SURVEY AND DRAFTING DIRECTIONS FOR MINING SURVEYORS

Issued as an adjunct to

General Rule 2000

under the

Mines Inspection Act 1901

SURVEY AND DRAFTING DIRECTIONS FOR MINING SURVEYORS

CONTENTS

1. GENERAL

1.1 General

1.1.1. These Directions are to be followed by all mining surveyors in all open cut and underground operations:

i. on current mining leases

ii. on mineral claims where advice by the Chief Inspector has been given under Section 41(1)(b) of the *Mines Inspection Act 1901*.

iii. involving extractive industries operations employing 20 or more persons

iv. involving other extractive industries operations where advice by the Chief Inspector has been given under Section 41(1)(b) of the *Mines Inspection Act 1901*.

1.1.2 These Directions are to be used in the compilation of a Mine Workings Plan for each mining operation.

1.1.3 A Mine Workings Plan consists of any number of sheets showing the entire workings of a mine in plan or section. Each sheet will represent a part or whole of one or more mining horizons or an area of the mining or quarrying operation shown in plan. The Mine Workings Plan as defined in these Directions includes any cross section or longitudinal section sheets used.

1.1.4 Other plans may be required as set out in Section 5 of these Directions.

1.1.5 The Chief Inspector may grant an exemption from any clause of these Directions if particular circumstances warrant. Any application for an exemption from compliance with any clause of these Directions must be made in writing to the Chief Inspector.

1.2 Preparation

These Directions provide for both the digital and non digital recording, storage and preparation of a Mine Workings Plan. Mines operating at the date of gazettal of these Directions which cannot conform with this requirement will prepare the Mine Workings Plan as detailed in Section 4.

Section 5 lists the details required for both the digital and non digital plans.

1.3 Compilation

1.3.1 Unless otherwise specified by the Chief Inspector the Mine Workings Plan shall be compiled on the Map Grid of Australia 1994 (MGA94) based on the Geocentric Datum of Australia 1994 (GDA94) values.

1.3.2 The Mine Workings Plan shall be sectionalised into sheets as a best fit for individual mines, while complying with sheet format and maximum scale requirements as set out in the Mines Inspection Act 1901 and these Directions.

1.3.3 The Surveyor General may request of the Department of Mineral Resources copies of all or any digital data themes used in the production of the Mine Workings Plan, to be lodged with the Central Plan Register in accordance with the *Survey Co-ordination Act 1949*.

1.3.4 All mine plans used in the compilation of the Mine Workings Plan should be regarded with suspicion until their accuracy has been verified, and every effort should be made to obtain all existing information about the extents and location of old workings.

1.3.5 Where old workings are known to exist which may constitute a danger, it shall be assumed, for the purpose of marking or annotating the Mine Workings Plan, that the workings contain water or fill, until the contrary has been proven.

1.3.6 Workings which have become inaccessible or which constitute a danger, (ie, bad ground, caving, no road), shall be annotated on the Mine Workings Plan by the mining surveyor. The annotation shall correctly describe the condition rendering the ground inaccessible or dangerous.

1.4 Conversion to MGA94

1.4.1 A period of two years from the date of gazettal of these Directions is provided for the transfer of the Mine Workings Plan to the MGA94. The general manager of an existing mine, where the life expectancy of the mine is less than two years from the date of gazettal of these Directions, may apply to the Chief Inspector for an exemption from this requirement.

1.4.2 When new sheets of the Mine Workings Plan are being prepared to comply with Clause 1.3.1 and the workings of any part of the mine are deemed to be completed, sealed or otherwise become inaccessible, it shall be acceptable to draw an outline of such workings and to endorse the new Mine Workings Plan to refer to the previously prepared Mine Workings Plans for detail.

1.4.3 Any previously prepared Mine Workings Plan referred to in clause 1.3.2, may also be a historical set of mine drawings, not in current usage, but accessible and in good condition. The relationship of the

origin and height datum of any set of drawings to the current mine grid and datum or to MGA94 and AHD must be established.

1.4.4 Should the workings referred to in clause 1.4.2 become active, or are used for access in an area previously shown in outline the survey of the workings shall be transferred in full to the new Mine Workings Plan.

1.4.5 Nothing shall prevent the mining surveyor from transferring inactive mine workings in full to the new Mine Workings Plan.

1.4.6 An existing mine operating to a local grid and height datum, may apply in writing to the Chief Inspector for an exemption from clause 1.3.1, where the relationship between the local grid and height datum and MGA94 and AHD can be accurately provided.

1.4.7 If an exemption is granted under clause 1.4.6, the relationship in terms of bearing, distance and coordinates between local grid and MGA94 must be set out in a 'Letter of Datum Reference' to be provided to the Chief Inspector. The letter will be kept on file at the Department of Mineral Resources and the information updated as necessary.

1.4.8 A notation must appear on the Mine Workings Plan as to the location of any additional information relevant to the Mine Workings Plan including reference to datums.

1.4.9 Sufficient points of known coordinate value in both the local mine grid and MGA94 must be provided to allow 'rubber sheeting' of the Mine Workings Plan onto the MGA94 grid. The datum reference points should be chosen to give a broad coverage of the mine lease area or if there is no mine lease (as could be the case with an extractive operation) a broad coverage of the extent of the operation should be used. The lease external boundary pegs would be suitable for the purpose. It is envisaged that at least six points would be tabulated in the 'Letter of Datum Reference'.

1.5 Symbols

1.5.1 The technical symbols, sign conventions and definitions for strata to be shown on the Mine Workings Plan shall be in accordance with these Directions, and shall conform, as appropriate, to those illustrated in the Australian Standard for Mine Symbols (AS-4368), the Australian Standard for Geological Symbols (AS-2916) and Geoscience Australia 'Symbols Used on Geological Maps'.

1.5.2 If a symbol is not provided for in these publications, the mining surveyor may create a suitable symbol to be shown in the legend. Any such created symbol shall carry a full explanation on the sheet of the Mine Workings Plan.

1.5.3 An existing operating mine which has developed and utilised a set of their own symbols, may apply in writing to the Chief Inspector for an exemption from clause 1.5.1. Where an exemption is granted, a full explanation of the symbols must appear on the Mine Workings Plan.

1.5.4 Where mining operations are conducted in the vicinity of old workings, it shall be appropriate for a mining surveyor to use the symbols used for those old workings to ensure consistency between plans.

1.6 Liability of a mining surveyor or general manager

The liability of the mining surveyor or general manager for the provision and accuracy of the Mine Workings Plan shall be limited to the period of time of appointment as the mining surveyor or general manager for that mine.

2. DEFINITIONS & ABREVIATIONS

In these Directions the following words and terms have the meanings indicated:

Abandoned
A mine shall be deemed to be abandoned where the working of the mine, or deposit, as the case may be, has ceased, and there is no care and maintenance in place.

Act
means the *Mines Inspection Act 1901*.

Adit
means a horizontal or near horizontal entrance to a mine

AHD
Australian Height Datum 1971

ANFO
Ammonium Nitrate - Fuel Oil explosive

Annotation
means a note on the Mine Workings Plan providing additional explanation of some feature or characteristic of the workings not otherwise evident from viewing the Plan. For example, the words, 'No Road', on a level plan would indicate a non-trafficable or inaccessible section of the mine. Similarly, the notation - 'Old Workings nearby - No survey' would alert the plan viewer to the possibility of workings of unknown extents and condition in the vicinity of the working mine.

AS
followed by a designation refers to the Australian Standard having that designation that is published by the Standards Association of Australia and includes a reference to that standard as at the date of gazettal of these Directions.

