resources and Water

Survey Search Detail Report

Details of Registered Number: 112922

Current Information

Administrative			
Alternate Name(s)	GANZER RD CREST		
Parish	TOOWOOMBA		
Town			
Local Authority	TOOWOOMBA REGIONAL		
Locality Description	GANZERS RD		
Related Information			
Mark Details			
Mark Type	STAND	**Mark Condition**	BURIED
Installed By	LANDS	**Installed Date**	06/03/1995
Last Visited	12/12/2006	**Sketch Available**	YES
Connection(s)	SP198122		
	SP198123		
	SP198212		
	SP135001		
	IS129310		
Horizontal			
Datum	GDA94		
Latitude	27°30' 42.7306" S	**Longitude**	151°53' 43.9453" E
Easting	390917.440	**Northing**	6956382.722
Zone	56		
Order	1st ORDER	**Class**	CLASS A
Adjustment Name	GDA - JONDARYAN SHIRE COUNCIL CONTROL	**Fixed By**	GPS
Prominent Feature	NO		
Vertical			
Height	560.173	**Datum**	AHD
Order	4th ORDER	**Class**	Class D
Fixed By		**Origin**	44222
Geoid/Ellipsoid Separation(N)	0.000		
Model			

Survey Search Detail Report

Queensland Government

Details of Registered Number: 112929

Current Information			
Administrative			
Alternate Name(s)	DREW RD		
Parish	WESTBROOK		
Town			
Local Authority	TOOWOOMBA REGIONAL		
Locality Description	DREWS RD		
Related Information			
Mark Details			
Mark Type	STAND	**Mark Condition**	GOOD
Installed By	LANDS	**Installed Date**	06/03/1995
Last Visited	30/10/2007	**Sketch Available**	YES
Connection(s)	SP195601		
	SP207400		
	SP187185		
Horizontal			
Datum	GDA94		
Latitude	27°35' 9.2981" S	**Longitude**	151°52' 8.9837" E
Easting	388386.877	**Northing**	6948156.343
Zone	56		
Order	1st ORDER	**Class**	CLASS A
Adjustment Name	GDA - JONDARYAN SHIRE COUNCIL CONTROL	**Fixed By**	GPS
Prominent Feature	NO		
Vertical			
Height	525.702	**Datum**	AHD
Order	4th ORDER	**Class**	Class D
Fixed By		**Origin**	44222
Geoid/Ellipsoid Separation(N)	0.000		
Model			

Queensland Government

Survey Search Detail Report

Details of Registered Number: 112930

Current Information			
Administrative			
Alternate Name(s)	DREW RD CORNER		
Parish	WESTBROOK		
Town			
Local Authority	TOOWOOMBA REGIONAL		
Locality Description	DREWS RD		
Related Information			
Mark Details			
Mark Type	STAND	Mark Condition	GOOD
Installed By	LANDS	Installed Date	06/03/1995
Last Visited	15/06/2007	Sketch Available	YES
Connection(s)	SP207400		
	SP187185		
Horizontal			
Datum	GDA94		
Latitude	27°35' 12.6599" S	Longitude	151°52' 34.0575" E
Easting	389075.304	Northing	6948059.159
Zone	56		
Order	1st ORDER	Class	CLASS A
Adjustment Name	GDA - JONDARYAN SHIRE COUNCIL CONTROL	Fixed By	GPS
Prominent Feature	NO		
Vertical			
Height	535.220	Datum	AHD
Order	4th ORDER	Class	Class D
Fixed By		Origin	44222
Geoid/Ellipsoid Separation(N)	0.000		
Model			

Appendix D: NGS Calibrated Antenna – Trimble R8-2

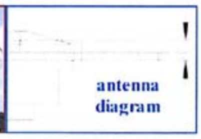
Trimble Antennas

This page is maintained by NGS Software Requests

updated:06/11/09.14:01:16

```
TRM_R8_GNSS          Integrated Antenna (R8) Model 2          NGS (  2) 06/05/22
       0.9       0.0      103.9
   0.0   0.6   1.6   2.9   4.2   5.5   6.7   7.5   7.9   8.0
   7.6   6.8   5.5   3.8   1.6  -0.9  -3.5   0.0   0.0
      -1.9       0.2       88.5
   0.0  -0.9  -0.9  -0.1   1.1   2.3   3.5   4.4   4.9   5.0
   4.6   3.7   2.3   0.5  -1.6  -3.7  -5.8   0.0   0.0

RMS MM RMS -  2  MEASUREMENTS
       0.4       0.6        0.4
   0.0   0.1   0.2   0.2   0.2   0.2   0.2   0.2   0.2   0.2
   0.2   0.2   0.2   0.2   0.3   0.3   0.3   0.0   0.0
       0.2       0.5        0.0
   0.0   0.0   0.0   0.1   0.1   0.0   0.1   0.0   0.0   0.0
   0.0   0.0   0.0   0.0   0.1   0.1   0.2   0.0   0.0
```



Trimble

Appendix E: GPS Observation Sheets

GPS Observation Sheet - 178770

Mark Details		Observation Details					Height		Receiver		General Info	
Station Name	**Type**	**Date**	**Start**	**End**	**Duration**	**By**	**m**	**Measured To**	**Details**	**SN #**	**Session No.**	**File Name**
178770	SS MINI	25/09/2009	06:12	18:00	12	MK	1.605	COB	R8-2 S/CROVER	4748141574	1	15742670
178770	SS MINI	26/09/2009	08:50	12:50	4	MK	1.565	COB	R8-2 T ROVER	4748141573	2	15732680
178770	SS MINI	27/09/2009	08:30	13:50	5.2	MK	1.48	COB	R8-2 T ROVER	4748141573	3	15732690
178770	SS MINI	27/09/2009	14:38	16:38	2	MK	1.48	COB	R8-2 T ROVER	4748141573	4	15732701
178770	SS MINI	28/09/2009	06:30	12:15	6	MK	1.64	COB	R8 -T BASE	4749142127	5	21272701
178770	SS MINI	28/09/2009	12:35	16:35	4	MK	1.64	COB	R8 -T BASE	4749142127	6	21272711
178770	SS MINI	30/09/2009	06:47	14:50	8	TR	1.664	COB	R8 -S/C BASE	4837157449	7	74492722
178770	SS MINI	1/10/2009	06:07	07:21	1	TR	1.722	COB	R8 -S/C BASE	4837157449	8	74492731
178770	SS MINI	2/10/2009	09:32	17:17	8	MK	1.582	COB	R8 -S/C BASE	4837157449	9	74492742
178770	SS MINI	5/10/2009	EDIT	EDIT	10	MK	1.605	COB	R8-2 S/C ROVER	4748141574	10	1574267A

AUSPOS DATA

Obs. Time (hrs)	**RINEX File Name**	**Comments**
1	74492731	Orig File
2	15732701	Orig File
4	21272711	Orig File
6	21272701	Orig File
8	74492722	Orig File
10	1574267A	Edit -2hr
12	15742670	Orig File

GPS Observation Sheet - 51859

Mark Details		Observation Details					Height		Receiver		General Info	
Station Name	**Type**	**Date**	**Start**	**End**	**Duration**	**By**	**m**	**Measured To**	**Details**	**SN #**	**Session No.**	**Comments**
51858	Std	23/09/2009	10:50am	24/09/2009 15:04pm	1.4:12.40 - 28hrs	MK	1.519	COB	R8 - 2 S/C BASE	S/C BASE 4837157449	1	File: 74492660
51858	Std	24/09/2009	15:14pm	18:10	3	MK	1.519	COB	R8 - 2 S/C BASE	S/C BASE 4837157449	2	74492670
51858	Std	25/09/2009	06:11	12:22	6	MK	1.519	COB	R8 - 2 S/C BASE	S/C BASE 4837157449	3	74492671
51858	Std	29/09/2009	06:37	07:38	1	TR	1.562	COB	R8 - 2 S/C BASE	S/C BASE 4837157449	4	74492711
51858	Std	29/09/2009	07:43	09:44	2	TR	1.562	COB	R8 - 2 S/C BASE	S/C BASE 4837157449	5	74492712
51858	Std	30/09/2009	10:51	18:41	8	TR	1.318	COB	R8 2 S/C ROVER	S/C ROVER 4748141574	6	15742730
51858	Std	30/09/2009	06:41	18:42	12	TR	1.318	COB	R8 2 S/C ROVER	S/C ROVER 4748141574	7	15742731
51858	Std	1/10/2009	06:58	17:01	10	TR	1.318	COB	R8 2 S/C ROVER	S/C ROVER 4748141574	8	15742732
51858	Std	5/10/2009	EDIT	EDIT	4	MK	1.562	COB	R8 - 2 S/C BASE	S/C BASE 4837157449	9	7449267A

AUSPOS DATA

Obs. Time (hrs)	RINEX File Name	Comments
1	74492711	Orig File
2	74492712	Orig File
4	7449267A	Edit File -8hr
6	74492671	Orig File
8	15742730	Orig File
10	15742732	Orig File
12	15742731	Orig File

GPS Observation Sheet - 91269

Mark Details		Observation Details					Height		Receiver		General Info	
Station Name	**Type**	**Date**	**Start**	**End**	**Duration**	**By**	**m**	**Measured To**	**Details**	**SN #**	**Session No.**	**Comments**
91269	Spkt	3/10/2009	05:45	18:15	12	MK	1.298	COB	R8- T/Rover	T ROVER 4748141573	1	15732750
91269	Spkt	3/10/2009	EDIT	EDIT	10	MK	1.298	COB	R8- T/Rover	T ROVER 4748141573	2	1573275A
91269	Spkt	3/10/2009	EDIT	EDIT	8	MK	1.298	COB	R8- T/Rover	T ROVER 4748141573	3	1573275B
91269	Spkt	3/10/2009	EDIT	EDIT	6	MK	1.298	COB	R8- T/Rover	T ROVER 4748141573	4	1573275C
91269	Spkt	3/10/2009	EDIT	EDIT	4	MK	1.298	COB	R8- T/Rover	T ROVER 4748141573	5	1573275D
91269	Spkt	3/10/2009	EDIT	EDIT	2	MK	1.298	COB	R8- T/Rover	T ROVER 4748141573	6	1573275E
91269	Spkt	3/10/2009	EDIT	EDIT	1	MK	1.298	COB	R8- T/Rover	T ROVER 4748141573	7	1573275F

AUSPOS DATA

Obs. Time (hrs)	RINEX File Name	Comments
1	1573257F	Edit File - 11hr
2	1573257E	Edit File -10hr
4	1573257D	Edit File -8hr
6	1573257C	Edit File -6hr
8	1573257B	Edit File -4hr
10	1573257A	Edit File -2hr
12	15732750	Orig File

GPS Observation Sheet - 112802

Mark Details		Observation Details					Height		Receiver		General Info	
Station Name	**Type**	**Date**	**Start**	**End**	**Duration**	**By**	**m**	**Measured To**	**Details**	**SN #**	**Session No.**	**File Name**
112802	Spkt	5/10/2009	6:00	18:00	12	MK	1.5	COB	R8- T/Rover	T ROVER 4748141573	1	15732770
112802	Spkt	5/10/2009	EDIT	EDIT	10	MK	1.5	COB	R8- T/Rover	T ROVER 4748141573	2	1573277A
112802	Spkt	5/10/2009	EDIT	EDIT	8	MK	1.5	COB	R8- T/Rover	T ROVER 4748141573	3	1573277B
112802	Spkt	5/10/2009	EDIT	EDIT	6	MK	1.5	COB	R8- T/Rover	T ROVER 4748141573	4	1573277C
112802	Spkt	5/10/2009	EDIT	EDIT	4	MK	1.5	COB	R8- T/Rover	T ROVER 4748141573	5	1573277D
112802	Spkt	5/10/2009	EDIT	EDIT	2	MK	1.5	COB	R8- T/Rover	T ROVER 4748141573	6	1573277E
112802	Spkt	5/10/2009	EDIT	EDIT	1	MK	1.5	COB	R8- T/Rover	T ROVER 4748141573	7	1573277F

AUSPOS DATA

Obs. Time (hrs)	RINEX File Name	Comments
1	1573277F	Edit File -11hr
2	1573277E	Edit File -10hr
4	1573277D	Edit File -8hr
6	1573277C	Edit File -6hr
8	1573277B	Edit File -4hr
10	1573277A	Edit File -2hr
12	15732770	Orig File

GPS Observation Sheet - 112805

Mark Details		Observation Details					Height		Receiver		General Info	
Station Name	**Type**	**Date**	**Start**	**End**	**Duration**	**By**	**m**	**Measured To**	**Details**	**SN #**	**Session No.**	**File Name**
112805	Spkt	5/10/2009	6:25	18:20	12	MK	1.481	COB	R8- SC/Rover	S/C ROVER 4748141574	1	15742770
112805	Spkt	5/10/2009	EDIT	EDIT	10	MK	1.481	COB	R8- SC/Rover	S/C ROVER 4748141574	2	1574277A
112805	Spkt	5/10/2009	EDIT	EDIT	8	MK	1.481	COB	R8- SC/Rover	S/C ROVER 4748141574	3	1574277B
112805	Spkt	5/10/2009	EDIT	EDIT	6	MK	1.481	COB	R8- SC/Rover	S/C ROVER 4748141574	4	1574277C
112805	Spkt	5/10/2009	EDIT	EDIT	4	MK	1.481	COB	R8- SC/Rover	S/C ROVER 4748141574	5	1574277D
112805	Spkt	5/10/2009	EDIT	EDIT	2	MK	1.481	COB	R8- SC/Rover	S/C ROVER 4748141574	6	1574277E
112805	Spkt	5/10/2009	EDIT	EDIT	1	MK	1.481	COB	R8- SC/Rover	S/C ROVER 4748141574	7	1574277F

AUSPOS DATA

Obs. Time (hrs)	**RINEX File Name**	**Comments**
1	1574277F	Edit File -11hr
2	1574277E	Edit File -10hr
4	1574277D	Edit File -8hr
6	1574277C	Edit File -6hr
8	1574277B	Edit File -4hr
10	1574277A	Edit File -2hr
12	15742770	Orig File

GPS Observation Sheet - 112809

Mark Details		Observation Details					Height		Receiver		General Info	
Station Name	**Type**	**Date**	**Start**	**End**	**Duration**	**By**	**m**	**Measured To**	**Details**	**SN #**	**Session No.**	**File Name**
112809	SPKT	26/09/2009	07:53	15:50	8	MK	1.602	COB	R8 -S/C BASE	S/C BASE 4837157449	1	74492681
112809	SPKT	27/09/2009	07:26	17:18	10	TR	1.464	COB	R8-2 S/C ROVER	S/C ROVER 4748141574	2	15742690
112809	SPKT	28/09/2009	05:50	17:45	12	MK	1.577	COB	R8-2 S/C ROVER	S/C ROVER 4748141574	3	15742700
112809	SPKT	29/09/2009	10:46	16:47	6	TR	1.618	COB	R8 -S/C BASE	S/C BASE 4837157449	4	74492720
112809	SPKT	29/09/2009	16:52	17:53	1	TR	1.618	COB	R8 -S/C BASE	S/C BASE 4837157449	5	74492721
112809	SPKT	1/10/2009	08:10	10:11	2	TR	1.566	COB	R8 -S/C BASE	S/C BASE 4837157449	6	74492732
112809	SPKT	1/10/2009	10:21	14:40	4	TR	1.566	COB	R8 -S/C BASE	S/C BASE 4837157449	7	74492741

AUSPOS DATA

Obs. Time (hrs)	RINEX File Name	Comments
1	74492721	Orig File
2	74492732	Orig File
4	74492741	Orig File
6	74492720	Orig File
8	74492681	Orig File
10	15742690	Orig File
12	15742700	Orig File

GPS Observation Sheet - 112810

Mark Details		Observation Details					Height		Receiver		General Info	
Station Name	**Type**	**Date**	**Start**	**End**	**Duration**	**By**	**m**	**Measured To**	**Details**	**SN #**	**Session No.**	**File Name**
112810	Spkt	3/10/2009	6:05	18:05	12	MK	1.525	COB	R8- T/Base	T BASE 4749142127	1	21272750
112810	Spkt	3/10/2009	EDIT	EDIT	10	MK	1.525	COB	R8- T/Base	T BASE 4749142127	2	2127275A
112810	Spkt	3/10/2009	EDIT	EDIT	8	MK	1.525	COB	R8- T/Base	T BASE 4749142127	3	2127275B
112810	Spkt	3/10/2009	EDIT	EDIT	6	MK	1.525	COB	R8- T/Base	T BASE 4749142127	4	2127275C
112810	Spkt	3/10/2009	EDIT	EDIT	4	MK	1.525	COB	R8- T/Base	T BASE 4749142127	5	2127275D
112810	Spkt	3/10/2009	EDIT	EDIT	2	MK	1.525	COB	R8- T/Base	T BASE 4749142127	6	2127275E
112810	Spkt	3/10/2009	EDIT	EDIT	1	MK	1.525	COB	R8- T/Base	T BASE 4749142127	7	2127275F

AUSPOS DATA

Obs. Time (hrs)	**RINEX File Name**	**Comments**
1	2127275F	Edit File -11hr
2	2127275E	Edit File -10hr
4	2127275D	Edit File -8hr
6	2127275C	Edit File -6hr
8	2127275B	Edit File -4hr
10	2127275A	Edit File -2hr
12	21272750	Orig File

GPS Observation Sheet - 112922

Mark Details		Observation Details					Height		Receiver		General Info	
Station Name	**Type**	**Date**	**Start**	**End**	**Duration**	**By**	**m**	**Measured To**	**Details**	**SN #**	**Session No.**	**Comments**
112922	Std	23/09/2009	11:30	16:55	5	MK	1.435	COB	R8-2 S/C ROVER	S/C ROVER 4748141574	1	File: 15742660
112922	Std	24/09/2009	06:50	18:30	12	MK	1.697	COB	R8-2 S/C ROVER	S/C ROVER 4748141574	2	15742662
112922	Std	26/09/2009	07:30	15:35	8	MK	1.468	COB	R8-2 S/C ROVER	S/C ROVER 4748141574	3	15742680
112922	Std	27/09/2009	07:09	17:02	10	MK	1.605	COB	R8 -S/C BASE	S/C BASE 4837157449	4	74492690
112922	Std	28/09/2009	06:05	12:17	6	MK	1.672	COB	R8 -S/C BASE	S/C BASE 4837157449	5	74492700
112922	Std	28/09/2009	12:20	16:34	4	MK	1.672	COB	R8 -S/C BASE	S/C BASE 4837157449	6	74492710
112922	Std	29/09/2009	17:17	18:18	1	TR	1.755	COB	R8-2 S/C ROVER	S/C ROVER 4748141574	7	15742721
112922	Std	30/09/2009	15:31	17:32	2	TR	1.763	COB	R8 -S/C BASE	S/C BASE 4837157449	8	74492730

AUSPOS DATA

Obs. Time (hrs)	RINEX File Name	Comments
1	15742721	Orig File
2	74492730	Orig File
4	74492710	Orig File
6	74492700	Orig File
8	15742680	Orig File
10	74492690	Orig File
12	15742662	Orig File

GPS Observation Sheet - 112929

Mark Details		Observation Details					Height		Receiver		General Info	
Station Name	**Type**	**Date**	**Start**	**End**	**Duration**	**By**	**m**	**Measured To**	**Details**	**SN #**	**Session No.**	**File Name**
112929	Standard	5/10/2009	05:50	17:50	12	MK	1.589	COB	R8- T/Base	T BASE 4749142127	1	27272770
112929	Standard	5/10/2009	EDIT	EDIT	10	MK	1.589	COB	R8- T/Base	T BASE 4749142127	2	2727277A
112929	Standard	5/10/2009	EDIT	EDIT	8	MK	1.589	COB	R8- T/Base	T BASE 4749142127	3	2727277B
112929	Standard	5/10/2009	EDIT	EDIT	6	MK	1.589	COB	R8- T/Base	T BASE 4749142127	4	2727277C
112929	Standard	5/10/2009	EDIT	EDIT	4	MK	1.589	COB	R8- T/Base	T BASE 4749142127	5	2727277D
112929	Standard	5/10/2009	EDIT	EDIT	2	MK	1.589	COB	R8- T/Base	T BASE 4749142127	6	2727277E
112929	Standard	5/10/2009	EDIT	EDIT	1	MK	1.589	COB	R8- T/Base	T BASE 4749142127	7	2727277F

AUSPOS DATA

Obs. Time (hrs)	RINEX File Name	Comments
1	2727277F	Edit File -11hr
2	2727277E	Edit File -10hr
4	2727277D	Edit File -8hr
6	2727277C	Edit File -6hr
8	2727277B	Edit File -4hr
10	2727277A	Edit File -2hr
12	27272770	Orig File

GPS Observation Sheet - 112930

Mark Details		Observation Details					Height		Receiver		General Info	
Station Name	**Type**	**Date**	**Start**	**End**	**Duration**	**By**	**m**	**Measured To**	**Details**	**SN #**	**Session No.**	**File Name**
112930	STD	26/09/2009	08:15	16:06	8	MK	1.542	COB	R8 -T BASE	T BASE 4749142127	1	21272680
112930	STD	27/09/2009	07:45	17:35	10	TR	1.496	COB	R8 -T BASE	T BASE 4749142127	2	21272690
112930	STD	28/09/2009	05:30	17:30	12	MK	1.61	COB	R8-2 T ROVER	T ROVER 4748141573	3	15732702
112930	STD	29/09/2009	07:08	08:09	1	TR	1.666	COB	R8-2 S/C ROVER	S/C ROVER 4748141574	4	15742710
112930	STD	29/09/2009	08:12	10:13	2	TR	1.666	COB	R8-2 S/C ROVER	S/C ROVER 4748141574	5	15742711
112930	STD	29/09/2009	10:17	16:18	6	TR	1.666	COB	R8-2 S/C ROVER	S/C ROVER 4748141574	6	15742720
112930	STD	30/09/2009	06:27	10:31	4	MK	1.513	COB	R8-2 S/C ROVER	S/C ROVER 4748141574	7	15742722

AUSPOS DATA

Obs. Time (hrs)	RINEX File Name	Comments
1	15742710	Orig File
2	15742711	Orig File
4	15742722	Orig File
6	15742720	Orig File
8	21272680	Orig File
10	21272690	Orig File
12	15732702	Orig File

Appendix F: AUPOS Processing Reports

Appendix F.1 PSM 178770 Processing Reports

178770 - 1 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
74492731.09o	TRM_R8_GNSS	1.7220	2009-09-30 20:08:00	2009-09-30 21:21:59

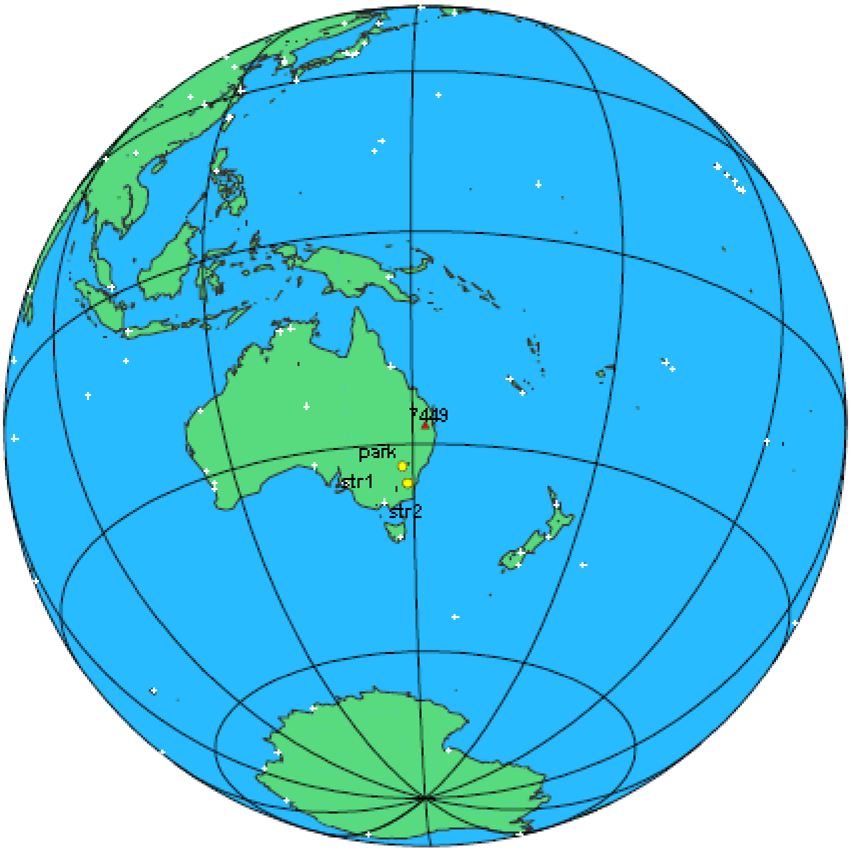


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-09-30	park str1 str2	7449	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session and to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.311	2816652.547	-3454060.945	GDA94
str1	-4467102.300	2683089.534	-3666949.984	GDA94
str2	-4467074.352	2683011.906	-3667008.281	GDA94
7449	-4993664.086	2659730.984	-2936144.931	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.172	GDA94
str1	-35-18 -55.9396	149 0 36.1796	800.031	780.694	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.237	GDA94
7449	-27-35 -5.5284	151 57 33.4512	725.808	683.804	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.172	GDA94
str1	682726.014	6090110.667	55	800.031	780.694	GDA94
str2	682733.893	6090040.859	55	802.574	783.237	GDA94
7449	397282.259	6948350.578	56	725.803	683.804	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.832	2816652.459	-3454060.170	2009/09/30
str1	-4467102.830	2683089.480	-3666949.230	2009/09/30
str2	-4467074.882	2683011.852	-3667007.527	2009/09/30
7449	-4993664.486	2659730.797	-2936144.135	2009/09/30

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)
park	-32-59 -55.5536	148 15 52.6028	397.358	374.691
str1	-35-18 -55.9117	149 0 36.1922	799.948	780.698
str2	-35-18 -58.1712	149 0 36.5601	802.486	783.241
7449	-27-35 -5.4959	151 57 33.4650	725.709	684.240

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %;

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

	Height(m)	Antenna Offsets(m)			
Station	Up	East	North	Up	yyyy/mm/dd
7449	1.7220	0.0000	0.0009	0.1039	2009/09/30

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
7449	-0.095	0.042	-0.044	2009/09/30

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
7449	0.027	0.024	0.015	2009/09/30

5.4 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0059	1532	0 %	2009-09-30
str1	0.0057	1450	0 %	2009-09-30
str2	0.0058	1452	0 %	2009-09-30
7449	0.0058	4434	0 %	2009-09-30

178770 - 2 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
15732701.09o	TRM_R8_GNSS	1.4800	2009-09-27 04:37:59	2009-09-27 06:40:00

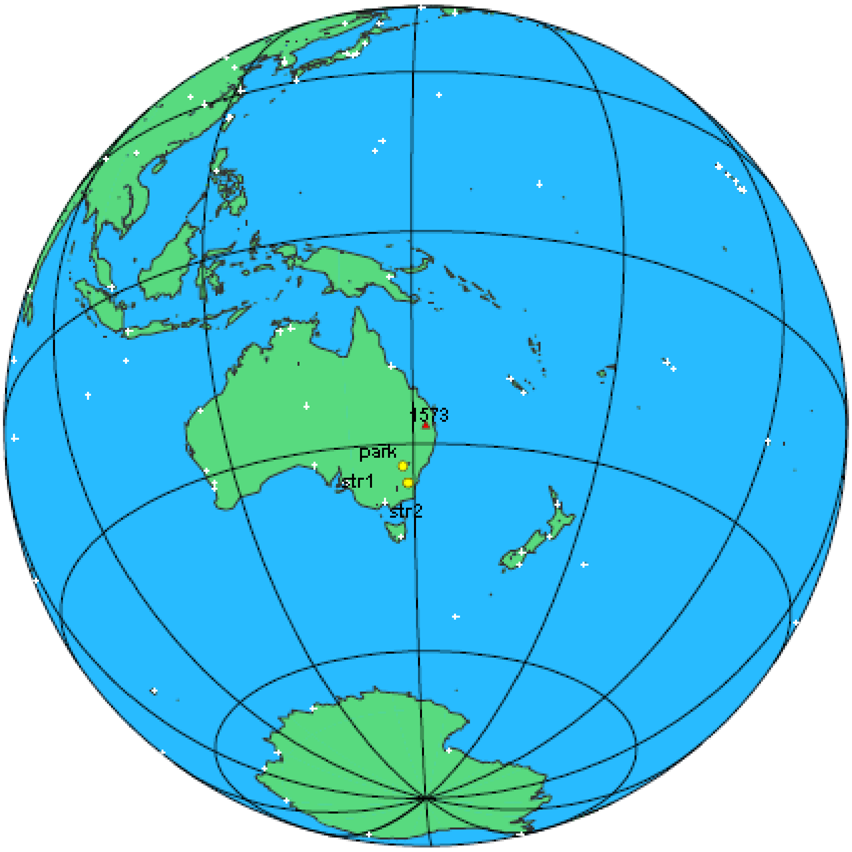


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-09-27	park str1 str2	1573	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.312	2816652.547	-3454060.946	GDA94
str1	-4467102.301	2683089.534	-3666949.983	GDA94
str2	-4467074.352	2683011.906	-3667008.280	GDA94
1573	-4993666.137	2659735.911	-2936147.241	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str1	-35-18 -55.9396	149 0 36.1796	800.031	780.694	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.237	GDA94
1573	-27-35 -5.5272	151 57 33.3287	730.569	688.570	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str1	682726.014	6090110.068	55	800.031	780.694	GDA94
str2	682733.893	6090040.859	55	802.574	783.237	GDA94
1573	397278.900	6948350.433	56	730.569	688.570	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.832	2816652.459	-3454060.171	2009/09/27
str1	-4467102.830	2683089.480	-3666949.230	2009/09/27
str2	-4467074.882	2683011.852	-3667007.527	2009/09/27
1573	-4993666.587	2659735.724	-2936146.446	2009/09/27

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)
park	-32-59 -55.5537	148 15 52.6028	397.358	374.691
str1	-35-18 -55.9117	149 0 36.1922	799.943	780.698
str2	-35-18 -58.1712	149 0 36.5601	802.486	783.241
1573	-27-35 -5.4997	151 57 33.3424	730.475	689.006

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %.

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

	Height(m)	Antenna Offsets(m)			
Station	Up	East	North	Up	yyyy/mm/dd
1573	1.4800	-0.0000	0.0009	0.1039	2009/09/27

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
1573	-2.090	5.004	-2.339	2009/09/27

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
1573	0.684	0.547	0.410	2009/09/27

5.4 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.2433	2140	0 %	2009-09-27
str1	0.2475	2094	0 %	2009-09-27
str2	0.3095	2094	0 %	2009-09-27
1573	0.2683	6328	0 %	2009-09-27

WARNING: This solution has MAJOR modelling problems associated with the submitted GPS data. Please consider this solution as INVALID. If you would like more information on this solution you can contact the Geoscience Australia at geodesy@ga.gov.au but to help us please quote your processing job number.

178770 - 4 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
21272711.09o	TRM_R8_GNSS	1.6400	2009-09-28 02:40:00	2009-09-28 07:00:00

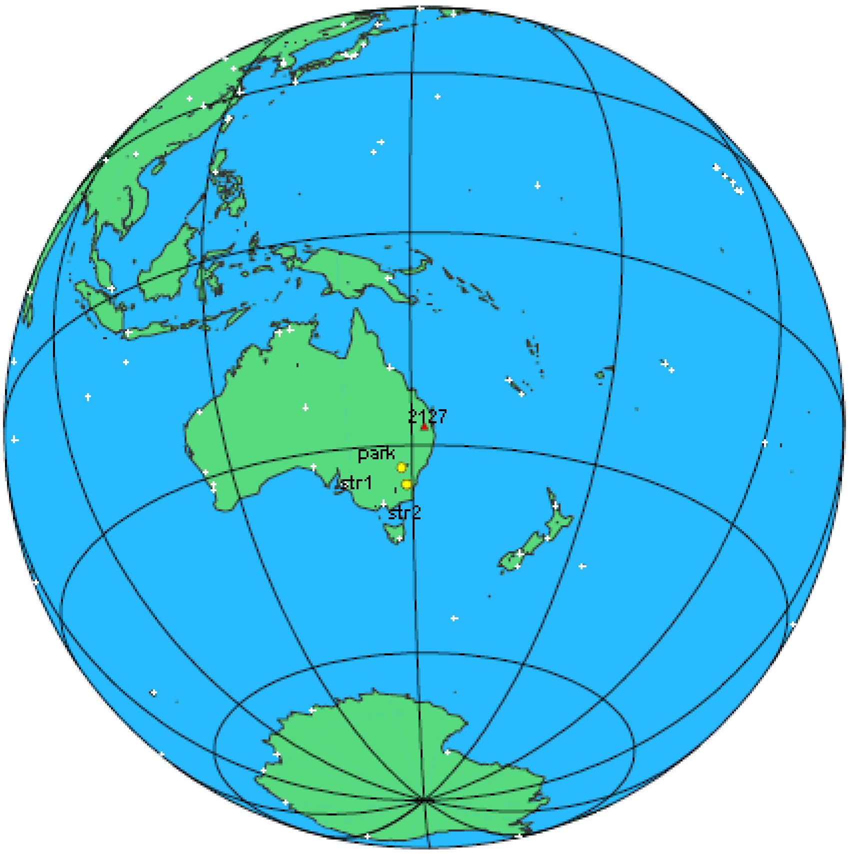


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-09-28	park str1 str2	2127	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
str1	-4467102.300	2683089.534	-3666949.984	GDA94
str2	-4467074.352	2683011.906	-3667008.281	GDA94
2127	-4993665.453	2659733.284	-2936145.765	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
str1	-35-18 -55.9396	149 0 36.1796	800.031	780.694	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.237	GDA94
2127	-27-35 -5.5124	151 57 33.4015	728.256	686.257	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
str1	682726.014	6090110.668	55	800.031	780.694	GDA94
str2	682733.893	6090040.859	55	802.574	783.237	GDA94
2127	397280.892	6948350.907	56	728.256	686.257	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
str1	-4467102.830	2683089.480	-3666949.230	2009/09/28
str2	-4467074.882	2683011.852	-3667007.527	2009/09/28
2127	-4993665.902	2659733.097	-2936144.969	2009/09/28

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)
str1	-35-18 -55.9117	149 0 36.1922	799.943	780.698
str2	-35-18 -58.1712	149 0 36.5601	802.486	783.241
2127	-27-35 -5.4848	151 57 33.4152	728.161	686.692

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

Station	Height(m) Up	Antenna Offsets(m) East	North	Up	yyyy/mm/dd
2127	1.6400	0.0000	0.0009	0.1039	2009/09/28

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
2127	-1.351	2.211	-0.812	2009/09/28

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
2127	0.466	0.372	0.372	2009/09/28

5.4 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
str1	0.2111	2026	0 %	2009-09-28
str2	0.1562	2730	0 %	2009-09-28
2127	0.1816	4756	0 %	2009-09-28

WARNING: This solution has MAJOR modelling problems associated with the submitted GPS data.. Please consider this solution as INVALID. If you would like more information on this solution you can contact the Geoscience Australia at geodesy@ga.gov.au but to help us please quote your processing job number.

178770 - 6 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
21272701.09o	TRM_R8_GNSS	1.6400	2009-09-27 20:36:00	2009-09-28 02:14:00

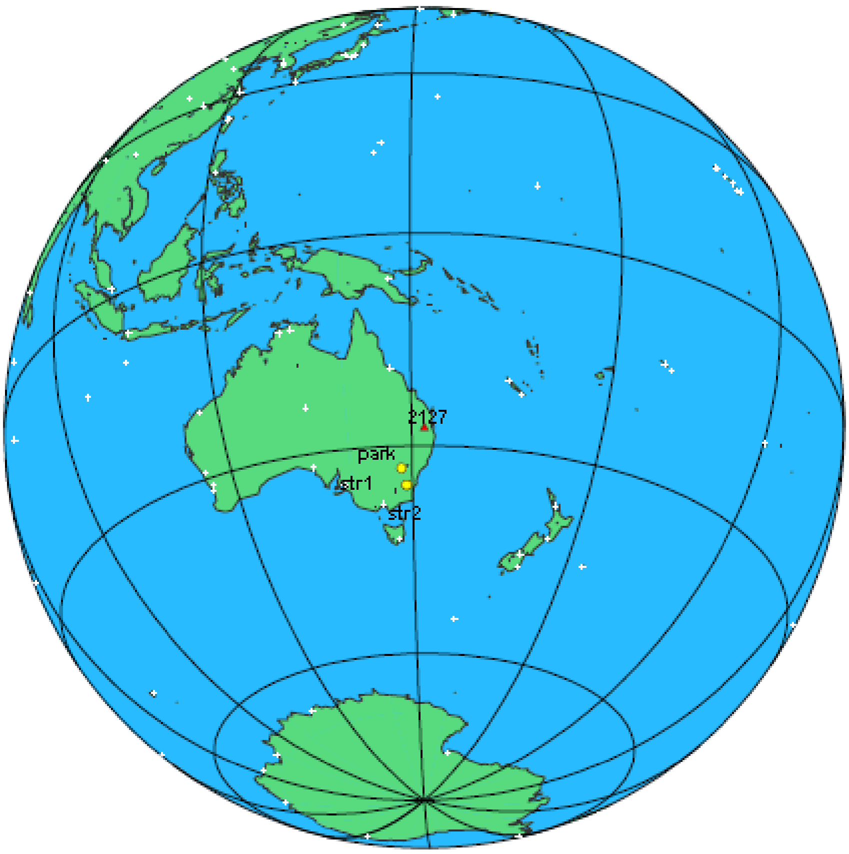


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-09-27	park str1 str2	2127	IGS Rapid
2009-09-28	park str1 str2	2127	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.312	2816652.547	-3454060.946	GDA94
str1	-4467102.301	2683089.534	-3666949.983	GDA94
str2	-4467074.352	2683011.906	-3667008.280	GDA94
2127	-4993664.054	2659730.997	-2936144.899	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str1	-35-18 -55.9396	149 0 36.1796	800.031	780.694	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.237	GDA94
2127	-27-35 -5.5222	151 57 33.4511	725.807	683.808	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str1	682726.014	6090110.668	55	800.031	780.694	GDA94
str2	682733.893	6090040.859	55	802.574	783.237	GDA94
2127	397282.255	6948350.616	56	725.807	683.808	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.832	2816652.459	-3454060.171	2009/09/27
str1	-4467102.830	2683089.480	-3666949.230	2009/09/28
str2	-4467074.882	2683011.852	-3667007.527	2009/09/28

2127	-4993664.503	2659730.810	-2936144.104	2009/09/28	
2127	0.017 m	0.025 m	0.004 m		RMS

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5537	148 15 52.6028	397.358	374.691	
str1	-35-18 -55.9117	149 0 36.1922	799.943	780.698	
str2	-35-18 -58.1712	149 0 36.5601	802.486	783.241	
2127	-27-35 -5.4946	151 57 33.4648	725.713	684.244	
2127	0.009 m	0.014 m	0.025 m		RMS

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

Station	Height(m) Up	Antenna Offsets(m) East	North	Up	yyyy/mm/dd
2127	1.6400	0.0000	0.0009	0.1039	2009/09/27
2127	1.6400	-0.0000	0.0009	0.1039	2009/09/28

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
2127	-0.013	0.005	-0.002	2009/09/27
2127	0.028	-0.020	0.002	2009/09/28

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
2127	0.017	0.011	0.009	2009/09/27
2127	0.014	0.008	0.008	2009/09/28

5.4 Coordinate Value - Cartesian, ITRF2005, per day

	X(m)	Y(m)	Z(m)	ITRF2005 @
2127	-4993664.483	2659730.779	-2936144.100	2009/09/27
2127	-4993664.516	2659730.826	-2936144.107	2009/09/28

5.5 Geodetic, GRS80 Ellipsoid, ITRF2005, per day

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	
2127	-27-35 -5.4950	151 57 33.4655	725.683	2009/09/27
2127	-27-35 -5.4945	151 57 33.4645	725.732	2009/09/28

5.6 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0056	1618	4 %	2009-09-27
str1	0.0054	1602	3 %	2009-09-27
str2	0.0056	2389	5 %	2009-09-27
2127	0.0056	5609	4 %	2009-09-27
str1	0.0054	1456	23 %	2009-09-28
str2	0.0052	1922	0 %	2009-09-28
2127	0.0053	3378	11 %	2009-09-28

178770 - 8 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
74492722.09o	TRM_R8_GNSS	1.6640	2009-09-29 20:49:00	2009-09-30 04:50:59

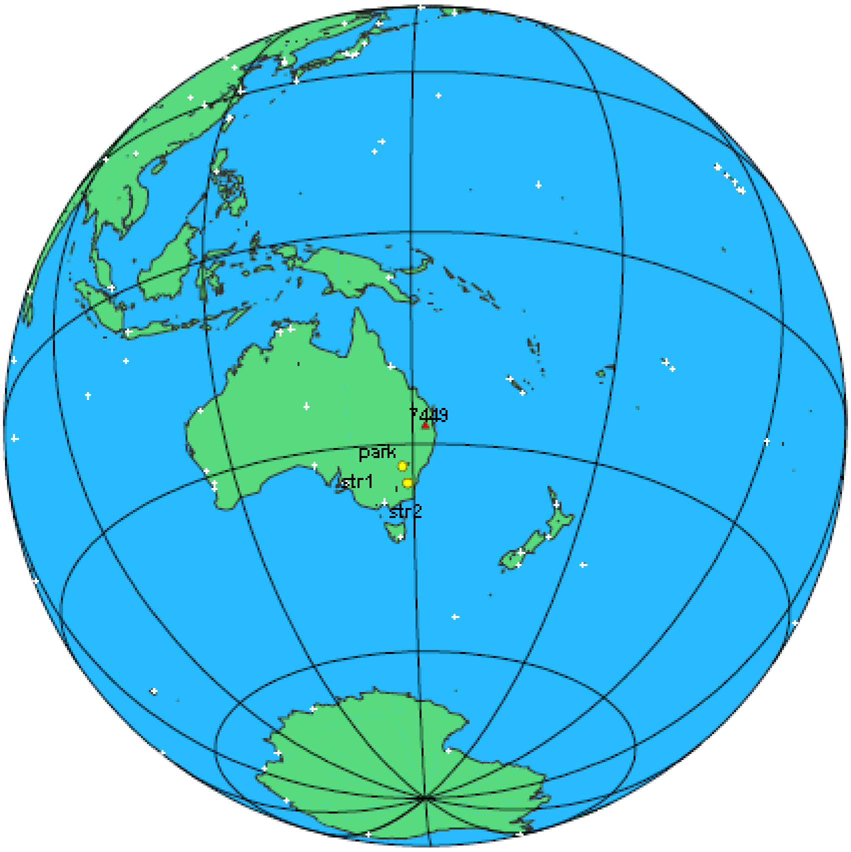


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-09-29	park str1 str2	7449	IGS Rapid
2009-09-30	park str1 str2	7449	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.311	2816652.547	-3454060.945	GDA94
str2	-4467074.352	2683011.906	-3667008.281	GDA94
7449	-4993664.069	2659731.028	-2936144.904	GDA94
str1	-4467102.300	2683089.534	-3666949.984	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.287	GDA94
7449	-27-35 -5.5219	151 57 33.4504	725.834	683.835	GDA94
str1	-35-18 -55.9396	149 0 36.1796	800.031	780.694	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str2	682733.893	6090040.859	55	802.574	783.287	GDA94
7449	397282.235	6948350.624	56	725.834	683.835	GDA94
str1	682726.014	6090110.668	55	800.031	780.694	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.832	2816652.459	-3454060.170	2009/09/30
str2	-4467074.882	2683011.852	-3667007.527	2009/09/30
7449	-4993664.518	2659730.841	-2936144.108	2009/09/30

7449	0.016 m	0.026 m	0.008 m	RMS
str1	-4467102.830	2683089.480	-3666949.230	2009/09/30

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)
park	-32-59 -55.5536	148 15 52.6028	397.358	374.691
str2	-35-18 -58.1712	149 0 36.5601	802.486	783.241
7449	-27-35 -5.4943	151 57 33.4641	725.740	684.271
7449	0.005 m	0.016 m	0.027 m	RMS
str1	-35-18 -55.9117	149 0 36.1922	799.943	780.698

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

	Height(m)	Antenna Offsets(m)			
Station	Up	East	North	Up	yyyy/mm/dd
7449	1.6640	0.0000	0.0009	0.1039	2009/09/29
7449	1.6640	-0.0000	0.0009	0.1039	2009/09/30

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
7449	-0.016	-0.004	-0.023	2009/09/29
7449	-0.015	0.011	-0.013	2009/09/30

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
7449	0.021	0.016	0.012	2009/09/29
7449	0.011	0.007	0.007	2009/09/30

5.4 Coordinate Value - Cartesian, ITRF2005, per day

	X(m)	Y(m)	Z(m)	ITRF2005 @
7449	-4993664.497	2659730.804	-2936144.097	2009/09/29
7449	-4993664.525	2659730.848	-2936144.112	2009/09/30

5.5 Geodetic, GRS80 Ellipsoid, ITRF2005, per day

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	
7449	-27-35 -5.4946	151 57 33.4649	725.702	2009/09/29
7449	-27-35 -5.4943	151 57 33.4640	725.749	2009/09/30

5.6 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0082	2206	6 %	2009-09-29
str2	0.0078	2245	4 %	2009-09-29
7449	0.0080	4451	5 %	2009-09-29
park	0.0073	3390	3 %	2009-09-30
str1	0.0072	3452	1 %	2009-09-30
str2	0.0074	3456	1 %	2009-09-30
7449	0.0073	10298	2 %	2009-09-30

178770 – 10 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
15742678.09o	TRM_R8_GNSS	1.6050	2009-09-24 20:13:00	2009-09-25 05:55:00

