

# Department of Primary Industries and Water

INFORMATION & LAND SERVICES

Office of the Surveyor General



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## Circular Memorandum No. 1 / 2009

TOPIC:	<b>Coordination of Surveys of Land LIST Cadastre Positional Uncertainty Sample Survey Notes</b>
DATE:	<b>5<sup>th</sup> January 2009</b>

## Coordination of Surveys of Land

### Requirements

The requirement to coordinate surveys of land has been included in the Survey Directions since January 2005. This concept is supported by both government and the survey profession as having strategic importance to the future reinstatement of boundaries and the further use of cadastral survey data for the benefit of the Tasmanian community.

Surveys must comply with the requirements of the Survey Directions for coordinate origin.

The origin must be a mark held in the Survey Control Marks Database (SurCoM) maintained by the Office of the Surveyor General or be traceable to such a mark through an existing registered survey. AusPOS qualifies under this requirement as it uses AU016, a mark held in SurCoM, as an origin station.

The correct term to use in relation to the absolute accuracy of coordinates is 'positional uncertainty'. This is a term defined in the Inter-Governmental Committee on Surveying and Mapping 'Standards and Practices for Control Surveys (SPI)', which is the national standard applicable to all control surveys.

Section 3.1.2.3 of the Survey Directions requires an estimate of positional uncertainty to be documented with coordinates calculated for lot corners. The term 'estimate' in its common usage denotes a value arrived at by calculation or informed judgement.

The paper "[Advice on the Calculation of Positional Uncertainty for Cadastral Surveys \(September 2007\)](#)", gives practical information in determining positional uncertainty for cadastral surveys. It is available on the Office of the Surveyor General website.

### Common Problems

While a majority of registered land surveyors have embraced the requirement and ensured that their knowledge is current and survey practices provide a compliant outcome, there are clearly still

misconceptions and poor practices among some practitioners that result in non-compliant outcomes in surveys certified as being correct.

Many coordinate inconsistencies and errors are being expeditiously identified as all surveys creating title are now entered into the LIST cadastre upon registration. Several surveys have been found to have coordinates in error by hundreds of metres.

Unclosed traverses of several kilometres for coordination using normal cadastral traversing techniques, apart from the obvious risk of gross error, rarely produce the required coordinate accuracy due to the tight precision required for angles.

A similar situation arises for coordinates calculated from a boundary surround traverse of several kilometres.

A common error indicative of poor quality assurance processes is the use of an incorrect scale factor or height factor, or simple calculation errors leading to incorrect coordinates.

Some estimates of positional uncertainty for coordinates shown in survey notes are clearly either a guess based on inadequate knowledge or the maximum allowable value shown in the Survey Directions. These coordinates, together with those without a documented estimate of positional uncertainty, have limited value in future cadastral surveys and in the provision of digital cadastral data.

Not only are coordinate errors being detected, but some apparent coordinate errors have been found to be the result of boundary errors, requiring investigation by my Office and correction by the surveyor.

### **Recommended Practices**

Surveyors should undertake some pre-planning when coordinating rural surveys remote from a coordinated origin to ensure that the required positional uncertainty will be achieved.

For mark coordinates from SurCoM, surveyors should check the 'order' of the mark and refer to Survey Directions section 2.1.2.4 for the applicable positional uncertainty. Lower order marks will not be suitable in urban situations.

It is incumbent on surveyors to have in place procedures, including independent field and office checking processes, that identify errors prior to the completion of the survey and certifying that the survey is correct.

A basic tenet of good survey practice is to introduce redundancy wherever possible. This might include closure of traverses made for coordination purposes, connection to more than one coordinated mark and radiations to remote trigs for bearing control.

For boundary surround traverses of several kilometres, surveyors should consider using GPS or controlling traverses with GPS at appropriate intervals along the traverse.

Surveyors should be aware that all cadastral parcels are shown on LIST and a gross coordinate check is easily made. Generally the LIST cadastre coordinates will have a positional uncertainty of better than five metres in urban areas and twenty metres in rural areas.

Privately operated GPS correction services must be connected to one or more marks in SurCoM to be eligible for use in coordinating cadastral surveys. In this case the identity and coordinates of the origin mark must be documented as part of the survey notes.

The positional uncertainty of the origin point, together with the precision of the field measurement method used, will determine the positional uncertainty of the coordinates derived for lot corners in surveys of land. That is, the positional uncertainty of the origin point must be incorporated into every estimate of positional uncertainty. Coordinates derived from a previously coordinated and registered survey of land must rely on and incorporate the estimate of positional uncertainty shown on that survey.

Coordinates may be calculated from a coordinated origin mark using adopted traverse information derived from other registered but uncoordinated surveys. In this case, the survey notes must state the existing (estimate of) positional uncertainty of the origin coordinates. In addition, both the positional uncertainty of the origin coordinates and the expected accuracy of the surveys relied on to propagate the new coordinates must be incorporated into the estimate of positional uncertainty of those new coordinates calculated in the current survey.

For coordinates derived using AusPOS the surveyor must follow the recommended survey and processing practices, which will be accepted as producing a second order outcome for cadastral coordination purposes.

In all cases the coordinate origin and its coordinates, and for traverses the bearing origin and its bearing, are required to be clearly documented:

- where coordination is achieved using GPS from a remote origin point, the origin mark and its coordinates must be documented;
- where the origin is a previously registered survey, the coordinate origin and its coordinates – and for traverses the bearing origin and its bearing – must be clearly documented; and similarly
- for coordinates derived from a mark shown in SurCoM through the adoption of traverse information from other registered but uncoordinated surveys, the origin mark and its coordinates must be documented together with the bearing origin and its bearing.

## **LIST Cadastre Positional Uncertainty**

A new service to surveyors will become available to surveyors in early 2009, by which the positional uncertainty of boundaries depicted in LISTmap will be able to be ascertained. The service will be free of charge.

Surveyors will be able to access this positional uncertainty information for lot boundaries by selecting an additional layer of Boundary Segments from the Cadastre category in LISTmap. Clicking on a boundary using the Identify tool will return attributes including the positional uncertainty of the line. The coordinates displayed on LISTmap in these areas will serve a useful guide for a coordinate check.

The cadastral parcels dataset maintained within the LIST comprises polygons that have been built from boundary segments (line features). These boundary segments are attributed with information including the positional uncertainty and the source of the data used to create the line. Although the cadastre was originally derived from 1:5,000 and 1:25,000 map base, in recent years new subdivisions have been plotted to the absolute position determined from coordinated surveys. In most of these cases this has necessitated the replotting of adjoining areas to fit the higher accuracy data. In addition there have also been significant areas of the State that have been replotted to a higher degree of spatial accuracy.

## Sample Survey Notes

There have been requests from a number of surveyors for sample survey notes to use as a guide to presentation of surveys of land. Samples of surveys where field work was undertaken using both traversing and GPS have been placed on the Office of the Surveyor General website under 'Cadastral Standards Maintenance' at <http://www.dpiw.tas.gov.au/inter.nsf/ThemeNodes/PBAS-5JV28D?open> .

While these survey notes depict well-reported and presented surveys they should not be taken as being prescriptive or an alternative to a thorough knowledge of and conformance to the requirements of the Survey Directions. The Survey Directions allow some flexibility in presentation, the critical factor being that all required information is documented in a clear and easily understood manner.

A handwritten signature in black ink, appearing to read 'Peter Murphy', with a stylized flourish at the end.

Peter Murphy  
SURVEYOR GENERAL.