Bad ground
The term is used for any ground made inaccessible or non trafficable because of instability. The term includes any area of a mine where there is heavily faulted, stressed or caved ground, or where there has been pillar fracturing or failure.

Mine Baseline
A permanently marked survey line established as part of the State Survey Control Network. The mine baseline may be computed from conventional or GPS observations.

Underground Baseline
A permanently marked survey line established in underground workings from which underground surveys are developed.

Batter of a face or profile of an open cut
means the angle that the face or side of an open cut makes with the horizontal overall

Bench
means the horizontal step or floor along which ore, stone or overburden is worked or mined

Bench Marks
Marks established at or in a mine from which the levels of the mine workings are determined.

Berm
means a level surface or bench left or specially cut in the side of an open cut for the purpose of trapping falling material

Bin
means a structure used to hold loose material

Borehole
A borehole includes any hole, which may affect the safety of the mine, drilled for-

(a) exploration (either vertically, horizontally or inclined),
(b) gas or water drainage,
(c) auger holes,
(d) for transport of materials including (but not limited to), sand, inflammable materials or fuels, cement, slurry, sewage or water
(e) Services (*eg* power, water and other services)

Brace
means a platform area around a shaft on the surface at a mine

Certification
A written statement or a schedule signed by the mining surveyor attesting that the surveying procedures and plan preparation for the period certified have been carried out pursuant to the standard required by the Survey and Drafting Directions for Mining Surveyors, the *Mines Inspection Act 1901* and the Regulations issued pursuant to that Act. In the case of information submitted digitally a signed write once read many compact disc or other medium approved by the Chief Inspector shall be deemed to be a certification.

Check Survey

means a survey traverse carried out to check or improve the accuracy of a previously run survey. The Check Survey will be carried out to a higher Class (as defined in SP1), than the previously run survey.

Control Surveys
Substantially marked surveys developed from a mine baseline to define the direction and position of the workings of a mine.

Cross Section Sheet
A sheet prepared as part of the Mine Workings Plan for open cut or underground operations, which shows the cross sections referred to on the plan sheets of the Mine Workings Plan.

Department
means the Department of Mineral Resources, New South Wales

Decline
means a downward sloping entrance or a downward sloping area or development of less than 15^{o} slope

Development
in relation to a mining operation, includes all work undertaken to open up a mine by driving development openings or pre-stripping an open-cut body of ore

Development opening or **development heading**
in relation to an underground mine, means any drive, cross-cut, tunnel, adit, incline, decline, ramp, winze, rise, or shaft which is driven to provide access and services to underground operations, however excavated

Directions
means the 'Survey and Drafting Directions for Mining Surveyors issued as an adjunct pursuant to General Rule 2000 under the *Mines Inspection Act 1901*'.

Director-General
means the Director-General of the Department of Mineral Resources, New South Wales

Discontinued
Where an open cut or underground mine or a deposit has ceased being mined, but the mine is on care and maintenance, that open cut or underground mine or deposit shall be deemed to be discontinued.

Endorsement
means a significant notation by the mining surveyor, on a plan prepared in accordance with these Directions. Any such notations may draw attention to any aspect of the compilation of the Mine Workings Plan that is considered necessary or informative. For example, any major event at the mine which

creates a significant hazard, such as an inrush of mud, a pillar failure or the failure of a stope fill bulkhead, would all warrant endorsement.

Face
means the current or most recently surveyed position of advance of a mine development or excavation.

First aid facilities
includes first aid kits, special first aid equipment, safety showers and eyewashes

General manager
of a mine means the person nominated under section 5 of the *Mines Inspection Act 1901* as general manager of the mine.

General Rule
means general rule made or deemed to be made under Section 56 of the *Mines Inspection Act 1901*

The Geocentric Datum of Australia 1994 (GDA94) and Map Grid of Australia 1994 (MGA94) Co-ordinate System
The datum for surveys in NSW is known as the Geocentric Datum of Australia 1994(GDA94). GDA94 is based on the Geodetic Reference System 1980 (GRS80) ellipsoid, the International Terrestrial Reference Frame 94 (ITRF94) and the geographical co-ordinates of the Australian Fiducial Network (AFN). Grid co-ordinates are obtained using a transverse mercator projection known as the Map Grid of Australia 1994 (MGA94) having the following specifications:

Designation of MGA94 Zones

(a) the central meridians and the designation of the several zones are as follows:

Central Meridian Longitude East of Greenwich	Designation of MGA94 Zone
141^{o}	54
147^{o}	55
153^{o}	56

(b) the central meridian scale factor is 0.9996,

(c) the zone width, 6^{o} longitude plus ½^{o} overlaps on each side,

(d) the co-ordinates of a point on the earth's surface, to be used in expressing the position or location of each point in the appropriate zone, consists of two distances expressed in metres and decimals of a metre; the first expressed of these distances, the East, or E. co-ordinate gives the position in an east direction, the second expressed, the North, or N co-ordinate gives the position in a north direction

(e) the origin of co-ordinates of each zone is at the intersection of the central meridian of that zone with the equator, which origin is given the value of:
E 500,000m; N 10,000,000m,

(f) the units used will be the international metre,

(g) co-ordinates stated for any point in the system shall be co-ordinate values determined in accordance with the principles of the projection of the Map Grid of Australia 1994 and shall depend upon and conform to the co-ordinates of the State survey control marks.

Geoscience Australia
Was formerly the Australian Geological Survey Organisation and previously known as the Bureau of Mineral Resources (BMR)

GPS
Global Positioning System. This term covers all types of satellite positioning system, in these Directions. This includes both the US Department of Defence GPS NAVSTAR system and the Russian GLONASS system, and includes any other current or future satellite positioning system with the same purpose or functionality. All control survey carried out using GPS equipment and techniques should comply with the standards and practices set out in SP1. (The Inter-Governmental Committee on Survey and Mapping Special Publication 1 - "Standards and Practices for Control Surveys").

Hazard
means an agent which has the potential to injure or compromise the health or safety of a person

Height Datum
All levels shall be related to Australian Height Datum (AHD) minus 10,000 metres. Where a mine survey is based on another datum, the method of reducing to AHD minus 10,000 metres shall be indicated on the Mine Workings Plan or mine data sheets, or in a 'Letter of Datum Reference'.

ICSM
The Inter-Governmental Committee on Survey and Mapping

Incline
means a development opening driven up from any level to the surface or between any two levels in a mine at gradients permitting the use of trackless equipment

Inspector
means Inspector of Mines appointed under the *Public Sector Management Act 1988*, for the purposes of the *Mines Inspection Act 1901*, and includes the Chief Inspector of Mines, Deputy Chief Inspector of Mines and Senior Inspector of Mines.

The Integrated Survey Grid and Co-ordinate System
A system of co-ordinate surveys for the State of New South Wales. This grid is a Transverse Mercator projection of the Australian National Spheroid of 1966 having the following specifications:

(a) The central meridians and the designation of the several zones is as follows:-

Central Meridian Longitude East of Greenwich	Designation of ISG Zone
141^0	54/2
143^0	54/3
145^0	55/1
147^0	55/2
149^0	55/3
151^0	56/1
153^0	56/2

(b) The central meridian scale factor is 0.99994.

(c) The zone width is 2^0 of longitude plus $¼^0$ overlaps on each side.

(d) The co-ordinates of a point on the earth's surface, to be used in expressing the position or location of each point in the appropriate zone, consists of two distances expressed in metres and decimals of a metre; the first expressed of these distances, the East, or E, co-ordinate gives the position in an east direction, the second expressed, the North, or N, co-ordinate gives the position in a north direction.