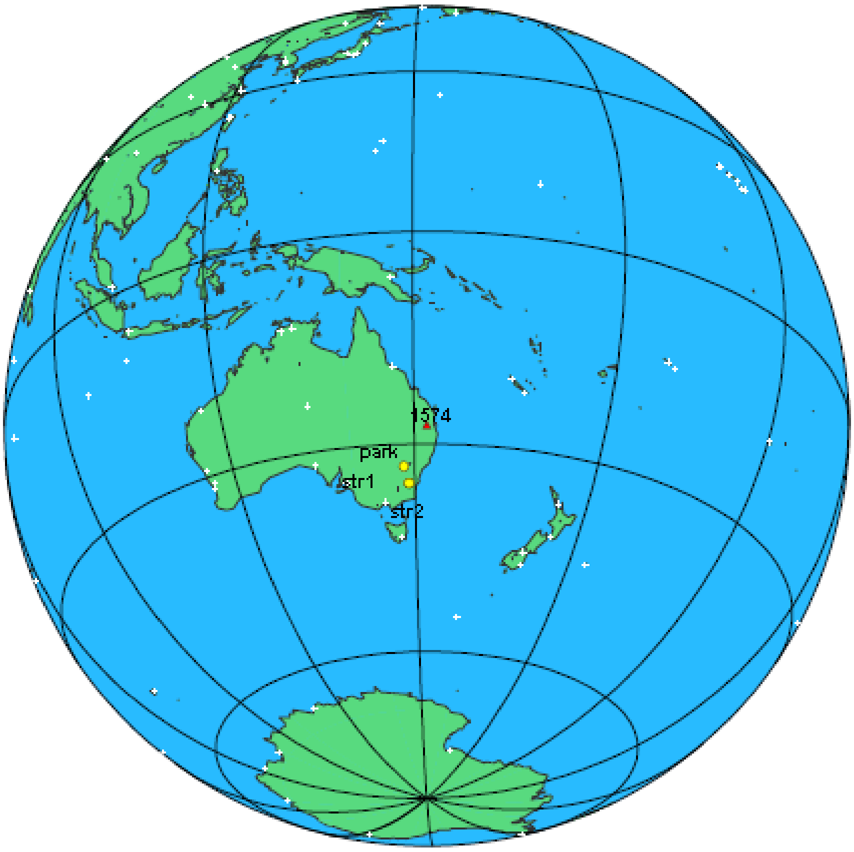


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-09-24	park str1 str2	1574	IGS Rapid
2009-09-25	park str1 str2	1574	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.312	2816652.547	-3454060.945	GDA94
str1	-4467102.301	2683089.534	-3666949.983	GDA94
str2	-4467074.352	2683011.906	-3667008.281	GDA94
1574	-4993664.068	2659731.016	-2936144.926	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str1	-35-18 -55.9396	149 0 36.1796	800.031	780.694	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.287	GDA94
1574	-27-35 -5.5226	151 57 33.4507	725.839	683.840	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str1	682726.015	6090110.068	55	800.031	780.694	GDA94
str2	682733.893	6090040.859	55	802.574	783.287	GDA94
1574	397282.245	6948350.602	56	725.839	683.840	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.832	2816652.459	-3454060.171	2009/09/24
str1	-4467102.830	2683089.480	-3666949.230	2009/09/25
str2	-4467074.881	2683011.852	-3667007.528	2009/09/25

1574	-4993664.518	2659730.829	-2936144.131	2009/09/25	
1574	0.002 m	0.013 m	0.005 m		RMS

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5537	148 15 52.6028	397.358	374.691	
str1	-35-18 -55.9117	149 0 36.1922	799.948	780.698	
str2	-35-18 -58.1712	149 0 36.5601	802.486	783.241	
1574	-27-35 -5.4951	151 57 33.4645	725.745	684.276	
1574	0.001 m	0.011 m	0.009 m		RMS

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

Station	Height(m) Up	Antenna Offsets(m) East	North	Up	yyyy/mm/dd
1574	1.6050	-0.0000	0.0009	0.1039	2009/09/24
1574	1.6050	0.0000	0.0009	0.1039	2009/09/25

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
1574	-0.017	-0.006	0.009	2009/09/24
1574	0.041	-0.037	0.031	2009/09/25

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
1574	0.015	0.012	0.009	2009/09/24
1574	0.012	0.008	0.008	2009/09/25

5.4 Coordinate Value - Cartesian, ITRF2005, per day

	X(m)	Y(m)	Z(m)	ITRF2005 @
1574	-4993664.516	2659730.813	-2936144.125	2009/09/24
1574	-4993664.519	2659730.837	-2936144.135	2009/09/25

5.5 Geodetic, GRS80 Ellipsoid, ITRF2005, per day

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	
1574	-27-35 -5.4951	151 57 33.4650	725.734	2009/09/24
1574	-27-35 -5.4952	151 57 33.4642	725.751	2009/09/25

5.6 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0043	2916	0 %	2009-09-24
str1	0.0056	4138	2 %	2009-09-24
str2	0.0061	4137	2 %	2009-09-24
1574	0.0066	5359	3 %	2009-09-24
str1	0.0080	3996	3 %	2009-09-25
str2	0.0078	4000	3 %	2009-09-25
1574	0.0079	7996	3 %	2009-09-25

178770 – 12 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
15742670.09o	TRM_R8_GNSS	1.6050	2009-09-24 20:13:00	2009-09-25 07:54:59

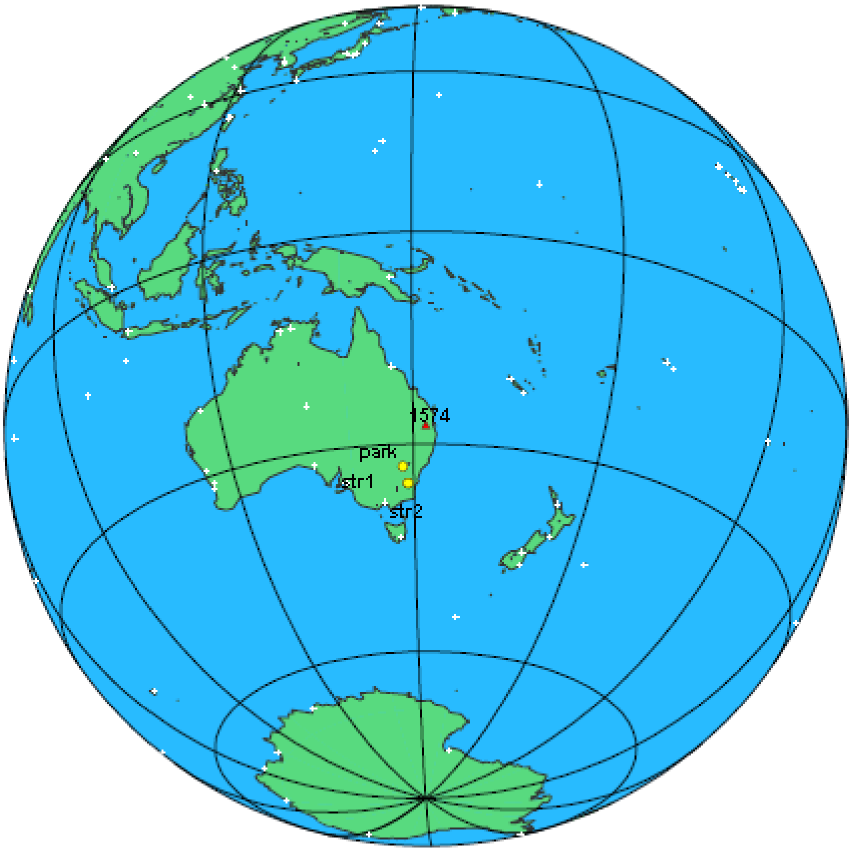


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-09-24	park str1 str2	1574	IGS Rapid
2009-09-25	park str1 str2	1574	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.312	2816652.547	-3454060.945	GDA94
str1	-4467102.301	2683089.534	-3666949.983	GDA94
str2	-4467074.352	2683011.906	-3667008.281	GDA94
1574	-4993664.068	2659731.006	-2936144.926	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str1	-35-18 -55.9396	149 0 36.1796	800.031	780.694	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.287	GDA94
1574	-27-35 -5.5227	151 57 33.4511	725.834	683.835	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str1	682726.015	6090110.668	55	800.031	780.694	GDA94
str2	682733.893	6090040.859	55	802.574	783.287	GDA94
1574	397282.254	6948350.600	56	725.834	683.835	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.832	2816652.459	-3454060.171	2009/09/24
str1	-4467102.830	2683089.480	-3666949.230	2009/09/25
str2	-4467074.881	2683011.852	-3667007.528	2009/09/25

1574	-4993664.517	2659730.819	-2936144.131	2009/09/25	
1574	0.001 m	0.005 m	0.006 m		RMS

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at
earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5537	148 15 52.6028	397.358	374.691	
str1	-35-18 -55.9117	149 0 36.1922	799.943	780.698	
str2	-35-18 -58.1712	149 0 36.5601	802.486	783.241	
1574	-27-35 -5.4952	151 57 33.4648	725.740	684.271	
1574	0.004 m	0.004 m	0.006 m		RMS

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %;

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

	Height(m)	Antenna Offsets(m)			
Station	Up	East	North	Up	yyyy/mm/dd
1574	1.6050	-0.0000	0.0009	0.1039	2009/09/24
1574	1.6050	0.0000	0.0009	0.1039	2009/09/25

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
1574	-0.017	-0.006	0.009	2009/09/24
1574	0.082	-0.054	0.027	2009/09/25

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
1574	0.015	0.012	0.009	2009/09/24
1574	0.014	0.009	0.009	2009/09/25

5.4 Coordinate Value - Cartesian, ITRF2005, per day

	X(m)	Y(m)	Z(m)	ITRF2005 @
1574	-4993664.516	2659730.813	-2936144.125	2009/09/24
1574	-4993664.518	2659730.828	-2936144.137	2009/09/25

5.5 Geodetic, GRS80 Ellipsoid, ITRF2005, per day

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	
1574	-27-35 -5.4951	151 57 33.4650	725.734	2009/09/24
1574	-27-35 -5.4953	151 57 33.4647	725.745	2009/09/25

5.6 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0043	2916	0 %	2009-09-24
str1	0.0056	4138	2 %	2009-09-24
str2	0.0061	4137	2 %	2009-09-24
1574	0.0066	5359	3 %	2009-09-24
str1	0.0098	5158	8 %	2009-09-25
str2	0.0085	5027	10 %	2009-09-25
1574	0.0092	10185	9 %	2009-09-25

Appendix F.2 PSM 51858 Processing Reports

51858 - 1 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
74492711.09o	TRM_R8_GNSS	1.5620	2009-09-28 20:36:59	2009-09-28 21:39:00

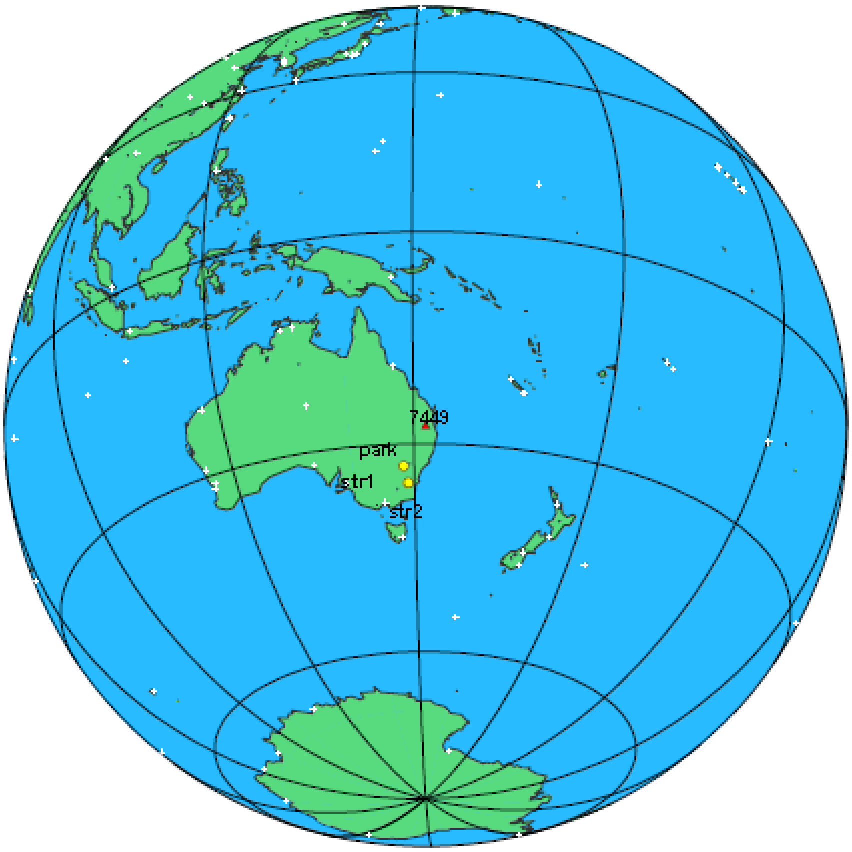


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-09-28	park str1 str2	7449	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session and to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
str1	-4467102.300	2683039.534	-3666949.984	GDA94
str2	-4467074.352	2683011.906	-3667008.281	GDA94
7449	-4988107.470	2667654.447	-2938133.280	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
str1	-35-18 -55.9396	149 0 36.1796	800.031	780.694	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.237	GDA94
7449	-27-36 -20.3903	151 51 43.1946	608.765	566.885	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
str1	682726.014	6090110.668	55	800.031	780.694	GDA94
str2	682733.893	6090040.859	55	802.574	783.237	GDA94
7449	387699.908	6945962.171	56	608.765	566.885	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
str1	-4467102.830	2683039.480	-3666949.230	2009/09/28
str2	-4467074.882	2683011.852	-3667007.527	2009/09/28
7449	-4988107.921	2667654.261	-2938132.485	2009/09/28

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)
str1	-35-18 -55.9117	149 0 36.1922	799.948	780.698
str2	-35-18 -58.1712	149 0 36.5601	802.486	783.241
7449	-27-36 -20.3628	151 51 43.2084	608.670	567.366

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %.

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

	Height(m)	Antenna Offsets(m)			
Station	Up	East	North	Up	yyyy/mm/dd
7449	1.5620	-0.0000	0.0009	0.1039	2009/09/28

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
7449	-4.727	2.651	-2.272	2009/09/28

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
7449	0.848	0.530	0.459	2009/09/28

5.4 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
str1	0.0615	667	0 %	2009-09-28
str2	0.0677	667	0 %	2009-09-28
7449	0.0647	1334	0 %	2009-09-28

WARNING: This solution has modelling problems associated with the submitted GPS data. Please consider this solution with CAUTION.

51858 - 2 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
74492712.09o	TRM_R8_GNSS	1.5620	2009-09-28 21:43:59	2009-09-28 23:45:00

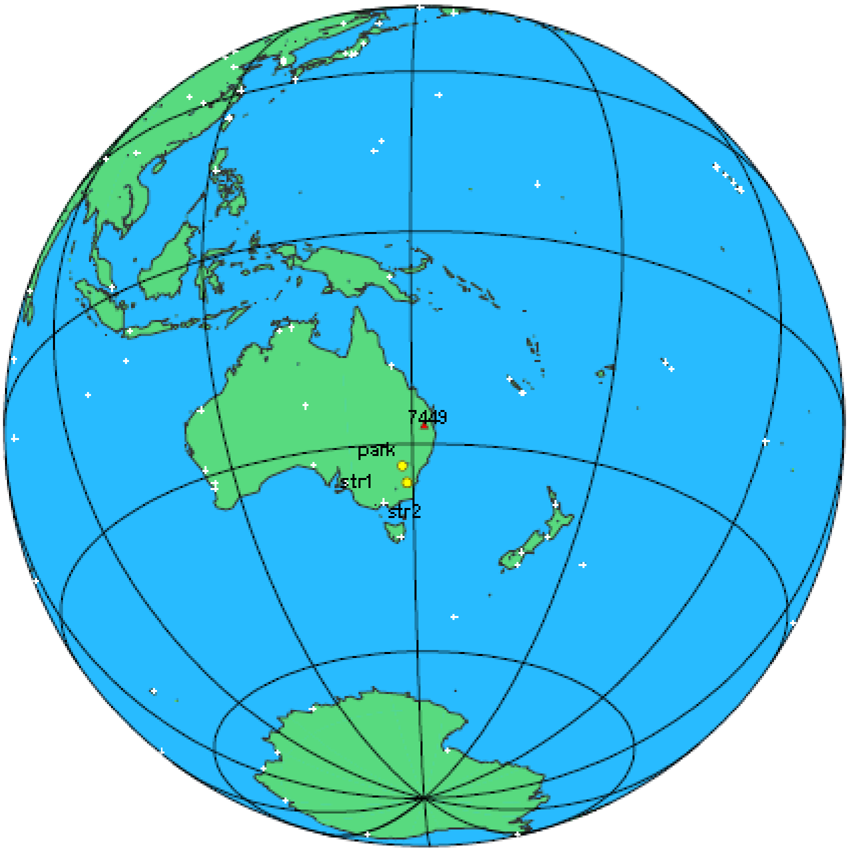


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-09-28	park str1 str2	7449	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
str1	-4467102.300	2683089.534	-3666949.984	GDA94
str2	-4467074.352	2683011.906	-3667008.281	GDA94
7449	-4988107.499	2667654.481	-2938133.269	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
str1	-35-18 -55.9396	149 0 36.1796	800.031	780.694	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.237	GDA94
7449	-27-36 -20.3894	151 51 43.1941	608.796	566.917	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
str1	682726.014	6090110.968	55	800.031	780.694	GDA94
str2	682733.893	6090040.859	55	802.574	783.237	GDA94
7449	387699.891	6945962.200	56	608.796	566.917	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
str1	-4467102.830	2683089.480	-3666949.230	2009/09/28
str2	-4467074.882	2683011.852	-3667007.527	2009/09/28
7449	-4988107.950	2667654.295	-2938132.474	2009/09/28

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)
str1	-35-18 -55.9117	149 0 36.1922	799.943	780.698
str2	-35-18 -58.1712	149 0 36.5601	802.486	783.241
7449	-27-36 -20.3618	151 51 43.2078	608.702	567.398

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %.

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

	Height(m)	Antenna Offsets(m)			
Station	Up	East	North	Up	yyyy/mm/dd
7449	1.5620	-0.0000	0.0009	0.1039	2009/09/28

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
7449	0.044	0.018	-0.004	2009/09/28

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
7449	0.044	0.028	0.028	2009/09/28

5.4 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
str1	0.0099	1532	0 %	2009-09-28
str2	0.0113	1523	0 %	2009-09-28
7449	0.0106	3055	0 %	2009-09-28

51858 - 4 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
74492678.09o	TRM_R8_GNSS	1.5190	2009-09-24 08:11:00	2009-09-24 12:25:00

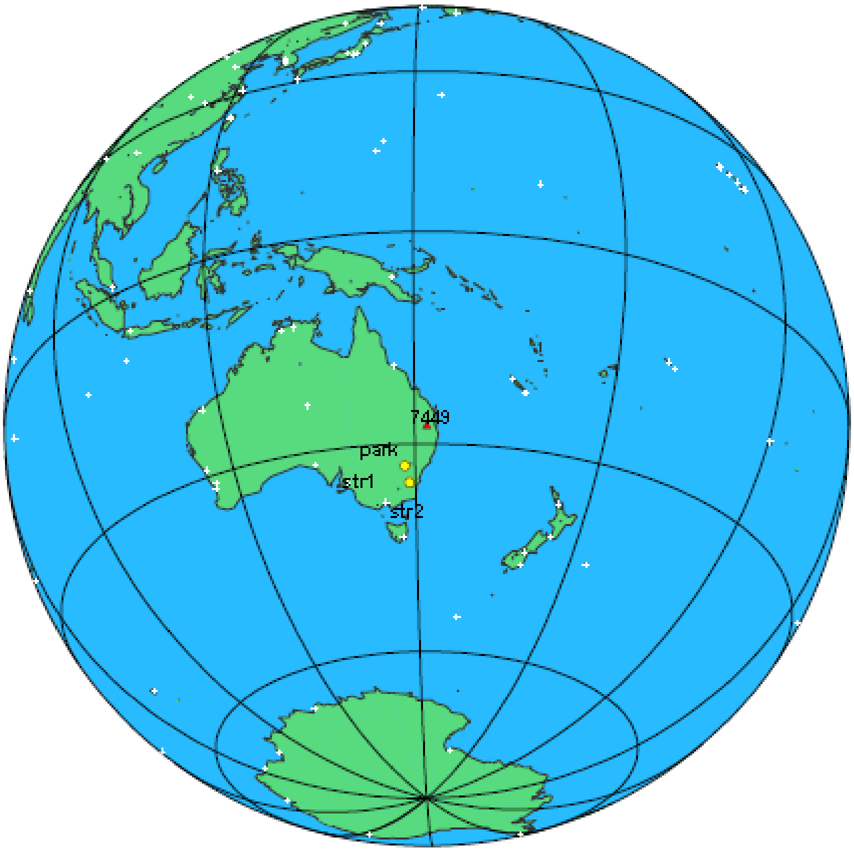


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-09-24	park str1 str2	7449	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session and to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.312	2816652.547	-3454060.945	GDA94
str1	-4467102.301	2683089.534	-3666949.983	GDA94
str2	-4467074.352	2683011.906	-3667008.281	GDA94
7449	-4988107.406	2667654.422	-2938133.227	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str1	-35-18 -55.9396	149 0 36.1796	800.031	780.694	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.287	GDA94
7449	-27-36 -20.3898	151 51 43.1943	608.679	566.800	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str1	682726.015	6090110.668	55	800.031	780.694	GDA94
str2	682733.893	6090040.858	55	802.574	783.287	GDA94
7449	387699.899	6945962.187	56	608.679	566.800	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.832	2816652.459	-3454060.171	2009/09/24
str1	-4467102.830	2683089.480	-3666949.230	2009/09/24
str2	-4467074.881	2683011.852	-3667007.528	2009/09/24
7449	-4988107.856	2667654.236	-2938132.432	2009/09/24

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)
park	-32-59 -55.5537	148 15 52.6028	397.358	374.691
str1	-35-18 -55.9117	149 0 36.1922	799.943	780.698
str2	-35-18 -58.1712	149 0 36.5601	802.486	783.241
7449	-27-36 -20.3623	151 51 43.2081	608.585	567.281

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

	Height(m)	Antenna Offsets(m)			
Station	Up	East	North	Up	yyyy/mm/dd
7449	1.5190	0.0000	0.0009	0.1039	2009/09/24

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
7449	0.097	-0.050	0.089	2009/09/24

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
7449	0.024	0.012	0.012	2009/09/24

5.4 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0114	3253	1 %	2009-09-24
str1	0.0114	3261	1 %	2009-09-24
str2	0.0119	3249	1 %	2009-09-24
7449	0.0116	9763	1 %	2009-09-24

51858 - 6 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
74492671.09o	TRM_R8_GNSS	1.5190	2009-09-24 08:11:00	2009-09-24 14:24:00

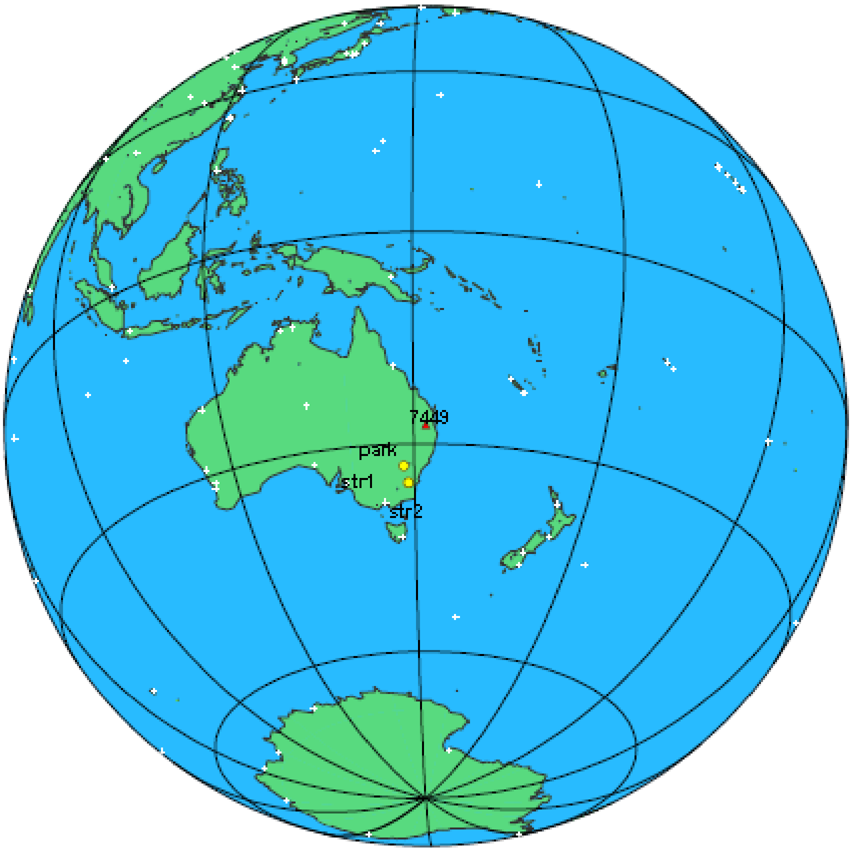


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-09-24	park str1 str2	7449	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session and to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.312	2816652.547	-3454060.945	GDA94
str1	-4467102.301	2683089.534	-3666949.983	GDA94
str2	-4467074.352	2683011.906	-3667008.281	GDA94
7449	-4988107.437	2667654.428	-2938133.238	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str1	-35-18 -55.9396	149 0 36.1796	800.031	780.694	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.237	GDA94
7449	-27-36 -20.3897	151 51 43.1947	608.711	566.832	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str1	682726.015	6090110.668	55	800.031	780.694	GDA94
str2	682733.893	6090040.858	55	802.574	783.237	GDA94
7449	387899.909	6945962.191	56	608.711	566.832	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.882	2816652.459	-3454060.171	2009/09/24
str1	-4467102.880	2683089.480	-3666949.230	2009/09/24
str2	-4467074.881	2683011.852	-3667007.528	2009/09/24
7449	-4988107.887	2667654.242	-2938132.443	2009/09/24

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)
park	-32-59 -55.5537	148 15 52.6028	397.358	374.691
str1	-35-18 -55.9117	149 0 36.1922	799.943	780.698
str2	-35-18 -58.1712	149 0 36.5601	802.486	783.241
7449	-27-36 -20.3621	151 51 43.2084	608.617	567.313

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

Station	Height(m) Up	Antenna Offsets(m) East	North	Up	yyyy/mm/dd
7449	1.5190	0.0000	0.0009	0.1039	2009/09/24

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
7449	0.017	-0.009	0.012	2009/09/24

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
7449	0.023	0.012	0.012	2009/09/24

5.4 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0119	4345	2 %	2009-09-24
str1	0.0114	4338	2 %	2009-09-24
str2	0.0115	4337	2 %	2009-09-24
7449	0.0116	13020	2 %	2009-09-24

51858 - 8 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
15742730.09o	TRM_R8_GNSS	1.3180	2009-09-30 00:52:00	2009-09-30 08:39:00

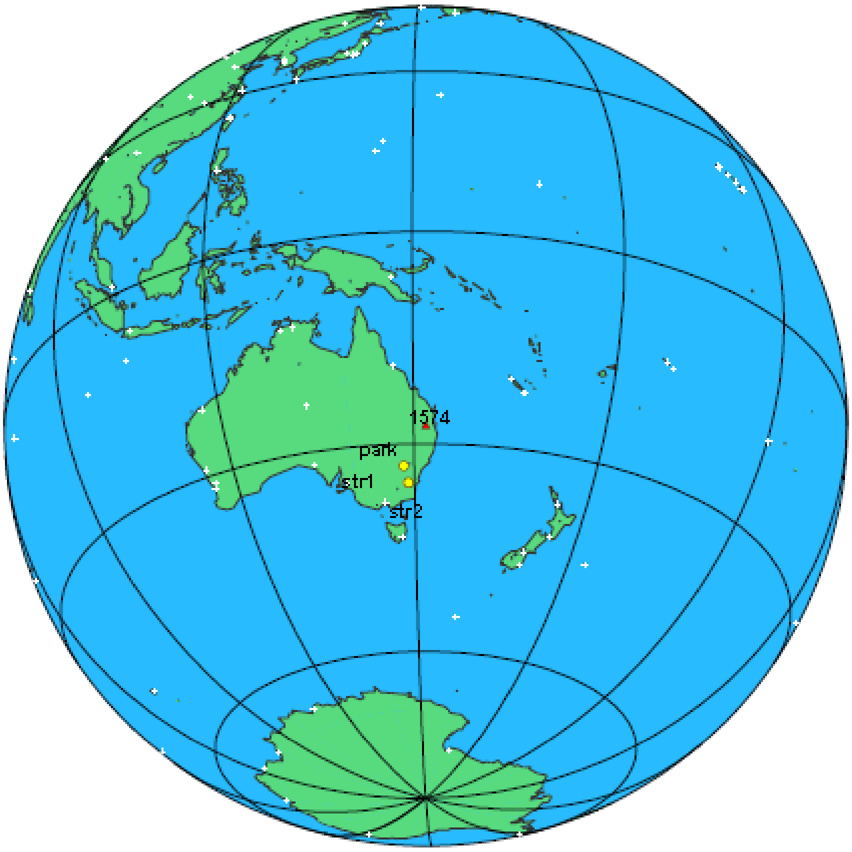


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-09-30	park str1 str2	1574	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session and to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.311	2816652.547	-3454060.945	GDA94
str1	-4467102.300	2683039.534	-3666949.984	GDA94
str2	-4467074.352	2683011.906	-3667008.281	GDA94
1574	-4988107.494	2667654.467	-2938133.273	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.172	GDA94
str1	-35-18 -55.9396	149 0 36.1796	800.031	780.694	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.237	GDA94
1574	-27-36 -20.3896	151 51 43.1944	608.788	566.908	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.172	GDA94
str1	682726.014	6090110.667	55	800.031	780.694	GDA94
str2	682733.893	6090040.859	55	802.574	783.237	GDA94
1574	387699.901	6945962.192	56	608.788	566.908	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.832	2816652.459	-3454060.170	2009/09/30
str1	-4467102.830	2683039.480	-3666949.230	2009/09/30
str2	-4467074.882	2683011.852	-3667007.527	2009/09/30
1574	-4988107.945	2667654.281	-2938132.477	2009/09/30

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)
park	-32-59 -55.5536	148 15 52.6028	397.358	374.691
str1	-35-18 -55.9117	149 0 36.1922	799.943	780.698
str2	-35-18 -58.1712	149 0 36.5601	802.486	783.241
1574	-27-36 -20.3621	151 51 43.2081	608.694	567.390

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

Station	Height(m) Up	Antenna Offsets(m) East	North	Up	yyyy/mm/dd
1574	1.3180	0.0000	0.0009	0.1039	2009/09/30

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
1574	0.018	0.028	-0.009	2009/09/30

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
1574	0.012	0.012	0.012	2009/09/30

5.4 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0115	4605	12 %	2009-09-30
str1	0.0120	4507	13 %	2009-09-30
str2	0.0121	4699	10 %	2009-09-30
1574	0.0119	13811	12 %	2009-09-30

51858 - 10 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
15742732.09o	TRM_R8_GNSS	1.3180	2009-09-30 20:59:00	2009-10-01 07:02:59

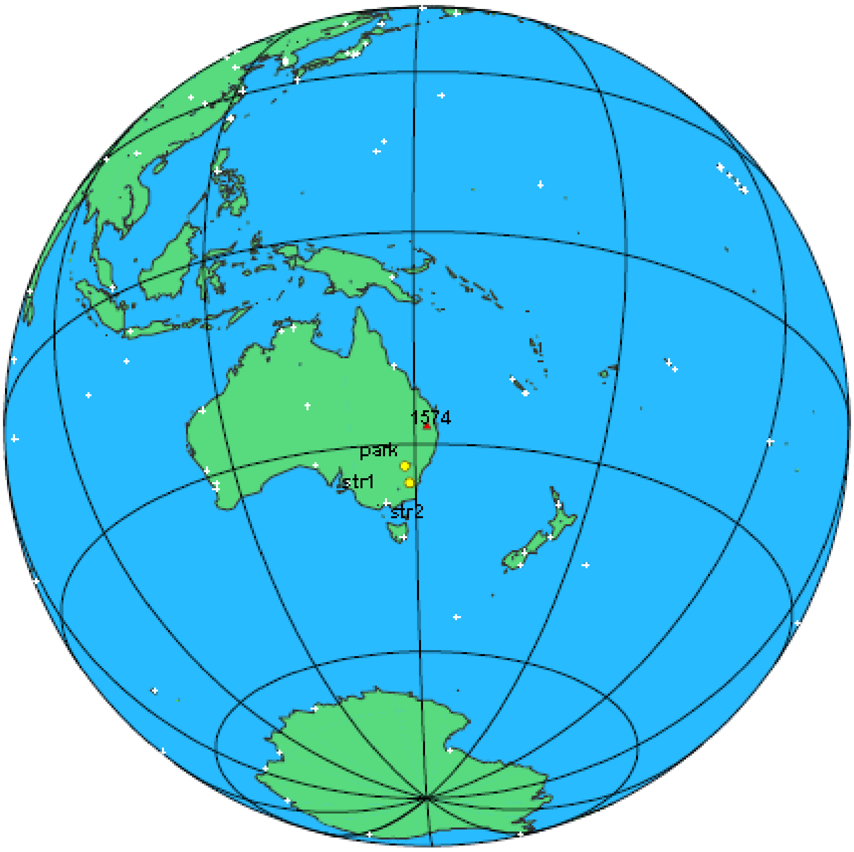


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-09-30	park str1 str2	1574	IGS Rapid
2009-10-01	park str1 str2	1574	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.312	2816652.547	-3454060.945	GDA94
str1	-4467102.300	2683089.534	-3666949.983	GDA94
str2	-4467074.352	2683011.906	-3667008.281	GDA94
1574	-4988107.492	2667654.508	-2938133.271	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5817	148 15 52.5889	397.447	374.173	GDA94
str1	-35-18 -55.9396	149 0 36.1796	800.030	780.693	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.237	GDA94
1574	-27-36 -20.3893	151 51 43.1931	608.808	566.924	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.931	6348138.984	55	397.447	374.173	GDA94
str1	682726.014	6090110.668	55	800.030	780.693	GDA94
str2	682733.893	6090040.859	55	802.574	783.237	GDA94
1574	387699.864	6945962.202	56	608.803	566.924	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.833	2816652.459	-3454060.170	2009/10/01
str1	-4467102.830	2683089.480	-3666949.229	2009/10/01
str2	-4467074.882	2683011.852	-3667007.527	2009/10/01

1574	-4988107.943	2667654.322	-2938132.475	2009/10/01	
1574	0.113 m	1.194 m	0.227 m		RMS

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5536	148 15 52.6028	397.358	374.691	
str1	-35-18 -55.9117	149 0 36.1922	799.943	780.698	
str2	-35-18 -58.1712	149 0 36.5601	802.486	783.241	
1574	-27-36 -20.3617	151 51 43.2068	608.709	567.405	
1574	0.416 m	1.106 m	0.305 m		RMS

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

	Height(m)	Antenna Offsets(m)			
Station	Up	East	North	Up	yyyy/mm/dd
1574	1.3180	0.0000	0.0009	0.1039	2009/09/30
1574	1.3180	-0.0000	0.0009	0.1039	2009/10/01

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
1574	0.096	1.708	0.301	2009/09/30
1574	-0.014	0.095	-0.011	2009/10/01

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
1574	0.525	0.350	0.350	2009/09/30
1574	0.018	0.009	0.009	2009/10/01

5.4 Coordinate Value - Cartesian, ITRF2005, per day

	X(m)	Y(m)	Z(m)	ITRF2005 @
1574	-4988107.784	2667656.010	-2938132.154	2009/09/30
1574	-4988107.944	2667654.321	-2938132.475	2009/10/01

5.5 Geodetic, GRS80 Ellipsoid, ITRF2005, per day

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	
1574	-27-36 -20.3426	151 51 43.1498	609.141	2009/09/30
1574	-27-36 -20.3617	151 51 43.2068	608.709	2009/10/01

5.6 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.3472	3421	4 %	2009-09-30
str1	0.3452	3405	3 %	2009-09-30
str2	0.3444	3404	3 %	2009-09-30
1574	0.3456	10230	4 %	2009-09-30
park	0.0183	7572	6 %	2009-10-01
str1	0.0176	6609	8 %	2009-10-01
str2	0.0180	7402	7 %	2009-10-01
1574	0.0180	21583	7 %	2009-10-01

WARNING: This solution has MAJOR modelling problems associated with the submitted GPS data. Please consider this solution as INVALID. If you would like more information on this solution you can contact the Geoscience Australia at geodesy@ga.gov.au but to help us please quote your processing job number.

51858 - 12 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
15742731.09o	TRM_R8_GNSS	1.3180	2009-09-30 08:41:00	2009-09-30 20:43:00

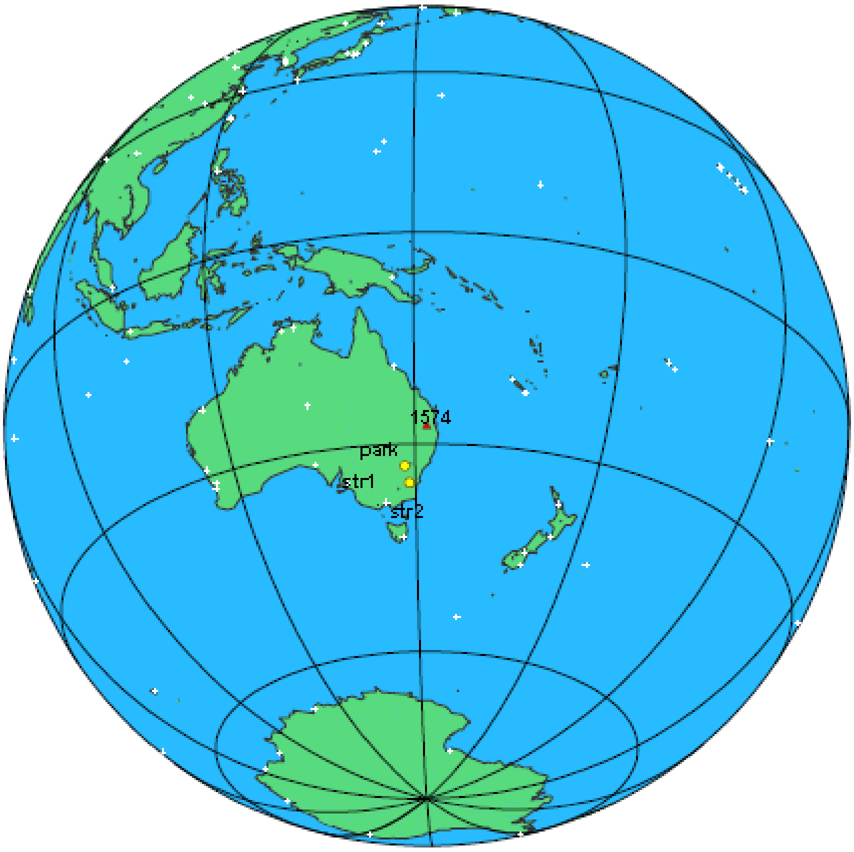


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-09-30	park str1 str2	1574	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session and to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.311	2816652.547	-3454060.945	GDA94
str1	-4467102.300	2683089.534	-3666949.984	GDA94
str2	-4467074.352	2683011.906	-3667008.281	GDA94
1574	-4988107.575	2667654.468	-2938133.329	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.172	GDA94
str1	-35-18 -55.9396	149 0 36.1796	800.031	780.694	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.237	GDA94
1574	-27-36 -20.3902	151 51 43.1958	608.877	566.998	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.172	GDA94
str1	682726.014	6090110.667	55	800.031	780.694	GDA94
str2	682733.893	6090040.859	55	802.574	783.237	GDA94
1574	387699.938	6945962.176	56	608.877	566.998	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.832	2816652.459	-3454060.170	2009/09/30
str1	-4467102.830	2683089.480	-3666949.230	2009/09/30
str2	-4467074.882	2683011.852	-3667007.527	2009/09/30
1574	-4988108.026	2667654.282	-2938132.533	2009/09/30

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)
park	-32-59 -55.5536	148 15 52.6028	397.358	374.691
str1	-35-18 -55.9117	149 0 36.1922	799.943	780.698
str2	-35-18 -58.1712	149 0 36.5601	802.486	783.241
1574	-27-36 -20.3626	151 51 43.2095	608.783	567.479

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %;

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

Station	Height(m) Up	Antenna Offsets(m) East	North	Up	yyyy/mm/dd
1574	1.3180	-0.0000	0.0009	0.1039	2009/09/30

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
1574	-0.017	-0.005	-0.020	2009/09/30

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
1574	0.015	0.015	0.008	2009/09/30

5.4 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0155	7227	17 %	2009-09-30
str1	0.0154	6973	18 %	2009-09-30
str2	0.0150	7136	17 %	2009-09-30
1574	0.0153	21336	17 %	2009-09-30

Appendix F.3 PSM 91269 Processing Reports

91269 - 1 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
1573275F.09o	TRM_R8_GNSS	1.2980	2009-10-02 19:45:59	2009-10-02 21:05:59

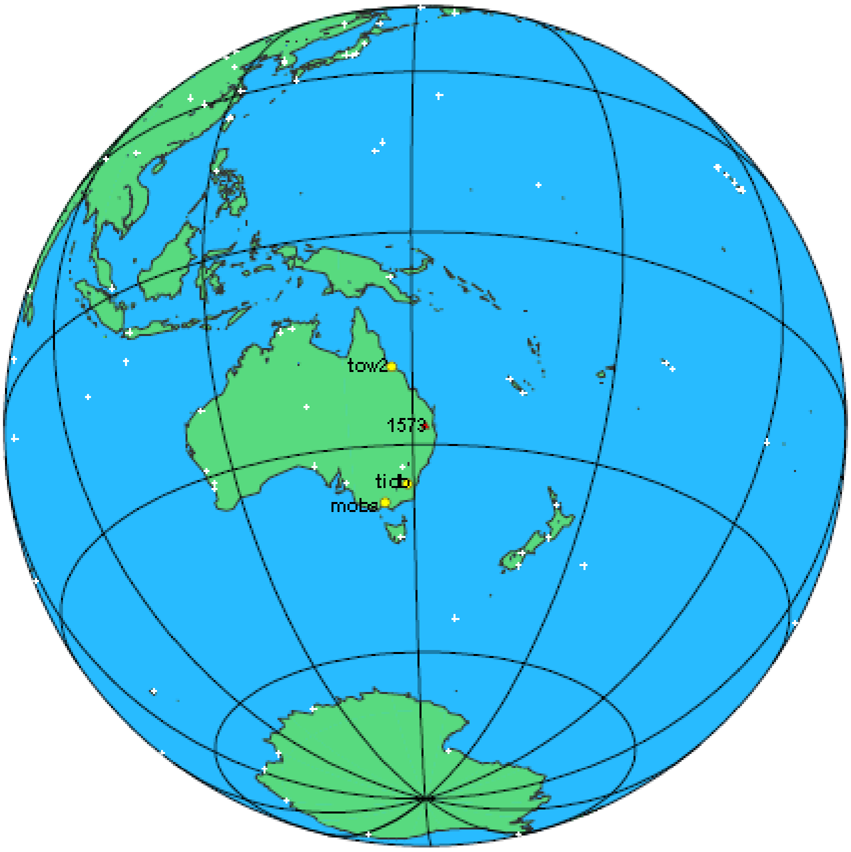


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-10-02	tidb tow2 mobs	1573	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
mobs	-4130635.782	2894953.103	-3890531.459	GDA94
tidb	-4460996.063	2682557.139	-3674443.868	GDA94
tow2	-5054582.669	3275504.568	-2091539.894	GDA94
1573	-4995114.257	2665974.632	-2927700.706	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
mobs	-37-49 -45.8989	144 58 31.2064	40.672	35.725	GDA94
tidb	-35-23 -57.1563	148 58 47.9843	665.430	646.145	GDA94
tow2	-19-16 -9.4283	147 3 20.4654	88.227	30.138	GDA94
1573	-27-29 -58.9617	151 54 37.5339	560.409	518.167	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
mobs	321819.585	5811180.087	55	40.672	35.725	GDA94
tidb	679807.854	6080884.470	55	665.430	646.145	GDA94
tow2	505851.330	7869375.315	55	88.227	30.138	GDA94
1573	392375.908	6957742.579	56	560.409	518.167	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
mobs	-4130636.359	2894953.105	-3890530.712	2009/10/02
tidb	-4460996.594	2682557.087	-3674443.115	2009/10/02
tow2	-5054583.096	3275504.275	-2091539.033	2009/10/02
1573	-4995114.707	2665974.444	-2927699.909	2009/10/02

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)
mobs	-37-49 -45.8703	144 58 31.2198	40.588	35.998
tidb	-35-23 -57.1283	148 58 47.9969	665.343	646.180
tow2	-19-16 -9.3997	147 3 20.4817	88.130	30.083
1573	-27-29 -58.9341	151 54 37.5476	560.314	518.644

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

	Height(m)	Antenna Offsets(m)			
Station	Up	East	North	Up	yyyy/mm/dd
1573	1.2980	0.0000	0.0009	0.1039	2009/10/02

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
1573	-0.081	0.036	-0.047	2009/10/02

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
1573	0.069	0.055	0.087	2009/10/02

5.4 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
mobs	0.0076	735	0 %	2009-10-02
tidb	0.0095	760	0 %	2009-10-02
tow2	0.0087	745	0 %	2009-10-02
1573	0.0087	2240	0 %	2009-10-02

91269 - 2 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
1573275E.09o	TRM_R8_GNSS	1.2980	2009-10-02 19:45:59	2009-10-02 22:16:59

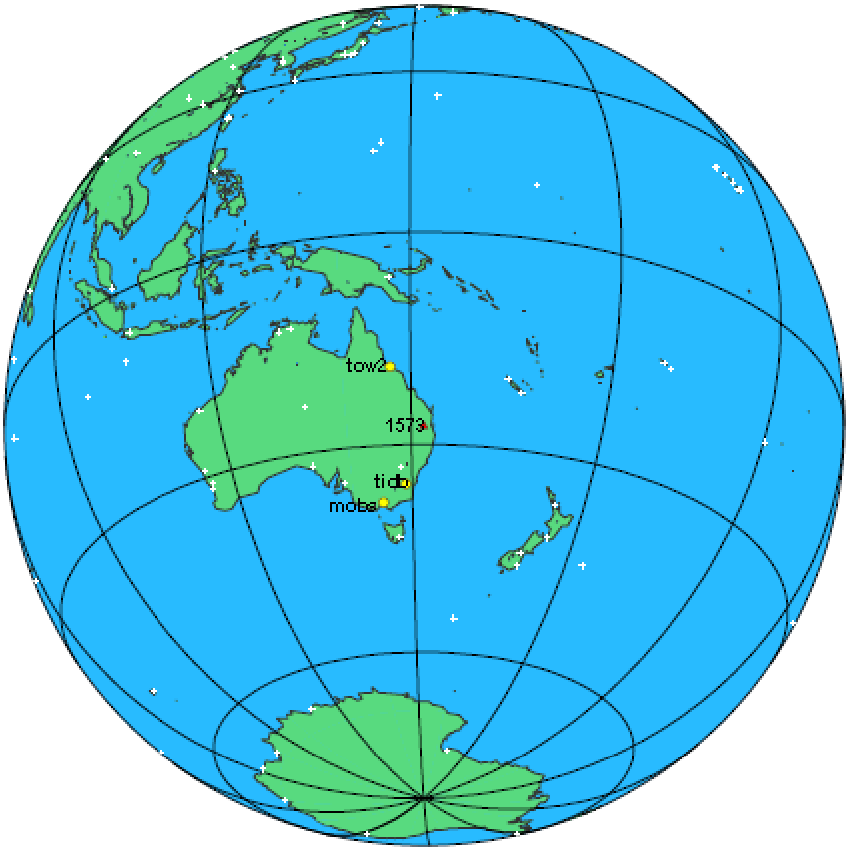


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-10-02	tidb tow2 mobs	1573	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session and to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
mobs	-4130635.782	2894953.108	-3890531.459	GDA94
tidb	-4460996.063	2682557.139	-3674443.868	GDA94
tow2	-5054582.669	3275504.568	-2091539.894	GDA94
1573	-4995114.228	2665974.557	-2927700.648	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
mobs	-37-49 -45.8989	144 58 31.2064	40.672	35.725	GDA94
tidb	-35-23 -57.1563	148 58 47.9843	665.430	646.145	GDA94
tow2	-19-16 -9.4283	147 3 20.4654	88.227	30.138	GDA94
1573	-27-29 -58.9610	151 54 37.5358	560.328	518.086	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
mobs	321819.585	5811180.087	55	40.672	35.725	GDA94
tidb	679807.854	6080884.470	55	665.430	646.145	GDA94
tow2	505851.330	7869375.315	55	88.227	30.138	GDA94
1573	392875.960	6957742.603	56	560.328	518.086	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
mobs	-4130636.359	2894953.105	-3890530.712	2009/10/02
tidb	-4460996.594	2682557.087	-3674443.115	2009/10/02
tow2	-5054583.096	3275504.275	-2091539.033	2009/10/02
1573	-4995114.678	2665974.369	-2927699.851	2009/10/02

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)
mobs	-37-49 -45.8703	144 58 31.2198	40.588	35.998
tidb	-35-23 -57.1283	148 58 47.9969	665.343	646.180
tow2	-19-16 -9.3997	147 3 20.4817	88.130	30.083
1573	-27-29 -58.9334	151 54 37.5495	560.233	518.563

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

	Height(m)	Antenna Offsets(m)			
Station	Up	East	North	Up	yyyy/mm/dd
1573	1.2980	0.0000	0.0009	0.1039	2009/10/02

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
1573	0.075	-0.065	0.020	2009/10/02

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
1573	0.029	0.021	0.013	2009/10/02

5.4 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
mobs	0.0079	1472	0 %	2009-10-02
tidb	0.0085	1499	0 %	2009-10-02
tow2	0.0081	1585	0 %	2009-10-02
1573	0.0082	4556	0 %	2009-10-02

91269 - 4 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
1573275D.09o	TRM_R8_GNSS	1.2980	2009-10-02 19:45:59	2009-10-02 23:59:59

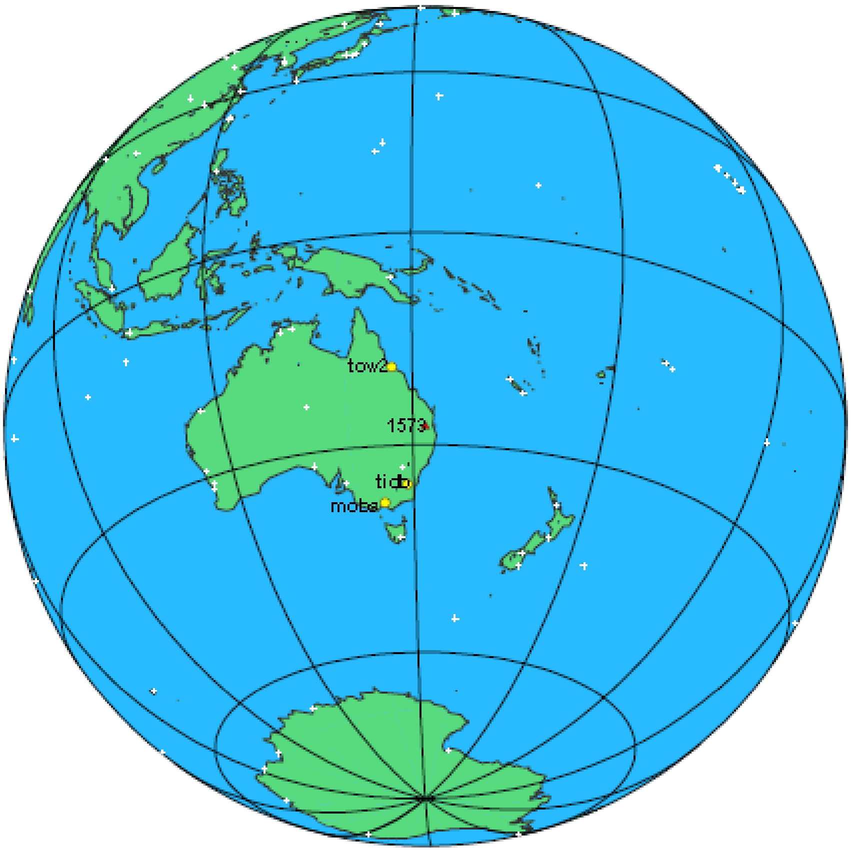


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-10-02	tidb tow2 mobs	1573	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
mobs	-4130635.782	2894953.108	-3890531.459	GDA94
tidb	-4460996.063	2682557.139	-3674443.868	GDA94
tow2	-5054582.669	3275504.568	-2091539.894	GDA94
1573	-4995114.289	2665974.571	-2927700.670	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
mobs	-37-49 -45.8989	144 58 31.2064	40.672	35.725	GDA94
tidb	-35-23 -57.1563	148 58 47.9843	665.430	646.145	GDA94
tow2	-19-16 -9.4283	147 3 20.4654	88.227	30.138	GDA94
1573	-27-29 -58.9607	151 54 37.5364	560.392	518.150	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
mobs	321819.585	5811180.087	55	40.672	35.725	GDA94
tidb	679807.854	6080884.470	55	665.430	646.145	GDA94
tow2	505851.330	7869375.315	55	88.227	30.138	GDA94
1573	392875.977	6957742.612	56	560.392	518.150	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
mobs	-4130636.359	2894953.105	-3890530.712	2009/10/02
tidb	-4460996.594	2682557.087	-3674443.115	2009/10/02
tow2	-5054583.096	3275504.275	-2091539.033	2009/10/02
1573	-4995114.739	2665974.383	-2927699.873	2009/10/02

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)
mobs	-37-49 -45.8703	144 58 31.2198	40.588	35.998
tidb	-35-23 -57.1283	148 58 47.9969	665.343	646.180
tow2	-19-16 -9.3997	147 3 20.4817	88.130	30.083
1573	-27-29 -58.9331	151 54 37.5501	560.297	518.627

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %;

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

Station	Height(m) Up	Antenna Offsets(m) East	North	Up	yyyy/mm/dd
1573	1.2980	0.0000	0.0009	0.1039	2009/10/02

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
1573	-0.010	-0.022	0.001	2009/10/02

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
1573	0.012	0.008	0.008	2009/10/02

5.4 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
mobs	0.0079	2867	0 %	2009-10-02
tidb	0.0078	2933	0 %	2009-10-02
tow2	0.0079	2969	0 %	2009-10-02
1573	0.0079	8769	0 %	2009-10-02

91269 - 6 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
15732750.09o	TRM_R8_GNSS	1.2980	2009-10-02 19:45:59	2009-10-03 02:17:00

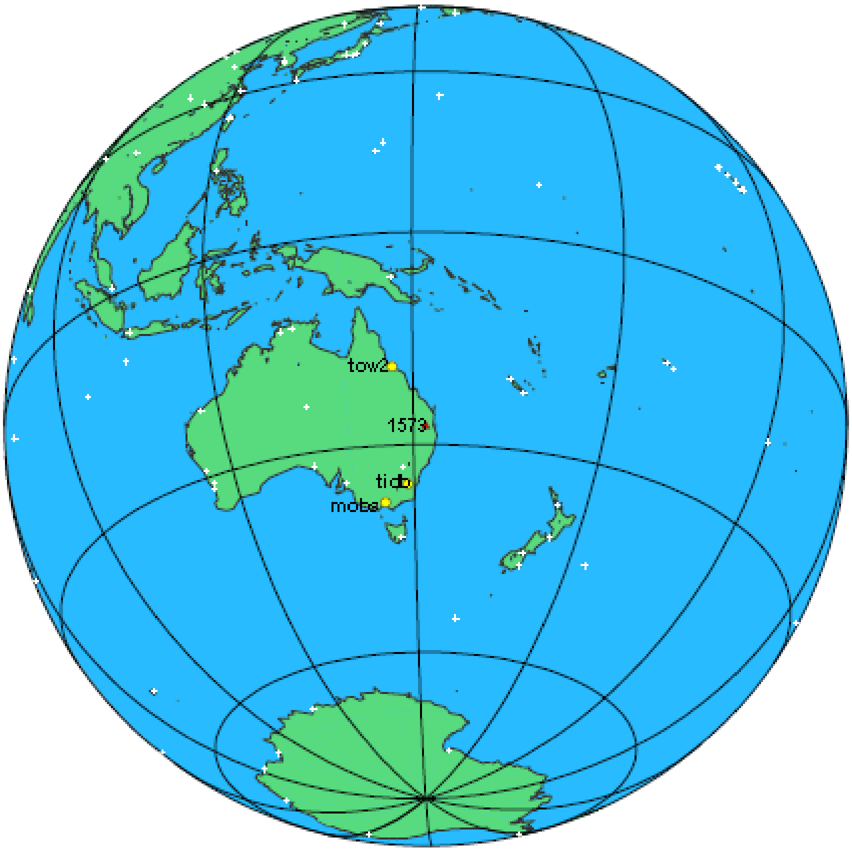


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-10-02	tidb tow2 mobs	1573	IGS Rapid
2009-10-03	tidb tow2 mobs	1573	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
mobs	-4130635.782	2894953.108	-3890531.459	GDA94
tidb	-4460996.063	2682557.139	-3674443.868	GDA94
tow2	-5054582.669	3275504.568	-2091539.894	GDA94
1573	-4995114.318	2665974.595	-2927700.685	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
mobs	-37-49 -45.8989	144 58 31.2064	40.673	35.726	GDA94
tidb	-35-23 -57.1563	148 58 47.9843	665.430	646.145	GDA94
tow2	-19-16 -9.4283	147 3 20.4654	88.227	30.138	GDA94
1573	-27-29 -58.9606	151 54 37.5361	560.431	518.189	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
mobs	321819.585	5811180.087	55	40.673	35.726	GDA94
tidb	679807.854	6080884.470	55	665.430	646.145	GDA94
tow2	505851.330	7869375.315	55	88.227	30.138	GDA94
1573	392375.970	6957742.615	56	560.431	518.189	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
mobs	-4130636.359	2894953.105	-3890530.712	2009/10/03
tidb	-4460996.594	2682557.087	-3674443.115	2009/10/03
tow2	-5054583.096	3275504.275	-2091539.033	2009/10/03

1573	-4995114.768	2665974.406	-2927699.889	2009/10/03
1573	0.043 m	0.024 m	0.016 m	RMS

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
mobs	-37-49 -45.8703	144 58 31.2199	40.588	35.998	
tidb	-35-23 -57.1283	148 58 47.9969	665.343	646.180	
tow2	-19-16 -9.3997	147 3 20.4817	88.130	30.083	
1573	-27-29 -58.9330	151 54 37.5499	560.337	518.667	
1573	0.009 m	0.006 m	0.050 m		RMS

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

	Height(m)	Antenna Offsets(m)			
Station	Up	East	North	Up	yyyy/mm/dd
1573	1.2980	0.0000	0.0009	0.1039	2009/10/02
1573	1.2980	-0.0000	0.0009	0.1039	2009/10/03

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
1573	-0.010	-0.022	0.001	2009/10/02
1573	-0.019	0.002	0.004	2009/10/03

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
1573	0.012	0.008	0.008	2009/10/02
1573	0.016	0.008	0.008	2009/10/03

5.4 Coordinate Value - Cartesian, ITRF2005, per day

	X(m)	Y(m)	Z(m)	ITRF2005 @
1573	-4995114.739	2665974.383	-2927699.873	2009/10/02
1573	-4995114.821	2665974.430	-2927699.904	2009/10/03

5.5 Geodetic, GRS80 Ellipsoid, ITRF2005, per day

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	
1573	-27-29 -58.9331	151 54 37.5501	560.297	2009/10/02
1573	-27-29 -58.9326	151 54 37.5500	560.395	2009/10/03

5.6 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
mobs	0.0079	2857	0 %	2009-10-02
tidb	0.0078	2933	0 %	2009-10-02
tow2	0.0079	2969	0 %	2009-10-02
1573	0.0079	8769	0 %	2009-10-02
mobs	0.0074	3084	0 %	2009-10-03
tidb	0.0082	3253	0 %	2009-10-03
tow2	0.0083	3105	0 %	2009-10-03
1573	0.0080	9442	0 %	2009-10-03

91269 - 8 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
15732758.09o	TRM_R8_GNSS	1.2980	2009-10-02 19:45:59	2009-10-03 04:16:59

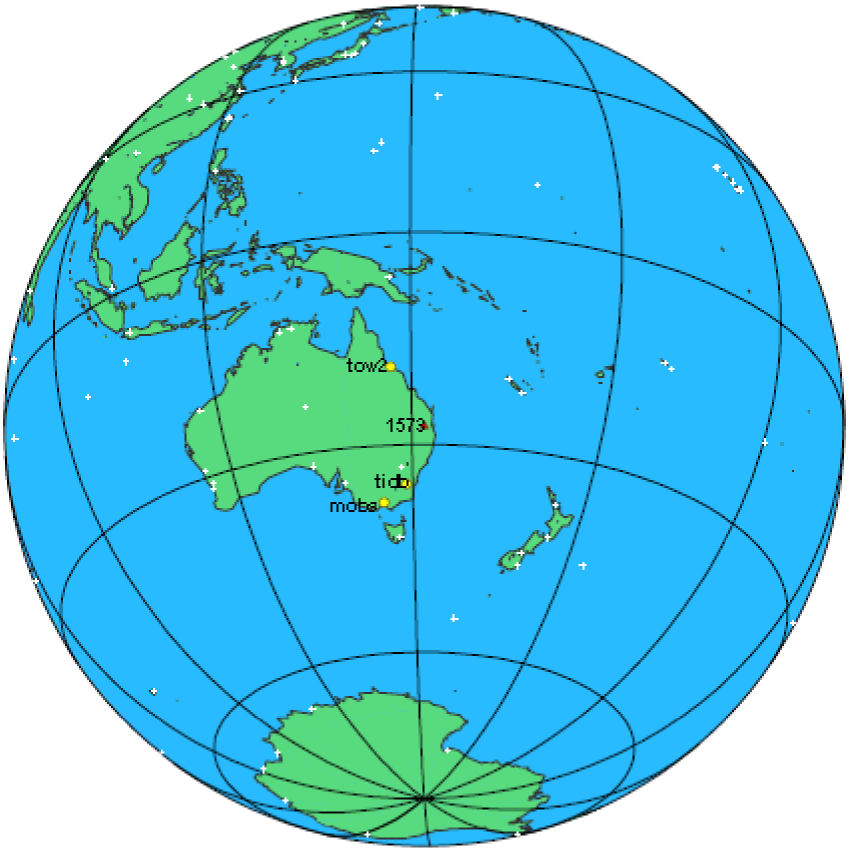


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-10-02	tidb tow2 mobs	1573	IGS Rapid
2009-10-03	tidb tow2 mobs	1573	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session and to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
mobs	-4130635.782	2894953.108	-3890531.459	GDA94
tidb	-4460996.063	2682557.139	-3674443.868	GDA94
tow2	-5054582.669	3275504.568	-2091539.894	GDA94
1573	-4995114.307	2665974.579	-2927700.675	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
mobs	-37-49 -45.8989	144 58 31.2064	40.673	35.726	GDA94
tidb	-35-23 -57.1563	148 58 47.9843	665.430	646.145	GDA94
tow2	-19-16 -9.4283	147 3 20.4654	88.227	30.138	GDA94
1573	-27-29 -58.9605	151 54 37.5364	560.412	518.170	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
mobs	321819.585	5811180.087	55	40.673	35.726	GDA94
tidb	679807.854	6080884.470	55	665.430	646.145	GDA94
tow2	505851.330	7869375.315	55	88.227	30.138	GDA94
1573	392375.979	6957742.616	56	560.412	518.170	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
mobs	-4130636.359	2894953.105	-3890530.712	2009/10/03
tidb	-4460996.594	2682557.087	-3674443.115	2009/10/03
tow2	-5054583.096	3275504.275	-2091539.033	2009/10/03

1573	-4995114.757	2665974.391	-2927699.879	2009/10/03	
1573	0.021 m	0.009 m	0.006 m		RMS

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
mobs	-37-49 -45.8703	144 58 31.2199	40.588	35.998	
tidb	-35-23 -57.1283	148 58 47.9969	665.343	646.180	
tow2	-19-16 -9.3997	147 3 20.4817	88.130	30.083	
1573	-27-29 -58.9830	151 54 37.5502	560.317	518.647	
1573	0.005 m	0.002 m	0.023 m		RMS

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

Station	Height(m) Up	Antenna Offsets(m) East	North	Up	yyyy/mm/dd
1573	1.2980	0.0000	0.0009	0.1039	2009/10/02
1573	1.2980	0.0000	0.0009	0.1039	2009/10/03

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
1573	-0.010	-0.022	0.001	2009/10/02
1573	0.023	-0.025	0.019	2009/10/03

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
1573	0.012	0.008	0.008	2009/10/02
1573	0.014	0.009	0.009	2009/10/03

5.4 Coordinate Value - Cartesian, ITRF2005, per day

	X(m)	Y(m)	Z(m)	ITRF2005 @
1573	-4995114.739	2665974.383	-2927699.873	2009/10/02
1573	-4995114.781	2665974.400	-2927699.885	2009/10/03

5.5 Geodetic, GRS80 Ellipsoid, ITRF2005, per day

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	
1573	-27-29 -58.9831	151 54 37.5501	560.297	2009/10/02
1573	-27-29 -58.9828	151 54 37.5503	560.343	2009/10/03

5.6 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
mobs	0.0079	2867	0 %	2009-10-02
tidb	0.0078	2933	0 %	2009-10-02
tow2	0.0079	2969	0 %	2009-10-02
1573	0.0079	8769	0 %	2009-10-02
mobs	0.0089	4814	0 %	2009-10-03
tidb	0.0090	5057	0 %	2009-10-03
tow2	0.0090	4776	0 %	2009-10-03
1573	0.0089	14647	0 %	2009-10-03

91269 – 10 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
1573275A.09o	TRM_R8_GNSS	1.2980	2009-10-02 19:45:59	2009-10-03 06:01:00

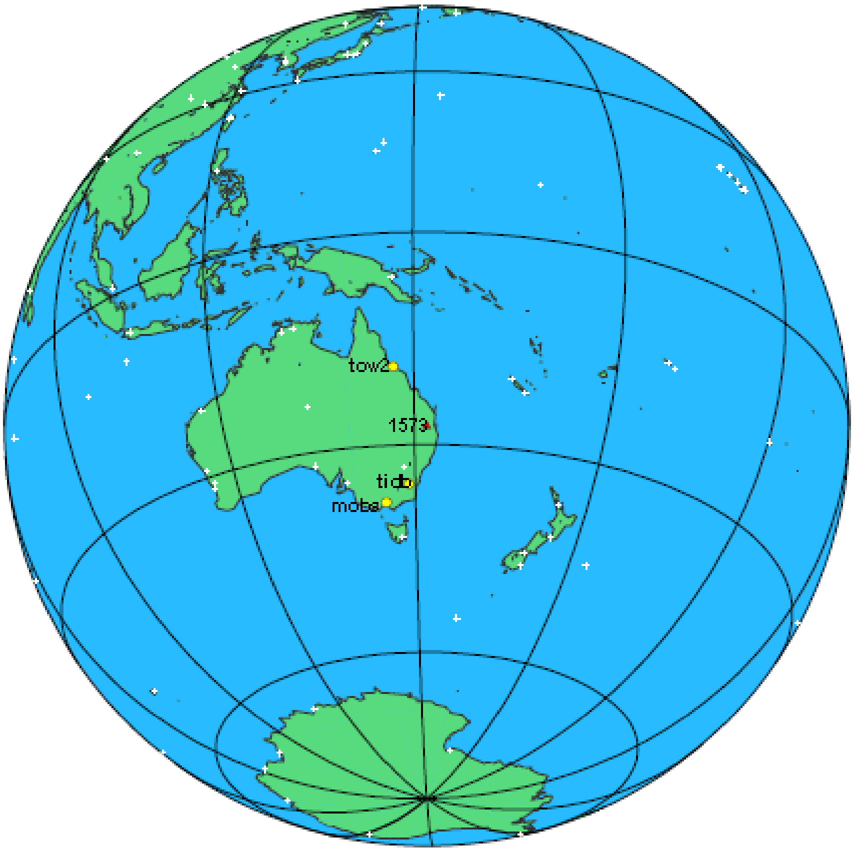


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-10-02	tidb tow2 mobs	1573	IGS Rapid
2009-10-03	tidb tow2 mobs	1573	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
mobs	-4130635.782	2894953.108	-3890531.459	GDA94
tidb	-4460996.063	2682557.139	-3674443.868	GDA94
tow2	-5054582.669	3275504.568	-2091539.894	GDA94
1573	-4995114.305	2665974.580	-2927700.673	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
mobs	-37-49 -45.8989	144 58 31.2064	40.673	35.726	GDA94
tidb	-35-23 -57.1563	148 58 47.9843	665.430	646.145	GDA94
tow2	-19-16 -9.4283	147 3 20.4654	88.227	30.138	GDA94
1573	-27-29 -58.9605	151 54 37.5364	560.409	518.167	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
mobs	321819.585	5811180.087	55	40.673	35.726	GDA94
tidb	679807.854	6080884.470	55	665.430	646.145	GDA94
tow2	505851.330	7869375.315	55	88.227	30.138	GDA94
1573	392875.976	6957742.618	56	560.409	518.167	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
mobs	-4130636.359	2894953.105	-3890530.712	2009/10/03
tidb	-4460996.594	2682557.087	-3674443.115	2009/10/03
tow2	-5054583.096	3275504.275	-2091539.033	2009/10/03

1573	-4995114.755	2665974.392	-2927699.876	2009/10/03	
1573	0.013 m	0.007 m	0.003 m		RMS

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
mobs	-37-49 -45.8703	144 58 31.2199	40.588	35.998	
tidb	-35-23 -57.1283	148 58 47.9969	665.343	646.180	
tow2	-19-16 -9.3997	147 3 20.4817	88.130	30.083	
1573	-27-29 -58.9329	151 54 37.5501	560.315	518.645	
1573	0.005 m	0.001 m	0.015 m		RMS

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %;

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

Station	Height(m) Up	Antenna Offsets(m) East	North	Up	yyyy/mm/dd
1573	1.2980	0.0000	0.0009	0.1039	2009/10/02
1573	1.2980	0.0000	0.0009	0.1039	2009/10/03

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
1573	-0.010	-0.022	0.001	2009/10/02
1573	-0.004	-0.021	0.011	2009/10/03

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
1573	0.012	0.008	0.008	2009/10/02
1573	0.009	0.005	0.009	2009/10/03

5.4 Coordinate Value - Cartesian, ITRF2005, per day

	X(m)	Y(m)	Z(m)	ITRF2005 @
1573	-4995114.739	2665974.383	-2927699.873	2009/10/02
1573	-4995114.765	2665974.395	-2927699.879	2009/10/03

5.5 Geodetic, GRS80 Ellipsoid, ITRF2005, per day

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	
1573	-27-29 -58.9331	151 54 37.5501	560.297	2009/10/02
1573	-27-29 -58.9329	151 54 37.5502	560.325	2009/10/03

5.6 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
mobs	0.0079	2867	0 %	2009-10-02
tidb	0.0078	2933	0 %	2009-10-02
tow2	0.0079	2969	0 %	2009-10-02
1573	0.0079	8769	0 %	2009-10-02
mobs	0.0089	5905	0 %	2009-10-03
tidb	0.0092	6160	0 %	2009-10-03
tow2	0.0093	5969	0 %	2009-10-03
1573	0.0091	18034	0 %	2009-10-03

91269 – 12 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
15732750.09o	TRM_R8_GNSS	1.2980	2009-10-02 19:45:59	2009-10-03 08:17:00

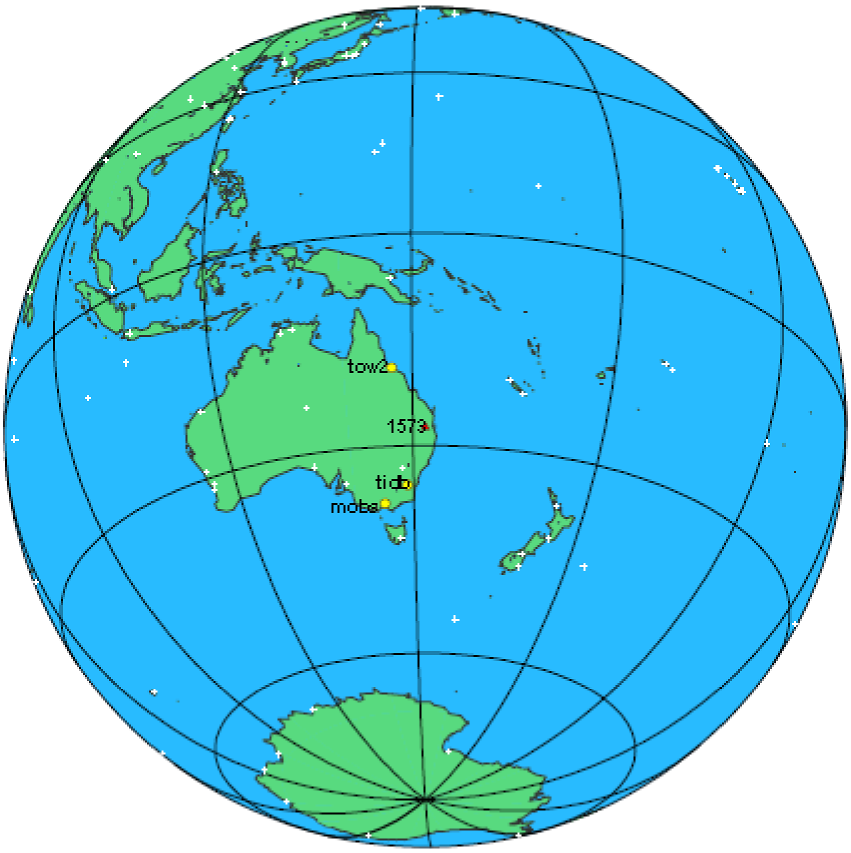


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-10-02	tidb tow2 mobs	1573	IGS Rapid
2009-10-03	tidb tow2 mobs	1573	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
mobs	-4130635.782	2894953.108	-3890531.459	GDA94
tidb	-4460996.063	2682557.139	-3674443.868	GDA94
tow2	-5054582.669	3275504.568	-2091539.894	GDA94
1573	-4995114.308	2665974.584	-2927700.677	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
mobs	-37-49 -45.8989	144 58 31.2064	40.673	35.726	GDA94
tidb	-35-23 -57.1563	148 58 47.9843	665.430	646.145	GDA94
tow2	-19-16 -9.4283	147 3 20.4654	88.227	30.138	GDA94
1573	-27-29 -58.9605	151 54 37.5363	560.415	518.173	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
mobs	321819.585	5811180.087	55	40.673	35.726	GDA94
tidb	679807.854	6080884.470	55	665.430	646.145	GDA94
tow2	505851.330	7869375.315	55	88.227	30.138	GDA94
1573	392375.974	6957742.616	56	560.415	518.173	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
mobs	-4130636.359	2894953.105	-3890530.712	2009/10/03
tidb	-4460996.594	2682557.087	-3674443.115	2009/10/03
tow2	-5054583.096	3275504.275	-2091539.033	2009/10/03

1573	-4995114.757	2665974.396	-2927699.880	2009/10/03
1573	0.015 m	0.010 m	0.005 m	RMS

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at
earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
mobs	-37-49 -45.8703	144 58 31.2199	40.588	35.998	
tidb	-35-23 -57.1283	148 58 47.9969	665.343	646.180	
tow2	-19-16 -9.3997	147 3 20.4817	88.130	30.083	
1573	-27-29 -58.9330	151 54 37.5500	560.320	518.650	
1573	0.004 m	0.002 m	0.018 m		RMS

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %;

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

Station	Height(m) Up	Antenna Offsets(m) East	North	Up	yyyy/mm/dd
1573	1.2980	0.0000	0.0009	0.1039	2009/10/02
1573	1.2980	0.0000	0.0009	0.1039	2009/10/03

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
1573	-0.010	-0.022	0.001	2009/10/02
1573	-0.009	-0.015	0.007	2009/10/03

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
1573	0.012	0.008	0.008	2009/10/02
1573	0.009	0.004	0.004	2009/10/03

5.4 Coordinate Value - Cartesian, ITRF2005, per day

	X(m)	Y(m)	Z(m)	ITRF2005 @
1573	-4995114.739	2665974.383	-2927699.873	2009/10/02
1573	-4995114.768	2665974.400	-2927699.882	2009/10/03

5.5 Geodetic, GRS80 Ellipsoid, ITRF2005, per day

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	
1573	-27-29 -58.9331	151 54 37.5501	560.297	2009/10/02
1573	-27-29 -58.9329	151 54 37.5501	560.331	2009/10/03

5.6 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
mobs	0.0079	2857	0 %	2009-10-02
tidb	0.0078	2933	0 %	2009-10-02
tow2	0.0079	2969	0 %	2009-10-02
1573	0.0079	8769	0 %	2009-10-02
mobs	0.0087	7748	0 %	2009-10-03
tidb	0.0090	7762	4 %	2009-10-03
tow2	0.0088	8016	0 %	2009-10-03
1573	0.0089	23526	1 %	2009-10-03

Appendix F.4 PSM 112802 Processing Reports

112802 - 1 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
1573277F.09o	TRM_R8_GNSS	1.5000	2009-10-04 20:01:00	2009-10-04 21:04:00

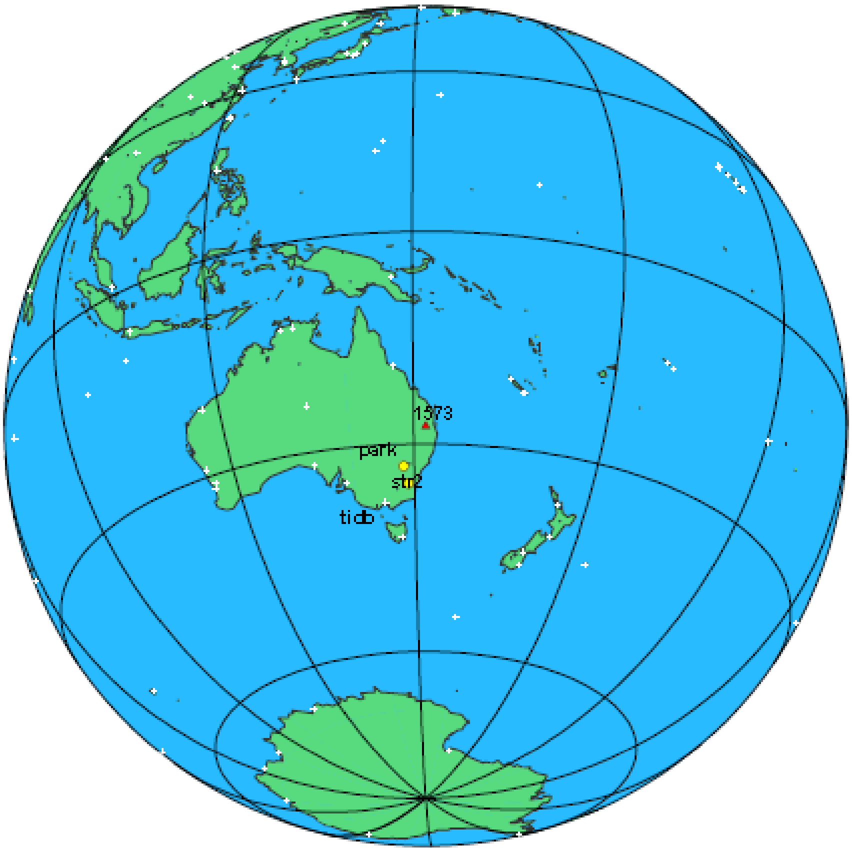


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-10-04	park str2 tidb	1573	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.312	2816652.547	-3454060.946	GDA94
str2	-4467074.353	2683011.906	-3667008.280	GDA94
tidb	-4460996.063	2682557.139	-3674443.868	GDA94
1573	-4988923.214	2668265.628	-2936062.368	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.287	GDA94
tidb	-35-23 -57.1562	148 58 47.9843	665.430	646.144	GDA94
1573	-27-35 -5.6098	151 51 37.5713	542.417	500.482	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str2	682733.893	6090040.859	55	802.574	783.287	GDA94
tidb	679807.854	6080884.470	55	665.430	646.144	GDA94
1573	387524.548	6948261.940	56	542.417	500.482	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.883	2816652.459	-3454060.170	2009/10/04
str2	-4467074.883	2683011.852	-3667007.526	2009/10/04
tidb	-4460996.594	2682557.087	-3674443.114	2009/10/04
1573	-4988923.665	2668265.436	-2936061.571	2009/10/04

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)
park	-32-59 -55.5536	148 15 52.6028	397.358	374.691
str2	-35-18 -58.1711	149 0 36.5601	802.486	783.241
tidb	-35-23 -57.1283	148 58 47.9969	665.342	646.179
1573	-27-35 -5.5822	151 51 37.5851	542.322	500.959

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

	Height(m)	Antenna Offsets(m)			
Station	Up	East	North	Up	yyyy/mm/dd
1573	1.5000	-0.0000	0.0009	0.1039	2009/10/04

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
1573	-0.005	-0.022	-0.010	2009/10/04

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
1573	0.040	0.026	0.021	2009/10/04

5.4 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0045	742	0 %	2009-10-04
str2	0.0043	742	0 %	2009-10-04
tidb	0.0044	744	0 %	2009-10-04
1573	0.0044	2228	0 %	2009-10-04

112802 - 2 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
1573277E.09o	TRM_R8_GNSS	1.5000	2009-10-04 20:01:00	2009-10-04 22:02:00

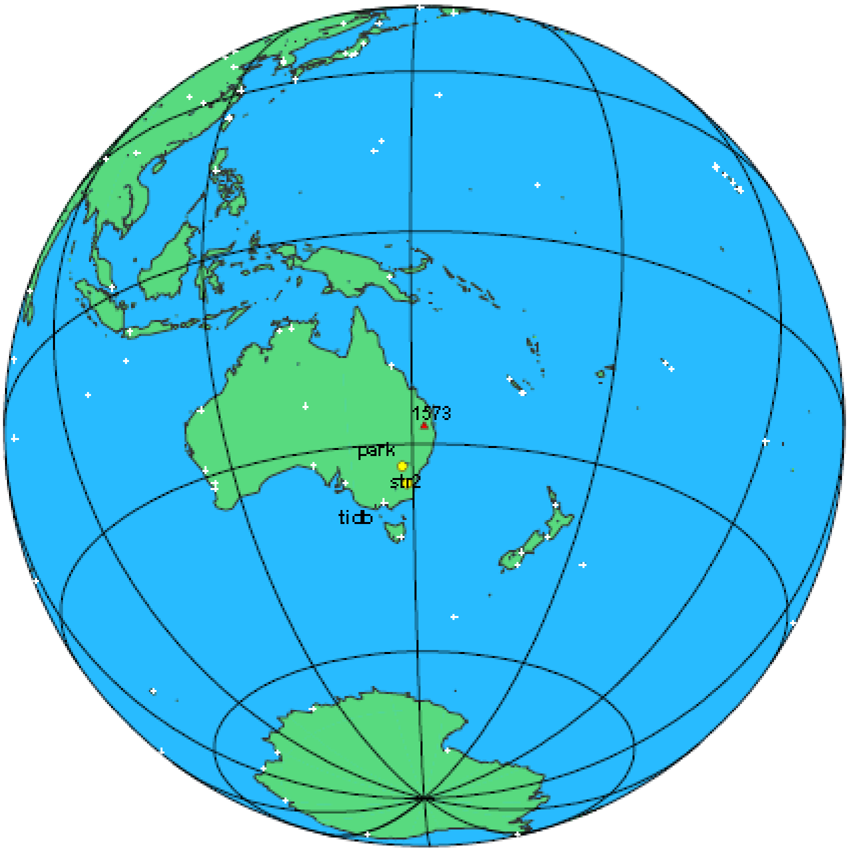


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-10-04	park str2 tidb	1573	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session and to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.312	2816652.547	-3454060.946	GDA94
str2	-4467074.353	2683011.906	-3667008.280	GDA94
tidb	-4460996.063	2682557.139	-3674443.868	GDA94
1573	-4988923.201	2668265.614	-2936062.317	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.287	GDA94
tidb	-35-23 -57.1562	148 58 47.9843	665.430	646.144	GDA94
1573	-27-35 -5.6085	151 51 37.5714	542.379	500.444	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str2	682733.893	6090040.859	55	802.574	783.287	GDA94
tidb	679807.854	6080884.470	55	665.430	646.144	GDA94
1573	387524.550	6948261.978	56	542.379	500.444	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.833	2816652.459	-3454060.170	2009/10/04
str2	-4467074.883	2683011.852	-3667007.526	2009/10/04
tidb	-4460996.594	2682557.087	-3674443.114	2009/10/04
1573	-4988923.652	2668265.427	-2936061.520	2009/10/04

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at
earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)
park	-32-59 -55.5536	148 15 52.6028	397.358	374.691
str2	-35-18 -58.1711	149 0 36.5601	802.486	783.241
tidb	-35-23 -57.1283	148 58 47.9969	665.342	646.179
1573	-27-35 -5.5809	151 51 37.5852	542.285	500.922

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

Station	Height(m) Up	Antenna Offsets(m) East	North	Up	yyyy/mm/dd
1573	1.5000	0.0000	0.0009	0.1039	2009/10/04

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
1573	-0.004	-0.054	-0.006	2009/10/04

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
1573	0.023	0.015	0.009	2009/10/04

5.4 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0057	1347	0 %	2009-10-04
str2	0.0055	1313	1 %	2009-10-04
tidb	0.0058	1316	0 %	2009-10-04
1573	0.0057	3976	0 %	2009-10-04

112802 - 4 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
1573277D.09o	TRM_R8_GNSS	1.5000	2009-10-04 20:01:00	2009-10-04 23:59:59

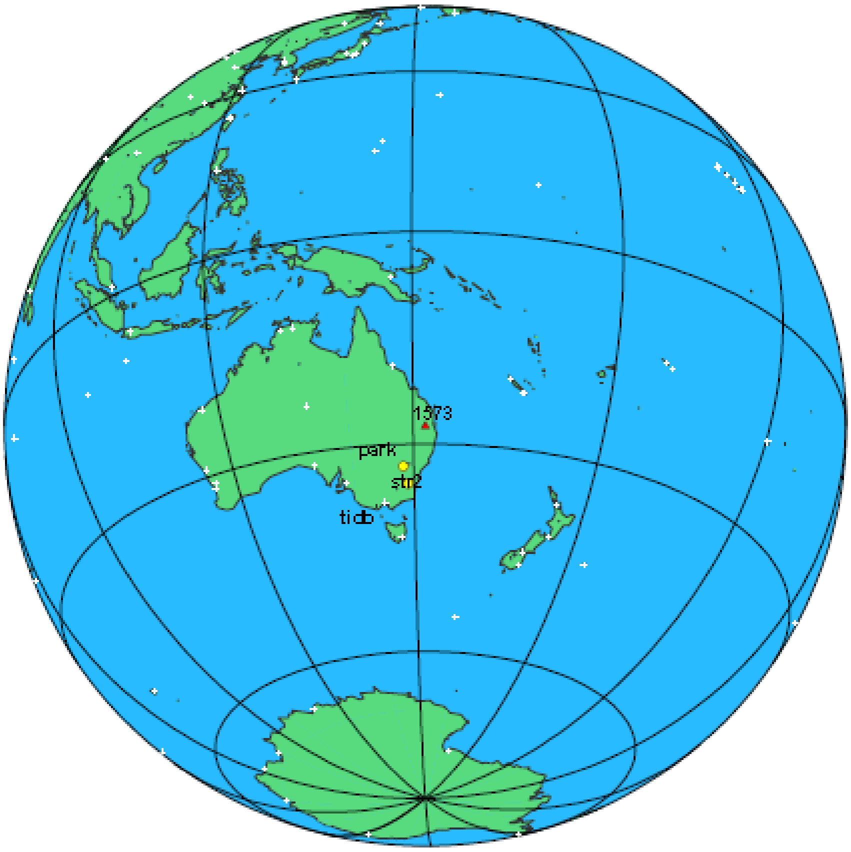


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-10-04	park str2 tidb	1573	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session and to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.312	2816652.547	-3454060.946	GDA94
str2	-4467074.353	2683011.906	-3667008.280	GDA94
tidb	-4460996.063	2682557.139	-3674443.868	GDA94
1573	-4988928.157	2668265.602	-2936062.305	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.287	GDA94
tidb	-35-23 -57.1562	148 58 47.9843	665.430	646.144	GDA94
1573	-27-35 -5.6089	151 51 37.5710	542.334	500.399	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str2	682733.893	6090040.859	55	802.574	783.287	GDA94
tidb	679807.854	6080884.470	55	665.430	646.144	GDA94
1573	387524.540	6948261.968	56	542.334	500.399	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.833	2816652.459	-3454060.170	2009/10/04
str2	-4467074.883	2683011.852	-3667007.526	2009/10/04
tidb	-4460996.594	2682557.087	-3674443.114	2009/10/04
1573	-4988928.608	2668265.415	-2936061.508	2009/10/04

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)
park	-32-59 -55.5536	148 15 52.6023	397.358	374.691
str2	-35-18 -58.1711	149 0 36.5601	802.486	783.241
tidb	-35-23 -57.1283	148 58 47.9969	665.342	646.179
1573	-27-35 -5.5813	151 51 37.5848	542.240	500.877

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %;

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

	Height(m)	Antenna Offsets(m)			
Station	Up	East	North	Up	yyyy/mm/dd
1573	1.5000	0.0000	0.0009	0.1039	2009/10/04

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
1573	0.006	-0.004	0.006	2009/10/04

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
1573	0.009	0.006	0.006	2009/10/04

5.4 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0059	2856	4 %	2009-10-04
str2	0.0060	2613	13 %	2009-10-04
tidb	0.0061	2714	9 %	2009-10-04
1573	0.0060	8183	8 %	2009-10-04

112802 - 6 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
1573277C.09o	TRM_R8_GNSS	1.5000	2009-10-04 20:01:00	2009-10-05 02:02:00

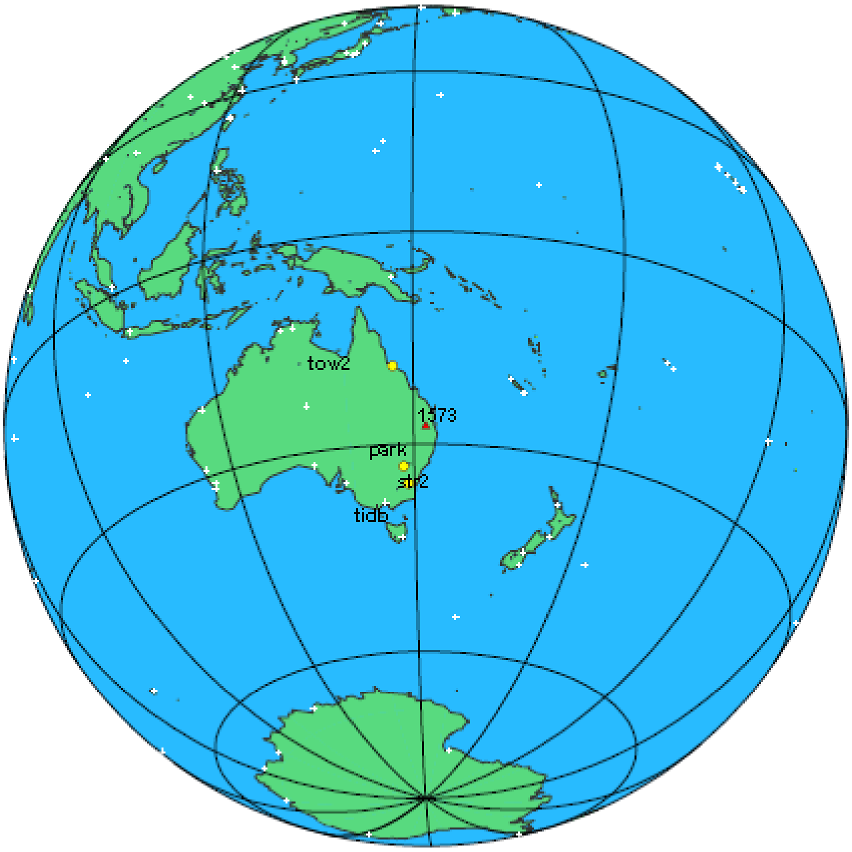


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-10-04	park str2 tidb	1573	IGS Rapid
2009-10-05	park tidb tow2	1573	IGS Ultra-Rapid