(e) The origin of co-ordinates of each zone is at the intersection of the central meridian of that zone with the equator which origin is given the co-ordinate value of: E 300 000 m; N 5 000 000 m.

(f) The conversion factors to be followed in these Directions in the conversion of any dimensions from Imperial to Metric Units are those specified in the Weights and Measures (National Standards) Regulations, 1961, namely: 1 foot = 0.3048 metre exactly.

(g) Co-ordinates stated for any point in the system shall be co-ordinate values determined in accordance with the principles of the projection of the Integrated Survey grid and shall depend upon and conform to the co-ordinates of the State survey control marks.

Laser

means any product or assembly of components which constitutes, incorporates or is intended to incorporate a laser. In particular, it is any device than can produce or amplify electromagnetic radiation in the wave length range from 100 nanometres to one millimetre by the process of controlled stimulated emission but does not include electric light globes, fluorescent light tubes, electric radiators used for heating, radio or video communication equipment, domestic cooking appliances using high powered lamps or navigation and search lights.

The class of the laser used will conform with any current mining regulations or directions and the Australian Standard (AS2211.1) and any other Code of Practice currently under development or specified under the Occupational Health and Safety Act. The class of laser used in mining shall be restricted to Classes 1, 2 and 3A, unless permission is obtained in writing from the Chief Inspector.

Note of Caution*:*
Australian Radiation Safety and Nuclear Protection Agency (ARPANSA) have provided the following Laser Hazard Categories and caution:
'Currently, Lasers are classified according to the hazard associated with their emissions, as defined in the Australian/New Zealand Standard AS/NZS 2211.1:1997 Laser Safety Part 1: Equipment classification, requirements and user's guide:

- *Class 1 lasers are considered safe under reasonably foreseeable conditions of operation.*
- *Class 2 lasers emit visible light at higher levels than Class 1, but eye protection is provided by aversion responses such as the human blink reflex.*
- *Class 3A lasers have higher power levels than Class 2 and the beam has a larger cross section such that the power of the beam entering the eye does not exceed the power of Class 2. This class of laser can be a hazard if optical devices such as binoculars focus the beam onto the retina.*
- *Class 3B (Restricted) lasers are similar to Class 3A except that the irradiance (power density) limit is increased by a factor of two.*
- *Class 3B lasers are sufficiently powerful to cause eye damage in a time shorter than the human blink reflex (0.25 seconds). Laser products with power output near the upper range of Class 3B may also cause skin burns.*
- *Class 4 lasers are high power devices capable of causing both eye and skin burns, and diffuse reflections may also be hazardous.*

In 1993, the Radiation Health Committee of Australia's National Health and Medical Research Council determined that laser pointers (and other consumer laser products) should not exceed Class 2. For visible laser emissions, a Class 2 laser is limited to a maximum power level of 1 milliwatt (mW) continuous wave emission. Unfortunately, there are laser pointers on the market with output powers well above 1 mW (that is, Class 3B). To make matters worse, some of these products are incorrectly labelled and hence their hazard potential is not known to the user. In particular, owing to different classification criteria in the U.S.A. and Australia, some lasers imported
into Australia may be labelled as Class 3A when they are actually Class 3B. (Paragraph extracted from URL:http://www.arpansa.gov.au/is_lsrptr.htm*)*

Longitudinal Section Sheet
A sheet prepared as part of the Mine Workings Plan for open cut or underground operations, which shows the longitudinal sections referred to on the plan.

Magazine
means a building, storehouse, structure, or place in which any explosive or blasting agent is kept or stored, whether in or about a mine, and includes detonator storage buildings and buildings containing capped fuses

Metal and **mineral**

includes gold, sandstone, basalt, andesite, trachyte, porphyry, any substance which is for the time being a mineral within the meaning of the *Mining Act 1992* or the Offshore Minerals Act 1999 and any other substance or rock used for commercial or industrial purposes or obtained for use by a council, or by a county council, within the meaning of *the Local Government Act 1993*, and includes coal and shale.

Mine Services Plan
Plan prepared showing services around the surface of the mine and any information that may assist in the case of an emergency.

Mine Surface Plan
Plan prepared in accordance with section 4 of these Directions showing surface features.

Mine
is defined in section 4A of the *Mines Inspection Act 1901*:

> **4A. (1)** In this Act, ``**mine''** means any aboveground or underground site where any of the following activities take place:
> (a) exploration for metals and minerals,
> (b) extraction of metals or minerals.
>
> **(2)** Without limiting subsection (1), ``**mine''** includes:
> (a) the treatment of metals or minerals extracted from a site referred to in subsection (1) if the treatment is carried out at a place at, adjoining or near the site, and
> (b) any machinery, equipment, appliance or plant, whether moveable or not, or any building, laboratory, tunnel, drift, haul road or other structure or work, that is situated at a site referred to in subsection (1) and that is used in connection with an activity referred to in subsection (1), and
> (c) any place where waste resulting from an activity referred to in subsection (1) is stacked, stored or treated if the place is at, adjoins or is near the site where the activity takes place, and
> (d) any quarry and any ready mix concrete or bitumen hot mix plant that adjoins, and is in common ownership with, the quarry (whether or not the plant uses material excavated from the quarry in the manufacture of the concrete or bitumen), and
> (e) any place on which treatment and separation plants are installed for the recovery and treatment of zircon, rutile, ilmenite, monazite and associated minerals, and
> (f) any part of a site referred to in subsection (1) where environmental rehabilitation is being carried out (irrespective of whether mining operations at the site have been completed), and
> (g) any abandoned mine (other than an abandoned mine used for the storage, treatment or disposal of waste that is unconnected with an activity referred to in subsection (1)), and
> (h) any place where operations for the care, security and maintenance of a site referred to in subsection (1) are being carried out during any time when mining operations at the site are suspended, and

(i) any place where restoration, decommissioning or abandonment operations of a site referred to in subsection (1) are being carried out.

Mining Surveyor
The mining surveyor is the person referred to in Section 41(1A)(c) of the *Mines Inspection Act 1901*. The duties of the mining surveyor are as follows:

- To survey or supervise the surveying of the mine to the standards set out in these Directions.
- To prepare or supervise the preparation, update and maintenance of the Mine Workings Plan to the standards set out in these Directions.
- To endorse the Mine Workings Plan as required, and certify the accuracy and completeness of the Mine Workings Plan.

In any mine there may be a number of surveyors competent to carry out these tasks, but at any one time, only one surveyor will be designated as the mining surveyor for the purposes of Section 41(1A)(c) of the *Mines Inspection Act 1901*.

Mine Workings Plan
The plan required to be kept under Section 41 of the *Mines Inspection Act 1901* to accurately show the position of the mine workings and compiled in accordance with these Directions. For those plans prepared in accordance with Section 4.4 of these Directions, the Mine Workings Plan is the digital version of the plan. For those plans prepared in accordance with Section 4.5 of these Directions, the Mine Workings Plan is the hard copy.

(a) Digital
A digital image file of the Mine Workings Plan in accordance with section 5 of these Directions.

(b) Hard Copy
A copy of the Mine Workings Plan plotted on the appropriate medium in accordance with section 5 of these Directions.

Plan and **sections**
include correct copies of any original plan and section sheet forming part of the Mine Workings Plan. Sections includes both cross and longitudinal sections.