Warning: An IGS Ultra-Rapid orbit product has been used in this computation. For improved results please resubmit approximately 2 days after the observation session end to ensure the use of the IGS Rapid orbit product. Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.312	2816652.547	-3454060.946	GDA94
str2	-4467074.353	2683011.906	-3667008.280	GDA94
tidb	-4460996.063	2682557.139	-3674443.868	GDA94
1573	-4988928.152	2668265.598	-2936062.290	GDA94
tow2	-5054582.670	3275504.569	-2091539.894	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.287	GDA94
tidb	-35-23 -57.1562	148 58 47.9843	665.430	646.144	GDA94
1573	-27-35 -5.6085	151 51 37.5711	542.322	500.388	GDA94
tow2	-19-16 -9.4283	147 3 20.4654	88.228	30.139	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str2	682733.893	6090040.859	55	802.574	783.287	GDA94
tidb	679807.854	6080884.470	55	665.430	646.144	GDA94
1573	387524.541	6948261.978	56	542.322	500.388	GDA94
tow2	505851.330	7869375.314	55	88.228	30.139	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @	
park	-4554254.833	2816652.459	-3454060.170	2009/10/05	
str2	-4467074.883	2683011.852	-3667007.526	2009/10/04	
tidb	-4460996.594	2682557.087	-3674443.114	2009/10/05	
1573	-4988923.603	2668265.412	-2936061.494	2009/10/05	
1573	0.008 m	0.004 m	0.016 m		RMS
tow2	-5054583.097	3275504.275	-2091539.033	2009/10/05	

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5536	148 15 52.6028	397.358	374.691	
str2	-35-18 -58.1711	149 0 36.5601	802.486	783.241	
tidb	-35-23 -57.1283	148 58 47.9969	665.342	646.179	
1573	-27-35 -5.5809	151 51 37.5848	542.228	500.865	
1573	0.010 m	0.001 m	0.015 m		RMS
tow2	-19-16 -9.3997	147 3 20.4818	88.131	30.084	

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

Station	Height(m) Up	Antenna Offsets(m) East	North	Up	yyyy/mm/dd
1573	1.5000	0.0000	0.0009	0.1039	2009/10/04
1573	1.5000	-0.0000	0.0009	0.1039	2009/10/05

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
1573	0.006	-0.004	0.006	2009/10/04
1573	-0.003	-0.012	0.010	2009/10/05

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
1573	0.009	0.006	0.006	2009/10/04
1573	0.013	0.007	0.007	2009/10/05

5.4 Coordinate Value - Cartesian, ITRF2005, per day

	X(m)	Y(m)	Z(m)	ITRF2005 @
1573	-4988923.608	2668265.415	-2936061.508	2009/10/04
1573	-4988923.593	2668265.407	-2936061.476	2009/10/05

5.5 Geodetic, GRS80 Ellipsoid, ITRF2005, per day

```
                                                  Ellipsoidal
      Latitude(DMS)     Longitude(DMS)           Height(m)
1573  -27-35  -5.5813  151 51  37.5848            542.240 2009/10/04
1573  -27-35  -5.5806  151 51  37.5848            542.210 2009/10/05
```

5.6 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0059	2856	4 %	2009-10-04
str2	0.0060	2613	13 %	2009-10-04
tidb	0.0061	2714	9 %	2009-10-04
1573	0.0060	8183	8 %	2009-10-04
park	0.0070	2894	0 %	2009-10-05
tidb	0.0068	2917	0 %	2009-10-05
tow2	0.0060	2813	0 %	2009-10-05
1573	0.0066	8624	0 %	2009-10-05

112802 - 8 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
15732778.09o	TRM_R8_GNSS	1.5000	2009-10-04 20:01:00	2009-10-05 04:02:00

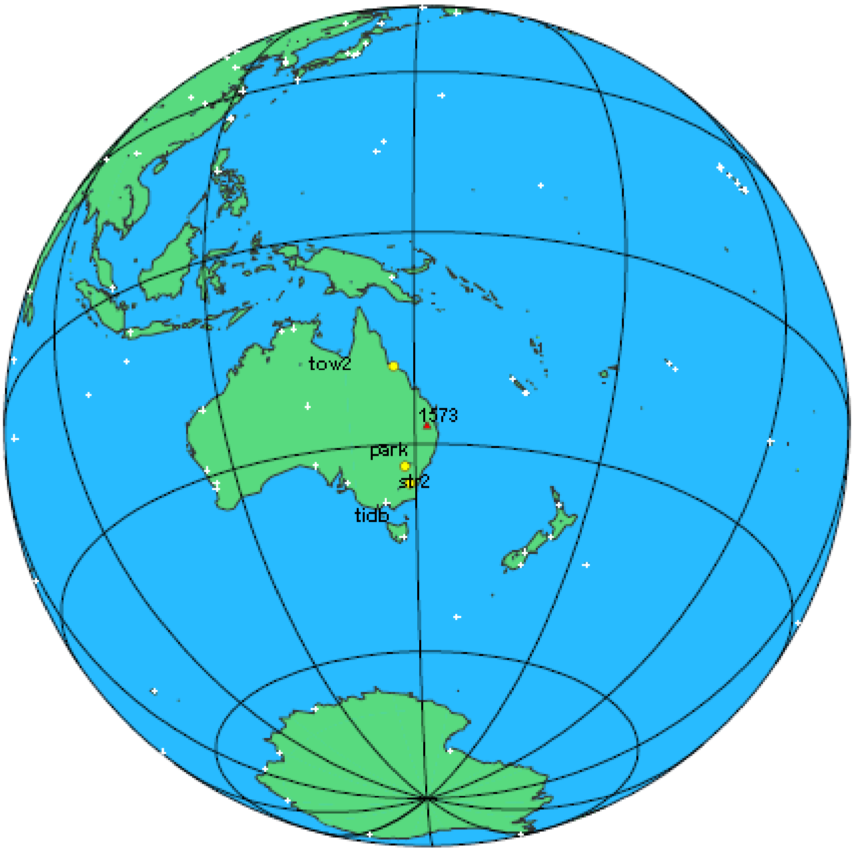


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-10-04	park str2 tidb	1573	IGS Rapid
2009-10-05	park tidb tow2	1573	IGS Ultra-Rapid

Warning: An IGS Ultra-Rapid orbit product has been used in this computation. For improved results please resubmit approximately 2 days after the observation session end to ensure the use of the IGS Rapid orbit product. Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.312	2816652.547	-3454060.946	GDA94
str2	-4467074.353	2683011.906	-3667008.280	GDA94
tidb	-4460996.063	2682557.139	-3674443.868	GDA94
1573	-4988923.154	2668265.600	-2936062.297	GDA94
tow2	-5054582.670	3275504.569	-2091539.894	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.287	GDA94
tidb	-35-23 -57.1562	148 58 47.9843	665.430	646.144	GDA94
1573	-27-35 -5.6087	151 51 37.5710	542.328	500.393	GDA94
tow2	-19-16 -9.4283	147 3 20.4654	88.228	30.139	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str2	682733.893	6090040.859	55	802.574	783.287	GDA94
tidb	679807.854	6080884.470	55	665.430	646.144	GDA94
1573	387524.540	6948261.974	56	542.328	500.393	GDA94
tow2	505851.330	7869375.314	55	88.228	30.139	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @	
park	-4554254.833	2816652.459	-3454060.170	2009/10/05	
str2	-4467074.883	2683011.852	-3667007.526	2009/10/04	
tidb	-4460996.594	2682557.087	-3674443.114	2009/10/05	
1573	-4988928.605	2668265.414	-2936061.500	2009/10/05	
1573	0.004 m	0.002 m	0.010 m		RMS
tow2	-5054583.097	3275504.275	-2091539.033	2009/10/05	

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5536	148 15 52.6023	397.358	374.691	
str2	-35-18 -58.1711	149 0 36.5601	802.486	783.241	
tidb	-35-23 -57.1283	148 58 47.9969	665.342	646.179	
1573	-27-35 -5.5811	151 51 37.5848	542.233	500.870	
1573	0.007 m	0.000 m	0.008 m		RMS
tow2	-19-16 -9.3997	147 3 20.4818	88.131	30.084	

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

Station	Height(m) Up	Antenna Offsets(m) East	North	Up	yyyy/mm/dd
1573	1.5000	0.0000	0.0009	0.1039	2009/10/04
1573	1.5000	-0.0000	0.0009	0.1039	2009/10/05

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
1573	0.006	-0.004	0.006	2009/10/04
1573	0.016	-0.021	0.015	2009/10/05

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
1573	0.009	0.006	0.006	2009/10/04
1573	0.011	0.007	0.007	2009/10/05

5.4 Coordinate Value - Cartesian, ITRF2005, per day

	X(m)	Y(m)	Z(m)	ITRF2005 @
1573	-4988928.608	2668265.415	-2936061.508	2009/10/04
1573	-4988928.601	2668265.411	-2936061.489	2009/10/05

5.5 Geodetic, GRS80 Ellipsoid, ITRF2005, per day

```
                                              Ellipsoidal
      Latitude(DMS)      Longitude(DMS)        Height(m)
1573  -27-35  -5.5813  151 51  37.5848          542.240 2009/10/04
1573  -27-35  -5.5808  151 51  37.5848          542.224 2009/10/05
```

5.6 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0059	2856	4 %	2009-10-04
str2	0.0060	2613	13 %	2009-10-04
tidb	0.0061	2714	9 %	2009-10-04
1573	0.0060	8183	8 %	2009-10-04
park	0.0074	4820	0 %	2009-10-05
tidb	0.0074	4784	0 %	2009-10-05
tow2	0.0061	4259	4 %	2009-10-05
1573	0.0071	13863	1 %	2009-10-05

112802 - 10 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
15732778.09o	TRM_R8_GNSS	1.5000	2009-10-04 20:01:00	2009-10-05 06:02:00

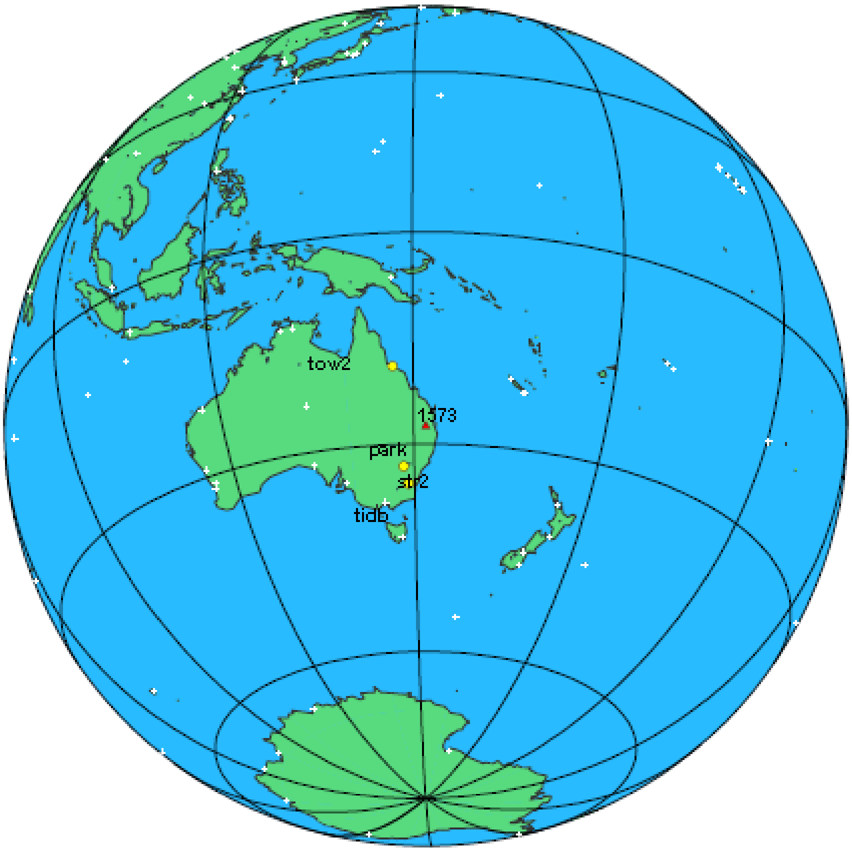


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-10-04	park str2 tidb	1573	IGS Rapid
2009-10-05	park tidb tow2	1573	IGS Ultra-Rapid

Warning: An IGS Ultra-Rapid orbit product has been used in this computation. For improved results please resubmit approximately 2 days after the observation session end to ensure the use of the IGS Rapid orbit product. Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.312	2816652.547	-3454060.946	GDA94
str2	-4467074.353	2683011.906	-3667008.280	GDA94
tidb	-4460996.063	2682557.139	-3674443.868	GDA94
1573	-4988923.153	2668265.598	-2936062.297	GDA94
tow2	-5054582.670	3275504.569	-2091539.894	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.287	GDA94
tidb	-35-23 -57.1562	148 58 47.9843	665.430	646.144	GDA94
1573	-27-35 -5.6087	151 51 37.5711	542.326	500.391	GDA94
tow2	-19-16 -9.4283	147 3 20.4654	88.228	30.139	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str2	682733.893	6090040.859	55	802.574	783.287	GDA94
tidb	679807.854	6080884.470	55	665.430	646.144	GDA94
1573	387524.541	6948261.972	56	542.326	500.391	GDA94
tow2	505851.330	7869375.314	55	88.228	30.139	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @	
park	-4554254.833	2816652.459	-3454060.170	2009/10/05	
str2	-4467074.883	2683011.852	-3667007.526	2009/10/04	
tidb	-4460996.594	2682557.087	-3674443.114	2009/10/05	
1573	-4988928.604	2668265.411	-2936061.501	2009/10/05	
1573	0.004 m	0.004 m	0.010 m		RMS
tow2	-5054583.097	3275504.275	-2091539.033	2009/10/05	

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5536	148 15 52.6028	397.358	374.691	
str2	-35-18 -58.1711	149 0 36.5601	802.486	783.241	
tidb	-35-23 -57.1283	148 58 47.9969	665.342	646.179	
1573	-27-35 -5.5811	151 51 37.5849	542.232	500.869	
1573	0.007 m	0.002 m	0.009 m		RMS
tow2	-19-16 -9.3997	147 3 20.4818	88.131	30.084	

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

	Height(m)	Antenna Offsets(m)			
Station	Up	East	North	Up	yyyy/mm/dd
1573	1.5000	0.0000	0.0009	0.1039	2009/10/04
1573	1.5000	0.0000	0.0009	0.1039	2009/10/05

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
1573	0.006	-0.003	0.006	2009/10/04
1573	-0.030	-0.011	0.009	2009/10/05

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
1573	0.009	0.006	0.006	2009/10/04
1573	0.008	0.004	0.008	2009/10/05

5.4 Coordinate Value - Cartesian, ITRF2005, per day

	X(m)	Y(m)	Z(m)	ITRF2005 @
1573	-4988928.608	2668265.416	-2936061.508	2009/10/04
1573	-4988928.601	2668265.409	-2936061.489	2009/10/05

5.5 Geodetic, GRS80 Ellipsoid, ITRF2005, per day

```
                                                 Ellipsoidal
       Latitude(DMS)     Longitude(DMS)          Height(m)
1573   -27-35  -5.5813   151 51  37.5848           542.240 2009/10/04
1573   -27-35  -5.5809   151 51  37.5849           542.228 2009/10/05
```

5.6 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0059	2856	4 %	2009-10-04
str2	0.0060	2613	13 %	2009-10-04
tidb	0.0061	2713	9 %	2009-10-04
1573	0.0060	8182	8 %	2009-10-04
park	0.0078	6136	0 %	2009-10-05
tidb	0.0075	6052	0 %	2009-10-05
tow2	0.0074	5686	2 %	2009-10-05
1573	0.0076	17874	0 %	2009-10-05

112802 - 12 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
15732770.09o	TRM_R8_GNSS	1.5000	2009-10-04 20:01:00	2009-10-05 08:02:00

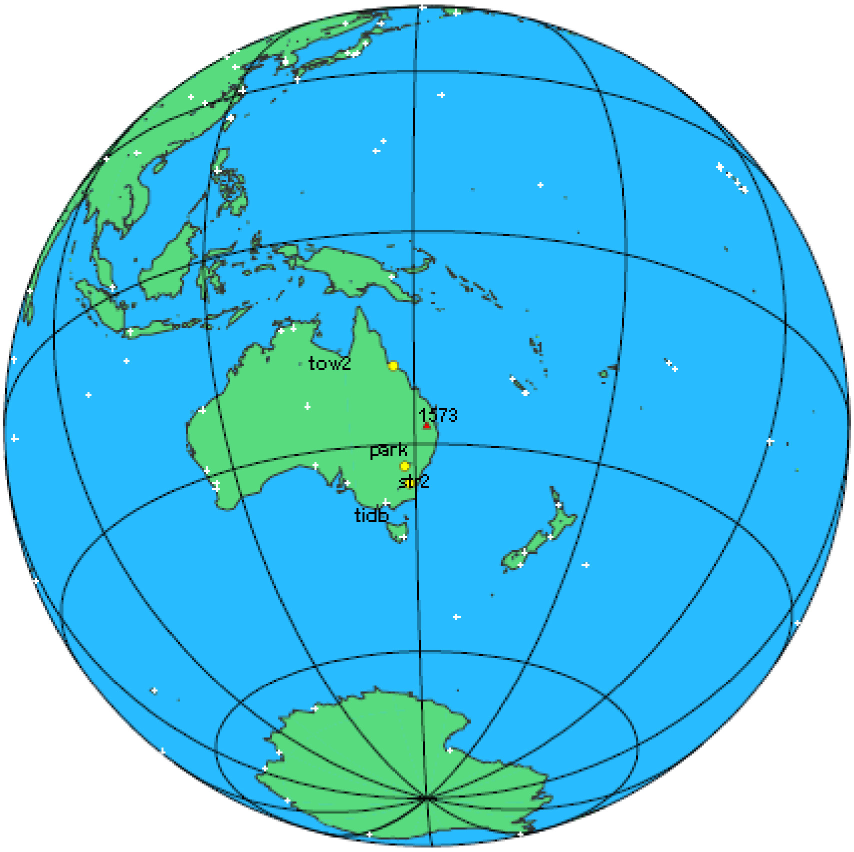


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-10-04	park str2 tidb	1573	IGS Rapid
2009-10-05	park tidb tow2	1573	IGS Ultra-Rapid

Warning: An IGS Ultra-Rapid orbit product has been used in this computation. For improved results please resubmit approximately 2 days after the observation session end to ensure the use of the IGS Rapid orbit product. Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.312	2816652.547	-3454060.946	GDA94
str2	-4467074.353	2683011.906	-3667008.280	GDA94
tidb	-4460996.063	2682557.139	-3674443.868	GDA94
1573	-4988928.160	2668265.597	-2936062.296	GDA94
tow2	-5054582.670	3275504.569	-2091539.894	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.287	GDA94
tidb	-35-23 -57.1562	148 58 47.9843	665.430	646.144	GDA94
1573	-27-35 -5.6086	151 51 37.5713	542.330	500.395	GDA94
tow2	-19-16 -9.4283	147 3 20.4654	88.228	30.139	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str2	682733.893	6090040.859	55	802.574	783.287	GDA94
tidb	679807.854	6080884.470	55	665.430	646.144	GDA94
1573	387524.546	6948261.976	56	542.330	500.395	GDA94
tow2	505851.330	7869375.314	55	88.228	30.139	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @	
park	-4554254.883	2816652.459	-3454060.170	2009/10/05	
str2	-4467074.883	2683011.852	-3667007.526	2009/10/04	
tidb	-4460996.594	2682557.087	-3674443.114	2009/10/05	
1573	-4988928.611	2668265.410	-2936061.499	2009/10/05	
1573	0.003 m	0.005 m	0.007 m		RMS
tow2	-5054583.097	3275504.275	-2091539.033	2009/10/05	

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5536	148 15 52.6028	397.358	374.691	
str2	-35-18 -58.1711	149 0 36.5601	802.486	783.241	
tidb	-35-23 -57.1283	148 58 47.9969	665.342	646.179	
1573	-27-35 -5.5810	151 51 37.5850	542.236	500.873	
1573	0.006 m	0.005 m	0.003 m		RMS
tow2	-19-16 -9.3997	147 3 20.4818	88.131	30.084	

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

Station	Height(m) Up	Antenna Offsets(m) East	North	Up	yyyy/mm/dd
1573	1.5000	0.0000	0.0009	0.1039	2009/10/04
1573	1.5000	0.0000	0.0009	0.1039	2009/10/05

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
1573	0.006	-0.008	0.006	2009/10/04
1573	-0.085	-0.009	0.006	2009/10/05

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
1573	0.009	0.006	0.006	2009/10/04
1573	0.008	0.004	0.004	2009/10/05

5.4 Coordinate Value - Cartesian, ITRF2005, per day

	X(m)	Y(m)	Z(m)	ITRF2005 @
1573	-4988928.608	2668265.416	-2936061.508	2009/10/04
1573	-4988928.613	2668265.407	-2936061.496	2009/10/05

5.5 Geodetic, GRS80 Ellipsoid, ITRF2005, per day

```
                                           Ellipsoidal
      Latitude(DMS)    Longitude(DMS)     Height(m)
1573  -27-35  -5.5813  151 51  37.5848      542.240 2009/10/04
1573  -27-35  -5.5809  151 51  37.5851      542.235 2009/10/05
```

5.6 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0059	2856	4 %	2009-10-04
str2	0.0060	2613	13 %	2009-10-04
tidb	0.0061	2713	9 %	2009-10-04
1573	0.0060	8182	8 %	2009-10-04
park	0.0080	7682	0 %	2009-10-05
tidb	0.0078	7454	2 %	2009-10-05
tow2	0.0069	7314	2 %	2009-10-05
1573	0.0076	22450	1 %	2009-10-05

Appendix F.5 PSM 112805 Processing Reports

112805 - 1 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
1574277F.09o	TRM_R8_GNSS	1.4810	2009-10-04 20:28:00	2009-10-04 21:30:00

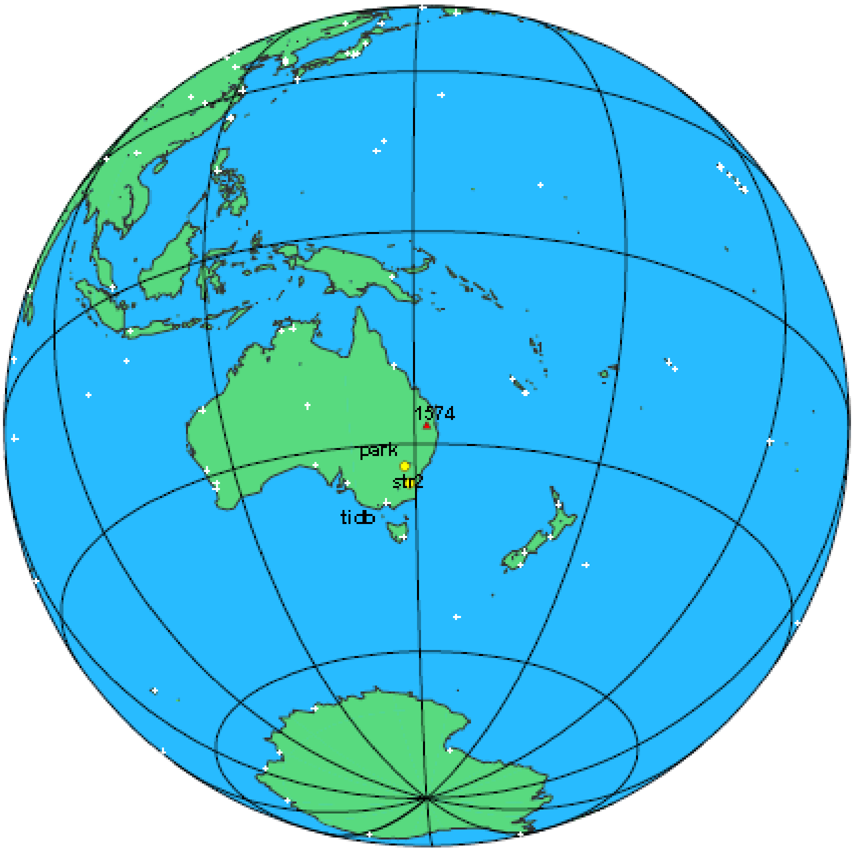


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-10-04	park str2 tidb	1574	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session and to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.312	2816652.547	-3454060.946	GDA94
str2	-4467074.353	2683011.906	-3667008.280	GDA94
tidb	-4460996.063	2682557.139	-3674443.868	GDA94
1574	-4988606.069	2667601.981	-2937261.608	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.287	GDA94
tidb	-35-23 -57.1562	148 58 47.9843	665.430	646.144	GDA94
1574	-27-35 -49.0523	151 51 53.4550	572.618	530.709	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str2	682733.893	6090040.859	55	802.574	783.287	GDA94
tidb	679807.854	6080884.470	55	665.430	646.144	GDA94
1574	387972.329	6946929.106	56	572.618	530.709	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.833	2816652.459	-3454060.170	2009/10/04
str2	-4467074.883	2683011.852	-3667007.526	2009/10/04
tidb	-4460996.594	2682557.087	-3674443.114	2009/10/04
1574	-4988606.520	2667601.794	-2937260.812	2009/10/04

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)
park	-32-59 -55.5536	148 15 52.6023	397.358	374.691
str2	-35-18 -58.1711	149 0 36.5601	802.486	783.241
tidb	-35-23 -57.1283	148 58 47.9969	665.342	646.179
1574	-27-35 -49.0248	151 51 53.4688	572.523	531.190

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

	Height(m)	Antenna Offsets(m)			
Station	Up	East	North	Up	yyyy/mm/dd
1574	1.4810	0.0000	0.0009	0.1039	2009/10/04

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
1574	0.157	-0.099	0.026	2009/10/04

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
1574	0.053	0.034	0.019	2009/10/04

5.4 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0062	696	0 %	2009-10-04
str2	0.0060	674	0 %	2009-10-04
tidb	0.0054	670	0 %	2009-10-04
1574	0.0059	2040	0 %	2009-10-04

112805 - 2 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
1574277E.09o	TRM_R8_GNSS	1.4810	2009-10-04 20:28:00	2009-10-04 22:30:00

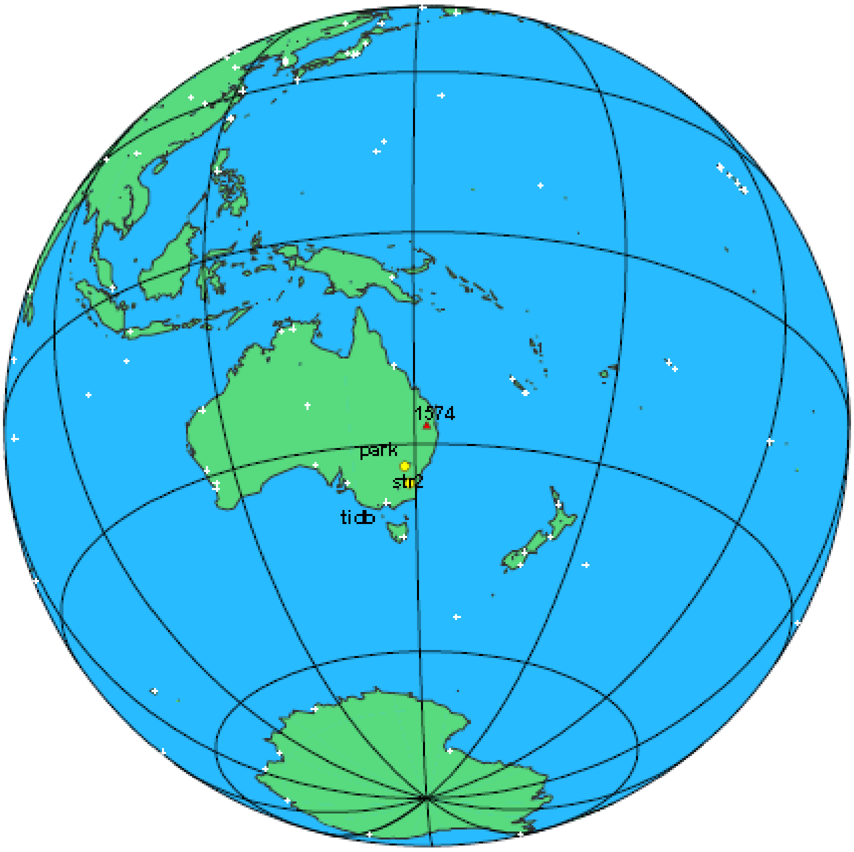


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-10-04	park str2 tidb	1574	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.312	2816652.547	-3454060.946	GDA94
str2	-4467074.353	2683011.906	-3667008.280	GDA94
tidb	-4460996.063	2682557.139	-3674443.868	GDA94
1574	-4988606.128	2667602.001	-2937261.607	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.287	GDA94
tidb	-35-23 -57.1562	148 58 47.9843	665.430	646.144	GDA94
1574	-27-35 -49.0514	151 51 53.4554	572.672	530.763	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str2	682733.893	6090040.859	55	802.574	783.287	GDA94
tidb	679807.854	6080884.470	55	665.430	646.144	GDA94
1574	387972.339	6946929.136	56	572.672	530.763	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.833	2816652.459	-3454060.170	2009/10/04
str2	-4467074.883	2683011.852	-3667007.526	2009/10/04
tidb	-4460996.594	2682557.087	-3674443.114	2009/10/04
1574	-4988606.579	2667601.814	-2937260.811	2009/10/04

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)
park	-32-59 -55.5536	148 15 52.6028	397.358	374.691
str2	-35-18 -58.1711	149 0 36.5601	802.486	783.241
tidb	-35-23 -57.1283	148 58 47.9969	665.342	646.179
1574	-27-35 -49.0238	151 51 53.4691	572.577	531.244

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

	Height(m)	Antenna Offsets(m)			
Station	Up	East	North	Up	yyyy/mm/dd
1574	1.4810	0.0000	0.0009	0.1039	2009/10/04

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
1574	0.027	-0.050	0.006	2009/10/04

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
1574	0.024	0.018	0.009	2009/10/04

5.4 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0060	1276	8 %	2009-10-04
str2	0.0058	1352	0 %	2009-10-04
tidb	0.0057	1348	0 %	2009-10-04
1574	0.0058	3976	3 %	2009-10-04

112805 - 4 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
1574277D.09o	TRM_R8_GNSS	1.4810	2009-10-04 20:28:00	2009-10-05 01:00:59

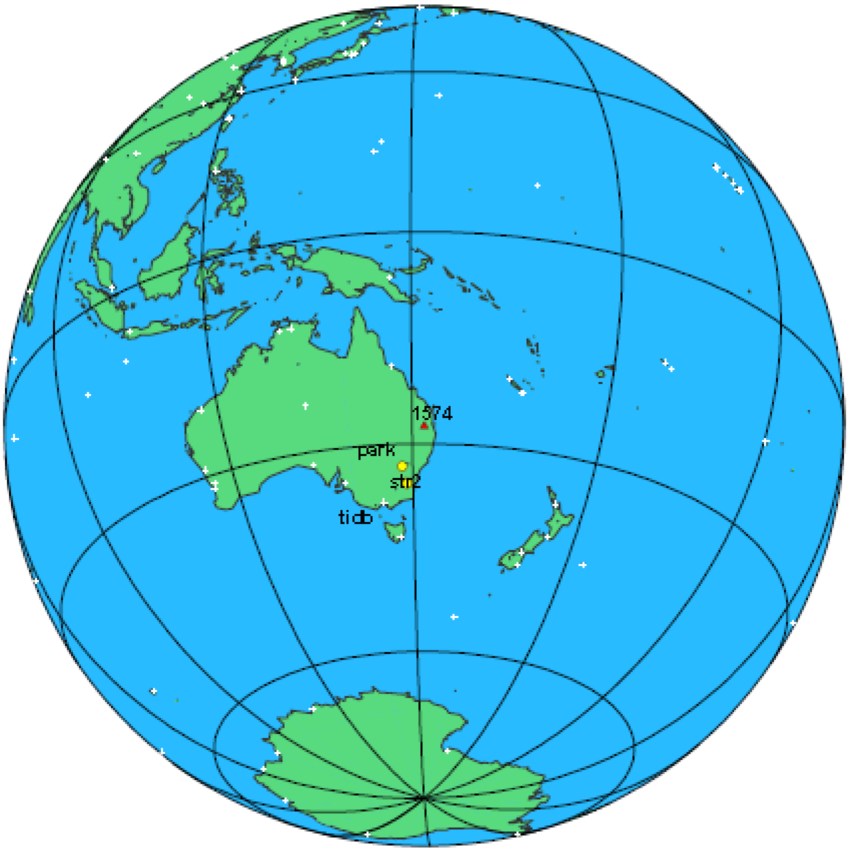


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-10-04	park str2 tidb	1574	IGS Rapid
2009-10-05	park str2 tidb	1574	IGS Ultra-Rapid

Warning: An IGS Ultra-Rapid orbit product has been used in this computation. For improved results please resubmit approximately 2 days after the observation session end to ensure the use of the IGS Rapid orbit product. Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.312	2816652.547	-3454060.946	GDA94
str2	-4467074.353	2683011.906	-3667008.280	GDA94
tidb	-4460996.063	2682557.139	-3674443.868	GDA94
1574	-4988606.071	2667601.954	-2937261.558	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.287	GDA94
tidb	-35-23 -57.1562	148 58 47.9843	665.430	646.144	GDA94
1574	-27-35 -49.0511	151 51 53.4559	572.584	530.676	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str2	682733.893	6090040.859	55	802.574	783.287	GDA94
tidb	679807.854	6080884.470	55	665.430	646.144	GDA94
1574	387972.354	6946929.146	56	572.584	530.676	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.883	2816652.459	-3454060.170	2009/10/05
str2	-4467074.883	2683011.852	-3667007.526	2009/10/05
tidb	-4460996.594	2682557.087	-3674443.114	2009/10/05
1574	-4988606.522	2667601.767	-2937260.761	2009/10/05
1574	0.050 m	0.001 m	0.047 m	RMS

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5536	148 15 52.6028	397.358	374.691	
str2	-35-18 -58.1711	149 0 36.5601	802.486	783.241	
tidb	-35-23 -57.1283	148 58 47.9969	665.342	646.179	
1574	-27-35 -49.0285	151 51 53.4697	572.490	531.157	
1574	0.022 m	0.028 m	0.061 m		RMS

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

	Height(m)	Antenna Offsets(m)			
Station	Up	East	North	Up	yyyy/mm/dd
1574	1.4810	0.0000	0.0009	0.1039	2009/10/04
1574	1.4810	0.0000	0.0009	0.1039	2009/10/05

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
1574	-0.336	0.097	-0.050	2009/10/04
1574	0.013	0.024	0.011	2009/10/05

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
1574	0.082	0.021	0.021	2009/10/04
1574	0.051	0.025	0.025	2009/10/05

5.4 Coordinate Value - Cartesian, ITRF2005, per day

	X(m)	Y(m)	Z(m)	ITRF2005 @
1574	-4988606.548	2667601.767	-2937260.800	2009/10/04
1574	-4988606.456	2667601.766	-2937260.707	2009/10/05

5.5 Geodetic, GRS80 Ellipsoid, ITRF2005, per day

```
                                              Ellipsoidal
       Latitude(DMS)    Longitude(DMS)        Height(m)
1574   -27-35 -49.0242  151 51   53.4701        572.528 2009/10/04
1574   -27-35 -49.0228  151 51   53.4686        572.413 2009/10/05
```

5.6 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0235	2623	0 %	2009-10-04
str2	0.0195	2651	0 %	2009-10-04
tidb	0.0199	2649	0 %	2009-10-04
1574	0.0210	7923	0 %	2009-10-04
park	0.0090	888	0 %	2009-10-05
str2	0.0075	898	0 %	2009-10-05
tidb	0.0078	898	0 %	2009-10-05
1574	0.0081	2684	0 %	2009-10-05

112805 - 6 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
1574277D.09o	TRM_R8_GNSS	1.4810	2009-10-04 20:28:00	2009-10-05 02:21:00

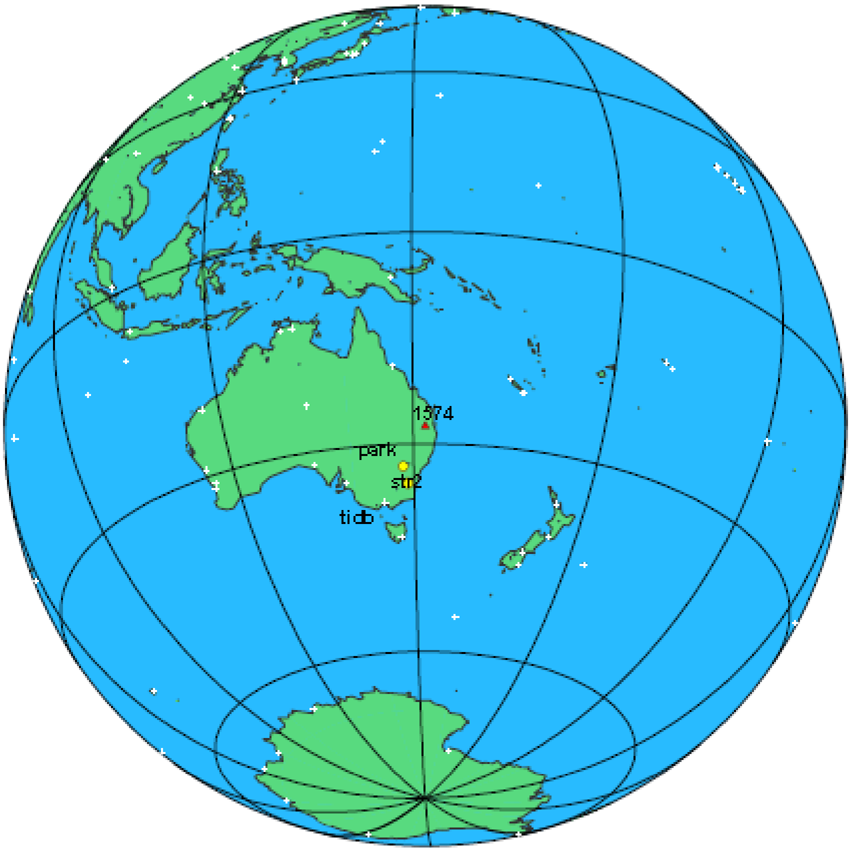


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-10-04	park str2 tidb	1574	IGS Rapid
2009-10-05	park str2 tidb	1574	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session and to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.312	2816652.547	-3454060.946	GDA94
str2	-4467074.353	2683011.906	-3667008.280	GDA94
tidb	-4460996.063	2682557.139	-3674443.868	GDA94
1574	-4988606.085	2667601.962	-2937261.579	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoid separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.287	GDA94
tidb	-35-23 -57.1562	148 58 47.9843	665.430	646.144	GDA94
1574	-27-35 -49.0514	151 51 53.4559	572.609	530.701	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str2	682733.893	6090040.859	55	802.574	783.287	GDA94
tidb	679807.854	6080884.470	55	665.430	646.144	GDA94
1574	387972.353	6946929.135	56	572.609	530.701	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.833	2816652.459	-3454060.170	2009/10/05
str2	-4467074.883	2683011.852	-3667007.526	2009/10/05
tidb	-4460996.594	2682557.087	-3674443.114	2009/10/05

1574	-4988606.536	2667601.776	-2937260.783	2009/10/05	
1574	0.009 m	0.007 m	0.013 m		RMS

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5536	148 15 52.6028	397.358	374.691	
str2	-35-18 -58.1711	149 0 36.5601	802.486	783.241	
tidb	-35-23 -57.1283	148 58 47.9969	665.342	646.179	
1574	-27-35 -49.0238	151 51 53.4696	572.515	531.182	
1574	0.009 m	0.011 m	0.010 m		RMS

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

Station	Height(m) Up	Antenna Offsets(m) East	North	Up	yyyy/mm/dd
1574	1.4810	0.0000	0.0009	0.1039	2009/10/04
1574	1.4810	0.0000	0.0009	0.1039	2009/10/05

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
1574	-0.336	0.097	-0.050	2009/10/04
1574	-0.017	0.025	-0.011	2009/10/05

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
1574	0.032	0.021	0.021	2009/10/04
1574	0.022	0.013	0.013	2009/10/05

5.4 Coordinate Value - Cartesian, ITRF2005, per day

	X(m)	Y(m)	Z(m)	ITRF2005 @
1574	-4988606.548	2667601.766	-2937260.800	2009/10/04
1574	-4988606.531	2667601.779	-2937260.777	2009/10/05

5.5 Geodetic, GRS80 Ellipsoid, ITRF2005, per day

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	
1574	-27-35 -49.0242	151 51 53.4701	572.528	2009/10/04
1574	-27-35 -49.0237	151 51 53.4694	572.510	2009/10/05

5.6 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0235	2623	0 %	2009-10-04
str2	0.0195	2651	0 %	2009-10-04
tidb	0.0199	2649	0 %	2009-10-04
1574	0.0210	7923	0 %	2009-10-04
park	0.0086	1904	0 %	2009-10-05
str2	0.0081	1805	4 %	2009-10-05
tidb	0.0090	1877	0 %	2009-10-05
1574	0.0086	5586	1 %	2009-10-05

112805 - 8 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
15742778.09o	TRM_R8_GNSS	1.4810	2009-10-04 20:28:00	2009-10-05 04:21:00

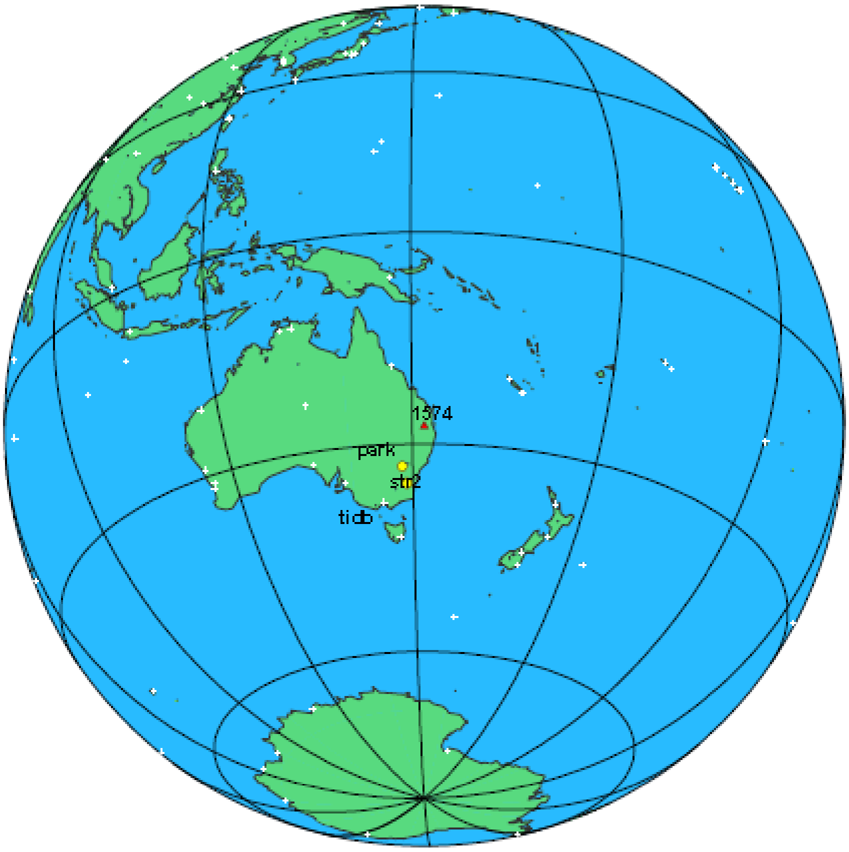


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-10-04	park str2 tidb	1574	IGS Rapid
2009-10-05	park str2 tidb	1574	IGS Ultra-Rapid

Warning: An IGS Ultra-Rapid orbit product has been used in this computation. For improved results please resubmit approximately 2 days after the observation session end to ensure the use of the IGS Rapid orbit product. Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.312	2816652.547	-3454060.946	GDA94
str2	-4467074.353	2683011.906	-3667008.280	GDA94
tidb	-4460996.063	2682557.139	-3674443.868	GDA94
1574	-4988606.084	2667601.956	-2937261.584	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.287	GDA94
tidb	-35-23 -57.1562	148 58 47.9843	665.430	646.144	GDA94
1574	-27-35 -49.0516	151 51 53.4561	572.608	530.699	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str2	682733.893	6090040.859	55	802.574	783.287	GDA94
tidb	679807.854	6080884.470	55	665.430	646.144	GDA94
1574	387972.358	6946929.128	56	572.608	530.699	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.833	2816652.459	-3454060.170	2009/10/05
str2	-4467074.883	2683011.852	-3667007.526	2009/10/05
tidb	-4460996.594	2682557.087	-3674443.114	2009/10/05
1574	-4988606.535	2667601.770	-2937260.788	2009/10/05
1574	0.001 m	0.008 m	0.006 m	RMS

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5536	148 15 52.6023	397.358	374.691	
str2	-35-18 -58.1711	149 0 36.5601	802.486	783.241	
tidb	-35-23 -57.1283	148 58 47.9969	665.342	646.179	
1574	-27-35 -49.0240	151 51 53.4698	572.513	531.180	
1574	0.007 m	0.007 m	0.000 m		RMS

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %;

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

	Height(m)	Antenna Offsets(m)			
Station	Up	East	North	Up	yyyy/mm/dd
1574	1.4810	0.0000	0.0009	0.1039	2009/10/04
1574	1.4810	0.0000	0.0009	0.1039	2009/10/05

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
1574	0.007	-0.042	0.003	2009/10/04
1574	0.058	0.009	0.019	2009/10/05

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
1574	0.011	0.008	0.008	2009/10/04
1574	0.018	0.009	0.009	2009/10/05

5.4 Coordinate Value - Cartesian, ITRF2005, per day

	X(m)	Y(m)	Z(m)	ITRF2005 @
1574	-4988606.535	2667601.763	-2937260.798	2009/10/04
1574	-4988606.534	2667601.778	-2937260.781	2009/10/05

5.5 Geodetic, GRS80 Ellipsoid, ITRF2005, per day

```
                                            Ellipsoidal
      Latitude(DMS)      Longitude(DMS)      Height(m)
1574  -27-35 -49.0242  151 51   53.4700       572.513 2009/10/04
1574  -27-35 -49.0238  151 51   53.4695       572.513 2009/10/05
```

5.6 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0075	2493	5 %	2009-10-04
str2	0.0072	2637	0 %	2009-10-04
tidb	0.0077	2622	1 %	2009-10-04
1574	0.0075	7752	2 %	2009-10-04
park	0.0094	2870	0 %	2009-10-05
str2	0.0085	2762	2 %	2009-10-05
tidb	0.0090	2818	0 %	2009-10-05
1574	0.0090	8450	1 %	2009-10-05

112805 - 10 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
15742778.09o	TRM_R8_GNSS	1.4810	2009-10-04 20:28:00	2009-10-05 06:21:00

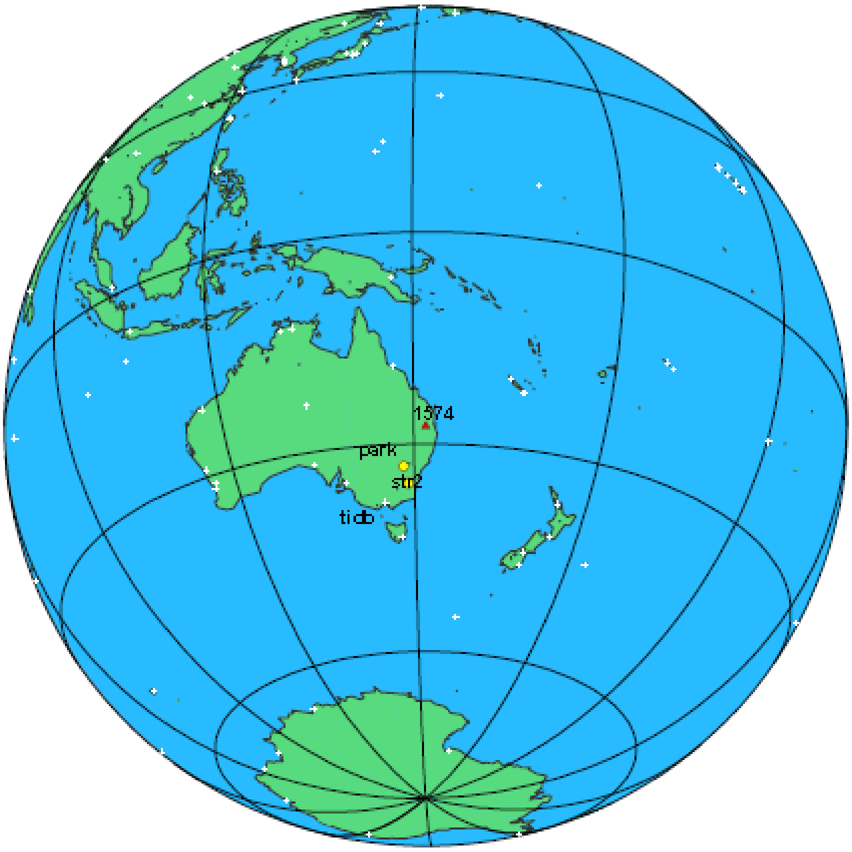


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-10-04	park str2 tidb	1574	IGS Rapid
2009-10-05	park str2 tidb	1574	IGS Ultra-Rapid

Warning: An IGS Ultra-Rapid orbit product has been used in this computation. For improved results please resubmit approximately 2 days after the observation session end to ensure the use of the IGS Rapid orbit product. Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.312	2816652.547	-3454060.946	GDA94
str2	-4467074.353	2683011.906	-3667008.280	GDA94
tidb	-4460996.063	2682557.139	-3674443.868	GDA94
1574	-4988606.082	2667601.952	-2937261.588	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.287	GDA94
tidb	-35-23 -57.1562	148 58 47.9843	665.430	646.144	GDA94
1574	-27-35 -49.0517	151 51 53.4562	572.604	530.696	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str2	682733.893	6090040.859	55	802.574	783.287	GDA94
tidb	679807.854	6080884.470	55	665.430	646.144	GDA94
1574	387972.361	6946929.128	56	572.604	530.696	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.833	2816652.459	-3454060.170	2009/10/05
str2	-4467074.883	2683011.852	-3667007.526	2009/10/05
tidb	-4460996.594	2682557.087	-3674443.114	2009/10/05
1574	-4988606.533	2667601.765	-2937260.787	2009/10/05
1574	0.002 m	0.002 m	0.007 m	RMS

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5536	148 15 52.6028	397.358	374.691	
str2	-35-18 -58.1711	149 0 36.5601	802.486	783.241	
tidb	-35-23 -57.1283	148 58 47.9969	665.342	646.179	
1574	-27-35 -49.0241	151 51 53.4699	572.510	531.177	
1574	0.005 m	0.008 m	0.004 m		RMS

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

	Height(m)	Antenna Offsets(m)			
Station	Up	East	North	Up	yyyy/mm/dd
1574	1.4810	0.0000	0.0009	0.1039	2009/10/04
1574	1.4810	0.0000	0.0009	0.1039	2009/10/05

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
1574	0.007	-0.042	0.003	2009/10/04
1574	0.066	-0.011	0.025	2009/10/05

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
1574	0.011	0.008	0.008	2009/10/04
1574	0.013	0.009	0.009	2009/10/05

5.4 Coordinate Value - Cartesian, ITRF2005, per day

	X(m)	Y(m)	Z(m)	ITRF2005 @
1574	-4988606.535	2667601.763	-2937260.798	2009/10/04
1574	-4988606.531	2667601.767	-2937260.780	2009/10/05

5.5 Geodetic, GRS80 Ellipsoid, ITRF2005, per day

```
                                              Ellipsoidal
      Latitude(DMS)     Longitude(DMS)       Height(m)
1574  -27-35 -49.0242  151 51  53.4700        572.513 2009/10/04
1574  -27-35 -49.0239  151 51  53.4698        572.506 2009/10/05
```

5.6 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0075	2493	5 %	2009-10-04
str2	0.0072	2637	0 %	2009-10-04
tidb	0.0077	2622	1 %	2009-10-04
1574	0.0075	7752	2 %	2009-10-04
park	0.0090	4257	0 %	2009-10-05
str2	0.0078	4119	2 %	2009-10-05
tidb	0.0085	4115	1 %	2009-10-05
1574	0.0085	12491	1 %	2009-10-05

112805 - 12 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
15742770.09o	TRM_R8_GNSS	1.4810	2009-10-04 20:28:00	2009-10-05 08:20:00

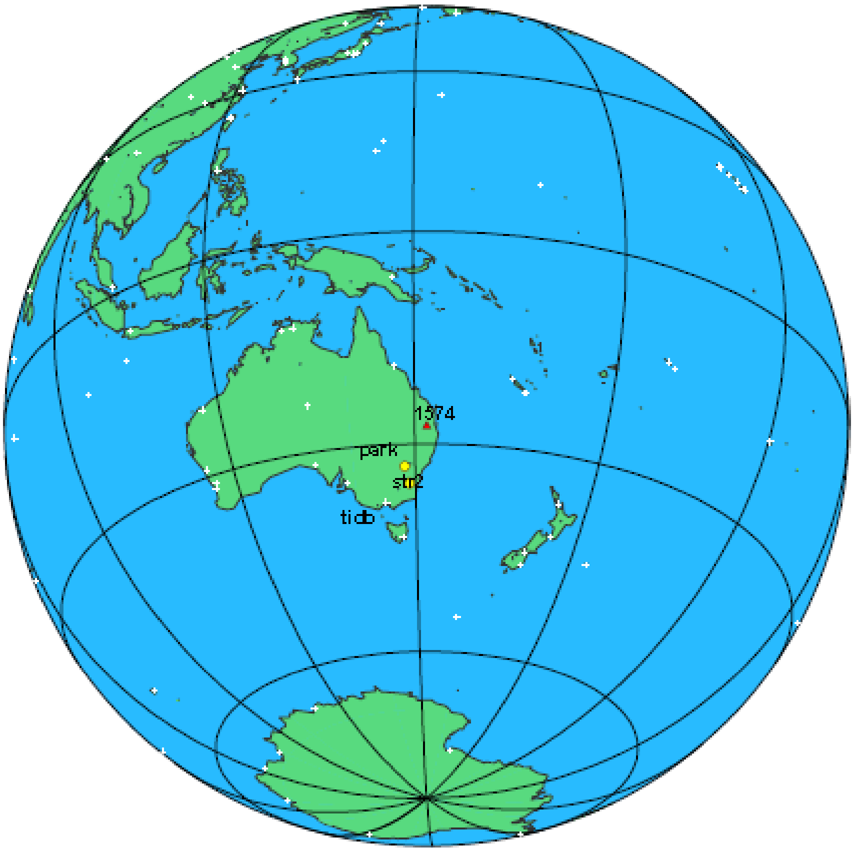


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-10-04	park str2 tidb	1574	IGS Rapid
2009-10-05	park str2 tidb	1574	IGS Ultra-Rapid

Warning: An IGS Ultra-Rapid orbit product has been used in this computation. For improved results please resubmit approximately 2 days after the observation session end to ensure the use of the IGS Rapid orbit product. Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.312	2816652.547	-3454060.946	GDA94
str2	-4467074.353	2683011.906	-3667008.280	GDA94
tidb	-4460996.063	2682557.139	-3674443.868	GDA94
1574	-4988606.092	2667601.948	-2937261.588	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.287	GDA94
tidb	-35-23 -57.1562	148 58 47.9843	665.430	646.144	GDA94
1574	-27-35 -49.0517	151 51 53.4565	572.613	530.705	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str2	682733.893	6090040.859	55	802.574	783.287	GDA94
tidb	679807.854	6080884.470	55	665.430	646.144	GDA94
1574	387972.369	6946929.127	56	572.613	530.705	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @	
park	-4554254.833	2816652.459	-3454060.170	2009/10/05	
str2	-4467074.883	2683011.852	-3667007.526	2009/10/05	
tidb	-4460996.594	2682557.087	-3674443.114	2009/10/05	
1574	-4988606.544	2667601.762	-2937260.792	2009/10/05	
1574	0.007 m	0.001 m	0.001 m		RMS

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5536	148 15 52.6028	397.358	374.691	
str2	-35-18 -58.1711	149 0 36.5601	802.486	783.241	
tidb	-35-23 -57.1283	148 58 47.9969	665.342	646.179	
1574	-27-35 -49.0241	151 51 53.4702	572.519	531.186	
1574	0.003 m	0.004 m	0.005 m		RMS

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

	Height(m)	Antenna Offsets(m)			
Station	Up	East	North	Up	yyyy/mm/dd
1574	1.4810	0.0000	0.0009	0.1039	2009/10/04
1574	1.4810	0.0000	0.0009	0.1039	2009/10/05

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
1574	0.007	-0.042	0.003	2009/10/04
1574	0.052	-0.019	0.024	2009/10/05

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
1574	0.011	0.008	0.008	2009/10/04
1574	0.008	0.004	0.004	2009/10/05

5.4 Coordinate Value - Cartesian, ITRF2005, per day

	X(m)	Y(m)	Z(m)	ITRF2005 @
1574	-4988606.535	2667601.763	-2937260.793	2009/10/04
1574	-4988606.548	2667601.761	-2937260.792	2009/10/05

5.5 Geodetic, GRS80 Ellipsoid, ITRF2005, per day

```
                                           Ellipsoidal
        Latitude(DMS)     Longitude(DMS)    Height(m)
1574  -27-35 -49.0242  151 51  53.4700       572.513 2009/10/04
1574  -27-35 -49.0240  151 51  53.4708       572.522 2009/10/05
```

5.6 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0075	2493	5 %	2009-10-04
str2	0.0072	2637	0 %	2009-10-04
tidb	0.0077	2622	1 %	2009-10-04
1574	0.0075	7752	2 %	2009-10-04
park	0.0083	5786	1 %	2009-10-05
str2	0.0075	5718	1 %	2009-10-05
tidb	0.0083	5572	3 %	2009-10-05
1574	0.0080	17076	2 %	2009-10-05

Appendix F.6 PSM 112809 Processing Reports

112809 - 1 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
74492721.09o	TRM_R8_GNSS	1.6180	2009-09-29 06:52:00	2009-09-29 07:54:00

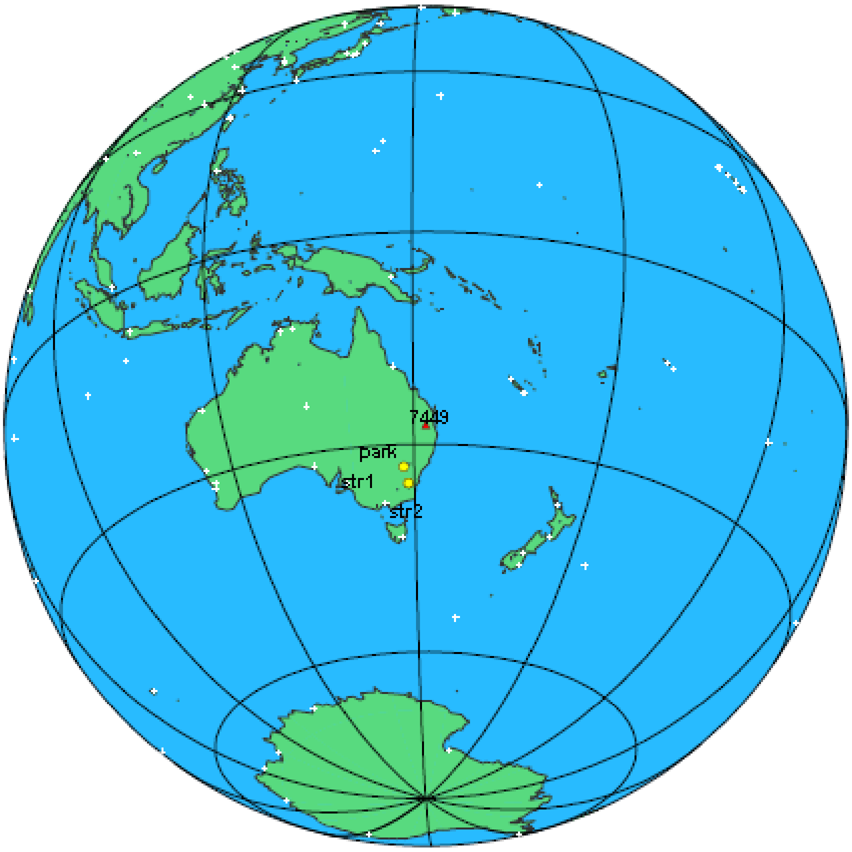


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-09-29	park str1 str2	7449	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session and to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.311	2816652.547	-3454060.946	GDA94
str2	-4467074.352	2683011.906	-3667008.281	GDA94
7449	-4991369.667	2669340.432	-2930969.388	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.287	GDA94
7449	-27-31 -58.8975	151 51 45.0792	547.998	505.908	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str2	682733.893	6090040.859	55	802.574	783.287	GDA94
7449	387677.624	6954009.418	56	547.993	505.908	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.832	2816652.459	-3454060.171	2009/09/29
str2	-4467074.882	2683011.852	-3667007.527	2009/09/29
7449	-4991370.117	2669340.245	-2930968.592	2009/09/29

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)
park	-32-59 -55.5537	148 15 52.6028	397.358	374.691
str2	-35-18 -58.1712	149 0 36.5601	802.486	783.241
7449	-27-31 -58.8699	151 51 45.0930	547.899	506.381

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

Station	Height(m) Up	Antenna Offsets(m) East	North	Up	yyyy/mm/dd
7449	1.6180	0.0000	0.0009	0.1039	2009/09/29

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
7449	0.170	-0.187	0.089	2009/09/29

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
7449	0.066	0.089	0.084	2009/09/29

5.4 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0043	721	1 %	2009-09-29
str2	0.0041	731	0 %	2009-09-29
7449	0.0042	1452	1 %	2009-09-29

112809 - 2 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
74492732.09o	TRM_R8_GNSS	1.5660	2009-09-30 22:09:59	2009-09-30 23:59:59

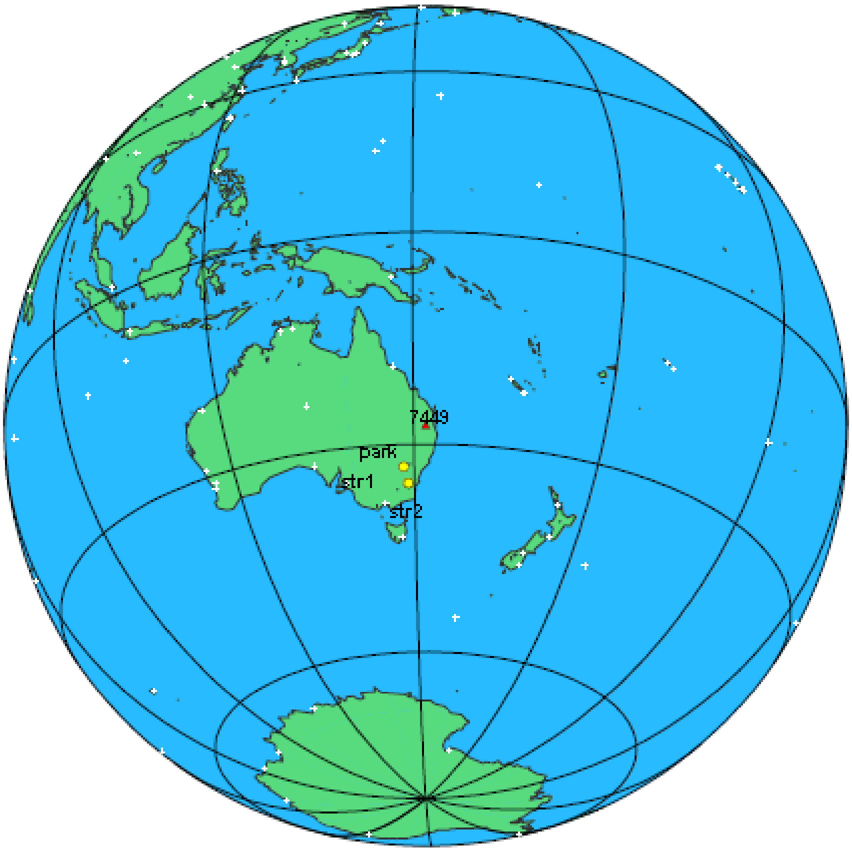


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-09-30	park str1 str2	7449	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.311	2816652.547	-3454060.945	GDA94
str1	-4467102.300	2683089.534	-3666949.984	GDA94
str2	-4467074.352	2683011.906	-3667008.281	GDA94
7449	-4991369.737	2669340.626	-2930969.443	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.172	GDA94
str1	-35-18 -55.9396	149 0 36.1796	800.031	780.694	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.287	GDA94
7449	-27-31 -58.8968	151 51 45.0742	548.154	506.069	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.172	GDA94
str1	682726.014	6090110.667	55	800.031	780.694	GDA94
str2	682733.893	6090040.859	55	802.574	783.287	GDA94
7449	387677.486	6954009.439	56	548.154	506.069	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.832	2816652.459	-3454060.170	2009/09/30
str1	-4467102.830	2683089.480	-3666949.230	2009/09/30
str2	-4467074.882	2683011.852	-3667007.527	2009/09/30
7449	-4991370.187	2669340.438	-2930968.647	2009/09/30

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)
park	-32-59 -55.5536	148 15 52.6028	397.358	374.691
str1	-35-18 -55.9117	149 0 36.1922	799.943	780.698
str2	-35-18 -58.1712	149 0 36.5601	802.486	783.241
7449	-27-31 -58.8692	151 51 45.0879	548.060	506.542

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

Station	Height(m) Up	Antenna Offsets(m) East	North	Up	yyyy/mm/dd
7449	1.5660	0.0000	0.0009	0.1039	2009/09/30

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
7449	-0.063	0.044	-0.010	2009/09/30

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
7449	0.015	0.005	0.008	2009/09/30

5.4 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0053	2475	1 %	2009-09-30
str1	0.0048	2519	0 %	2009-09-30
str2	0.0051	2519	0 %	2009-09-30
7449	0.0051	7513	0 %	2009-09-30

112809 - 4 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
74492741.09o	TRM_R8_GNSS	1.5660	2009-10-01 00:21:59	2009-10-01 04:40:00

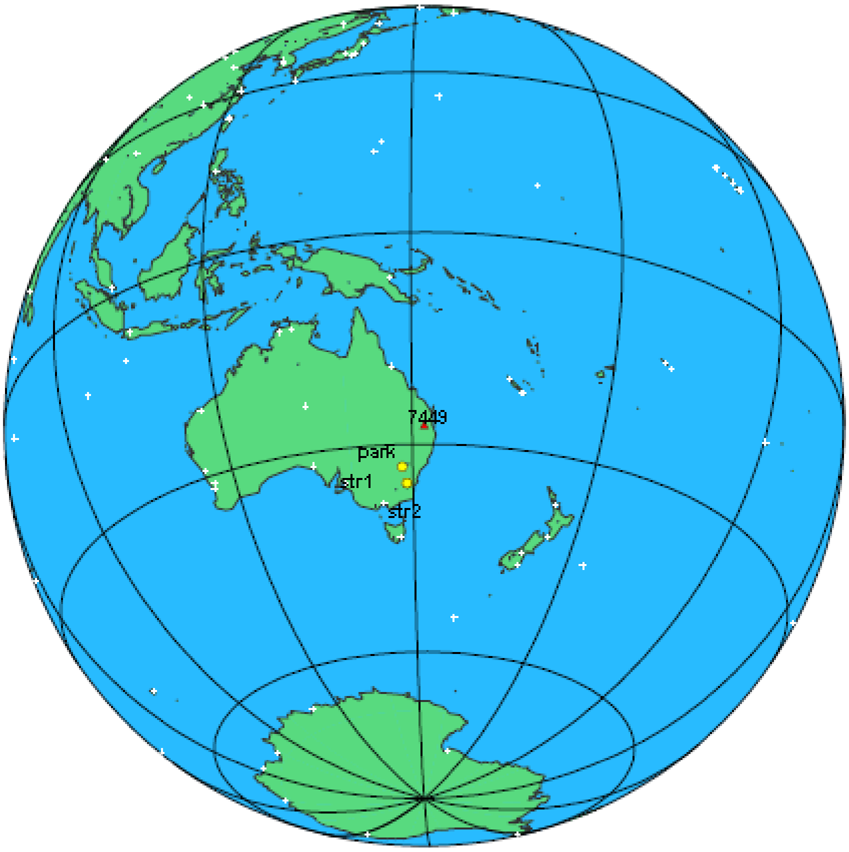


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-10-01	park str1 str2	7449	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.312	2816652.547	-3454060.945	GDA94
str1	-4467102.300	2683089.534	-3666949.983	GDA94
str2	-4467074.352	2683011.906	-3667008.281	GDA94
7449	-4991369.755	2669340.616	-2930969.437	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5817	148 15 52.5889	397.447	374.173	GDA94
str1	-35-18 -55.9396	149 0 36.1796	800.030	780.693	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.237	GDA94
7449	-27-31 -58.8965	151 51 45.0748	548.161	506.076	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.985	55	397.447	374.173	GDA94
str1	682726.014	6090110.668	55	800.030	780.693	GDA94
str2	682733.893	6090040.859	55	802.574	783.237	GDA94
7449	387677.503	6954009.449	56	548.161	506.076	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.833	2816652.459	-3454060.170	2009/10/01
str1	-4467102.830	2683089.480	-3666949.229	2009/10/01
str2	-4467074.882	2683011.852	-3667007.527	2009/10/01
7449	-4991370.205	2669340.428	-2930968.641	2009/10/01

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)
park	-32-59 -55.5536	148 15 52.6028	397.358	374.691
str1	-35-18 -55.9117	149 0 36.1922	799.942	780.697
str2	-35-18 -58.1712	149 0 36.5601	802.486	783.241
7449	-27-31 -58.8689	151 51 45.0886	548.067	506.549

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %;

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

Station	Height(m) Up	Antenna Offsets(m) East	North	Up	yyyy/mm/dd
7449	1.5660	-0.0000	0.0009	0.1039	2009/10/01

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
7449	-0.011	-0.007	-0.004	2009/10/01

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
7449	0.010	0.007	0.005	2009/10/01

5.4 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0051	2869	7 %	2009-10-01
str1	0.0041	2257	5 %	2009-10-01
str2	0.0050	2848	7 %	2009-10-01
7449	0.0048	7974	6 %	2009-10-01

112809 - 6 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
74492720.09o	TRM_R8_GNSS	1.6180	2009-09-29 00:46:00	2009-09-29 06:47:59

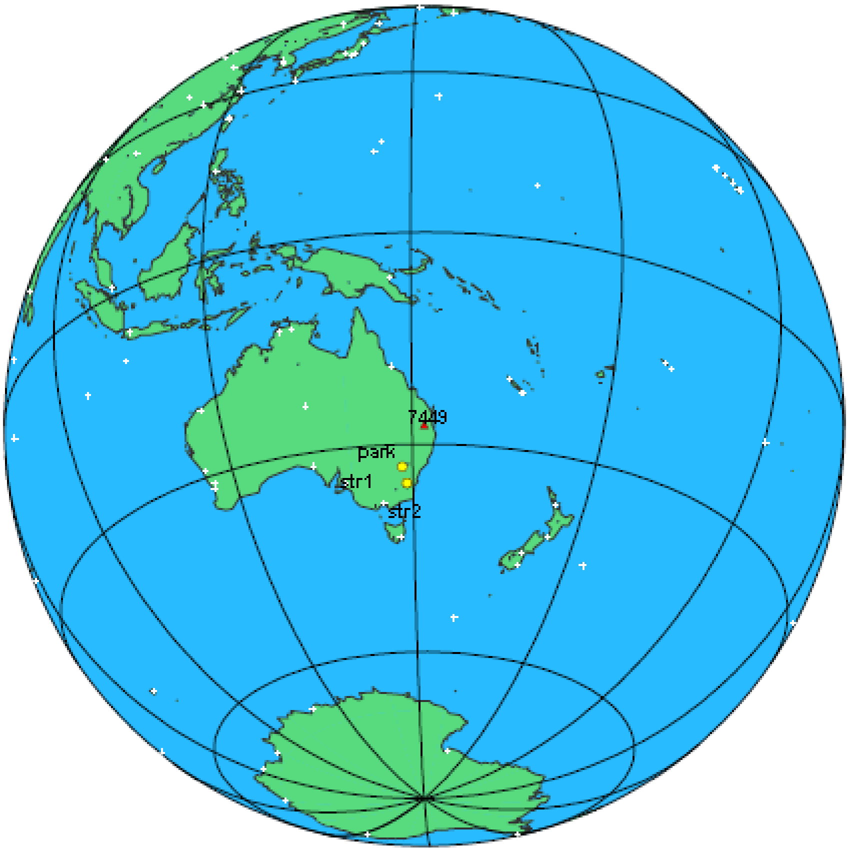


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-09-29	park str1 str2	7449	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session and to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.311	2816652.547	-3454060.946	GDA94
str2	-4467074.352	2683011.906	-3667008.281	GDA94
7449	-4991369.748	2669340.602	-2930969.453	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.287	GDA94
7449	-27-31 -58.8971	151 51 45.0751	548.157	506.072	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str2	682733.893	6090040.859	55	802.574	783.287	GDA94
7449	387677.513	6954009.430	56	548.157	506.072	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.882	2816652.459	-3454060.171	2009/09/29
str2	-4467074.882	2683011.852	-3667007.527	2009/09/29
7449	-4991370.198	2669340.415	-2930968.657	2009/09/29

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)
park	-32-59 -55.5537	148 15 52.6023	397.358	374.691
str2	-35-18 -58.1712	149 0 36.5601	802.486	783.241
7449	-27-31 -58.8695	151 51 45.0889	548.063	506.545

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %;

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

	Height(m)	Antenna Offsets(m)			
Station	Up	East	North	Up	yyyy/mm/dd
7449	1.6180	0.0000	0.0009	0.1039	2009/09/29

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
7449	0.041	-0.001	-0.003	2009/09/29

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
7449	0.013	0.007	0.010	2009/09/29

5.4 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0065	4147	2 %	2009-09-29
str2	0.0066	4170	0 %	2009-09-29
7449	0.0065	8317	1 %	2009-09-29

112809 - 8 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
74492681.09o	TRM_R8_GNSS	1.6020	2009-09-25 21:53:59	2009-09-26 05:52:00

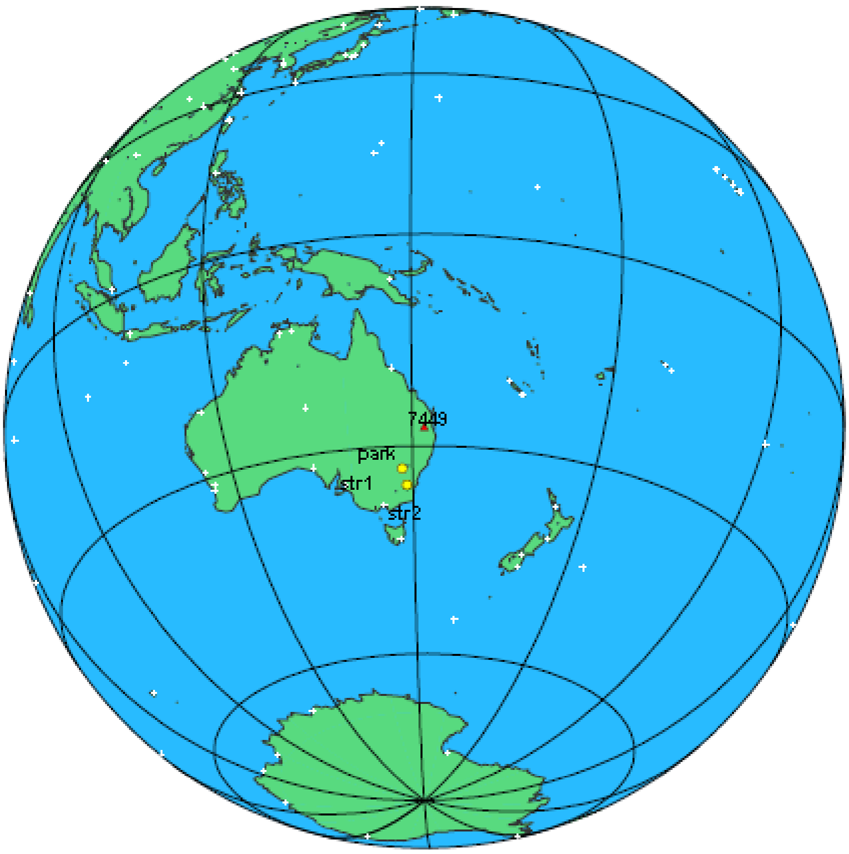


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-09-25	park str1 str2	7449	IGS Rapid
2009-09-26	park str1 str2	7449	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
str1	-4467102.301	2683089.534	-3666949.983	GDA94
str2	-4467074.353	2683011.906	-3667008.281	GDA94
7449	-4991369.766	2669340.645	-2930969.449	GDA94
park	-4554254.312	2816652.547	-3454060.945	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
str1	-35-18 -55.9396	149 0 36.1796	800.031	780.694	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.575	783.238	GDA94
7449	-27-31 -58.8964	151 51 45.0741	548.188	506.102	GDA94
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
str1	682726.015	6090110.668	55	800.031	780.694	GDA94
str2	682733.893	6090040.859	55	802.575	783.238	GDA94
7449	387677.483	6954009.450	56	548.188	506.102	GDA94
park	618139.981	6348138.984	55	397.447	374.173	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
str1	-4467102.830	2683089.480	-3666949.230	2009/09/26
str2	-4467074.882	2683011.852	-3667007.528	2009/09/26
7449	-4991370.216	2669340.458	-2930968.653	2009/09/26

7449	0.018 m	0.024 m	0.012 m	RMS
park	-4554254.832	2816652.459	-3454060.171	2009/09/26

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)
str1	-35-18 -55.9117	149 0 36.1922	799.943	780.698
str2	-35-18 -58.1712	149 0 36.5601	802.487	783.242
7449	-27-31 -58.8689	151 51 45.0878	548.098	506.575
7449	0.003 m	0.014 m	0.028 m	RMS
park	-32-59 -55.5537	148 15 52.6028	397.358	374.691

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

	Height(m)	Antenna Offsets(m)			
Station	Up	East	North	Up	yyyy/mm/dd
7449	1.6020	0.0000	0.0009	0.1039	2009/09/25
7449	1.6020	0.0000	0.0009	0.1039	2009/09/26

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
7449	-0.003	0.019	0.012	2009/09/25
7449	-0.027	0.026	-0.080	2009/09/26

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
7449	0.018	0.010	0.013	2009/09/25
7449	0.011	0.011	0.007	2009/09/26

5.4 Coordinate Value - Cartesian, ITRF2005, per day

	X(m)	Y(m)	Z(m)	ITRF2005 @
7449	-4991370.193	2669340.435	-2930968.637	2009/09/25
7449	-4991370.225	2669340.482	-2930968.658	2009/09/26

5.5 Geodetic, GRS80 Ellipsoid, ITRF2005, per day

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	
7449	-27-31 -58.8689	151 51 45.0881	548.058	2009/09/25
7449	-27-31 -58.8687	151 51 45.0872	548.113	2009/09/26

5.6 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
str1	0.0049	1600	0 %	2009-09-25
str2	0.0052	1596	0 %	2009-09-25
7449	0.0050	3196	0 %	2009-09-25
park	0.0068	2996	4 %	2009-09-26
str1	0.0072	2826	3 %	2009-09-26
str2	0.0077	3133	3 %	2009-09-26
7449	0.0073	8945	4 %	2009-09-26

112809 - 10 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
15742690.09o	TRM_R8_GNSS	1.4640	2009-09-26 21:26:00	2009-09-27 07:18:59

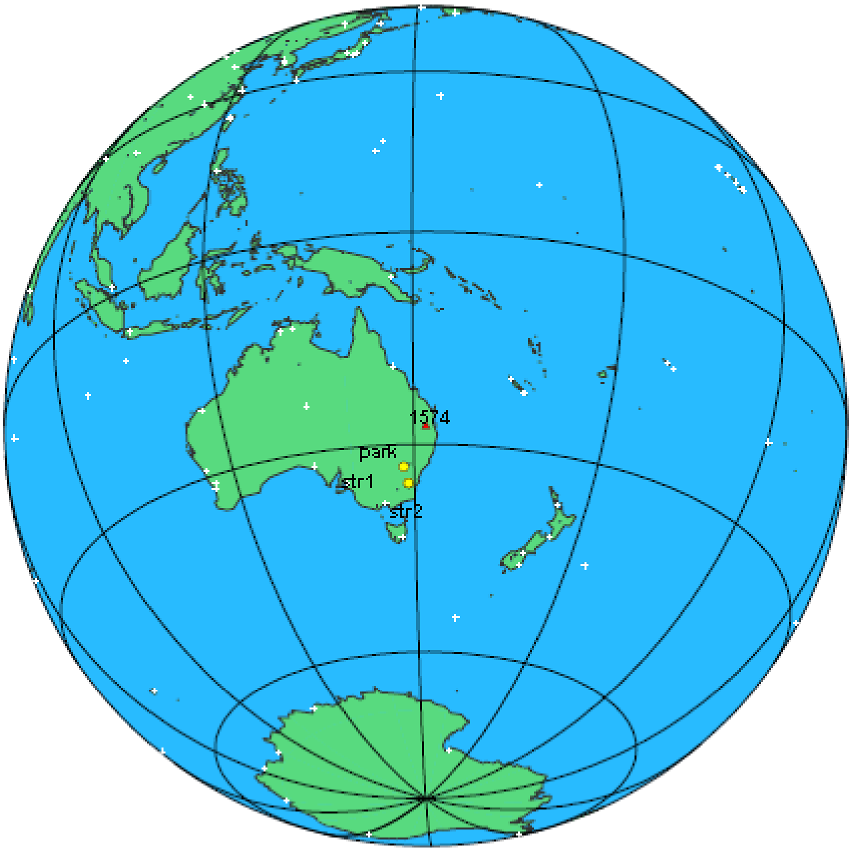


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-09-26	park str1 str2	1574	IGS Rapid
2009-09-27	park str1 str2	1574	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.312	2816652.547	-3454060.945	GDA94
str1	-4467102.301	2683089.534	-3666949.983	GDA94
str2	-4467074.353	2683011.906	-3667008.281	GDA94
1574	-4991369.759	2669340.619	-2930969.460	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str1	-35-18 -55.9396	149 0 36.1796	800.031	780.694	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.238	GDA94
1574	-27-31 -58.8970	151 51 45.0748	548.176	506.091	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str1	682726.015	6090110.668	55	800.031	780.694	GDA94
str2	682733.893	6090040.859	55	802.574	783.238	GDA94
1574	387677.503	6954009.432	56	548.176	506.091	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.832	2816652.459	-3454060.171	2009/09/27
str1	-4467102.830	2683089.480	-3666949.230	2009/09/27
str2	-4467074.882	2683011.852	-3667007.527	2009/09/27

1574	-4991370.209	2669340.432	-2930968.664	2009/09/27	
1574	0.039 m	0.012 m	0.024 m		RMS

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5537	148 15 52.6028	397.358	374.691	
str1	-35-18 -55.9117	149 0 36.1922	799.943	780.698	
str2	-35-18 -58.1712	149 0 36.5601	802.486	783.241	
1574	-27-31 -58.8695	151 51 45.0885	548.082	506.564	
1574	0.003 m	0.008 m	0.047 m		RMS

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %;

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

Station	Height(m) Up	Antenna Offsets(m) East	North	Up	yyyy/mm/dd
1574	1.4640	0.0000	0.0009	0.1039	2009/09/26
1574	1.4640	-0.0000	0.0009	0.1039	2009/09/27

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
1574	0.003	-0.003	0.006	2009/09/26
1574	0.007	-0.022	0.018	2009/09/27

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
1574	0.017	0.010	0.012	2009/09/26
1574	0.006	0.003	0.006	2009/09/27

5.4 Coordinate Value - Cartesian, ITRF2005, per day

	X(m)	Y(m)	Z(m)	ITRF2005 @
1574	-4991370.265	2669340.449	-2930968.697	2009/09/26
1574	-4991370.203	2669340.430	-2930968.656	2009/09/27

5.5 Geodetic, GRS80 Ellipsoid, ITRF2005, per day

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	
1574	-27-31 -58.8696	151 51 45.0889	548.148	2009/09/26
1574	-27-31 -58.8693	151 51 45.0885	548.073	2009/09/27

5.6 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0047	940	7 %	2009-09-26
str1	0.0045	1672	0 %	2009-09-26
str2	0.0049	1599	6 %	2009-09-26
1574	0.0047	4211	4 %	2009-09-26
park	0.0061	5237	0 %	2009-09-27
str1	0.0056	5255	0 %	2009-09-27
str2	0.0057	5107	3 %	2009-09-27
1574	0.0058	15599	1 %	2009-09-27

112809 - 12 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
15742700.09o	TRM_R8_GNSS	1.5770	2009-09-27 19:50:59	2009-09-28 07:47:00

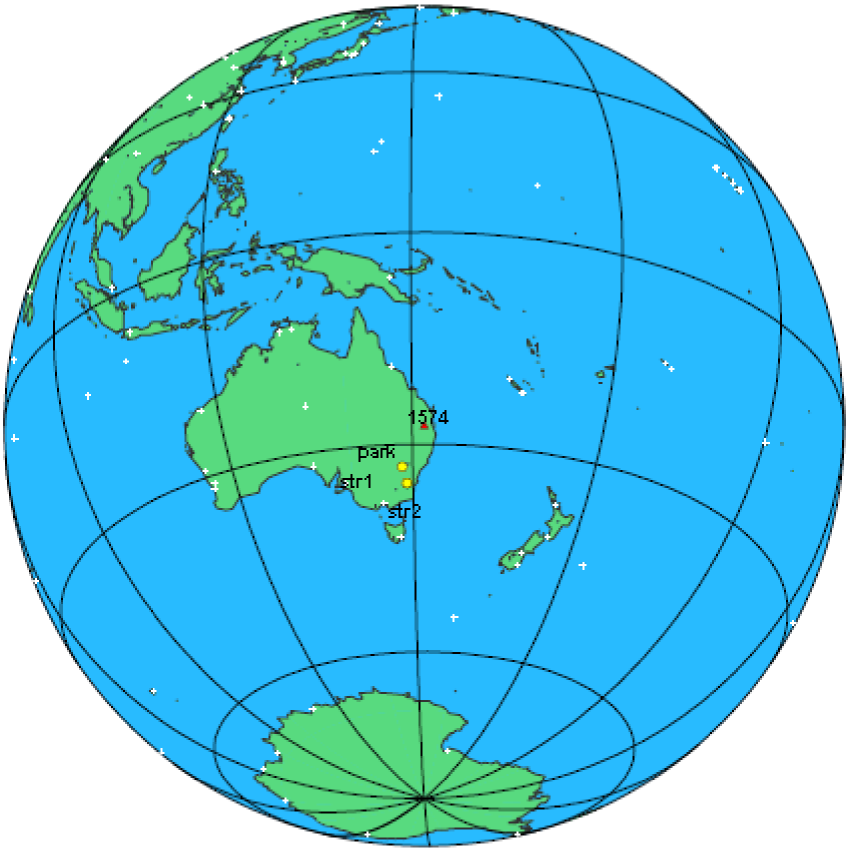


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-09-27	park str1 str2	1574	IGS Rapid
2009-09-28	park str1 str2	1574	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.312	2816652.547	-3454060.946	GDA94
str1	-4467102.301	2683089.534	-3666949.983	GDA94
str2	-4467074.352	2683011.906	-3667008.280	GDA94
1574	-4991369.745	2669340.628	-2930969.463	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str1	-35-18 -55.9396	149 0 36.1796	800.031	780.694	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.237	GDA94
1574	-27-31 -58.8973	151 51 45.0744	548.169	506.083	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str1	682726.014	6090110.668	55	800.031	780.694	GDA94
str2	682733.893	6090040.859	55	802.574	783.237	GDA94
1574	387677.493	6954009.424	56	548.169	506.083	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.832	2816652.459	-3454060.171	2009/09/27
str1	-4467102.830	2683089.480	-3666949.230	2009/09/28
str2	-4467074.882	2683011.852	-3667007.527	2009/09/28

1574	-4991370.195	2669340.436	-2930968.667	2009/09/28	
1574	0.007 m	0.169 m	0.094 m		RMS

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5537	148 15 52.6028	397.358	374.691	
str1	-35-18 -55.9117	149 0 36.1922	799.943	780.698	
str2	-35-18 -58.1712	149 0 36.5601	802.486	783.241	
1574	-27-31 -58.8697	151 51 45.0882	548.074	506.556	
1574	0.043 m	0.146 m	0.119 m		RMS

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

Station	Height(m) Up	Antenna Offsets(m) East	North	Up	yyyy/mm/dd
1574	1.5770	0.0000	0.0009	0.1039	2009/09/27
1574	1.5770	-0.0000	0.0009	0.1039	2009/09/28

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
1574	-0.095	-0.154	0.092	2009/09/27
1574	0.008	-0.014	0.009	2009/09/28

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
1574	0.120	0.072	0.072	2009/09/27
1574	0.008	0.005	0.005	2009/09/28

5.4 Coordinate Value - Cartesian, ITRF2005, per day

	X(m)	Y(m)	Z(m)	ITRF2005 @
1574	-4991370.185	2669340.197	-2930968.535	2009/09/27
1574	-4991370.195	2669340.437	-2930968.668	2009/09/28

5.5 Geodetic, GRS80 Ellipsoid, ITRF2005, per day

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	
1574	-27-31 -58.8677	151 51 45.0957	547.905	2009/09/27
1574	-27-31 -58.8697	151 51 45.0881	548.075	2009/09/28

5.6 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0664	2139	0 %	2009-09-27
str1	0.0440	2082	0 %	2009-09-27
str2	0.0289	2952	0 %	2009-09-27
1574	0.0471	7173	0 %	2009-09-27
str1	0.0049	4319	9 %	2009-09-28
str2	0.0052	5580	0 %	2009-09-28
1574	0.0051	9899	4 %	2009-09-28

WARNING: This solution has modelling problems associated with the submitted GPS data. Please consider this solution with CAUTION.