Open Cut
means a surface excavation

Ore pass
means an underground opening through which broken material is transferred, by gravity, from a higher level to a lower level

Owner
is defined in Section 4 of the Mines Inspection Act 1901:
means a person who is the immediate proprietor or lessee, or occupier of a mine, or of any part thereof, and does not include a person who merely receives a royalty, rent, or fine from a mine, or is merely the proprietor of a mine, subject to any lease, grant, or licence for the working thereof, or is merely the owner of the soil, and not interested in the minerals of the mine; but any contractor, subcontractor or tributer for the working of a mine, or any part thereof, shall be subject to this Act in like manner as if the contractor, subcontractor or tributer were an owner, but so as not to exempt the owner from any liability.

Pentice
means a cover or roof over a sinking shaft for the protection of employees working below in the shaft

Plat
means a platform area around a shaft at an underground level

Quarry
includes any place, open cut, or excavation wherein or whereby any operation is carried on above ground for or in connection with the purpose of obtaining any metal or mineral other than coal or shale and any place adjoining thereto on which any product of the quarry is stacked, stored or treated.

Raise or rise
means a development excavated upwards from a level drive or crosscut

Ramp
means a development opening driven up or down from any level development or the surface, or between any two mining horizons in a mine at gradients permitting the use of trackless equipment

Shaft
means an opening into a mine having an inclination to the horizontal of 15^{o} or more through which persons or materials are raised or lowered, or which is used as a main intake or outlet for ventilation

SP1
The Inter-Governmental Committee on Survey and Mapping Publication 1 - “Standards and Practices for Control Surveys”. This publication contains an explanation of the survey accuracy standards stated in these Directions.

Stope
means an excavation, other than development workings, made for the purpose of excavating ore

Subsidiary Survey
A survey based on control surveys to develop the workings of a mine or to locate the position of the workings of a mine.

Supervision
When a survey is carried out in accordance with these Directions the mining surveyor must exercise such immediate oversight and personal direction of the work as is necessary to ensure that the mining surveyor has the knowledge to certify all aspects of the survey and that the survey has been carried out in accordance with sound professional practice and these Directions.

Surveyor General
means the Surveyor General of New South Wales

Survey Records
For the purpose of these Directions, survey records shall be taken to mean field books, level books, co-ordinate books, computer data files, calculations and any other note books, sheets or plans used for recording relevant survey data, all survey observations, compilations and other relevant survey data whether recorded or stored in manual form or by electronic or other device.

Themes
Theme refers to a type of information presented on the Mine Workings Plan and stored on a single layer of a digital drawing document. The Department uses ArcInfo as a GIS database, and for the purposes of these Directions, a theme and a layer are similar.

Treatment
is defined in Section 4 of the Mines Inspection Act 1901:
means:

(a) the crushing, grinding, classifying, reducing, smelting, concentrating, precipitating or separating of any product of a mine, or
(b) any other process, or part of a process, for obtaining any metal or mineral from the product of a mine, or
(c) the mixing of any product of a quarry with any substance so as to produce ready mix concrete or bitumen hot mix, or
(d) the sorting, grading and preparation of recycled concrete, recycled brick, recycled bitumen, recycled stone or recycled rock to be blended with any product of a quarry.

Underground
means having an overlying cover of rock

Vertical or sub-vertical openings
includes stopes, access rises, fill passes, ore and waste passes, ventilation rises and shafts and escape ways.

Winze
means a development excavated downwards from a drive or crosscut

Working face
means the area of excavation which is being worked

3. SURVEY STANDARDS AND PROCEDURES

3.1 General

3.1.1 All surface and underground surveys for the production of the Mine Workings Plan for lodgement with the Department shall be made and carried out in accordance with these Directions.

3.1.2 The Chief Inspector may, in any particular case, approve in writing the survey of a mine by other methods or to an acceptable degree of accuracy other than set out in these Directions.

3.1.3 The standards of accuracy referred to in this document are as described in the Inter-Governmental Committee on Survey and Mapping Publication 1 - "Standards and Practices for Control Surveys" (ICSM SP1). The mining surveyor shall carry out surveys to the standards of accuracy listed in these Directions. The current technical description and procedures associated with the standard will be as defined in Part A of the (ICSM SP1) manual.

3.1.4 It is the responsibility of the mining surveyor to become conversant with the standards of accuracy, and to use survey methods which will achieve the standards of accuracy set out in these Directions.

3.1.5 The survey methods described in Part B of the (ICSM SP1) manual should be viewed as guidelines only in achieving the required standards of accuracy. The choice of technique is a professional decision of the mining surveyor, based on sound practice, and provided that methods employed are in compliance with all existing legislation and the safe working practices of the mine.

3.1.6 Laser devices used in mines shall generally be limited to classes 1, 2 and 3A. (refer to Laser entry in definitions) The use of any other class of laser device is prohibited except with the written permission of the Chief Inspector. The use of laser devices must conform to all relevant legislative requirements.

3.2 Origin of Co-ordinates

3.2.1 All surface and underground surveys made and carried out in accordance with these Directions shall be calculated and plotted by using the Universal Transverse Mercator Grid Coordinates: Map Grid of Australia (MGA94).

During the transition to the Geocentric Datum, the grids used may include:

i. the New South Wales Integrated Survey Grid and Co-ordinate System.
ii. the AGD66 coordinate set for geographical coordinates and the associated Australian Map Grid (AMG66) for projection coordinates.
iii. a local or mine grid system if the mine was established prior to the gazettal of these Directions.

The transitional arrangements for transfer of existing grid and coordinate systems to MGA94 are set out in Clause 1.4 of these Directions.

3.2.2 Where an established mine uses a local grid, and the relationship with MGA94 has been established, an exemption from the requirements of Clause 3.2.1, may be applied for, in writing, from the Chief Inspector.

3.2.3 The mining surveyor shall ensure that if a local grid system is in use at a mine, the relationship between that local grid and the Map Grid of Australia (MGA94) is established in terms of distance, coordinates and with respect to orientation.

3.2.4 All mine surveys and plans shall originate from the Mine Baseline.

3.2.5 The horizontal survey of the Mine Baseline should be planned to a minimum of the Class B standards of accuracy as defined in ICSM SP1. The geometry of the subsidiary survey network should be consistent with this standard of accuracy.

3.2.6 Each end of the Mine Baseline should be assigned an AHD Reduced Level using a minimum standard of either:

(a) Class LD spirit levelling (ICSM, SP1)
or
(b) Class B from Trigonometric or GPS Heighting (ICSM, SP1)

3.2.7 Should the position, coordinate value, or reduced level of the Mine Baseline change, this information shall be forwarded to the Director General for retention.

3.2.8 At each end of the Mine Baseline there shall also be established a reference mark of durable nature connected by bearing and distance to the baseline.

3.3 Surface Baseline

3.3.1 The Mine Baseline shall not be less than 250 metres in length and each end substantially marked.

3.3.2 Mine Baseline terminals for both open cut and underground mines, should be approved Permanent Marks as described in Surveyor Generals Direction No.1.

3.3.3 Where Permanent Marks are placed for a Surface Baseline, a plan and an electronic record with digital survey data should be forwarded to the Director General who in turn shall forward the information onto the Surveyor General for approval to be included in the State Control Network.

3.3.4 For an existing mine, the current baseline marks should be retained provided they are of a durable nature.

3.3.5 Permanent Baseline details shall be recorded on the Mine Workings Plan.

3.4 Underground Baseline

3.4.1 Each underground mine shall establish a baseline in the underground workings of each level. The underground baseline shall be in a suitable position and be as long as practicable. At each end of a Baseline shall be Permanent Station Marks. The marks shall be stable and durable and established in the floor or back of a development heading. The location shall be chosen to minimise movement or damage caused by blasting, ground movement or mobile equipment. The station number or identifier must be painted on the adjacent wall. A durable tag indicating the station number or identifier could be attached. Permanent Baseline details shall be recorded on the Mine Workings Plan.

3.4.2 The method of transference of azimuth and reduced level to an underground baseline shall conform to the methods and standards set out in Section 3.6 of these Directions.

3.5 Traverses

3.5.1 Accuracy: Each underground control and subsidiary survey shall, where possible, be closed to the standard of accuracy as prescribed in ICSM, SP1 Class D. If loop closure is not practical, the survey techniques recommended in SP1, Part B for achieving Class D should be employed.

3.5.2 Marking: Each underground control station shall be adequately referenced and substantially marked. The station number should be painted adjacent to the survey station and again on the adjacent wall. A durable tag indicating the station number could also be attached as an adjunct to painting the number. As far as practicable the marks shall be placed in a position least likely to be disturbed by the effects of ground movement or mobile equipment.

3.6 Correlation of Surface and Underground Surveys

3.6.1 Correlation between surface and underground surveys shall be consistent with a Class D survey as prescribed in ICSM SP1.

3.6.2 In correlation of surface and underground surveys the methods may be by:

- traversing through an adit or a decline/incline ramp;
- plummeting one or more vertical shafts,
- using a gyro-theodolite to establish azimuth,
- or a combination of these methods.

3.6.3 Where methods other than direct traverse through an adit or decline/incline ramp are employed for azimuth or coordinate transfer, the surveys shall be shown on a plan separate from the Mine Workings and shall disclose the survey methods employed. The plan shall be submitted to the Chief Inspector and the mining surveyor shall certify that the survey shown on the plan is accurate and meets the requirements of these Directions.

3.6.4 Where vertical measurement is necessary for transference of the value of the surface bench mark to a nominated underground bench mark, the maximum permissible error should not exceed 0.05 metre.

3.7 Accuracy of Levelling

3.7.1 Datum

3.7.1.1 Heights should be referred to the Australian Height Datum (AHD) + 10,000 metres as the datum for heights. This will avoid negative levels on mine plans.

3.7.1.2 A period of two years from the date of gazettal of these Directions is provided for the transfer of the Mine Workings Plan to the AHD + 10,000 metres datum. The general manager of a mine, where the life expectancy of the mine is less than two years from the date of gazettal of these

Directions, may apply to the Chief Inspector for an exemption from this requirement.

3.7.1.3 When connection to the Australian Height Datum is not possible, heights shall approximate as closely as possible to heights above mean sea level, and the datum used should be carefully defined. Further information on the AHD can be found in the GDA Technical Manual, Version 2.0.

3.7.1.4 Where an established mine uses a local height datum, and the relationship with AHD has been established, an exemption from the requirements of Clause 3.7.1.2, may be applied for in writing, from the Chief Inspector.

3.7.2 Order of accuracy of secondary bench marks

3.7.2.1. In an open cut mine it is expected that secondary benchmarks be established by traversing from the Mine Baseline Permanent Marks. Such levelling shall be to ICSM, SP1 Class LD standard of accuracy.

3.7.2.2. In an underground mine, secondary benchmarks should be to ICSM SP1 Class LD standard of accuracy.

3.7.3 Order of accuracy of position of workings

Such levelling shall be to ICSM SP1 Class LD standard of accuracy or to within 0.1 metre. In the case of inaccessible workings or where reflectorless EDM or laser ranging equipment is employed for cavity measurement, a lesser level of accuracy is acceptable, provided the Mine Workings Plan is appropriately annotated.

3.8 Survey Records and Supply of Survey Information

3.8.1 Systematic care should be taken for the safe and fireproof preservation of mine plans, note books, computer data files, traverse records and associated calculations, correlation records and associated calculations, coordinate books or sheets and other records from which the workings have been plotted

3.8.2 Survey records for each of the following purposes should be kept at the survey office for the mine:-

(a) surface surveys
(b) surface levelling
(c) underground control surveys
(d) underground subsidiary surveys

(e) underground check surveys
(f) underground levelling
(g) calculations
(h) any other relevant information

3.8.3 Such survey records shall be maintained, either manually on a stable material or, by electronic or other means not visually perceptible without the aid of a machine or device.

3.8.4 Where survey records are maintained in manual form the following requirements are to be observed:-

(a) All survey books shall be maintained in good order and shall have the following description attached:
  (i) titled with the mine name,
  (ii) sufficient information to indicate the location within the mine of the surveys contained in the survey book,
  (iii) consecutive index number

(b) Where practicable, the following procedures shall be adopted for entries into survey books:-
  (i) all survey observations and measurements shall be recorded at the time of survey;
  (ii) in the event of alteration of a mistake there shall be no erasure. The erroneous entry should be struck through and the correction written above;
  (iii) the datum line of the survey and the azimuth adopted shall be clearly indicated;
  (iv) lengths shall be entered at the time they are measured. Where appropriate, corrections shall be noted and the lengths deduced therefrom shall be clearly indicated;
  (v) bearing and distance from reference marks must be clearly shown;
  (vi) reference marks and bench marks placed by the mining surveyor shall be so noted and the positions and descriptions thereof shall be shown by a sketch in the appropriate book;
  (vii) lines remeasured shall be so specified and original distances and bearings shown;
  (viii) The mining surveyor shall sign the field book that the work shown therein was performed by him or under his supervision and indicate the date on which the work was performed

3.8.5 Where survey records are maintained in an electronic or other storage and retrieval device or system in a form not visually perceptible without the aid of a machine or device, a complete and separate duplicate of such records shall be preserved on paper or microfilm or on magnetic tape or disc or other permanent electronic medium.

3.8.6 The general manager or the mining surveyor of any mine, upon the request of the Chief Inspector, shall make available on a stable material all or any survey records or certified copies thereof.

3.8.7 The Mine Workings Plan must be revised if necessary, every three months to show any changes in respect of the workings that have been carried out, or the workings that are proposed to be carried out, at the mine.

3.8.8 Plans for lodgement with the Department must be compiled according to these Survey and Drafting Directions.

3.8.9 When suspension or abandonment of mining operations are imminent, the employer, or if a receiver has been appointed in respect of a principal employer, that receiver, or the general manager, must cause to be prepared by the mining surveyor, an update of the Mine Workings Plan to accurately reflect the surveyed mine workings at the time of suspension or abandonment.

3.8.10 Upon discontinuance of mining operations a copy of the Mine Workings Plan shall be submitted to the Director General for retention. The Mine Workings Plan shall be forwarded to the Department within 28 days of the abandonment of a mine.

3.8.11 Upon abandonment of a mine all survey records relevant to the preparation of the Mine Workings Plan shall be forwarded to the Director General for retention. The survey records shall be forwarded within 28 days of the abandonment of a mine.

3.9 Requirements when workings are to become inaccessible

Before any part of the workings of a mine become inaccessible, where practical and safe to do so, the position of all points of the workings shall be established from a subsidiary survey. Sufficient levels shall be taken to clearly indicate the height of the floor of the workings on any mining level, bench or berm on the Mine Workings Plan.

3.10 Surface Movement and Subsidence

3.10.1 Where the Chief Inspector directs, a survey is to be undertaken to record surface movement, including subsidence induced mining.

3.10.2 The survey shall be carried out in accordance with the standards set out in these Directions, or as otherwise directed by the Chief Inspector.