Appendix F.7 PSM 112810 Processing Reports

112810 - 1 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
2127275F.09o	TRM_R8_GNSS	1.5250	2009-10-02 20:07:00	2009-10-02 21:08:00

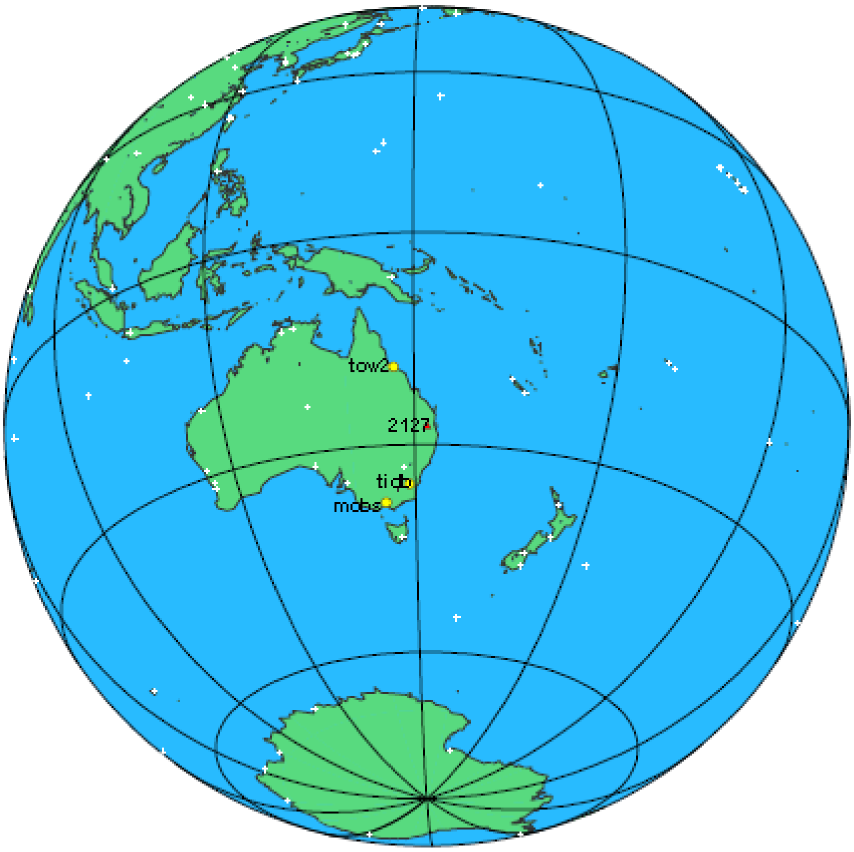


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-10-02	tidb tow2 mobs	2127	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session and to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
mobs	-4130635.782	2894953.108	-3890531.459	GDA94
tidb	-4460996.063	2682557.139	-3674443.868	GDA94
tow2	-5054582.669	3275504.568	-2091539.894	GDA94
2127	-4993294.220	2668237.928	-2928747.577	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
mobs	-37-49 -45.8989	144 58 31.2064	40.672	35.725	GDA94
tidb	-35-23 -57.1563	148 58 47.9843	665.430	646.145	GDA94
tow2	-19-16 -9.4283	147 3 20.4654	88.227	30.138	GDA94
2127	-27-30 -37.2154	151 52 53.5661	565.570	523.389	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
mobs	321819.585	5811180.087	55	40.672	35.725	GDA94
tidb	679807.854	6080884.470	55	665.430	646.145	GDA94
tow2	505851.330	7869375.315	55	88.227	30.138	GDA94
2127	389533.661	6956540.050	56	565.570	523.389	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
mobs	-4130636.359	2894953.105	-3890530.712	2009/10/02
tidb	-4460996.594	2682557.087	-3674443.115	2009/10/02
tow2	-5054583.096	3275504.275	-2091539.033	2009/10/02
2127	-4993294.670	2668237.740	-2928746.780	2009/10/02

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)
mobs	-37-49 -45.8703	144 58 31.2198	40.588	35.998
tidb	-35-23 -57.1283	148 58 47.9969	665.343	646.180
tow2	-19-16 -9.3997	147 3 20.4817	88.130	30.083
2127	-27-30 -37.1878	151 52 53.5799	565.476	523.868

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

	Height(m)	Antenna Offsets(m)			
Station	Up	East	North	Up	yyyy/mm/dd
2127	1.5250	-0.0000	0.0009	0.1039	2009/10/02

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
2127	-0.080	0.035	-0.013	2009/10/02

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
2127	0.042	0.030	0.020	2009/10/02

5.4 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
mobs	0.0050	680	0 %	2009-10-02
tidb	0.0049	702	0 %	2009-10-02
tow2	0.0041	661	0 %	2009-10-02
2127	0.0047	2043	0 %	2009-10-02

112810 - 2 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
2127275E.09o	TRM_R8_GNSS	1.5250	2009-10-02 20:07:00	2009-10-02 22:08:00

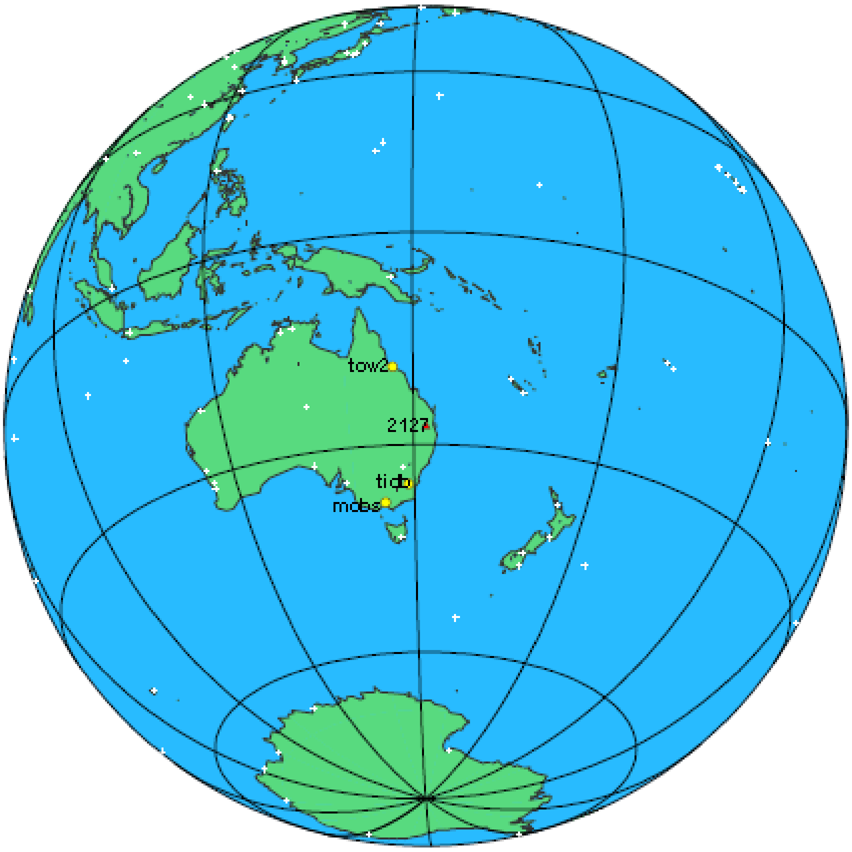


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-10-02	tidb tow2 mobs	2127	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
mobs	-4130635.782	2894953.108	-3890531.459	GDA94
tidb	-4460996.063	2682557.139	-3674443.868	GDA94
tow2	-5054582.669	3275504.568	-2091539.894	GDA94
2127	-4993294.215	2668287.904	-2928747.528	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
mobs	-37-49 -45.8989	144 58 31.2064	40.672	35.725	GDA94
tidb	-35-23 -57.1563	148 58 47.9843	665.430	646.145	GDA94
tow2	-19-16 -9.4283	147 3 20.4654	88.227	30.138	GDA94
2127	-27-30 -37.2142	151 52 53.5668	565.533	523.353	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
mobs	321819.585	5811180.087	55	40.672	35.725	GDA94
tidb	679807.854	6080884.470	55	665.430	646.145	GDA94
tow2	505851.330	7869375.315	55	88.227	30.138	GDA94
2127	389533.680	6956540.086	56	565.533	523.353	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
mobs	-4130636.359	2894953.105	-3890530.712	2009/10/02
tidb	-4460996.594	2682557.087	-3674443.115	2009/10/02
tow2	-5054583.096	3275504.275	-2091539.033	2009/10/02
2127	-4993294.665	2668287.716	-2928746.731	2009/10/02

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)
mobs	-37-49 -45.8703	144 58 31.2198	40.588	35.998
tidb	-35-23 -57.1283	148 58 47.9969	665.343	646.180
tow2	-19-16 -9.3997	147 3 20.4817	88.130	30.083
2127	-27-30 -37.1866	151 52 53.5805	565.439	523.831

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

Station	Height(m) Up	Antenna Offsets(m) East	North	Up	yyyy/mm/dd
2127	1.5250	0.0000	0.0009	0.1039	2009/10/02

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
2127	-0.008	-0.029	0.014	2009/10/02

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
2127	0.025	0.016	0.009	2009/10/02

5.4 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
mobs	0.0065	1308	0 %	2009-10-02
tidb	0.0053	1337	0 %	2009-10-02
tow2	0.0064	1374	0 %	2009-10-02
2127	0.0061	4019	0 %	2009-10-02

112810 - 4 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
2127275D.09o	TRM_R8_GNSS	1.5250	2009-10-02 20:07:00	2009-10-02 23:59:59

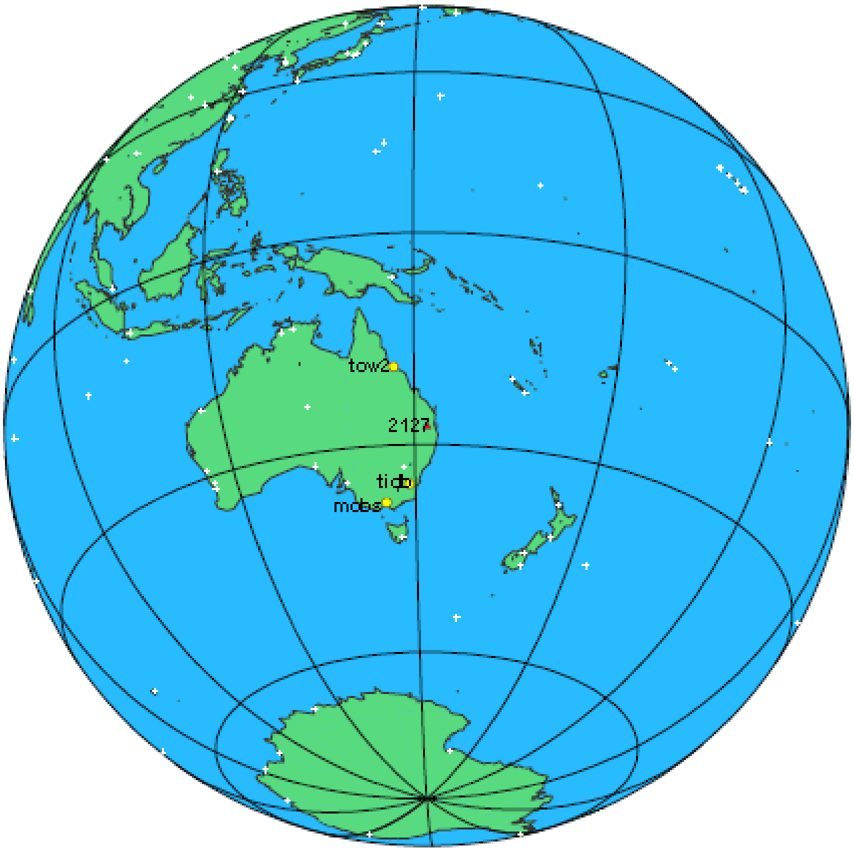


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-10-02	tidb tow2 mobs	2127	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
mobs	-4130635.782	2894953.108	-3890531.459	GDA94
tidb	-4460996.063	2682557.139	-3674443.868	GDA94
tow2	-5054582.669	3275504.568	-2091539.894	GDA94
2127	-4993294.282	2668287.897	-2928747.535	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
mobs	-37-49 -45.8989	144 58 31.2064	40.672	35.725	GDA94
tidb	-35-23 -57.1563	148 58 47.9843	665.430	646.145	GDA94
tow2	-19-16 -9.4283	147 3 20.4654	88.227	30.138	GDA94
2127	-27-30 -37.2142	151 52 53.5673	565.547	523.366	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
mobs	321819.585	5811180.087	55	40.672	35.725	GDA94
tidb	679807.854	6080884.470	55	665.430	646.145	GDA94
tow2	505851.330	7869375.315	55	88.227	30.138	GDA94
2127	389533.694	6956540.085	56	565.547	523.366	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
mobs	-4130636.359	2894953.105	-3890530.712	2009/10/02
tidb	-4460996.594	2682557.087	-3674443.115	2009/10/02
tow2	-5054583.096	3275504.275	-2091539.033	2009/10/02
2127	-4993294.682	2668287.709	-2928746.738	2009/10/02

-

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)
mobs	-37-49 -45.8703	144 58 31.2198	40.588	35.998
tidb	-35-23 -57.1283	148 58 47.9969	665.343	646.180
tow2	-19-16 -9.3997	147 3 20.4817	88.130	30.083
2127	-27-30 -37.1867	151 52 53.5811	565.453	523.845

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

Station	Height(m) Up	Antenna Offsets(m) East	North	Up	yyyy/mm/dd
2127	1.5250	0.0000	0.0009	0.1039	2009/10/02

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
2127	-0.004	-0.012	0.006	2009/10/02

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
2127	0.009	0.006	0.006	2009/10/02

5.4 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
mobs	0.0064	2792	0 %	2009-10-02
tidb	0.0055	2860	0 %	2009-10-02
tow2	0.0063	2881	0 %	2009-10-02
2127	0.0061	8533	0 %	2009-10-02

112810 - 6 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
2127275C.09o	TRM_R8_GNSS	1.5250	2009-10-02 20:07:00	2009-10-03 02:05:00

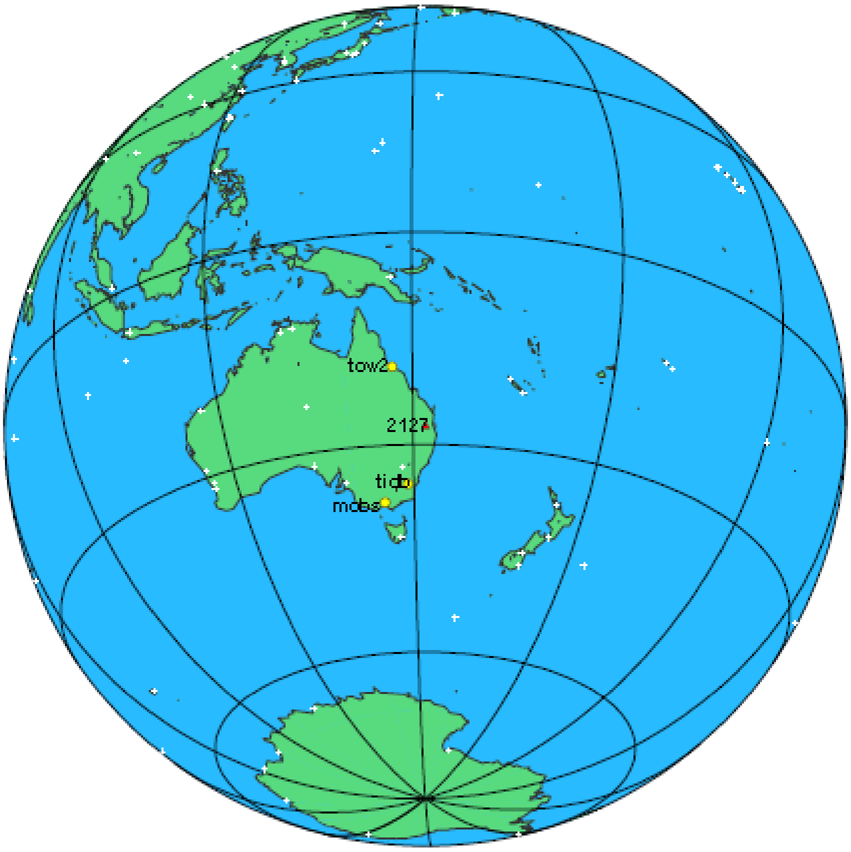


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-10-02	tidb tow2 mobs	2127	IGS Rapid
2009-10-03	tidb tow2 mobs	2127	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session and to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
mobs	-4130635.782	2894953.103	-3890531.459	GDA94
tidb	-4460996.063	2682557.139	-3674443.868	GDA94
tow2	-5054582.669	3275504.568	-2091539.894	GDA94
2127	-4993294.251	2668287.915	-2928747.545	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
mobs	-37-49 -45.8989	144 58 31.2064	40.673	35.726	GDA94
tidb	-35-23 -57.1563	148 58 47.9843	665.430	646.145	GDA94
tow2	-19-16 -9.4283	147 3 20.4654	88.227	30.138	GDA94
2127	-27-30 -37.2142	151 52 53.5670	565.574	523.393	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
mobs	321819.585	5811180.087	55	40.673	35.726	GDA94
tidb	679807.854	6080884.470	55	665.430	646.145	GDA94
tow2	505851.330	7869375.315	55	88.227	30.138	GDA94
2127	389533.687	6956540.088	56	565.574	523.393	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
mobs	-4130636.359	2894953.105	-3890530.712	2009/10/03
tidb	-4460996.594	2682557.087	-3674443.115	2009/10/03
tow2	-5054583.096	3275504.275	-2091539.033	2009/10/03

2127	-4993294.701	2668237.727	-2928746.749	2009/10/03	
2127	0.086 m	0.022 m	0.013 m		RMS

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
mobs	-37-49 -45.8703	144 58 31.2199	40.588	35.998	
tidb	-35-23 -57.1283	148 58 47.9969	665.343	646.180	
tow2	-19-16 -9.3997	147 3 20.4817	88.130	30.083	
2127	-27-30 -37.1866	151 52 53.5808	565.480	523.872	
2127	0.009 m	0.005 m	0.043 m		RMS

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

	Height(m)	Antenna Offsets(m)			
Station	Up	East	North	Up	yyyy/mm/dd
2127	1.5250	0.0000	0.0009	0.1039	2009/10/02
2127	1.5250	0.0000	0.0009	0.1039	2009/10/03

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
2127	-0.004	-0.012	0.006	2009/10/02
2127	-0.069	-0.018	0.001	2009/10/03

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
2127	0.009	0.006	0.006	2009/10/02
2127	0.015	0.007	0.007	2009/10/03

5.4 Coordinate Value - Cartesian, ITRF2005, per day

	X(m)	Y(m)	Z(m)	ITRF2005 @
2127	-4993294.682	2668237.709	-2928746.738	2009/10/02
2127	-4993294.748	2668237.753	-2928746.763	2009/10/03

5.5 Geodetic, GRS80 Ellipsoid, ITRF2005, per day

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	
2127	-27-30 -37.1867	151 52 53.5811	565.453	2009/10/02
2127	-27-30 -37.1862	151 52 53.5808	565.534	2009/10/03

5.6 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
mobs	0.0064	2792	0 %	2009-10-02
tidb	0.0055	2860	0 %	2009-10-02
tow2	0.0063	2881	0 %	2009-10-02
2127	0.0061	8533	0 %	2009-10-02
mobs	0.0065	2875	0 %	2009-10-03
tidb	0.0071	3035	0 %	2009-10-03
tow2	0.0080	2800	2 %	2009-10-03
2127	0.0072	8710	1 %	2009-10-03

112810 - 8 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
21272758.09o	TRM_R8_GNSS	1.5250	2009-10-02 20:07:00	2009-10-03 04:05:00

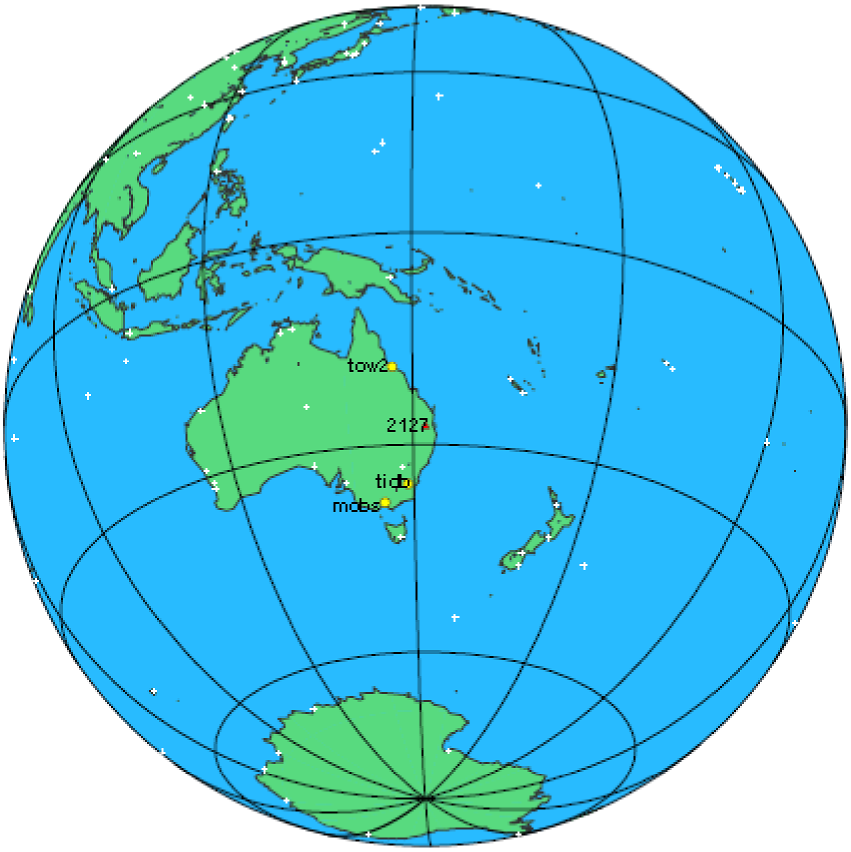


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-10-02	tidb tow2 mobs	2127	IGS Rapid
2009-10-03	tidb tow2 mobs	2127	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
mobs	-4130635.782	2894953.108	-3890531.459	GDA94
tidb	-4460996.063	2682557.139	-3674443.868	GDA94
tow2	-5054582.669	3275504.568	-2091539.894	GDA94
2127	-4993294.250	2668287.904	-2928747.541	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
mobs	-37-49 -45.8989	144 58 31.2064	40.673	35.726	GDA94
tidb	-35-23 -57.1563	148 58 47.9843	665.430	646.145	GDA94
tow2	-19-16 -9.4283	147 3 20.4654	88.227	30.138	GDA94
2127	-27-30 -37.2141	151 52 53.5674	565.567	523.386	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
mobs	321819.585	5811180.087	55	40.673	35.726	GDA94
tidb	679807.854	6080884.470	55	665.430	646.145	GDA94
tow2	505851.330	7869375.315	55	88.227	30.138	GDA94
2127	389533.697	6956540.088	56	565.567	523.386	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
mobs	-4130636.359	2894953.105	-3890530.712	2009/10/03
tidb	-4460996.594	2682557.087	-3674443.115	2009/10/03
tow2	-5054583.096	3275504.275	-2091539.033	2009/10/03

2127	-4993294.700	2668287.716	-2928746.745	2009/10/03	
2127	0.026 m	0.010 m	0.009 m		RMS

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
mobs	-37-49 -45.8703	144 58 31.2199	40.588	35.998	
tidb	-35-23 -57.1283	148 58 47.9969	665.343	646.180	
tow2	-19-16 -9.3997	147 3 20.4817	88.130	30.083	
2127	-27-30 -37.1866	151 52 53.5811	565.473	523.865	
2127	0.004 m	0.004 m	0.029 m		RMS

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %;

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

Station	Height(m) Up	Antenna Offsets(m) East	North	Up	yyyy/mm/dd
2127	1.5250	0.0000	0.0009	0.1039	2009/10/02
2127	1.5250	0.0000	0.0009	0.1039	2009/10/03

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
2127	-0.004	-0.012	0.006	2009/10/02
2127	-0.020	-0.026	0.008	2009/10/03

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
2127	0.009	0.006	0.006	2009/10/02
2127	0.012	0.008	0.008	2009/10/03

5.4 Coordinate Value - Cartesian, ITRF2005, per day

	X(m)	Y(m)	Z(m)	ITRF2005 @
2127	-4993294.682	2668287.709	-2928746.738	2009/10/02
2127	-4993294.732	2668287.728	-2928746.756	2009/10/03

5.5 Geodetic, GRS80 Ellipsoid, ITRF2005, per day

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	
2127	-27-30 -37.1867	151 52 53.5811	565.453	2009/10/02
2127	-27-30 -37.1864	151 52 53.5813	565.508	2009/10/03

5.6 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
mobs	0.0064	2792	0 %	2009-10-02
tidb	0.0055	2860	0 %	2009-10-02
tow2	0.0063	2881	0 %	2009-10-02
2127	0.0061	8533	0 %	2009-10-02
mobs	0.0078	4877	0 %	2009-10-03
tidb	0.0081	4800	2 %	2009-10-03
tow2	0.0085	4585	1 %	2009-10-03
2127	0.0081	14062	1 %	2009-10-03

112810 - 10 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
2127275A.09o	TRM_R8_GNSS	1.5250	2009-10-02 20:07:00	2009-10-03 06:04:00

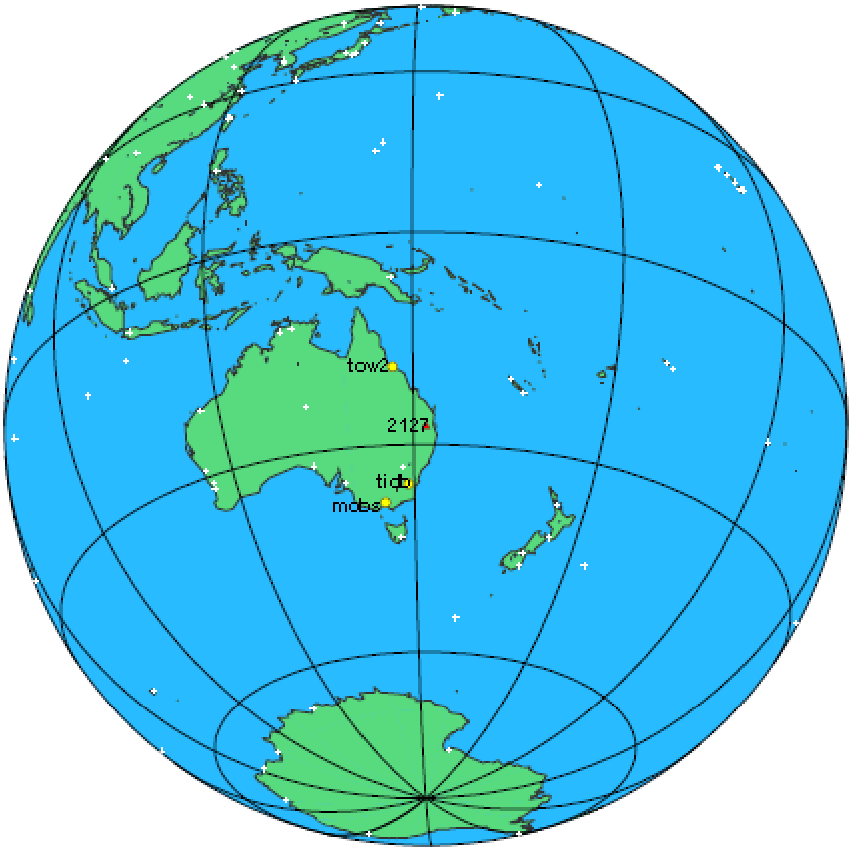


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-10-02	tidb tow2 mobs	2127	IGS Rapid
2009-10-03	tidb tow2 mobs	2127	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
mobs	-4130635.782	2894953.103	-3890531.459	GDA94
tidb	-4460996.063	2682557.139	-3674443.868	GDA94
tow2	-5054582.869	3275504.568	-2091539.894	GDA94
2127	-4993294.251	2668237.904	-2928747.542	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
mobs	-37-49 -45.8989	144 58 31.2064	40.673	35.726	GDA94
tidb	-35-23 -57.1563	148 58 47.9843	665.430	646.145	GDA94
tow2	-19-16 -9.4283	147 3 20.4654	88.227	30.138	GDA94
2127	-27-30 -37.2141	151 52 53.5674	565.567	523.387	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
mobs	321819.585	5811180.087	55	40.673	35.726	GDA94
tidb	679807.854	6080884.470	55	665.430	646.145	GDA94
tow2	505851.330	7869375.315	55	88.227	30.138	GDA94
2127	389533.696	6956540.088	56	565.567	523.387	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
mobs	-4130636.359	2894953.105	-3890530.712	2009/10/03
tidb	-4460996.594	2682557.087	-3674443.115	2009/10/03
tow2	-5054583.096	3275504.275	-2091539.033	2009/10/03

2127	-4993294.701	2668237.716	-2928746.745	2009/10/03	
2127	0.017 m	0.006 m	0.005 m		RMS

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
mobs	-37-49 -45.8703	144 58 31.2199	40.588	35.998	
tidb	-35-23 -57.1283	148 58 47.9969	665.343	646.180	
tow2	-19-16 -9.3997	147 3 20.4817	88.130	30.083	
2127	-27-30 -37.1866	151 52 53.5811	565.473	523.865	
2127	0.004 m	0.008 m	0.018 m		RMS

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

	Height(m)	Antenna Offsets(m)			
Station	Up	East	North	Up	yyyy/mm/dd
2127	1.5250	0.0000	0.0009	0.1039	2009/10/02
2127	1.5250	-0.0000	0.0009	0.1039	2009/10/03

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
2127	-0.004	-0.012	0.006	2009/10/02
2127	-0.037	-0.021	0.007	2009/10/03

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
2127	0.009	0.006	0.006	2009/10/02
2127	0.009	0.004	0.004	2009/10/03

5.4 Coordinate Value - Cartesian, ITRF2005, per day

	X(m)	Y(m)	Z(m)	ITRF2005 @
2127	-4993294.682	2668237.709	-2928746.738	2009/10/02
2127	-4993294.716	2668237.720	-2928746.748	2009/10/03

5.5 Geodetic, GRS80 Ellipsoid, ITRF2005, per day

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	
2127	-27-30 -37.1867	151 52 53.5811	565.453	2009/10/02
2127	-27-30 -37.1864	151 52 53.5813	565.488	2009/10/03

5.6 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
mobs	0.0064	2792	0 %	2009-10-02
tidb	0.0055	2860	0 %	2009-10-02
tow2	0.0063	2881	0 %	2009-10-02
2127	0.0061	8533	0 %	2009-10-02
mobs	0.0083	5919	0 %	2009-10-03
tidb	0.0085	6068	2 %	2009-10-03
tow2	0.0088	6000	0 %	2009-10-03
2127	0.0085	17987	1 %	2009-10-03

112810 - 12 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
21272750.09o	TRM_R8_GNSS	1.5250	2009-10-02 20:07:00	2009-10-03 08:05:00

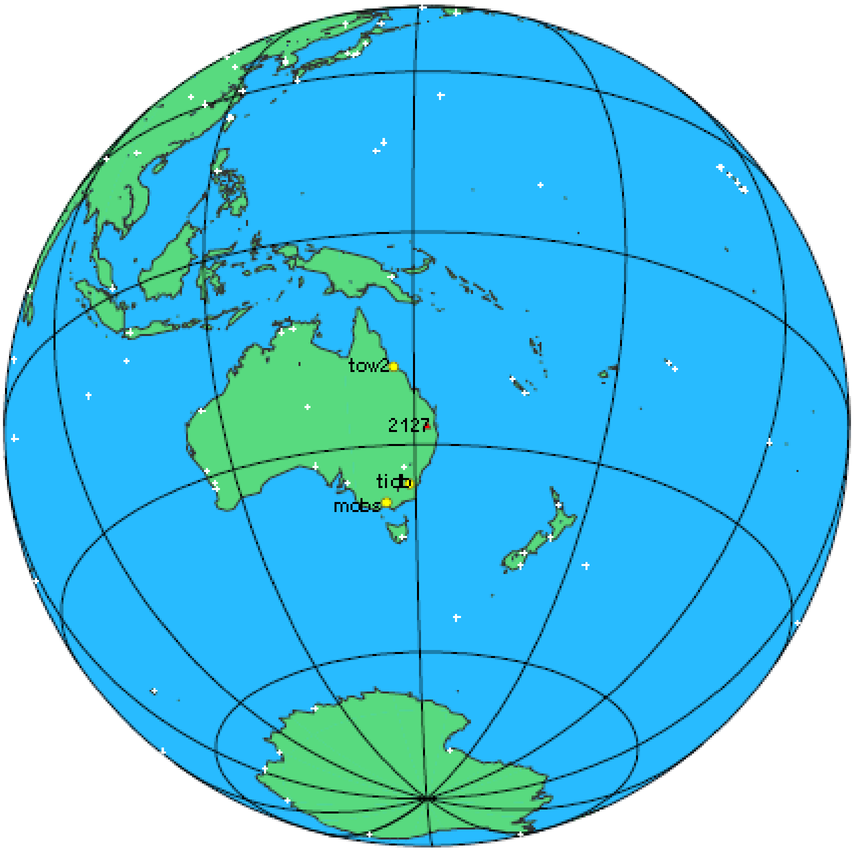


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-10-02	tidb tow2 mobs	2127	IGS Rapid
2009-10-03	tidb tow2 mobs	2127	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session and to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
mobs	-4130635.782	2894953.108	-3890531.459	GDA94
tidb	-4460996.063	2682557.139	-3674443.868	GDA94
tow2	-5054582.669	3275504.568	-2091539.894	GDA94
2127	-4993294.247	2668287.906	-2928747.544	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
mobs	-37-49 -45.8989	144 58 31.2064	40.673	35.726	GDA94
tidb	-35-23 -57.1563	148 58 47.9843	665.430	646.145	GDA94
tow2	-19-16 -9.4283	147 3 20.4654	88.227	30.138	GDA94
2127	-27-30 -37.2142	151 52 53.5673	565.566	523.386	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
mobs	321819.585	5811180.087	55	40.673	35.726	GDA94
tidb	679807.854	6080884.470	55	665.430	646.145	GDA94
tow2	505851.330	7869375.315	55	88.227	30.138	GDA94
2127	389533.693	6956540.085	56	565.566	523.386	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
mobs	-4130636.359	2894953.105	-3890530.712	2009/10/03
tidb	-4460996.594	2682557.087	-3674443.115	2009/10/03
tow2	-5054583.096	3275504.275	-2091539.033	2009/10/03

^

2127	-4993294.697	2668237.718	-2928746.747	2009/10/03
2127	0.014 m	0.007 m	0.007 m	RMS

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
mobs	-37-49 -45.8703	144 58 31.2199	40.588	35.998	
tidb	-35-23 -57.1283	148 58 47.9969	665.343	646.180	
tow2	-19-16 -9.3997	147 3 20.4817	88.130	30.083	
2127	-27-30 -37.1867	151 52 53.5810	565.472	523.864	
2127	0.002 m	0.002 m	0.017 m		RMS

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %;

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

	Height(m)	Antenna Offsets(m)			
Station	Up	East	North	Up	yyyy/mm/dd
2127	1.5250	0.0000	0.0009	0.1039	2009/10/02
2127	1.5250	0.0000	0.0009	0.1039	2009/10/03

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
2127	-0.004	-0.012	0.006	2009/10/02
2127	-0.024	-0.015	0.002	2009/10/03

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
2127	0.009	0.006	0.006	2009/10/02
2127	0.008	0.004	0.004	2009/10/03

5.4 Coordinate Value - Cartesian, ITRF2005, per day

	X(m)	Y(m)	Z(m)	ITRF2005 @
2127	-4993294.682	2668237.709	-2928746.738	2009/10/02
2127	-4993294.709	2668237.722	-2928746.751	2009/10/03

5.5 Geodetic, GRS80 Ellipsoid, ITRF2005, per day

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	
2127	-27-30 -37.1867	151 52 53.5811	565.453	2009/10/02
2127	-27-30 -37.1866	151 52 53.5811	565.485	2009/10/03

5.6 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
mobs	0.0064	2792	0 %	2009-10-02
tidb	0.0055	2860	0 %	2009-10-02
tow2	0.0063	2881	0 %	2009-10-02
2127	0.0061	8533	0 %	2009-10-02
mobs	0.0081	7284	1 %	2009-10-03
tidb	0.0081	7521	2 %	2009-10-03
tow2	0.0089	7529	0 %	2009-10-03
2127	0.0084	22334	1 %	2009-10-03

Appendix F.8 PSM 112922 Processing Reports

112922 - 1 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
15742721.09o	TRM_R8_GNSS	1.7550	2009-09-29 07:16:59	2009-09-29 08:19:00

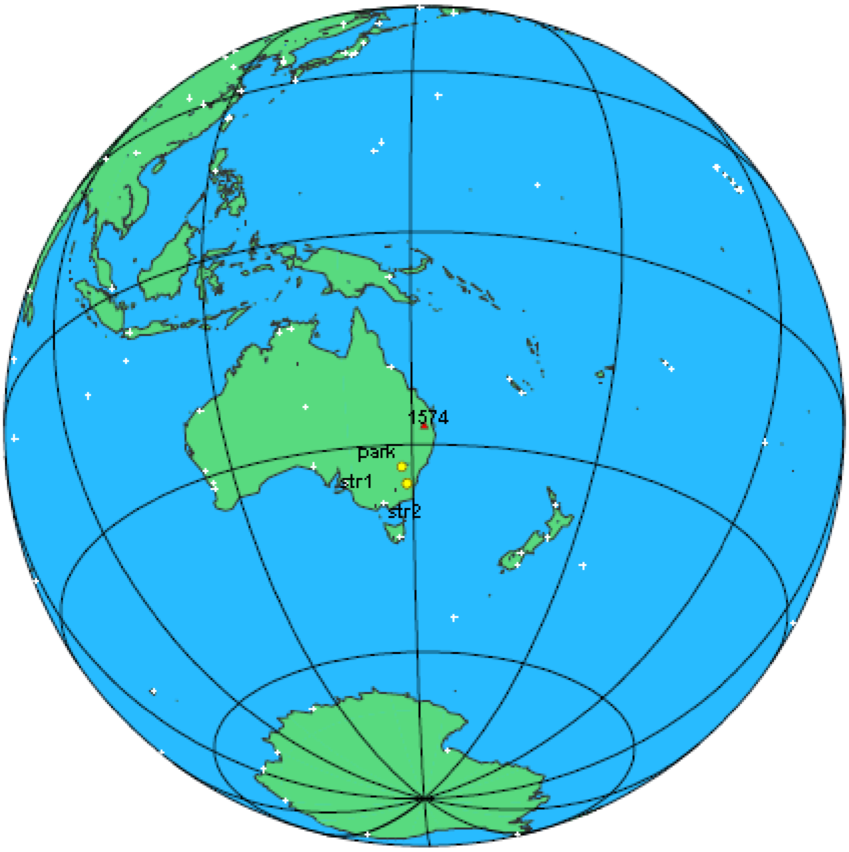


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-09-29	park str1 str2	1574	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.311	2816652.547	-3454060.946	GDA94
str2	-4467074.352	2683011.906	-3667008.281	GDA94
1574	-4993905.549	2666996.896	-2928915.336	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.287	GDA94
1574	-27-30 -42.7322	151 53 43.9415	602.664	560.469	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str2	682733.893	6090040.859	55	802.574	783.287	GDA94
1574	390917.335	6956382.672	56	602.664	560.469	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.832	2816652.459	-3454060.171	2009/09/29
str2	-4467074.882	2683011.852	-3667007.527	2009/09/29
1574	-4993905.998	2666996.708	-2928914.540	2009/09/29

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)
park	-32-59 -55.5537	148 15 52.6028	397.358	374.691
str2	-35-18 -58.1712	149 0 36.5601	802.486	783.241
1574	-27-30 -42.7046	151 53 43.9552	602.569	560.950

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

	Height(m)	Antenna Offsets(m)			
Station	Up	East	North	Up	yyyy/mm/dd
1574	1.7550	0.0000	0.0009	0.1039	2009/09/29

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
1574	-0.145	0.250	-0.059	2009/09/29

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
1574	0.060	0.101	0.029	2009/09/29

5.4 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0043	803	0 %	2009-09-29
str2	0.0039	840	0 %	2009-09-29
1574	0.0041	1643	0 %	2009-09-29

112922 - 2 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
74492730.09o	TRM_R8_GNSS	1.7630	2009-09-30 05:32:00	2009-09-30 07:32:59

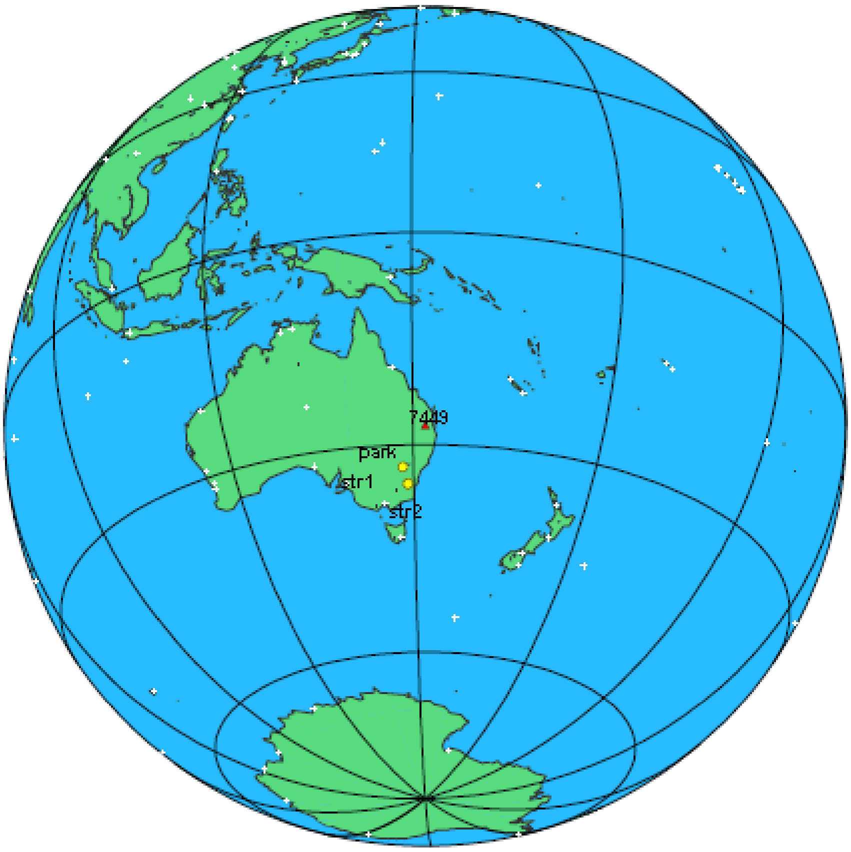


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-09-30	park str1 str2	7449	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.311	2816652.547	-3454060.945	GDA94
str1	-4467102.300	2683089.534	-3666949.984	GDA94
str2	-4467074.352	2683011.906	-3667008.281	GDA94
7449	-4993905.546	2666996.765	-2928915.308	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.172	GDA94
str1	-35-18 -55.9396	149 0 36.1796	800.031	780.694	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.287	GDA94
7449	-27-30 -42.7323	151 53 43.9456	602.594	560.399	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.172	GDA94
str1	682726.014	6090110.067	55	800.031	780.694	GDA94
str2	682733.893	6090040.859	55	802.574	783.287	GDA94
7449	390917.449	6956382.069	56	602.594	560.399	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.882	2816652.459	-3454060.170	2009/09/30
str1	-4467102.830	2683089.480	-3666949.230	2009/09/30
str2	-4467074.882	2683011.852	-3667007.527	2009/09/30
7449	-4993905.996	2666996.577	-2928914.511	2009/09/30

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)
park	-32-59 -55.5536	148 15 52.6028	397.358	374.691
str1	-35-18 -55.9117	149 0 36.1922	799.943	780.698
str2	-35-18 -58.1712	149 0 36.5601	802.486	783.241
7449	-27-30 -42.7048	151 53 43.9594	602.499	560.880

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

Station	Height(m) Up	Antenna Offsets(m) East	North	Up	yyyy/mm/dd
7449	1.7630	-0.0000	0.0009	0.1039	2009/09/30

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
7449	-0.081	0.009	-0.016	2009/09/30

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
7449	0.011	0.011	0.009	2009/09/30

5.4 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0046	1486	2 %	2009-09-30
str1	0.0042	14r5	0 %	2009-09-30
str2	0.0045	14r1	0 %	2009-09-30
7449	0.0044	4412	1 %	2009-09-30

112922 - 4 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
74492710.09o	TRM_R8_GNSS	1.6720	2009-09-28 02:20:00	2009-09-28 06:36:00

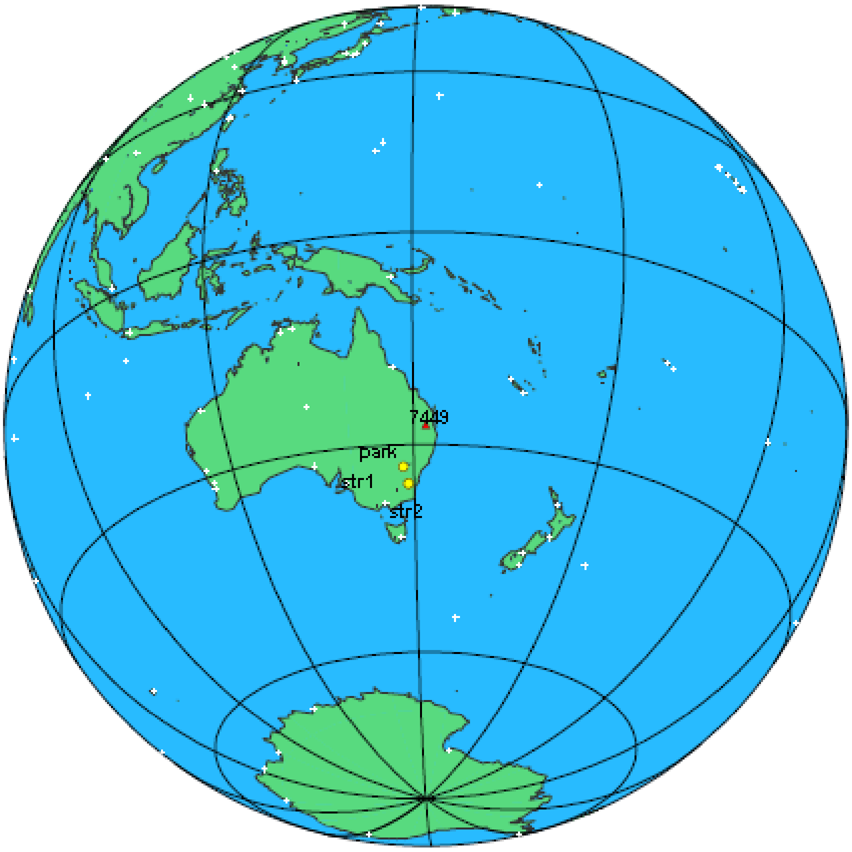


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-09-28	park str1 str2	7449	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
str1	-4467102.300	2683089.534	-3666949.984	GDA94
str2	-4467074.352	2683011.906	-3667008.281	GDA94
7449	-4993905.567	2606996.706	-2928915.318	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
str1	-35-18 -55.9396	149 0 36.1796	800.031	780.694	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.237	GDA94
7449	-27-30 -42.7324	151 53 43.9460	602.615	560.420	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
str1	682726.014	6090110.068	55	800.031	780.694	GDA94
str2	682733.893	6090040.859	55	802.574	783.237	GDA94
7449	390917.458	6956382.068	56	602.615	560.420	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
str1	-4467102.830	2683089.480	-3666949.230	2009/09/28
str2	-4467074.882	2683011.852	-3667007.527	2009/09/28
7449	-4993906.016	2606996.578	-2928914.522	2009/09/28

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)
str1	-35-18 -55.9117	149 0 36.1922	799.943	780.698
str2	-35-18 -58.1712	149 0 36.5601	802.486	783.241
7449	-27-30 -42.7048	151 53 43.9597	602.521	560.902

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

	Height(m)	Antenna Offsets(m)			
Station	Up	East	North	Up	yyyy/mm/dd
7449	1.6720	-0.0000	0.0009	0.1039	2009/09/28

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
7449	-0.024	-0.028	-0.015	2009/09/28

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
7449	0.020	0.014	0.014	2009/09/28

5.4 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
str1	0.0053	1815	4 %	2009-09-28
str2	0.0058	2429	7 %	2009-09-28
7449	0.0056	4304	6 %	2009-09-28