3.10.3 Such surveys shall be carried out under the supervision of, and certified by, a Registered Mining Surveyor.

3.10.4 All subsidence data including field notes is to be kept at the mine in accordance with Clause 3.7 of these Directions.

3.11 Maintenance and Adjustment of Survey Equipment

3.11.1 Survey equipment used for baseline or other precise surveys should be maintained regularly and kept in good adjustment.

3.11.2 Electronic distance measuring equipment used for precise surveys should be verified against the State primary standard of measurement of length, by using pillared test lines, at least once each year and immediately after service or repair. If this is not practical, a local baseline, measured with a standardised steel band, should be used.

3.11.3 GPS equipment should be verified against an approved control network upon acquisition and after any change in software, firmware or hardware.

3.12 Summary of Accuracy Standards

All the Standards referred to in this section are as described in the Inter-Governmental Committee on Survey and Mapping Publication 1 - "Standards and Practices for Control Surveys" (ICSM SP1). The mining surveyor should check to ensure that the current standards are being used.

The following is a summary of Standards set out in the Directions. Please note these are minimum standards.

Surface Baseline

EDM Observations	Class B
Horizontal Angle	Class B
Spirit levelling	Class LD
EDM Height Traversing	Class B
GPS Heighting	Class B
Trigonometric Heighting	Class B

Correlation of Surface and Underground Surveys

EDM Observations	Class D
Horizontal Angle	Class D
Maximum level error	0.05m

Underground Baseline

EDM Observations	Class D
Horizontal Angle	Class D
Spirit levelling	Class LD
EDM Height Traversing	Class B

Subsidiary Traverses

EDM Observations	Class D
Horizontal Angle	Class D
Spirit levelling	Class LD
EDM Height Traversing	Class C
GPS Heighting	Class C

Secondary Benchmarks

Opencut mine	Class LD
Underground mine	Class LD

Accuracy of position of mine workings or surface topography

EDM Observations	Class E
Horizontal Angle	Class E
Spirit levelling	Class LE
EDM Height Traversing	Class D
GPS Heighting	Class D or

to 0.1m where ranging equipment is used.

Control for Photogrammetry

Horizontal Ground Control Survey	Class C
Vertical Control Survey	Class LD or B or better

4. MINE WORKINGS PLAN

4.1 Authorisation of Plan

The Mine Workings Plan is required to be produced, maintained and kept by the *Mines Inspection Act 1901*.

Section 41 of the *Mines Inspection Act 1901* requires mine plans to be kept at mines employing 20 or more people. Mines employing less than 20 people are also required to keep mine plans if so advised by the Chief Inspector.

These Directions require the lodgement of plans with the Department and also constitute advice by the Chief Inspector under Section 41 (1) (b) for the following mines to prepare and lodge plans.

i. All underground mines on current mining leases
ii. All open cut mines on current mining leases

These Directions also apply to :

i. any extractive Industries mining operations employing less than 20 people where the Chief Inspector has advised that Section 41 applies to these operations.
ii. any underground or open cut mine on a mineral claim, where the Chief Inspector has advised that Section 41 applies to those mines.

4.2 Preparation of Plan

The following shall be observed in preparation of the Mine Workings Plan:

4.2.1 The owner or general manager of a mine must, before the commencement of any mining operations at the mine, cause an accurate plan of the proposed workings of the mine to be prepared in accordance with this clause by:

i. a mining surveyor authorised by the Chief Inspector, or
ii. a qualified mining engineer, or
iii. a production manager

4.2.2 The plan must include any previous workings at the mine if any part of the mine has been worked in the past or if the mine was an abandoned mine.

4.2.3 The plan must be drawn to a maximum scale of not more than 1:1250 unless the Chief Inspector, in writing, permits the plan to be drawn to another scale.

4.2.4 The plan must be revised every 3 months to show any significant changes in respect of the workings that have been carried out, or the workings that are proposed to be carried out, at the mine.

4.2.5 The plan, or plan as revised from time to time, must be deposited at the office of the mine and must be produced, on request, to an inspector or to any other person authorised in writing by the Chief Inspector to inspect it.

4.2.6 The owner or general manager of the mine must, if requested by an inspector or person authorised by the Chief Inspector:

(a) mark on the plan, to the best of the owner's or general manager's ability, the progress of the workings of the mine up to the time at which the plan is produced to the inspector or authorised person, and
(b) allow the inspector or authorised person to examine the plan and to take a copy of it.

4.2.7 The owner or general manager of a mine must, if requested to do so by the Chief Inspector by notice in writing, provide an inspector or an authorised person with a copy of a plan (or latest revision of a plan) as deposited at the office of the mine within the time specified in the notice.

4.2.8 An inspector or authorised person must file any copy of a plan provided to the inspector or authorised person in accordance with Clause 4.2.7 in the records of the Department.

4.3 Composition of Plan

4.3.1 General

4.3.1.1 The Mine Workings Plan for the purpose of this section, may be produced by either:

DIGITAL METHODS - prepared from the digital form of the plan held in the computer. It is either produced in hard copy form for presentation and archiving or lodged as a digital document in a software format compatible with the Department of Mineral Resources' software.

or:

MANUAL METHODS - manually drafted and reproduced in hard copy form for presentation, lodgement with the Department and archiving, during the transitional period.

4.3.1.2 In the digital form the Mine Workings Plan shall be compiled as a minimum number of themes for the whole of the mine as described in Section 4.4 in a software program of the mining surveyor's choice and compatible with the Department of Mineral Resources' software. Section 6.3 contains current information concerning digital standards. **

4.3.1.3 In the case of an underground mine, the hard copy of the digital Mine Workings Plan shall consist of Mine Workings Plan sheets for each mine level, prepared in accordance with Section 4.4 of these Directions.

4.3.1.4 In the case of an open cut mine, the hard copy of the digital Mine Workings Plan shall consist of mine plan workings sheets for each

deposit being worked, cross section and longitudinal sheets prepared in accordance with Section 4.4 of these Directions.

4.3.1.5 In the case of an underground mine, the hard copy of the manually drafted Mine Workings Plan shall consist of Mine Workings Plan sheets for each mine level or sublevel, prepared in accordance with Section 4.5 of these Directions.

In the case where a mine is worked from ramps and not from regular levels or sublevels, the Mine Workings Plan shall consist of whatever number of plan sheets is required to adequately show the extents of mine workings.

4.3.1.6 In the case of an open cut mine, the hard copy of the manually drafted Mine Workings Plan shall consist of mine plan workings sheets for each deposit being worked, cross section and longitudinal sheets prepared in accordance with Section 4.5 of these Directions.

4.3.1.7 A reference in these Directions to the Mine Workings Plan includes a reference to plan sheets and longitudinal and cross sections sheets of the workings of the mine and correct copies or tracings of any original plan and sections.

4.3.1.8 At any mine where mining or development has taken place during the reporting period, only those plan and section sheets of the Mine Workings Plan where mining or development has taken place during the reporting interval need to be lodged with the Department. This may include new sheets as the workings are extended.

4.3.2 Transitional Arrangements

4.3.2.1 A period of two years from the date of gazettal of these Directions is provided for the transfer of the Mine Workings Plan to digital form.

4.3.2.2 The general manager of a mine, where the life expectancy of the mine is less than two years from the date of gazettal of these Directions, may apply in writing to the Chief Inspector for an exemption from this requirement.

4.4 Preparation by Digital Methods

4.4.1 Themes

4.4.1.1 For the preparation of the Mine Workings Plan for the deposit being worked within the mapping area of the mine plan sheets, the following information shall be captured as a minimum of theme layers:

i. Mine holding's boundary
ii. Mining lease boundaries
iii. Mine development - Actual
iv. Mine development - Planned
v. Survey stations and their identification annotated

vi. Cadastre parcels and how derived (Digital Cadastre Data Base [DCDB], survey, original plans), with appropriate endorsements.
vii. Mine shafts, adits and declines
viii. Grid lines and values
ix. All workings in the deposit within 30 metres of the current workings including workings of adjacent mines.
x. For underground mines - an outline (boundary) of all old workings in any horizon or mine level in any direction within 5 metres of the current level being worked
xi. For underground mines - a detailed outline of current or associated workings within 5 metres in any direction of any development shown on a level plan sheet or section sheet
xii. Boreholes

4.4.1.2 The general manager of a mine with good cause, may apply in writing to the Chief Inspector for an exemption or variation from any of the requirements of clause 4.4.1.1.

4.4.2 Copy of Mine Workings Plan

4.4.2.1 A copy of the revised Mine Workings Plan shall be prepared from the digitally held data and presented in the form described in Section 5 of these Directions

4.4.2.2 The plan sheets and section sheets (as the case may be) on which workings occurred during the previous three monthly survey revision period will be produced on paper. The previous copies may be archived or destroyed on preparation of the updated copy.

4.4.2.3 In the case of the discontinuance or abandonment of a mine, the Mine Workings Plan sheets, cross section and longitudinal section sheets will be produced on durable polyester film for certification and retention at the office for the mine except where the Chief Inspector otherwise determines.

4.4.2.4 In the case of the discontinuance or abandonment of a mine, the Mine Workings Plan sheets, cross section and longitudinal section sheets will be produced on durable polyester film for lodgement with the Department within 28 days of the date of discontinuance or abandonment.

4.5 Manually Drafted Plans

4.5.1 General

4.5.1.1 Where the Chief Inspector so approves, the Mine Workings Plan can continue to be produced by non-digital means. In those cases:

i. The plan shall be drawn on durable, stable polyester matt drafting material and shall be in the form set out in Section 5 of these Directions.
ii. All drafting and printing is to be in dense black ink.

4.5.1.2 Care should be taken to ensure that the inks used bond satisfactorily with the material.

4.5.1.3 The overall sheet size of the plan shall be, where appropriate, to International Standards Organisation (ISO) standard sheet sizes

4.5.1.4 In compiling a Mine Workings Plan by non digital means, the following shall be adhered to:

i. The survey grid used shall be clearly identified.
ii. Plotting of all surveys on a plan made in accordance with these Directions shall be done so that all points in the survey are correctly plotted within 1mm plan scale of their calculated co-ordinate position.

4.5.1.5 If the Mine Workings Plan is produced photographically:

i. The reproduction must be an accurate same scale copy of the Mine Workings Plan with no error or distortions.
ii. The reproduction shall be on a durable, stable polyester matt drafting material.

4.5.2 Copy of Mine Workings Plan

4.5.2.1 The revised Mine Workings Plan shall be prepared from the manually derived data and presented in the form set out in Section 5 of these Directions

4.5.2.2 The plan sheets and section sheets (as the case may be) on which workings occurred during the three monthly survey revision period will be produced on a durable, stable polyester matt drafting material. The previous copies may be archived or destroyed on preparation of the updated copy.

4.5.2.3 In the case of the discontinuance or abandonment of a mine, the Mine Workings Plan sheets, cross section and longitudinal section sheets will

be produced on durable polyester film for certification and retention at the office for the mine except where the Chief Inspector otherwise determines.

4.5.2.4 In the case of the discontinuance or abandonment of a mine, the Mine Workings Plan sheets, cross section and longitudinal section sheets will be produced on durable polyester film for lodgement with the Department within 28 days of the date of discontinuance or abandonment.

4.6 Additional Information

4.6.1 Nothing in these Directions shall prevent the mining surveyor from including any additional information on the Mine Workings Plan providing it is shown in a manner consistent with these Directions.

4.6.2 The mining surveyor shall show on the Mine Workings Plan any additional information as directed in writing by the Chief Inspector.

4.6.3 The mining surveyor shall ensure that any information that may create a danger either to the mine or to adjacent mines or to adjacent strata if worked, is recorded accurately on the plan.

4.7 Endorsement of Plan

4.7.1 Endorsement of the Mine Workings Plan shall have two forms:

i. A Schedule of Endorsement indicating where information is absent or in doubt
ii. A Schedule of Certification of completeness and accuracy

4.7.2 Where any information shown on the Mine Workings Plan is in doubt or any other information that the mining surveyor considers requires endorsement, the Mine Workings Plan shall be suitably endorsed. An example of a Schedule of Endorsement is shown below:

SCHEDULE OF ENDORSEMENTS

REF	DATE	DESCRIPTION/ REFERENCES	SIGNED

4.7.3 Old Workings/Surveys
Where possible, old workings/surveys should be changed to GDA94 and AMG94 and suitably endorsed.

Where an exemption has been approved under clause 3.2.2 and/or clause 3.7.1.4, this clause 4.7.3, will not apply.

4.7.4 The mining surveyor shall, by signing and dating the Certification of Accuracy schedule and by signing and dating the Compact Disc with a permanent marking pen, declare for the most recent 3 monthly period that:

i. the Mine Workings Plan has been prepared in accordance with these Directions, and,
ii. the surveys shown on the Mine Workings Plan have been completed to an accuracy as prescribed in these Directions.

4.7.5 The Certification of Accuracy Schedule will appear on every Mine Workings Plan Sheet, and should follow the format shown below:

SCHEDULE OF CERTIFICATION OF ACCURACY

DATES		SIGNATURES	DATES		SIGNATURES
FROM	TO		FROM	TO	

4.7.6 The Mine Workings Plan sheets, produced from the digital form, shall have recorded digitally in the Certification of Accuracy schedule the certification details for each 3 monthly period charted since the commencement of these Directions.

4.8 Action upon Discontinuance or Abandonment

4.8.1 Authorisation

4.8.1.1 Section 42 of the *Mines Inspection Act 1901*, requires that the Mine Workings Plan be amended and lodged when operations at a mine are discontinued or abandoned. If the mine owner fails to comply with this section, that owner shall be guilty of an offence against the Act, and be liable to a fine not exceeding 10 penalty units.

4.8.1.2 An information for an offence under Section 42 may be laid at any time within 2 years after the abandonment of the mine, or after service on

the mine owner of a notice by an Inspector to comply with the requirements of Section 42, whichever last happens.

4.8.2 Action upon discontinuance or abandonment of a mine

4.8.2.1 Where any mine, of which a Mine Workings Plan is required, is discontinued or abandoned, a survey of the final position of the workings will be undertaken and the Mine Workings Plan amended. Upon the discontinuance or abandonment of a mine the Mine Workings Plan shall be dated and signed by the mining surveyor to the date of discontinuance or abandonment.

4.8.2.2 Upon the completion of the required survey and drafting, the Chief Inspector is to be notified that the Mine Workings Plan is available for inspection.

4.8.2.3 After the Chief Inspector is satisfied that the survey requirements have been met the owner shall, within three months after such discontinuance or abandonment, forward to the Minister the Mine Workings Plan.

4.8.2.4 A digital record in a form suitable for archiving and future reference and a plan in the form set out in Section 5 of these Directions on durable stable polyester matt material shall be produced and supplied to the Chief Inspector within 28 days of the date of abandonment.

4.8.2.5 Upon abandonment of a mine, unless otherwise directed in writing by the Chief Inspector, all survey records are to be submitted to the Chief Inspector for retention.