112922 - 6 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
74492700.09o	TRM_R8_GNSS	1.6720	2009-09-27 20:07:00	2009-09-28 02:18:00

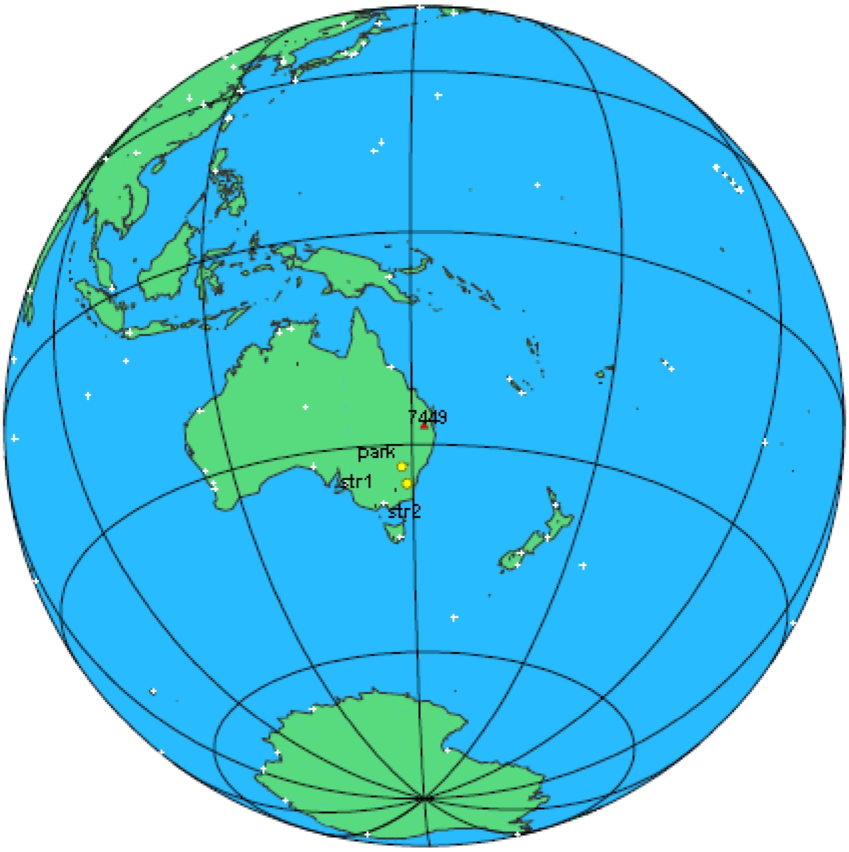


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-09-27	park str1 str2	7449	IGS Rapid
2009-09-28	park str1 str2	7449	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session and to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.312	2816652.547	-3454060.946	GDA94
str1	-4467102.301	2683089.534	-3666949.983	GDA94
str2	-4467074.352	2683011.906	-3667008.280	GDA94
7449	-4993905.580	2666996.813	-2928915.319	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str1	-35-18 -55.9396	149 0 36.1796	800.031	780.694	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.237	GDA94
7449	-27-30 -42.7319	151 53 43.9447	602.646	560.451	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str1	682726.014	6090110.668	55	800.031	780.694	GDA94
str2	682733.893	6090040.859	55	802.574	783.237	GDA94
7449	390917.423	6956382.683	56	602.646	560.451	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.832	2816652.459	-3454060.171	2009/09/27
str1	-4467102.830	2683089.480	-3666949.230	2009/09/28
str2	-4467074.882	2683011.852	-3667007.527	2009/09/28

7449	-4993906.080	2666996.625	-2928914.528	2009/09/28	
7449	0.003 m	0.005 m	0.008 m		RMS

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5537	148 15 52.6023	397.358	374.691	
str1	-35-18 -55.9117	149 0 36.1922	799.943	780.698	
str2	-35-18 -58.1712	149 0 36.5601	802.486	783.241	
7449	-27-30 -42.7043	151 53 43.9584	602.551	560.982	
7449	0.009 m	0.008 m	0.001 m		RMS

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

Station	Height(m) Up	Antenna Offsets(m) East	North	Up	yyyy/mm/dd
7449	1.6720	-0.0000	0.0009	0.1039	2009/09/27
7449	1.6720	0.0000	0.0009	0.1039	2009/09/28

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
7449	0.031	-0.036	0.009	2009/09/27
7449	0.019	-0.012	0.020	2009/09/28

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
7449	0.013	0.011	0.008	2009/09/27
7449	0.012	0.007	0.007	2009/09/28

5.4 Coordinate Value - Cartesian, ITRF2005, per day

	X(m)	Y(m)	Z(m)	ITRF2005 @
7449	-4993906.026	2666996.619	-2928914.531	2009/09/27
7449	-4993906.082	2666996.628	-2928914.516	2009/09/28

5.5 Geodetic, GRS80 Ellipsoid, ITRF2005, per day

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	
7449	-27-30 -42.7047	151 53 43.9586	602.550	2009/09/27
7449	-27-30 -42.7041	151 53 43.9584	602.551	2009/09/28

5.6 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0050	1841	11 %	2009-09-27
str1	0.0050	2002	0 %	2009-09-27
str2	0.0055	2852	0 %	2009-09-27
7449	0.0052	6295	3 %	2009-09-27
str1	0.0047	1517	21 %	2009-09-28
str2	0.0046	1954	0 %	2009-09-28
7449	0.0046	3471	10 %	2009-09-28

112922 - 8 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
15742680.09o	TRM_R8_GNSS	1.4680	2009-09-25 21:33:59	2009-09-26 05:38:00

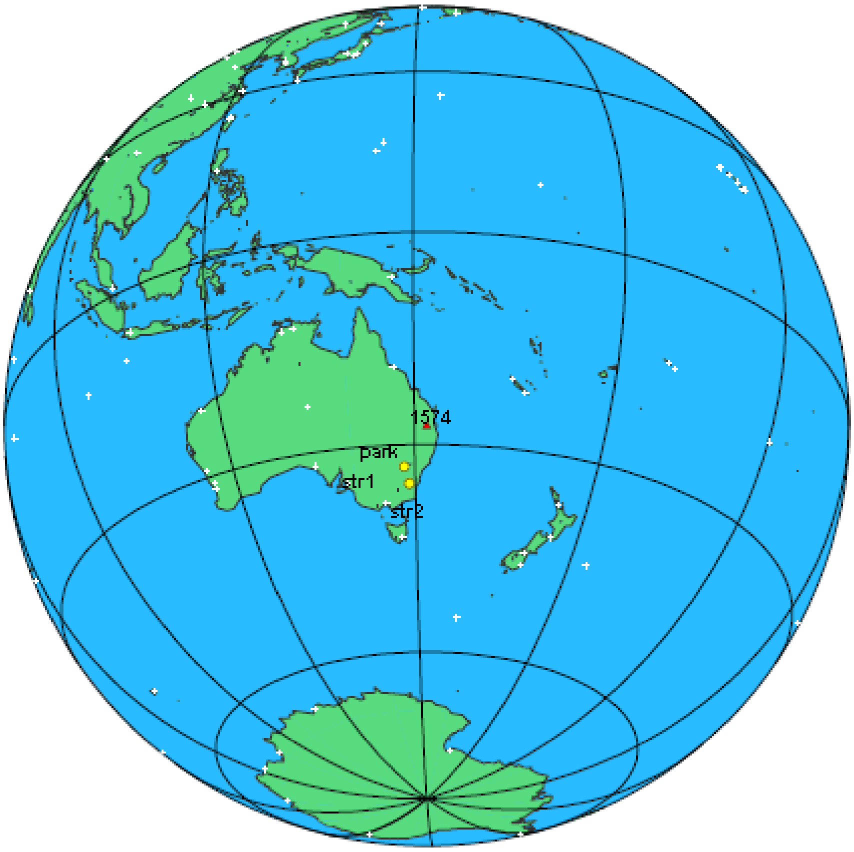


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-09-25	park str1 str2	1574	IGS Rapid
2009-09-26	park str1 str2	1574	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session and to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
str1	-4467102.301	2683089.534	-3666949.983	GDA94
str2	-4467074.353	2683011.906	-3667008.281	GDA94
1574	-4993905.564	2666996.805	-2928915.328	GDA94
park	-4554254.312	2816652.547	-3454060.945	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
str1	-35-18 -55.9396	149 0 36.1796	800.031	780.694	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.575	783.238	GDA94
1574	-27-30 -42.7323	151 53 43.9446	602.631	560.436	GDA94
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
str1	682726.015	6090110.068	55	800.031	780.694	GDA94
str2	682733.893	6090040.859	55	802.575	783.238	GDA94
1574	390917.422	6956382.671	56	602.631	560.436	GDA94
park	618139.981	6348138.984	55	397.447	374.173	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
str1	-4467102.830	2683089.480	-3666949.230	2009/09/26
str2	-4467074.882	2683011.852	-3667007.528	2009/09/26
1574	-4993906.013	2666996.618	-2928914.527	2009/09/26

1574	0.023 m	0.008 m	0.019 m	RMS
park	-4554254.832	2816652.459	-3454060.171	2009/09/26

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
str1	-35-18 -55.9117	149 0 36.1922	799.943	780.698	
str2	-35-18 -58.1712	149 0 36.5601	802.487	783.242	
1574	-27-30 -42.7047	151 53 43.9584	602.537	560.918	
1574	0.008 m	0.013 m	0.025 m		RMS
park	-32-59 -55.5537	148 15 52.6023	397.358	374.691	

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

	Height(m)	Antenna Offsets(m)			
Station	Up	East	North	Up	yyyy/mm/dd
1574	1.4680	0.0000	0.0009	0.1039	2009/09/25
1574	1.4680	0.0000	0.0009	0.1039	2009/09/26

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
1574	0.012	-0.006	-0.001	2009/09/25
1574	-0.052	-0.167	0.084	2009/09/26

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
1574	0.018	0.010	0.010	2009/09/25
1574	0.016	0.016	0.008	2009/09/26

5.4 Coordinate Value - Cartesian, ITRF2005, per day

	X(m)	Y(m)	Z(m)	ITRF2005 @
1574	-4993905.988	2666996.619	-2928914.505	2009/09/25
1574	-4993906.083	2666996.614	-2928914.541	2009/09/26

5.5 Geodetic, GRS80 Ellipsoid, ITRF2005, per day

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	
1574	-27-30 -42.7044	151 53 43.9579	602.508	2009/09/25
1574	-27-30 -42.7049	151 53 43.9588	602.557	2009/09/26

5.6 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
str1	0.0051	1777	0 %	2009-09-25
str2	0.0049	1784	0 %	2009-09-25
1574	0.0050	3561	0 %	2009-09-25
park	0.0079	2956	2 %	2009-09-26
str1	0.0078	2755	1 %	2009-09-26
str2	0.0080	2960	1 %	2009-09-26
1574	0.0079	8671	1 %	2009-09-26

112922 - 10 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
74492690.09o	TRM_R8_GNSS	1.6050	2009-09-26 21:08:59	2009-09-27 07:03:59

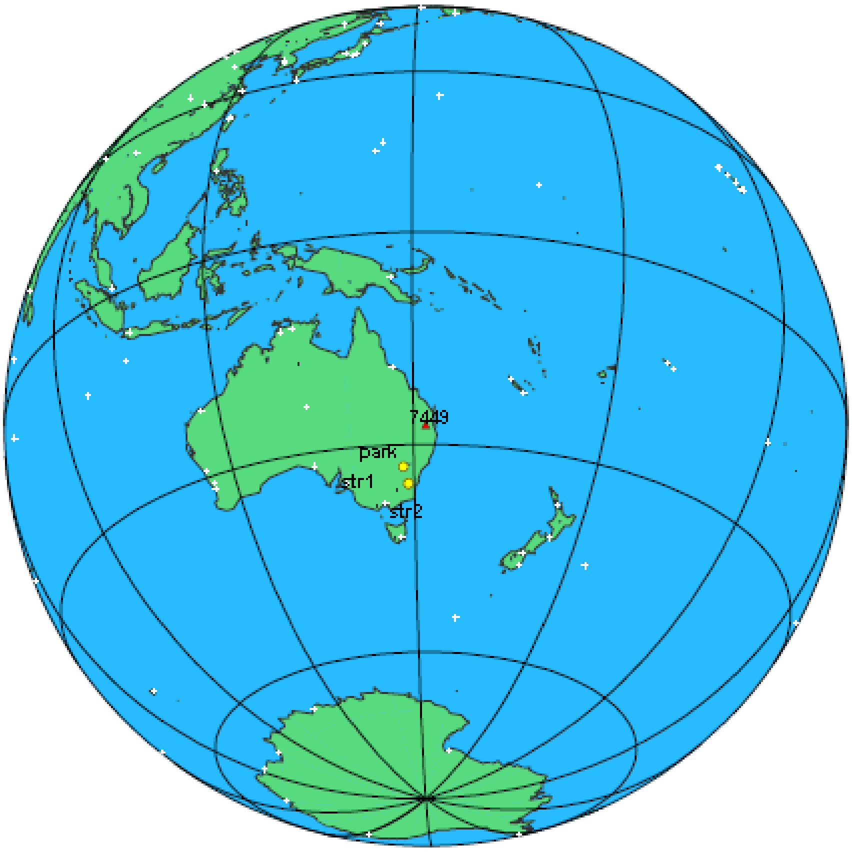


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-09-26	park str1 str2	7449	IGS Rapid
2009-09-27	park str1 str2	7449	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.312	2816652.547	-3454060.945	GDA94
str1	-4467102.301	2683089.534	-3666949.983	GDA94
str2	-4467074.353	2683011.906	-3667008.281	GDA94
7449	-4993905.568	2666996.800	-2928915.329	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str1	-35-18 -55.9396	149 0 36.1796	800.031	780.694	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.238	GDA94
7449	-27-30 -42.7324	151 53 43.9449	602.635	560.440	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str1	682726.015	6090110.068	55	800.031	780.694	GDA94
str2	682733.893	6090040.859	55	802.574	783.238	GDA94
7449	390917.428	6956382.066	56	602.635	560.440	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.832	2816652.459	-3454060.171	2009/09/27
str1	-4467102.830	2683089.480	-3666949.230	2009/09/27
str2	-4467074.882	2683011.852	-3667007.527	2009/09/27

7449	-4993906.017	2666996.612	-2928914.534	2009/09/27	
7449	0.056 m	0.016 m	0.081 m		RMS

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5537	148 15 52.6028	397.358	374.691	
str1	-35-18 -55.9117	149 0 36.1922	799.943	780.698	
str2	-35-18 -58.1712	149 0 36.5601	802.486	783.241	
7449	-27-30 -42.7049	151 53 43.9586	602.541	560.922	
7449	0.002 m	0.013 m	0.065 m		RMS

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

Station	Height(m) Up	Antenna Offsets(m) East	North	Up	yyyy/mm/dd
7449	1.6050	0.0000	0.0009	0.1039	2009/09/26
7449	1.6050	-0.0000	0.0009	0.1039	2009/09/27

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
7449	0.021	-0.019	0.084	2009/09/26
7449	0.004	-0.037	0.082	2009/09/27

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
7449	0.024	0.014	0.017	2009/09/26
7449	0.007	0.007	0.007	2009/09/27

5.4 Coordinate Value - Cartesian, ITRF2005, per day

	X(m)	Y(m)	Z(m)	ITRF2005 @
7449	-4993906.097	2666996.634	-2928914.577	2009/09/26
7449	-4993906.011	2666996.607	-2928914.526	2009/09/27

5.5 Geodetic, GRS80 Ellipsoid, ITRF2005, per day

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	
7449	-27-30 -42.7049	151 53 43.9598	602.632	2009/09/26
7449	-27-30 -42.7048	151 53 43.9587	602.530	2009/09/27

5.6 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0088	939	17 %	2009-09-26
str1	0.0063	1721	9 %	2009-09-26
str2	0.0056	1096	10 %	2009-09-26
7449	0.0067	4356	12 %	2009-09-26
park	0.0072	4964	4 %	2009-09-27
str1	0.0072	4976	2 %	2009-09-27
str2	0.0062	4817	5 %	2009-09-27
7449	0.0069	14657	3 %	2009-09-27

112922 - 12 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
15742662.09o	TRM_R8_GNSS	1.6970	2009-09-23 20:51:00	2009-09-24 08:32:00

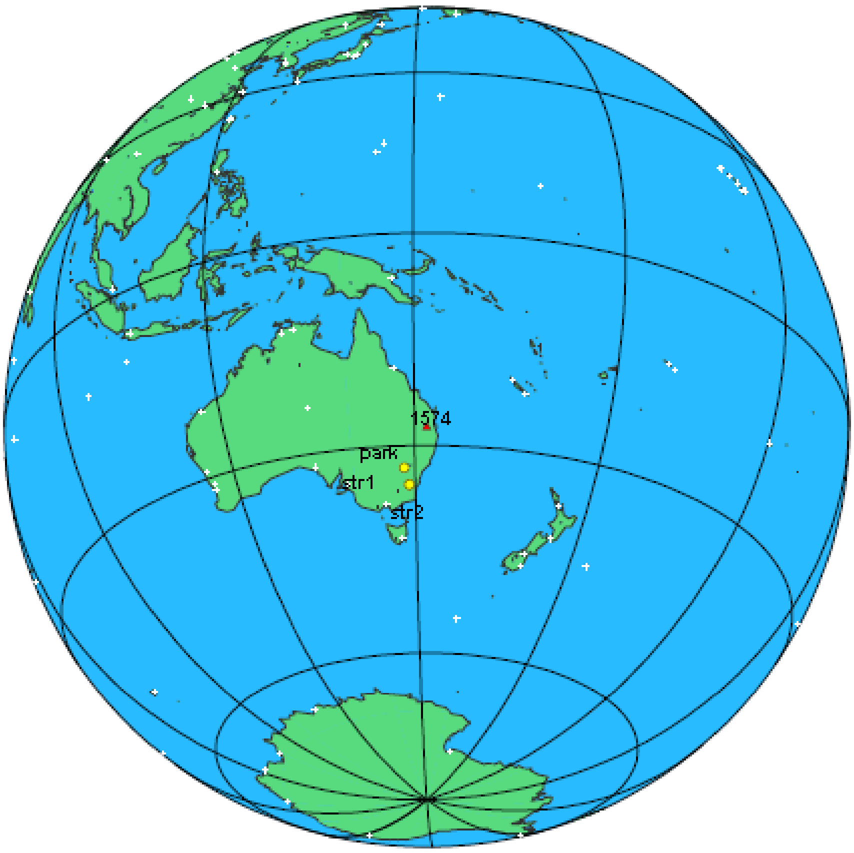


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-09-23	park str1 str2	1574	IGS Rapid
2009-09-24	park str1 str2	1574	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.312	2816652.547	-3454060.946	GDA94
str1	-4467102.301	2683089.534	-3666949.983	GDA94
str2	-4467074.352	2683011.906	-3667008.281	GDA94
1574	-4993905.594	2666996.827	-2928915.337	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str1	-35-18 -55.9396	149 0 36.1796	800.031	780.694	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.237	GDA94
1574	-27-30 -42.7321	151 53 43.9444	602.670	560.475	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str1	682726.015	6090110.668	55	800.031	780.694	GDA94
str2	682733.893	6090040.859	55	802.574	783.237	GDA94
1574	390917.416	6956382.676	56	602.670	560.475	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.832	2816652.459	-3454060.171	2009/09/24
str1	-4467102.830	2683089.480	-3666949.230	2009/09/24
str2	-4467074.881	2683011.852	-3667007.528	2009/09/24

1574	-4993906.043	2606996.640	-2928914.541	2009/09/24	
1574	0.019 m	0.010 m	0.005 m		RMS

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5537	148 15 52.6028	397.358	374.691	
str1	-35-18 -55.9117	149 0 36.1922	799.943	780.698	
str2	-35-18 -58.1712	149 0 36.5601	802.486	783.241	
1574	-27-30 -42.7046	151 53 43.9582	602.576	560.957	
1574	0.006 m	0.001 m	0.021 m		RMS

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

	Height(m)	Antenna Offsets(m)			
Station	Up	East	North	Up	yyyy/mm/dd
1574	1.6970	0.0000	0.0009	0.1039	2009/09/23
1574	1.6970	0.0000	0.0009	0.1039	2009/09/24

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
1574	0.016	-0.004	0.006	2009/09/23
1574	0.028	-0.016	0.018	2009/09/24

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
1574	0.013	0.008	0.005	2009/09/23
1574	0.006	0.003	0.003	2009/09/24

5.4 Coordinate Value - Cartesian, ITRF2005, per day

	X(m)	Y(m)	Z(m)	ITRF2005 @
1574	-4993906.069	2606996.654	-2928914.548	2009/09/23
1574	-4993906.037	2606996.637	-2928914.539	2009/09/24

5.5 Geodetic, GRS80 Ellipsoid, ITRF2005, per day

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	
1574	-27-30 -42.7043	151 53 43.9581	602.606	2009/09/23
1574	-27-30 -42.7046	151 53 43.9581	602.569	2009/09/24

5.6 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0053	2349	3 %	2009-09-23
str1	0.0048	3653	5 %	2009-09-23
str2	0.0053	3742	2 %	2009-09-23
1574	0.0051	9744	3 %	2009-09-23
park	0.0059	8319	1 %	2009-09-24
str1	0.0061	8356	0 %	2009-09-24
str2	0.0066	8337	0 %	2009-09-24
1574	0.0062	25012	0 %	2009-09-24

Appendix F.9 PSM 112929 Processing Reports

112929 - 1 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
2127277E.09o	TRM_R8_GNSS	1.5890	2009-10-04 19:50:59	2009-10-04 20:56:00

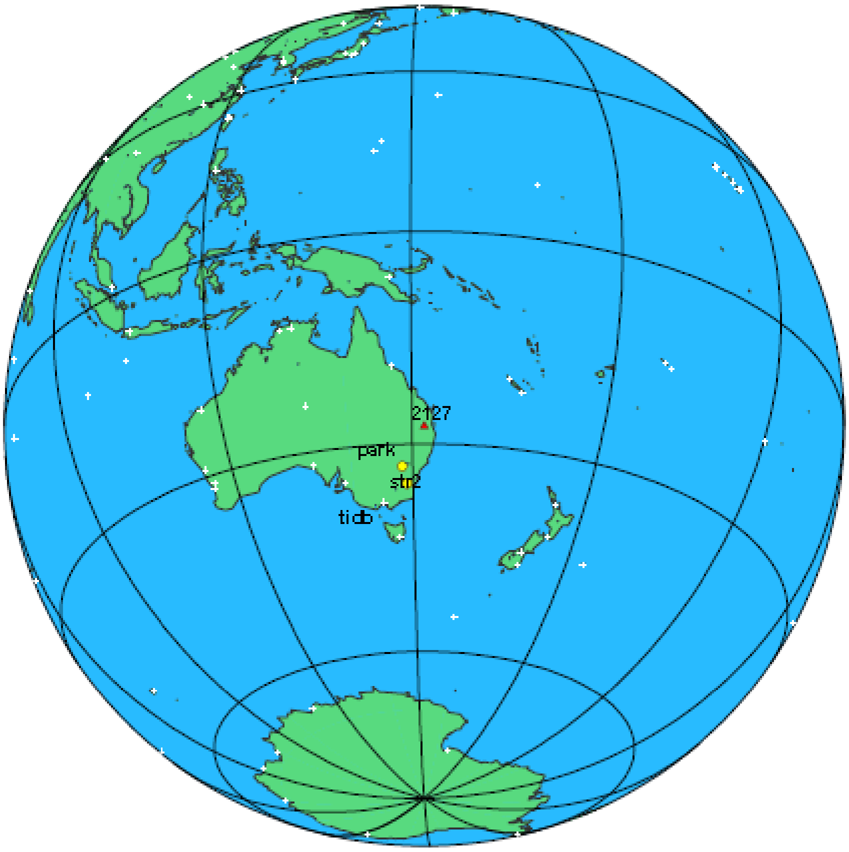


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-10-04	park str2 tidb	2127	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.312	2816652.547	-3454060.946	GDA94
str2	-4467074.353	2683011.906	-3667008.280	GDA94
tidb	-4460996.063	2682557.139	-3674443.868	GDA94
2127	-4989808.094	2667491.733	-2936174.896	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.287	GDA94
tidb	-35-23 -57.1562	148 58 47.9843	665.430	646.144	GDA94
2127	-27-35 -9.3000	151 52 8.9826	567.991	526.045	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str2	682733.893	6090040.859	55	802.574	783.287	GDA94
tidb	679807.854	6080884.470	55	665.430	646.144	GDA94
2127	388386.847	6948156.286	56	567.991	526.045	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.883	2816652.459	-3454060.170	2009/10/04
str2	-4467074.883	2683011.852	-3667007.526	2009/10/04
tidb	-4460996.594	2682557.087	-3674443.114	2009/10/04
2127	-4989808.545	2667491.546	-2936174.100	2009/10/04

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)
park	-32-59 -55.5536	148 15 52.6028	397.358	374.691
str2	-35-18 -58.1711	149 0 36.5601	802.486	783.241
tidb	-35-23 -57.1283	148 58 47.9969	665.342	646.179
2127	-27-35 -9.2724	151 52 8.9964	567.896	526.525

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %;

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

Station	Height(m) Up	Antenna Offsets(m) East	North	Up	yyyy/mm/dd
2127	1.5890	0.0000	0.0009	0.1039	2009/10/04

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
2127	0.043	0.011	0.048	2009/10/04

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
2127	0.048	0.036	0.081	2009/10/04

5.4 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0048	650	0 %	2009-10-04
str2	0.0044	650	0 %	2009-10-04
tidb	0.0051	650	0 %	2009-10-04
2127	0.0048	1950	0 %	2009-10-04

112929 - 2 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
2127277E.09o	TRM_R8_GNSS	1.5890	2009-10-04 19:50:59	2009-10-04 21:52:00

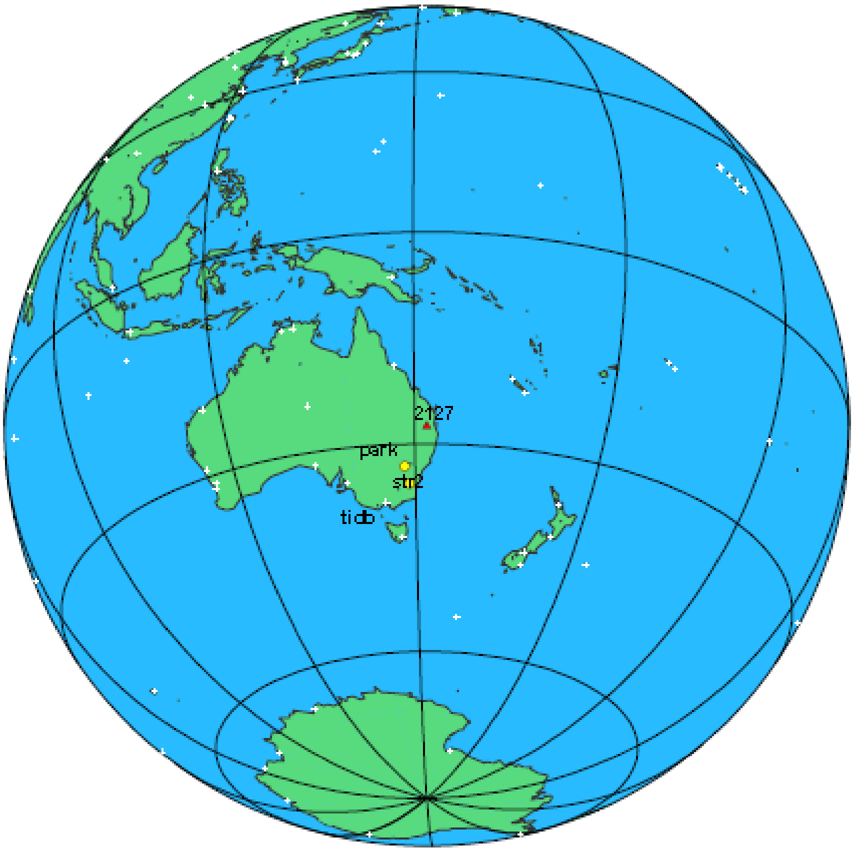


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-10-04	park str2 tidb	2127	IGS Ultra-Rapid

Warning: An IGS Ultra-Rapid orbit product has been used in this computation. For improved results please resubmit approximately 2 days after the observation session and to ensure the use of the IGS Rapid orbit product. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session and to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.312	2816652.547	-3454060.946	GDA94
str2	-4467074.353	2683011.906	-3667008.280	GDA94
tidb	-4460996.063	2682557.139	-3674443.868	GDA94
2127	-4989808.082	2667491.697	-2936174.855	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.287	GDA94
tidb	-35-23 -57.1562	148 58 47.9843	665.430	646.144	GDA94
2127	-27-35 -9.2992	151 52 8.9836	567.947	526.001	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str2	682733.893	6090040.859	55	802.574	783.287	GDA94
tidb	679807.854	6080884.470	55	665.430	646.144	GDA94
2127	388386.873	6948156.309	56	567.947	526.001	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.833	2816652.459	-3454060.170	2009/10/04
str2	-4467074.883	2683011.852	-3667007.526	2009/10/04
tidb	-4460996.594	2682557.087	-3674443.114	2009/10/04
2127	-4989808.533	2667491.510	-2936174.059	2009/10/04

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)
park	-32-59 -55.5536	148 15 52.6023	397.358	374.691
str2	-35-18 -58.1711	149 0 36.5601	802.486	783.241
tidb	-35-23 -57.1283	148 58 47.9969	665.342	646.179
2127	-27-35 -9.2716	151 52 8.9973	567.853	526.482

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %;

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

Station	Height(m) Up	Antenna Offsets(m) East	North	Up	yyyy/mm/dd
2127	1.5890	0.0000	0.0009	0.1039	2009/10/04

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
2127	0.083	-0.021	0.017	2009/10/04

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
2127	0.021	0.015	0.008	2009/10/04

5.4 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0051	1275	0 %	2009-10-04
str2	0.0048	1251	0 %	2009-10-04
tidb	0.0051	1249	0 %	2009-10-04
2127	0.0050	3775	0 %	2009-10-04

112929 - 4 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
2127277D.09o	TRM_R8_GNSS	1.5890	2009-10-04 19:50:59	2009-10-04 23:58:00

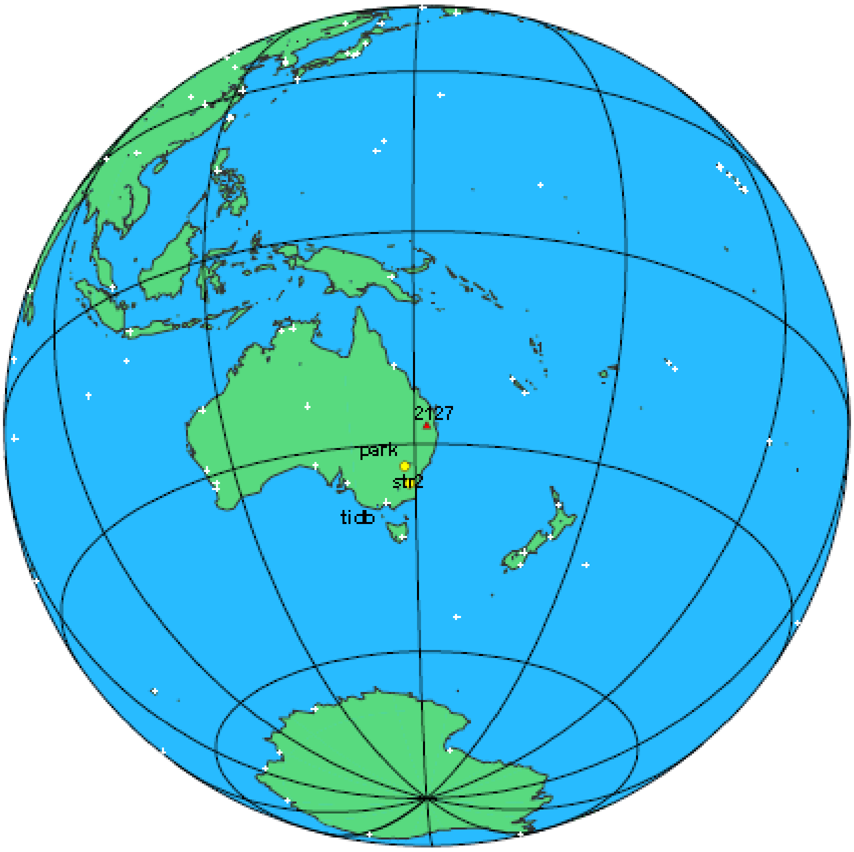


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-10-04	park str2 tidb	2127	IGS Ultra-Rapid

Warning: An IGS Ultra-Rapid orbit product has been used in this computation. For improved results please resubmit approximately 2 days after the observation session end to ensure the use of the IGS Rapid orbit product. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.312	2816652.547	-3454060.946	GDA94
str2	-4467074.353	2683011.906	-3667008.280	GDA94
tidb	-4460996.063	2682557.139	-3674443.868	GDA94
2127	-4989808.069	2667491.692	-2936174.848	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.287	GDA94
tidb	-35-23 -57.1562	148 58 47.9843	665.430	646.144	GDA94
2127	-27-35 -9.2992	151 52 8.9835	567.932	525.986	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str2	682733.893	6090040.859	55	802.574	783.287	GDA94
tidb	679807.854	6080884.470	55	665.430	646.144	GDA94
2127	388386.871	6948156.309	56	567.932	525.986	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.833	2816652.459	-3454060.170	2009/10/04
str2	-4467074.883	2683011.852	-3667007.526	2009/10/04
tidb	-4460996.594	2682557.087	-3674443.114	2009/10/04
2127	-4989808.520	2667491.505	-2936174.052	2009/10/04

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)
park	-32-59 -55.5536	148 15 52.6028	397.358	374.691
str2	-35-18 -58.1711	149 0 36.5601	802.486	783.241
tidb	-35-23 -57.1283	148 58 47.9969	665.342	646.179
2127	-27-35 -9.2716	151 52 8.9973	567.838	526.467

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %;

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

	Height(m)	Antenna Offsets(m)			
Station	Up	East	North	Up	yyyy/mm/dd
2127	1.5890	0.0000	0.0009	0.1039	2009/10/04

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
2127	-0.011	0.028	0.003	2009/10/04

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
2127	0.010	0.007	0.007	2009/10/04

5.4 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0068	2837	3 %	2009-10-04
str2	0.0061	2794	5 %	2009-10-04
tidb	0.0066	2803	5 %	2009-10-04
2127	0.0064	8434	4 %	2009-10-04

112929 - 6 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
2127277C.09o	TRM_R8_GNSS	1.5890	2009-10-04 19:50:59	2009-10-05 02:02:00

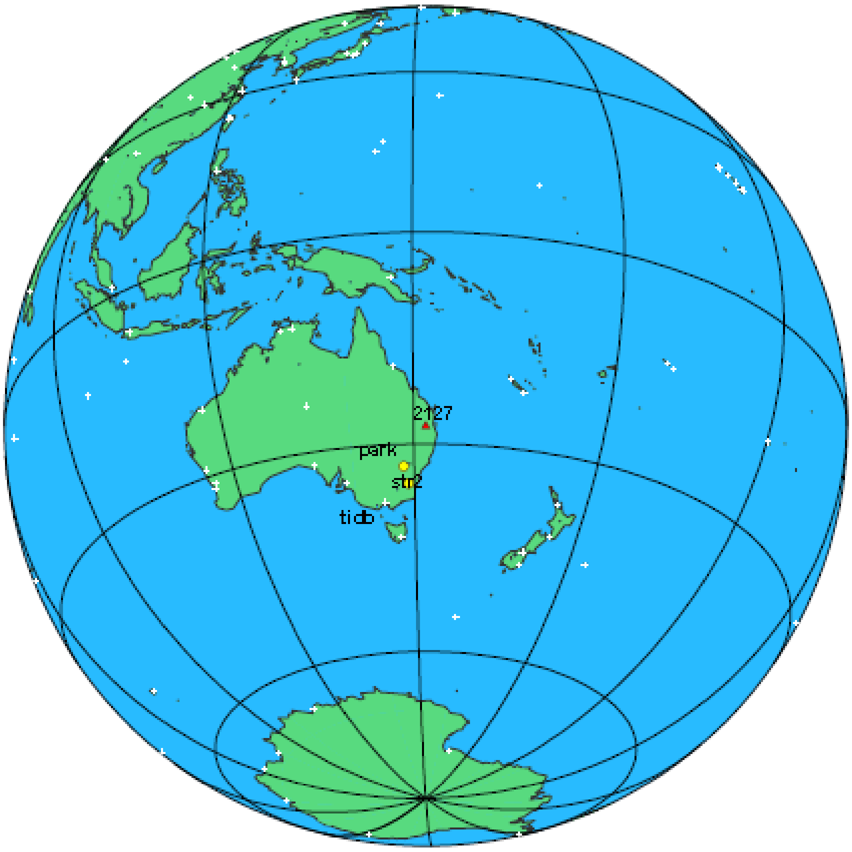


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-10-04	park str2 tidb	2127	IGS Rapid
2009-10-05	park str2 tidb	2127	IGS Ultra-Rapid

Warning: An IGS Ultra-Rapid orbit product has been used in this computation. For improved results please resubmit approximately 2 days after the observation session end to ensure the use of the IGS Rapid orbit product. Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.312	2816652.547	-3454060.946	GDA94
str2	-4467074.353	2683011.906	-3667008.280	GDA94
tidb	-4460996.063	2682557.139	-3674443.868	GDA94
2127	-4989808.066	2667491.699	-2936174.849	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.287	GDA94
tidb	-35-23 -57.1562	148 58 47.9848	665.430	646.144	GDA94
2127	-27-35 -9.2992	151 52 8.9832	567.932	525.986	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str2	682733.893	6090040.859	55	802.574	783.287	GDA94
tidb	679807.854	6080884.470	55	665.430	646.144	GDA94
2127	388386.864	6948156.309	56	567.932	525.986	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.883	2816652.459	-3454060.170	2009/10/05
str2	-4467074.883	2683011.852	-3667007.526	2009/10/05
tidb	-4460996.594	2682557.087	-3674443.114	2009/10/05
2127	-4989808.517	2667491.512	-2936174.052	2009/10/05
2127	0.012 m	0.002 m	0.006 m	RMS

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5536	148 15 52.6028	397.358	374.691	
str2	-35-18 -58.1711	149 0 36.5601	802.486	783.241	
tidb	-35-23 -57.1283	148 58 47.9969	665.342	646.179	
2127	-27-35 -9.2717	151 52 8.9970	567.838	526.467	
2127	0.001 m	0.007 m	0.012 m		RMS

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

	Height(m)	Antenna Offsets(m)			
Station	Up	East	North	Up	yyyy/mm/dd
2127	1.5890	-0.0000	0.0009	0.1039	2009/10/04
2127	1.5890	0.0000	0.0009	0.1039	2009/10/05

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
2127	-0.016	0.011	0.007	2009/10/04
2127	0.004	0.018	0.005	2009/10/05

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
2127	0.010	0.007	0.007	2009/10/04
2127	0.019	0.012	0.012	2009/10/05

5.4 Coordinate Value - Cartesian, ITRF2005, per day

	X(m)	Y(m)	Z(m)	ITRF2005 @
2127	-4989808.521	2667491.511	-2936174.055	2009/10/04
2127	-4989808.500	2667491.514	-2936174.044	2009/10/05

5.5 Geodetic, GRS80 Ellipsoid, ITRF2005, per day

```
                                               Ellipsoidal
        Latitude(DMS)     Longitude(DMS)      Height(m)
2127  -27-35  -9.2717  151 52   8.9971       567.842 2009/10/04
2127  -27-35  -9.2716  151 52   8.9986       567.822 2009/10/05
```

5.6 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0068	2893	3 %	2009-10-04
str2	0.0062	2860	5 %	2009-10-04
tidb	0.0066	2865	5 %	2009-10-04
2127	0.0066	8618	4 %	2009-10-04
park	0.0079	1680	0 %	2009-10-05
str2	0.0072	1697	0 %	2009-10-05
tidb	0.0077	1696	0 %	2009-10-05
2127	0.0076	5073	0 %	2009-10-05

112929 - 8 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
2127277B.09o	TRM_R8_GNSS	1.5890	2009-10-04 19:50:59	2009-10-05 03:49:00

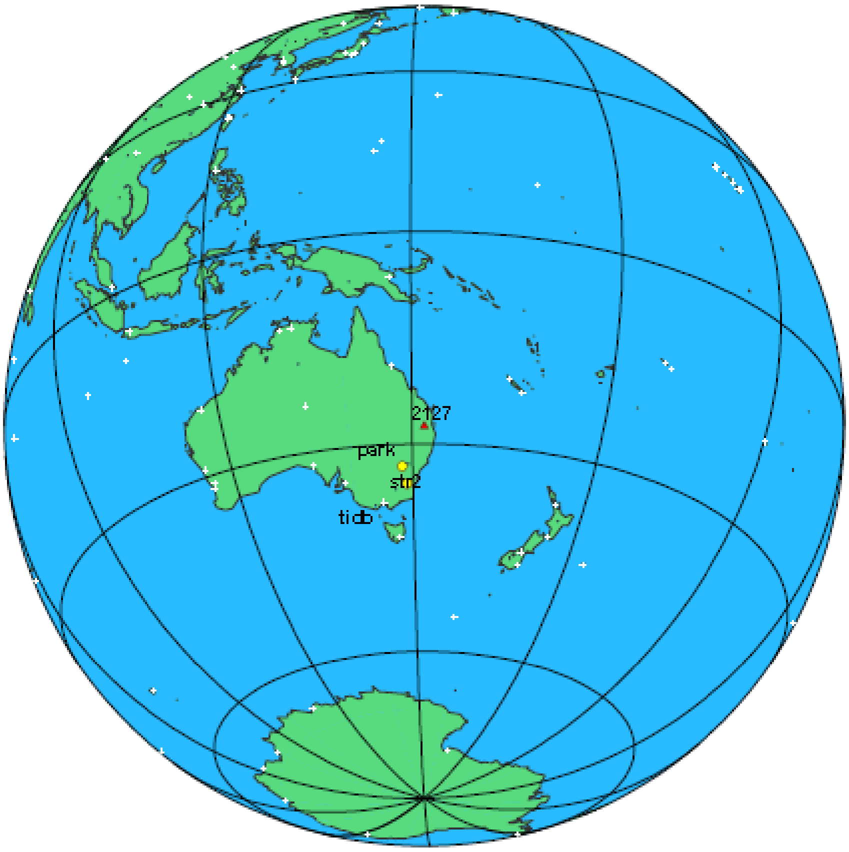


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-10-04	park str2 tidb	2127	IGS Rapid
2009-10-05	park str2 tidb	2127	IGS Ultra-Rapid

Warning: An IGS Ultra-Rapid orbit product has been used in this computation. For improved results please resubmit approximately 2 days after the observation session end to ensure the use of the IGS Rapid orbit product. Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.312	2816652.547	-3454060.946	GDA94
str2	-4467074.353	2683011.906	-3667008.280	GDA94
tidb	-4460996.063	2682557.139	-3674443.868	GDA94
2127	-4989808.069	2667491.698	-2936174.848	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.287	GDA94
tidb	-35-23 -57.1562	148 58 47.9843	665.430	646.144	GDA94
2127	-27-35 -9.2992	151 52 8.9833	567.934	525.987	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str2	682733.893	6090040.859	55	802.574	783.287	GDA94
tidb	679807.854	6080884.470	55	665.430	646.144	GDA94
2127	388386.865	6948156.311	56	567.934	525.987	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @	
park	-4554254.833	2816652.459	-3454060.170	2009/10/05	
str2	-4467074.883	2683011.852	-3667007.526	2009/10/05	
tidb	-4460996.594	2682557.087	-3674443.114	2009/10/05	
2127	-4989808.520	2667491.512	-2936174.051	2009/10/05	
2127	0.002 m	0.001 m	0.005 m		RMS

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5536	148 15 52.6028	397.358	374.691	
str2	-35-18 -58.1711	149 0 36.5601	802.486	783.241	
tidb	-35-23 -57.1283	148 58 47.9969	665.342	646.179	
2127	-27-35 -9.2716	151 52 8.9970	567.839	526.468	
2127	0.003 m	0.001 m	0.003 m		RMS

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

Station	Height(m) Up	Antenna Offsets(m) East	North	Up	yyyy/mm/dd
2127	1.5890	-0.0000	0.0009	0.1039	2009/10/04
2127	1.5890	-0.0000	0.0009	0.1039	2009/10/05

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
2127	-0.016	0.011	0.007	2009/10/04
2127	-0.029	0.027	-0.011	2009/10/05

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
2127	0.010	0.007	0.007	2009/10/04
2127	0.012	0.008	0.008	2009/10/05

5.4 Coordinate Value - Cartesian, ITRF2005, per day

	X(m)	Y(m)	Z(m)	ITRF2005 @
2127	-4989808.521	2667491.511	-2936174.055	2009/10/04
2127	-4989808.517	2667491.512	-2936174.046	2009/10/05

5.5 Geodetic, GRS80 Ellipsoid, ITRF2005, per day

```
                                          Ellipsoidal
     Latitude(DMS)      Longitude(DMS)     Height(m)
2127  -27-35  -9.2717  151 52   8.9971       567.842 2009/10/04
2127  -27-35  -9.2715  151 52   8.9970       567.835 2009/10/05
```

5.6 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0068	2893	3 %	2009-10-04
str2	0.0062	2860	5 %	2009-10-04
tidb	0.0066	2865	5 %	2009-10-04
2127	0.0066	8618	4 %	2009-10-04
park	0.0077	2805	1 %	2009-10-05
str2	0.0074	2867	0 %	2009-10-05
tidb	0.0080	2862	0 %	2009-10-05
2127	0.0077	8534	0 %	2009-10-05

112929 - 10 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
2127277k.09o	TRM_R8_GNSS	1.5890	2009-10-04 19:50:59	2009-10-05 05:49:00

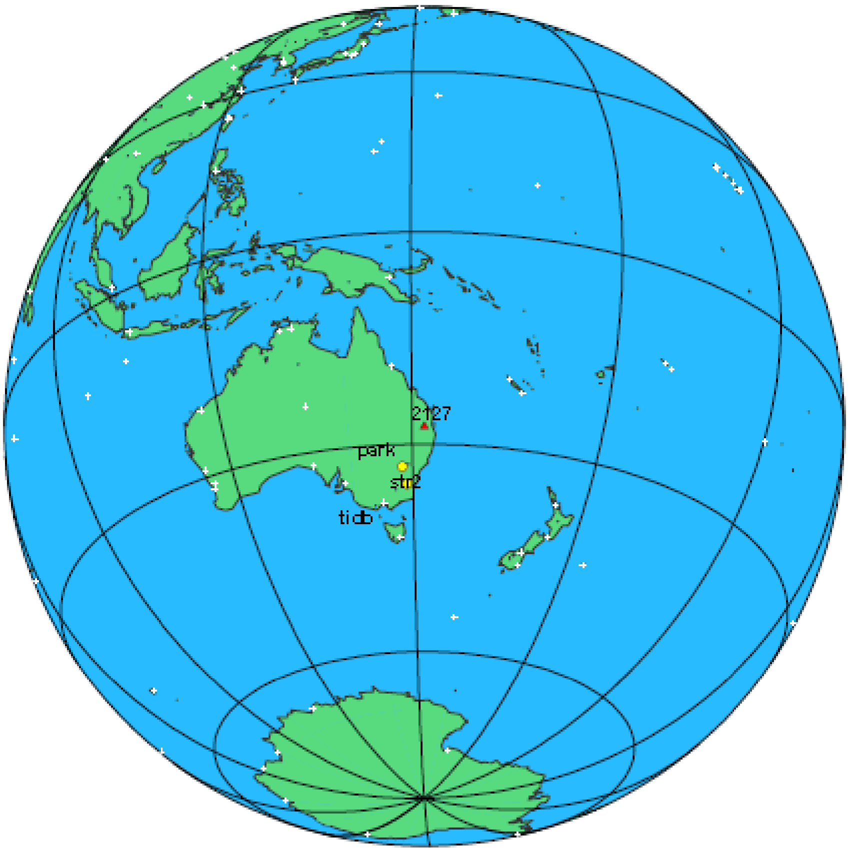


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-10-04	park str2 tidb	2127	IGS Rapid
2009-10-05	park str2 tidb	2127	IGS Ultra-Rapid

Warning: An IGS Ultra-Rapid orbit product has been used in this computation. For improved results please resubmit approximately 2 days after the observation session and to ensure the use of the IGS Rapid orbit product. Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.312	2816652.547	-3454060.946	GDA94
str2	-4467074.353	2683011.906	-3667008.280	GDA94
tidb	-4460996.063	2682557.139	-3674443.868	GDA94
2127	-4989808.070	2667491.696	-2936174.848	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.287	GDA94
tidb	-35-23 -57.1562	148 58 47.9843	665.430	646.144	GDA94
2127	-27-35 -9.2992	151 52 8.9834	567.934	525.988	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str2	682733.893	6090040.859	55	802.574	783.287	GDA94
tidb	679807.854	6080884.470	55	665.430	646.144	GDA94
2127	388386.868	6948156.311	56	567.934	525.988	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @	
park	-4554254.833	2816652.459	-3454060.170	2009/10/05	
str2	-4467074.883	2683011.852	-3667007.526	2009/10/05	
tidb	-4460996.594	2682557.087	-3674443.114	2009/10/05	
2127	-4989808.521	2667491.510	-2936174.051	2009/10/05	
2127	0.003 m	0.004 m	0.005 m		RMS

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5536	148 15 52.6028	397.358	374.691	
str2	-35-18 -58.1711	149 0 36.5601	802.486	783.241	
tidb	-35-23 -57.1283	148 58 47.9969	665.342	646.179	
2127	-27-35 -9.2716	151 52 8.9971	567.839	526.468	
2127	0.002 m	0.002 m	0.006 m		RMS

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

	Height(m)	Antenna Offsets(m)			
Station	Up	East	North	Up	yyyy/mm/dd
2127	1.5890	0.0000	0.0009	0.1039	2009/10/04
2127	1.5890	0.0000	0.0009	0.1039	2009/10/05

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
2127	-0.015	-0.014	0.001	2009/10/04
2127	-0.040	-0.007	0.004	2009/10/05

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
2127	0.010	0.006	0.006	2009/10/04
2127	0.012	0.008	0.008	2009/10/05

5.4 Coordinate Value - Cartesian, ITRF2005, per day

	X(m)	Y(m)	Z(m)	ITRF2005 @
2127	-4989808.523	2667491.512	-2936174.055	2009/10/04
2127	-4989808.517	2667491.505	-2936174.046	2009/10/05

5.5 Geodetic, GRS80 Ellipsoid, ITRF2005, per day

```
                                                  Ellipsoidal
       Latitude(DMS)      Longitude(DMS)          Height(m)
2127  -27-35  -9.2716  151 52   8.9971      567.844 2009/10/04
2127  -27-35  -9.2715  151 52   8.9972      567.832 2009/10/05
```

5.6 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0064	2895	3 %	2009-10-04
str2	0.0060	2854	5 %	2009-10-04
tidb	0.0064	2860	5 %	2009-10-04
2127	0.0063	8599	4 %	2009-10-04
park	0.0079	4056	1 %	2009-10-05
str2	0.0072	4088	0 %	2009-10-05
tidb	0.0078	4064	0 %	2009-10-05
2127	0.0077	12208	0 %	2009-10-05

112929 - 12 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
21272770.09o	TRM_R8_GNSS	1.5890	2009-10-04 19:50:59	2009-10-05 07:48:59

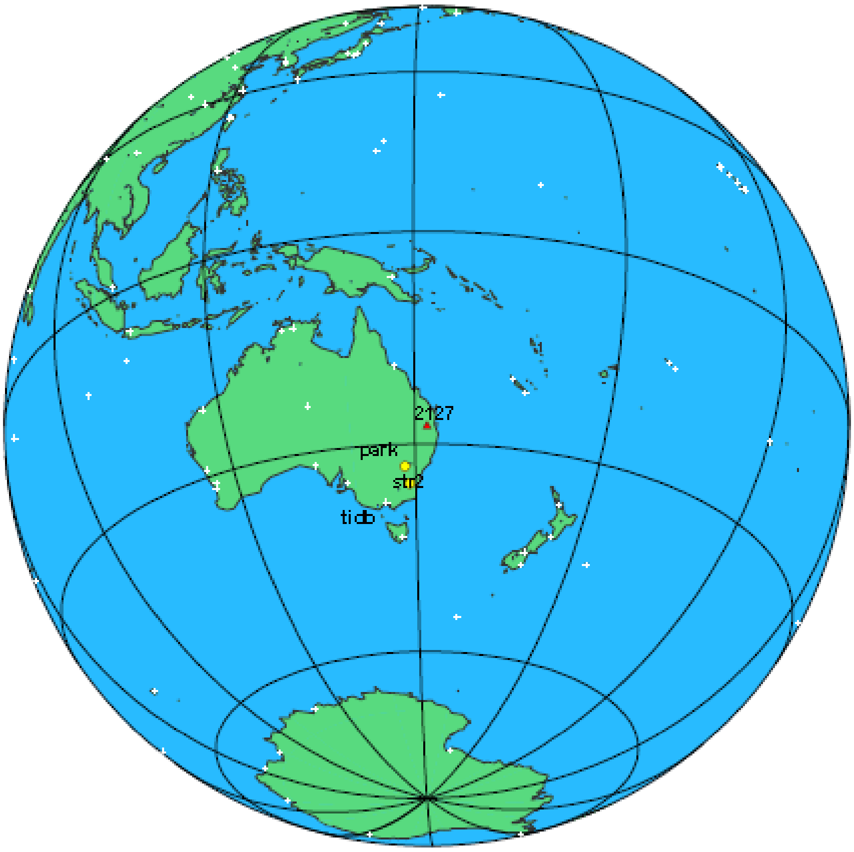


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-10-04	park str2 tidb	2127	IGS Rapid
2009-10-05	park str2 tidb	2127	IGS Ultra-Rapid

Warning: An IGS Ultra-Rapid orbit product has been used in this computation. For improved results please resubmit approximately 2 days after the observation session and to ensure the use of the IGS Rapid orbit product. Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session and to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.312	2816652.547	-3454060.946	GDA94
str2	-4467074.353	2683011.906	-3667008.280	GDA94
tidb	-4460996.063	2682557.139	-3674443.868	GDA94
2127	-4989808.071	2667491.687	-2936174.844	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.287	GDA94
tidb	-35-23 -57.1562	148 58 47.9843	665.430	646.144	GDA94
2127	-27-35 -9.2991	151 52 8.9837	567.929	525.983	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str2	682733.893	6090040.859	55	802.574	783.287	GDA94
tidb	679807.854	6080884.470	55	665.430	646.144	GDA94
2127	388386.876	6948156.313	56	567.929	525.983	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.883	2816652.459	-3454060.170	2009/10/05
str2	-4467074.883	2683011.852	-3667007.526	2009/10/05
tidb	-4460996.594	2682557.087	-3674443.114	2009/10/05
2127	-4989808.522	2667491.500	-2936174.047	2009/10/05
2127	0.002 m	0.009 m	0.006 m	RMS

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5536	148 15 52.6028	397.358	374.691	
str2	-35-18 -58.1711	149 0 36.5601	802.486	783.241	
tidb	-35-23 -57.1283	148 58 47.9969	665.342	646.179	
2127	-27-35 -9.2715	151 52 8.9974	567.834	526.463	
2127	0.002 m	0.007 m	0.007 m		RMS

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

	Height(m)	Antenna Offsets(m)			
Station	Up	East	North	Up	yyyy/mm/dd
2127	1.5890	0.0000	0.0009	0.1039	2009/10/04
2127	1.5890	0.0000	0.0009	0.1039	2009/10/05

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
2127	-0.015	-0.014	0.001	2009/10/04
2127	-0.014	-0.009	0.014	2009/10/05

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
2127	0.010	0.006	0.006	2009/10/04
2127	0.008	0.004	0.004	2009/10/05

5.4 Coordinate Value - Cartesian, ITRF2005, per day

	X(m)	Y(m)	Z(m)	ITRF2005 @
2127	-4989808.523	2667491.512	-2936174.055	2009/10/04
2127	-4989808.520	2667491.496	-2936174.045	2009/10/05

5.5 Geodetic, GRS80 Ellipsoid, ITRF2005, per day

```
                                            Ellipsoidal
       Latitude(DMS)    Longitude(DMS)     Height(m)
2127  -27-35  -9.2716  151 52   8.9971       567.844 2009/10/04
2127  -27-35  -9.2715  151 52   8.9975       567.831 2009/10/05
```

5.6 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0064	2885	3 %	2009-10-04
str2	0.0060	2854	5 %	2009-10-04
tidb	0.0064	2860	5 %	2009-10-04
2127	0.0063	8599	4 %	2009-10-04
park	0.0078	5600	0 %	2009-10-05
str2	0.0070	5652	0 %	2009-10-05
tidb	0.0075	5596	0 %	2009-10-05
2127	0.0074	16848	0 %	2009-10-05

Appendix F.10 PSM 112930 Processing Reports

112930 - 1 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
15742710.09o	TRM_R8_GNSS	1.6660	2009-09-28 21:08:59	2009-09-28 22:09:59

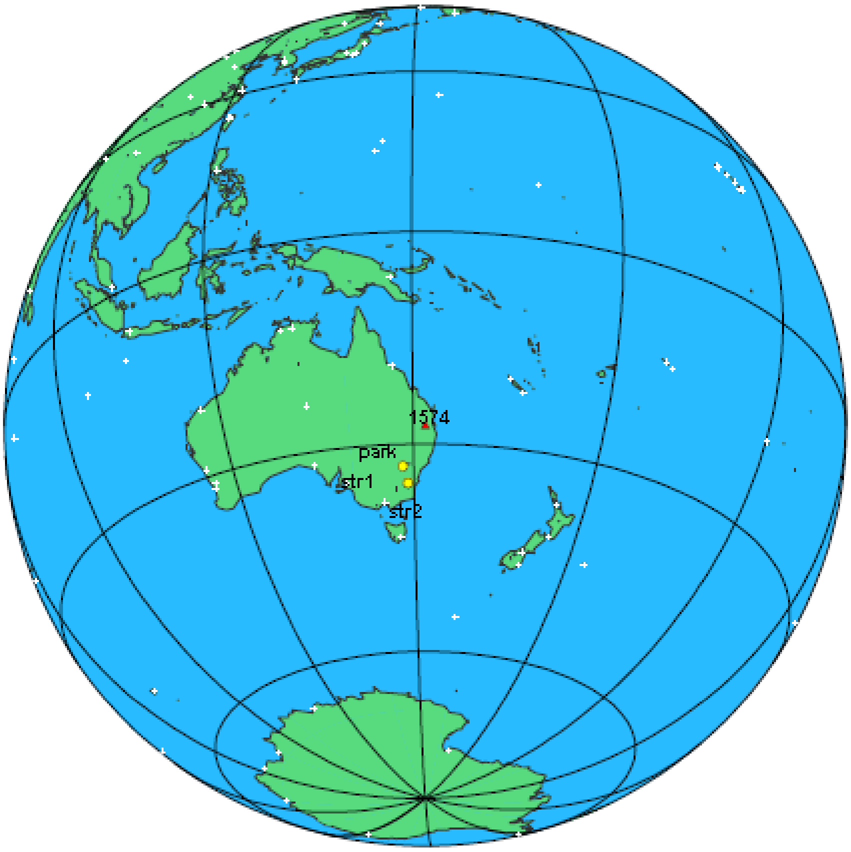


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-09-28	park str1 str2	1574	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
str1	-4467102.300	2683089.534	-3666949.984	GDA94
str2	-4467074.352	2683011.906	-3667008.281	GDA94
1574	-4989592.650	2666866.689	-2936271.022	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
str1	-35-18 -55.9396	149 0 36.1796	800.031	780.694	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.237	GDA94
1574	-27-35 -12.6589	151 52 34.0560	577.667	535.714	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
str1	682726.014	6090110.668	55	800.031	780.694	GDA94
str2	682733.893	6090040.859	55	802.574	783.237	GDA94
1574	389075.262	6948059.190	56	577.667	535.714	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
str1	-4467102.830	2683089.480	-3666949.230	2009/09/28
str2	-4467074.882	2683011.852	-3667007.527	2009/09/28
1574	-4989598.100	2666866.502	-2936270.226	2009/09/28

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)
str1	-35-18 -55.9117	149 0 36.1922	799.943	780.698
str2	-35-18 -58.1712	149 0 36.5601	802.486	783.241
1574	-27-35 -12.6313	151 52 34.0697	577.572	536.195

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

	Height(m)	Antenna Offsets(m)			
Station	Up	East	North	Up	yyyy/mm/dd
1574	1.6660	0.0000	0.0009	0.1039	2009/09/28

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
1574	-0.076	0.033	-0.018	2009/09/28

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
1574	0.093	0.059	0.088	2009/09/28

5.4 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
str1	0.0051	639	0 %	2009-09-28
str2	0.0073	631	1 %	2009-09-28
1574	0.0063	1270	0 %	2009-09-28

112930 - 2 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
15742711.09o	TRM_R8_GNSS	1.6660	2009-09-28 22:11:59	2009-09-28 23:59:59

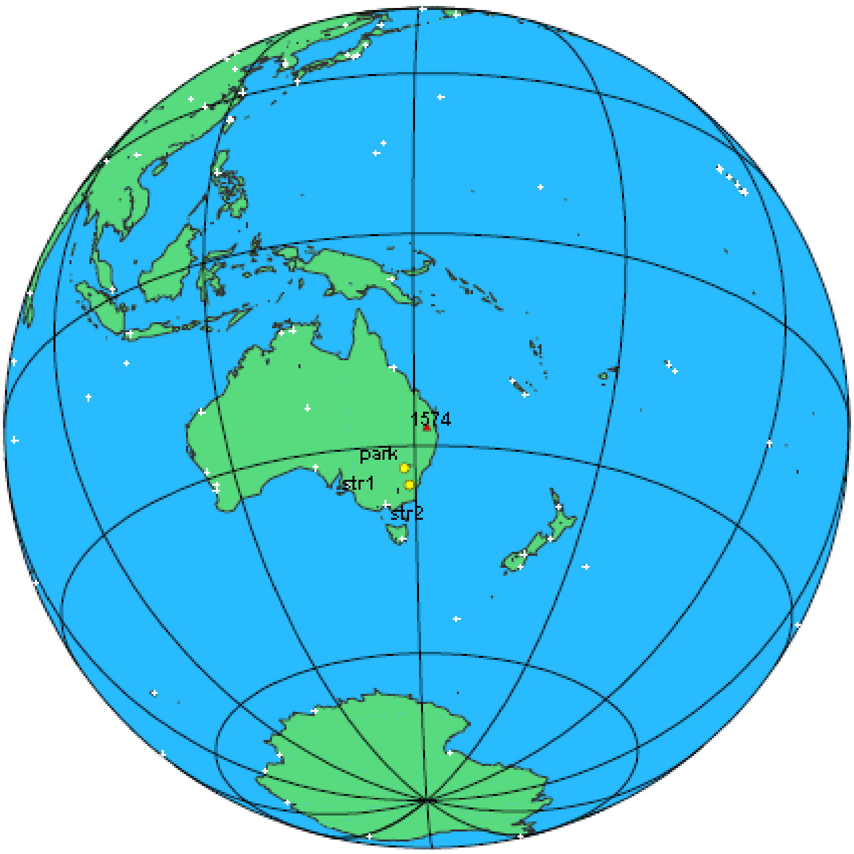


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-09-28	park str1 str2	1574	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
str1	-4467102.300	2683089.534	-3666949.984	GDA94
str2	-4467074.352	2683011.906	-3667008.281	GDA94
1574	-4989592.498	2666866.570	-2936270.978	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
str1	-35-18 -55.9396	149 0 36.1796	800.031	780.694	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.237	GDA94
1574	-27-35 -12.6605	151 52 34.0572	577.478	535.525	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
str1	682726.014	6090110.068	55	800.031	780.694	GDA94
str2	682733.893	6090040.859	55	802.574	783.237	GDA94
1574	389075.296	6948059.141	56	577.478	535.525	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
str1	-4467102.830	2683089.480	-3666949.230	2009/09/28
str2	-4467074.882	2683011.852	-3667007.527	2009/09/28
1574	-4989592.948	2666866.383	-2936270.182	2009/09/28

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at
earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)
str1	-35-18 -55.9117	149 0 36.1922	799.943	780.698
str2	-35-18 -58.1712	149 0 36.5601	802.486	783.241
1574	-27-35 -12.6329	151 52 34.0710	577.384	536.007

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %.

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

	Height(m)	Antenna Offsets(m)			
Station	Up	East	North	Up	yyyy/mm/dd
1574	1.6660	0.0000	0.0009	0.1039	2009/09/28

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
1574	0.029	-0.021	0.008	2009/09/28

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
1574	0.023	0.010	0.013	2009/09/28

5.4 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
str1	0.0048	1482	0 %	2009-09-28
str2	0.0050	1487	0 %	2009-09-28
1574	0.0049	2869	0 %	2009-09-28

112930 - 4 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
15742722.09o	TRM_R8_GNSS	1.5130	2009-09-29 20:28:00	2009-09-29 23:59:59

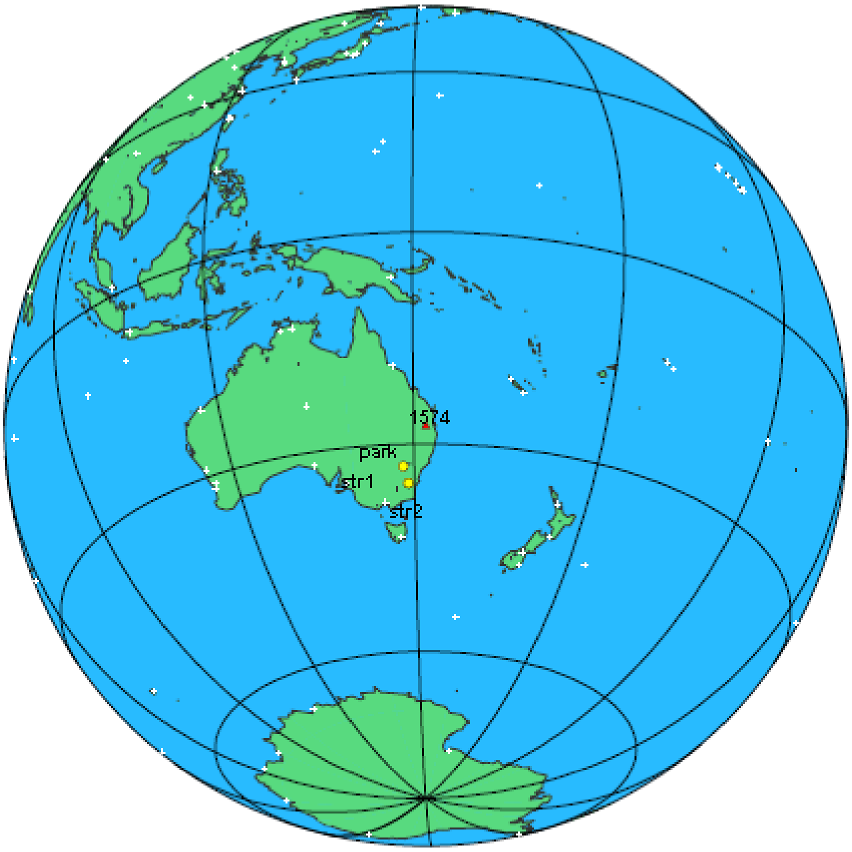


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-09-29	park str1 str2	1574	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.311	2816652.547	-3454060.946	GDA94
str2	-4467074.352	2683011.906	-3667008.281	GDA94
1574	-4989592.447	2606866.559	-2936270.950	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.287	GDA94
1574	-27-35 -12.6604	151 52 34.0567	577.421	535.468	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str2	682733.893	6090040.859	55	802.574	783.287	GDA94
1574	389075.282	6948059.143	56	577.421	535.468	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.832	2816652.459	-3454060.171	2009/09/29
str2	-4467074.882	2683011.852	-3667007.527	2009/09/29
1574	-4989592.898	2606866.372	-2936270.154	2009/09/29

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)
park	-32-59 -55.5537	148 15 52.6028	397.358	374.691
str2	-35-18 -58.1712	149 0 36.5601	802.486	783.241
1574	-27-35 -12.6328	151 52 34.0704	577.326	535.949

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

	Height(m)	Antenna Offsets(m)			
Station	Up	East	North	Up	yyyy/mm/dd
1574	1.5130	0.0000	0.0009	0.1039	2009/09/29

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
1574	0.088	-0.021	0.025	2009/09/29

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
1574	0.080	0.018	0.018	2009/09/29

5.4 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0138	2388	8 %	2009-09-29
str2	0.0092	2463	5 %	2009-09-29
1574	0.0117	4851	7 %	2009-09-29

112930 - 6 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
15742720.09o	TRM_R8_GNSS	1.6660	2009-09-29 00:17:00	2009-09-29 06:18:59

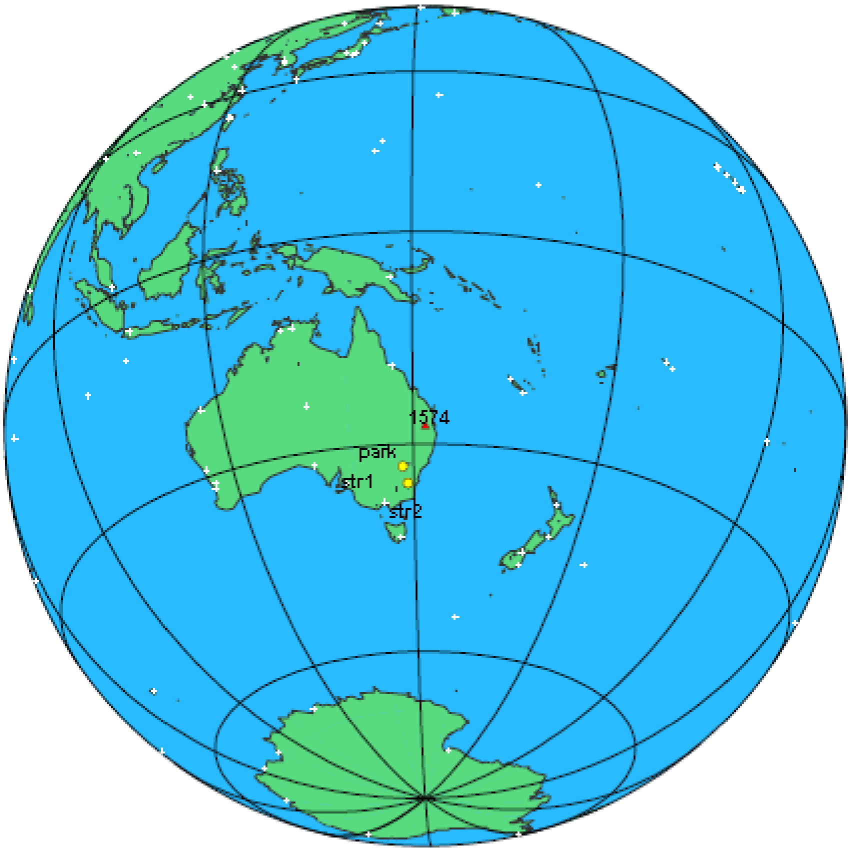


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-09-29	park str1 str2	1574	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.311	2816652.547	-3454060.946	GDA94
str2	-4467074.352	2683011.906	-3667008.281	GDA94
1574	-4989592.459	2666866.582	-2936270.953	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.287	GDA94
1574	-27-35 -12.6602	151 52 34.0562	577.441	535.488	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str2	682733.893	6090040.859	55	802.574	783.287	GDA94
1574	389075.267	6948059.150	56	577.441	535.488	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.832	2816652.459	-3454060.171	2009/09/29
str2	-4467074.882	2683011.852	-3667007.527	2009/09/29
1574	-4989592.909	2666866.395	-2936270.157	2009/09/29

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)
park	-32-59 -55.5537	148 15 52.6028	397.358	374.691
str2	-35-18 -58.1712	149 0 36.5601	802.486	783.241
1574	-27-35 -12.6326	151 52 34.0699	577.346	535.969

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

Station	Height(m) Up	Antenna Offsets(m) East	North	Up	yyyy/mm/dd
1574	1.6660	0.0000	0.0009	0.1039	2009/09/29

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
1574	-0.009	0.000	-0.007	2009/09/29

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
1574	0.015	0.007	0.007	2009/09/29

5.4 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0077	4146	4 %	2009-09-29
str2	0.0068	4056	5 %	2009-09-29
1574	0.0073	8202	4 %	2009-09-29

112930 - 8 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
21272680.09o	TRM_R8_GNSS	1.5420	2009-09-25 22:16:59	2009-09-26 06:11:00

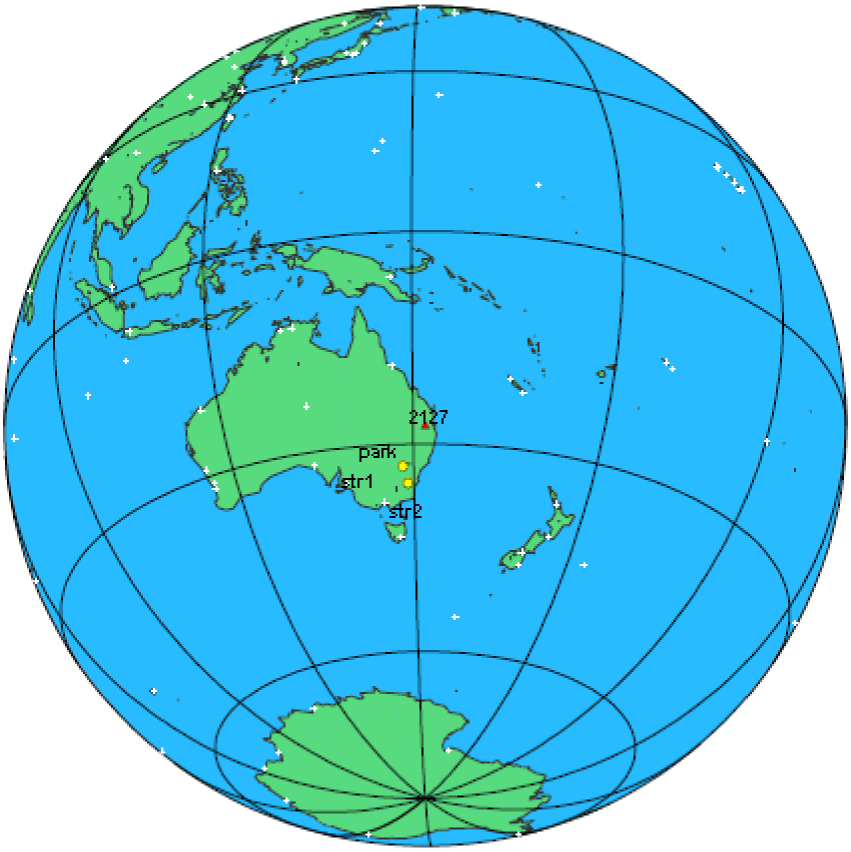


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-09-25	park str1 str2	2127	IGS Rapid
2009-09-26	park str1 str2	2127	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
str1	-4467102.301	2683089.534	-3666949.983	GDA94
str2	-4467074.353	2683011.906	-3667008.281	GDA94
2127	-4989592.456	2666866.598	-2936270.973	GDA94
park	-4554254.312	2816652.547	-3454060.945	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
str1	-35-18 -55.9396	149 0 36.1796	800.031	780.694	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.575	783.288	GDA94
2127	-27-35 -12.6607	151 52 34.0558	577.453	535.499	GDA94
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
str1	682726.015	6090110.068	55	800.031	780.694	GDA94
str2	682733.893	6090040.859	55	802.575	783.288	GDA94
2127	389075.256	6948059.134	56	577.453	535.499	GDA94
park	618139.981	6348138.984	55	397.447	374.173	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
str1	-4467102.830	2683089.480	-3666949.230	2009/09/26
str2	-4467074.882	2683011.852	-3667007.528	2009/09/26
2127	-4989592.906	2666866.407	-2936270.177	2009/09/26

2127	0.004 m	0.012 m	0.002 m	RMS
park	-4554254.882	2816652.459	-3454060.171	2009/09/26

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
str1	-35-18 -55.9117	149 0 36.1922	799.943	780.698	
str2	-35-18 -58.1712	149 0 36.5601	802.487	783.242	
2127	-27-35 -12.6331	151 52 34.0695	577.358	535.981	
2127	0.006 m	0.009 m	0.007 m		RMS
park	-32-59 -55.5537	148 15 52.6023	397.358	374.691	

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

	Height(m)	Antenna Offsets(m)			
Station	Up	East	North	Up	yyyy/mm/dd
2127	1.5420	-0.0000	0.0009	0.1039	2009/09/25
2127	1.5420	0.0000	0.0009	0.1039	2009/09/26

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
2127	0.015	-0.025	0.026	2009/09/25
2127	0.083	-0.108	0.057	2009/09/26

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
2127	0.028	0.016	0.016	2009/09/25
2127	0.017	0.012	0.008	2009/09/26

5.4 Coordinate Value - Cartesian, ITRF2005, per day

	X(m)	Y(m)	Z(m)	ITRF2005 @
2127	-4989592.901	2666866.392	-2936270.180	2009/09/25
2127	-4989592.908	2666866.416	-2936270.177	2009/09/26

5.5 Geodetic, GRS80 Ellipsoid, ITRF2005, per day

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	
2127	-27-35 -12.6334	151 52 34.0699	577.349	2009/09/25
2127	-27-35 -12.6330	151 52 34.0692	577.363	2009/09/26

5.6 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
str1	0.0059	1362	0 %	2009-09-25
str2	0.0060	1359	0 %	2009-09-25
2127	0.0060	2721	0 %	2009-09-25
park	0.0082	3369	1 %	2009-09-26
str1	0.0081	3179	0 %	2009-09-26
str2	0.0082	3481	1 %	2009-09-26
2127	0.0082	10029	1 %	2009-09-26

112930 - 10 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
21272690.09o	TRM_R8_GNSS	1.4960	2009-09-26 21:45:00	2009-09-27 07:35:59

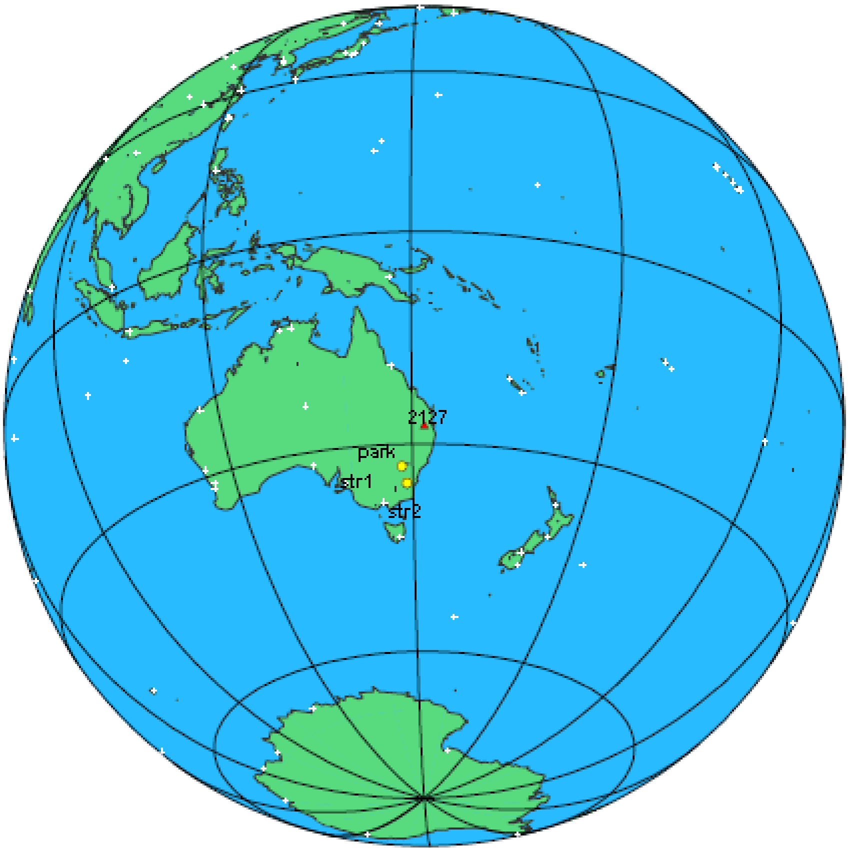


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-09-26	park str1 str2	2127	IGS Rapid
2009-09-27	park str1 str2	2127	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.312	2816652.547	-3454060.945	GDA94
str1	-4467102.301	2683089.534	-3666949.983	GDA94
str2	-4467074.353	2683011.906	-3667008.281	GDA94
2127	-4989592.481	2666866.578	-2936270.975	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str1	-35-18 -55.9396	149 0 36.1796	800.031	780.694	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.238	GDA94
2127	-27-35 -12.6605	151 52 34.0567	577.467	535.514	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str1	682726.015	6090110.668	55	800.031	780.694	GDA94
str2	682733.893	6090040.859	55	802.574	783.238	GDA94
2127	389075.281	6948059.138	56	577.467	535.514	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.832	2816652.459	-3454060.171	2009/09/27
str1	-4467102.830	2683089.480	-3666949.230	2009/09/27
str2	-4467074.882	2683011.852	-3667007.527	2009/09/27

2127	-4989592.981	2666866.391	-2936270.180	2009/09/27
2127	0.046 m	0.008 m	0.023 m	RMS

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5537	148 15 52.6028	397.358	374.691	
str1	-35-18 -55.9117	149 0 36.1922	799.943	780.698	
str2	-35-18 -58.1712	149 0 36.5601	802.486	783.241	
2127	-27-35 -12.6330	151 52 34.0704	577.373	535.996	
2127	0.003 m	0.015 m	0.050 m		RMS

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

Station	Height(m) Up	Antenna Offsets(m) East	North	Up	yyyy/mm/dd
2127	1.4960	-0.0000	0.0009	0.1039	2009/09/26
2127	1.4960	0.0000	0.0009	0.1039	2009/09/27

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
2127	-0.019	0.013	-0.007	2009/09/26
2127	-0.002	-0.009	0.013	2009/09/27

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
2127	0.022	0.011	0.014	2009/09/26
2127	0.006	0.003	0.006	2009/09/27

5.4 Coordinate Value - Cartesian, ITRF2005, per day

	X(m)	Y(m)	Z(m)	ITRF2005 @
2127	-4989592.996	2666866.402	-2936270.212	2009/09/26
2127	-4989592.926	2666866.390	-2936270.178	2009/09/27

5.5 Geodetic, GRS80 Ellipsoid, ITRF2005, per day

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	
2127	-27-35 -12.6330	151 52 34.0712	577.443	2009/09/26
2127	-27-35 -12.6329	151 52 34.0704	577.365	2009/09/27

5.6 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0053	753	3 %	2009-09-26
str1	0.0053	1509	0 %	2009-09-26
str2	0.0056	1479	3 %	2009-09-26
2127	0.0054	3741	2 %	2009-09-26
park	0.0067	5412	1 %	2009-09-27
str1	0.0061	5466	0 %	2009-09-27
str2	0.0063	5267	3 %	2009-09-27
2127	0.0064	16145	1 %	2009-09-27

112930 - 12 Hour Results

1 User and IGS GPS Data

All antenna heights refer to the vertical distance from the Ground Mark to the Antennna Reference Point (ARP).

User File	Antenna Type	Antenna Height (m)	Start Time	End Time
15732702.09o	TRM_R8_GNSS	1.6100	2009-09-27 19:33:59	2009-09-28 07:31:59

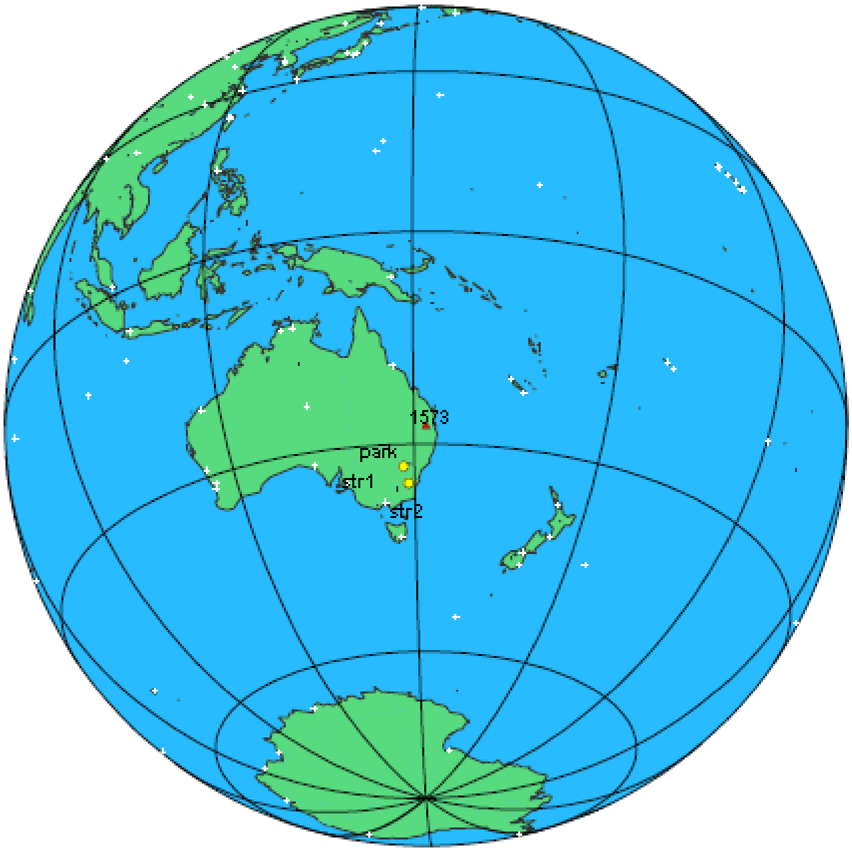


Figure 1: Global View – submitted GPS station(s) and nearby IGS GPS stations used in the processing; triangle(s) represent submitted user data; circle(s) represent the nearest available IGS stations.

2 Processing Summary

Date	IGS Data	User Data	Orbit Type
2009-09-27	park str1 str2	1573	IGS Rapid
2009-09-28	park str1 str2	1573	IGS Rapid

Warning: An IGS Rapid orbit product has been used in this computation. For the highest quality coordinates please resubmit approximately 2 weeks after the observation session end to ensure the use of the IGS Final orbit product.

3 Computed Coordinates, GDA94

For Australian users Geocentric Datum of Australia (GDA94, ITRF92@1994.0) coordinates are provided. GDA94 coordinates are determined from ITRF coordinates by an Geoscience Australia (GA) derived coordinate transformation process. GA transformation parameters between ITRF and GDA94 are re-computed weekly, incorporating the latest available tectonic motions (determined from the GA GPS network). GA recommends that users within Australia use GDA94 coordinates. All coordinates refer to the Ground Mark. For general/technical information on GDA94 see www.ga.gov.au/nmd/geodesy/datums/gda.jsp and www.icsm.gov.au/icsm/gda/gdatm/

3.1 Cartesian, GDA94

	X(m)	Y(m)	Z(m)	
park	-4554254.312	2816652.547	-3454060.946	GDA94
str1	-4467102.301	2683089.534	-3666949.983	GDA94
str2	-4467074.352	2683011.906	-3667008.280	GDA94
1573	-4989592.477	2666866.574	-2936270.968	GDA94

3.2 Geodetic, GRS80 Ellipsoid, GDA94

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations are computed using a bilinear interpolation of the AUSGeoid98 grid. The height above the Geoid is only provided for sites within the AUSGeoid98 extents. For information on AUSGeoid98 see www.ga.gov.au/nmd/geodesy/ausgeoid/

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5818	148 15 52.5889	397.447	374.173	GDA94
str1	-35-18 -55.9396	149 0 36.1796	800.031	780.694	GDA94
str2	-35-18 -58.1991	149 0 36.5475	802.574	783.287	GDA94
1573	-27-35 -12.6604	151 52 34.0567	577.459	535.506	GDA94

3.3 MGA Grid, GRS80 Ellipsoid, GDA94

	East(M)	North(M)	Zone	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	618139.981	6348138.984	55	397.447	374.173	GDA94
str1	682726.014	6090110.668	55	800.031	780.694	GDA94
str2	682733.893	6090040.859	55	802.574	783.287	GDA94
1573	389075.283	6948059.142	56	577.459	535.506	GDA94

4 Computed Coordinates, ITRF2005

All computed coordinates are based on the IGS realisation of the ITRF2005 reference frame, provided by the IGS cumulative solution. All the given ITRF2005 coordinates refer to a mean epoch of the site observation data. All coordinates refer to the Ground Mark.

4.1 Cartesian, ITRF2005

	X(m)	Y(m)	Z(m)	ITRF2005 @
park	-4554254.832	2816652.459	-3454060.171	2009/09/27
str1	-4467102.830	2683089.480	-3666949.230	2009/09/28
str2	-4467074.882	2683011.852	-3667007.527	2009/09/28

1573	-4989592.928	2666866.387	-2936270.172	2009/09/28	
1573	0.004 m	0.006 m	0.006 m		RMS

4.2 Geodetic, GRS80 Ellipsoid, ITRF2005

The height above the Geoid is computed using the GPS Ellipsoidal height and subtracting a Geoid-Ellipsoid separation. Geoid-Ellipsoidal separations, in this section, are computed using a spherical harmonic synthesis of the global EGM96 geoid. More information on the EGM96 geoid can be found at earth-info.nga.mil/GandG/wgsegm/egm96.html

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	Above-Geoid Height(m)	
park	-32-59 -55.5537	148 15 52.6028	397.358	374.691	
str1	-35-18 -55.9117	149 0 36.1922	799.943	780.698	
str2	-35-18 -58.1712	149 0 36.5601	802.486	783.241	
1573	-27-35 -12.6329	151 52 34.0705	577.365	535.988	
1573	0.003 m	0.008 m	0.009 m		RMS

5 Solution Information

To validate your solution you should check the :-

i. Antenna Reference Point (ARP) to Ground Mark records;

ii. Apriori Coordinate Updates (valid range is 0.000 - 15.000 m);

iii. Coordinate Precision (valid range is 0.001 - 0.025 m);

iv. Root Mean Square (RMS) (valid range is 0.0005 - 0.0250 m); and

v. % Observations Deleted (valid range is 0 - 25) %

5.1 ARP to Ground Mark, per day

All heights refer to the vertical distance from the Ground Mark to the Antenna Reference Point (ARP). The Antenna Offsets refer to the vertical distance from the ARP to the L1 phase centre.

	Height(m)	Antenna Offsets(m)			
Station	Up	East	North	Up	yyyy/mm/dd
1573	1.6100	0.0000	0.0009	0.1039	2009/09/27
1573	1.6100	-0.0000	0.0009	0.1039	2009/09/28

5.2 Apriori Coordinate Updates - Cartesian, per day

	dX(m)	dY(m)	dZ(m)	yyyy/mm/dd
1573	0.021	-0.028	0.024	2009/09/27
1573	0.033	-0.024	0.013	2009/09/28

5.3 Coordinate Precision - Cartesian, per day

1 Sigma	sX(m)	sY(m)	sZ(m)	yyyy/mm/dd
1573	0.016	0.009	0.009	2009/09/27
1573	0.010	0.006	0.006	2009/09/28

5.4 Coordinate Value - Cartesian, ITRF2005, per day

	X(m)	Y(m)	Z(m)	ITRF2005 @
1573	-4989592.922	2666866.380	-2936270.164	2009/09/27
1573	-4989592.930	2666866.391	-2936270.176	2009/09/28

5.5 Geodetic, GRS80 Ellipsoid, ITRF2005, per day

	Latitude(DMS)	Longitude(DMS)	Ellipsoidal Height(m)	
1573	-27-35 -12.6328	151 52 34.0706	577.353	2009/09/27
1573	-27-35 -12.6329	151 52 34.0704	577.370	2009/09/28

5.6 RMS, Observations, Deletions per day

Data	RMS (m)	# Observations	% Obs. Deleted	Date
park	0.0063	2406	0 %	2009-09-27
str1	0.0060	2354	0 %	2009-09-27
str2	0.0061	3204	0 %	2009-09-27
i573	0.0061	7964	0 %	2009-09-27
str1	0.0063	4152	9 %	2009-09-28
str2	0.0063	5415	0 %	2009-09-28
i573	0.0063	9567	4 %	2009-09-28