4.9 Cessation of Duties of the mining surveyor

4.9.1 Upon permanent cessation of duties of the mining surveyor the Mine Workings Plan shall be amended, dated and signed by the mining surveyor. The mining surveyor shall show the date of the workings at the time of cessation on these plans in a similar manner to that of the 3 monthly survey period.

4.9.2 The note ‘Charted to date of Cessation of Duties’ is to be shown in the ‘Schedule of Accuracy’ above the date and the mining surveyor’s signature.

4.9.3 At the time of cessation of duties, and after certification under clause 4.7.4 has taken place, the mining surveyor shall produce a durable copy

of the Mine Workings Plan for retention at the office for the mine except where the Chief Inspector otherwise determines.

4.9.4 The outgoing mining surveyor should where possible (with the consent of the mine owner) take a copy of the sheets for his own record.

4.9.5 The incoming mining surveyor should make a copy of the sheets for a record of his commencement of work.

4.10 Other Plans Required

4.10.1 General

Nothing shall prevent the mining surveyor from combining one or more of the following plans into the sheets of the Mine Workings Plan, provided legibility of the combined plans is retained.

4.10.2 Ventilation Plan (Underground Mines)

4.10.2.1 Clause 40 of the Mines Inspection General Rule 2000 under the *Mines Inspection Act 1901* requires that a plan of ventilation be kept.

4.10.2.2 The general manager of a mine must ensure that all major ventilating fans, air doors, brattices or other ventilating devices or controls in use at the mine are recorded on the plans and sections of the mine.

4.10.2.3 The general manager must arrange for the measurement (and recording on the plans and sections) of the direction, course and quantity of air currents in the mine at intervals that will enable the air in the mine to be adequately monitored.

4.10.2.4 The general manager must ensure that the information required to be recorded by Clause 4.10.2.1.2 and 4.10.2.1.3 is kept up to date and is made available to an inspector or a mine safety officer on request.

4.10.3 Surface Plan

4.10.3.1 The Surface Plan shall be of a scale of not less than 1:1250 and shall cover the areas where mining operations have been or are being carried out. Symbols used will be in accordance with AS 4368 and AS 1100-401.In the case of an underground mine, the Surface Plan shall show detail as set out in Section 5 of these Directions, and all streets, roads, reservoirs, swamps, water bodies, unconsolidated surface deposits, railways, main pipelines and any other feature whether of the same or a different kind.

4.10.3.2 In the case of an Open Cut Mine, the Surface Plan shall show all detail as set out in Section 5 of these Directions, and all streets, roads, reservoirs, swamps, water bodies and any other permanent feature whether of the same or of a different kind which, if disturbed by mining operations, is likely to cause damage to or danger in the mine.

4.10.3.3 In the case of coastal mining operations below mean sea level (MSL), the Mean High Water Mark (MHWM) should be indicated on the plan.

4.10.4 Accident Plan

4.10.4.1 Section 47 of the *Mines Inspection Act 1901* outlines the requirements for notification when a serious accident or dangerous incident occurs. The accident location must not be disturbed. Section 47A states:

"(1) The owner or general manager of the mine concerned must ensure that the place where a serious accident or dangerous incident occurred is left as it was immediately after the accident until:

(a) the expiration of 3 days after the notice was given under section 47 (1), or
(b) a visit to the place by an inspector

whichever occurs first.

(2) This section does not apply if compliance with the section would tend to increase or continue a danger or would unnecessarily impede the working of the mine".

4.10.4.2 In the case of any accident causing a fatality, a survey of the accident location is required, and an Accident Plan must be produced.

4.10.4.3 The Accident Plan shall be prepared from the accident location survey, by the mining surveyor or under the direct supervision of the mining surveyor.

4.10.4.4 In the case of a serious but non-fatal accident, an Inspector may require a survey to be carried out or an Accident Plan to be prepared.

4.10.4.5 Where possible, photographs of the accident location should accompany the Accident Plan.

4.10.4.6 Where conditions or continuing danger prevent a location survey being made, the position of the accident should be indicated on a

copy of a Mine workings Plan sheet, and annotated by the mining surveyor.

4.10.4.7 The information required on Accident Plan is set out in detail in Section 5 of these Directions. The detail shown must include an outline of the mine workings; the location within the mine; the location of all fixed and mobile plant; personal apparatus or clothing; together with sufficient annotation and labelling to clearly describe the condition and name of each object at the accident location.

4.10.5 Emergency Plan

4.10.5.1 An Emergency Plan shall be produced using the Mine Workings Plan as its basis.

4.10.5.2 The Emergency Plan shall be revised every three months, following the most recent revision of the Mine Working Plan, and contain relevant and up-to-date information on the following:

- Mine egress
- Firefighting system and appliances
- Mine rescue and safety

4.10.5.3 The Emergency Plan shall be at a scale of not less than 1:2000, and consist of a number of plan sheets adequately describing the major mine workings.

4.10.5.4 All symbols used shall be in accordance with AS 4368 and AS2916.

4.10.5.5 This plan shall show shafts, ramps and the main level development, the means of egress from each part of the mine to the surface and underground telephone stations.

4.10.5.6 The plan shall show positions in which pipe mains, hydrants, isolation valves, fire substations and fire depots are situated.

4.10.5.7 This plan will also show the position of stoppings, trapdoors, regulators, seals, prepared seal sites, overcasts, air crossings, ventilation doors, belt conveyors, main electric supply cables, fixed electrical apparatus, telephones and the direction of ventilation in the main development headings.

4.10.5.8 The plan shall show the location of first aid stations, underground telephone locations, any air quality or gas monitoring points together with the route of such monitoring

4.10.5.9 The plan shall show any bad or inaccessible ground, accumulations of water, filled voids, and any information identified as necessary for dealing with an emergency at the mine.

4.10.5.10 A copy of the Emergency Plan must be maintained on view at the mine, with an up-to-date copy kept in an accessible place in case of emergency.

4.11 Standards - General

Any plan (including, where appropriate, plans subject to these Directions) required to be drafted by the mining surveyor for purposes of the mine should be prepared in accordance with the relevant Australian Standard - in particular, but not limited to, AS 4368 and the Australian Standard AS1100 for technical drawing.

4.12 Plan Lodgement Requirements

4.12.1 All Underground Mines

4.12.1.1 The Mine Workings Plan shall be lodged with the Department annually, unless otherwise directed by the Chief Inspector.

4.12.1.2 Where a mine is to be discontinued or abandoned, a final Mine Workings Plan is to be lodged with the Department within 28 days after the date of discontinuance or abandonment.

4.12.1.3 Survey of a mine and lodgement of the Mine Workings Plan can be directed by the Chief Inspector at any time

4.12.2 All Open Cut Mines

4.12.2.1 The Mine Workings Plan shall be lodged with the Department annually unless otherwise directed by the Chief Inspector.

4.12.2.2 Where a mine is to be discontinued or abandoned, a final Mine Workings Plan is to be lodged with the Department within 28 days after the date of discontinuance or abandonment.

4.12.2.3 Survey of a mine and lodgement of the Mine Workings Plan can be directed by the Chief Inspector at any time

4.12.3 Extractive Industries Mining Operations either employing 20 or more people or subject to an advice by the Chief Inspector pursuant to Section 41 (1) (b) of the *Mines Inspection Act 1901*

4.12.3.1 The Mine Workings Plan is to be lodged as directed by the Chief Inspector

4.12.3.2 Where a mine is to be discontinued or abandoned, a final Mine Workings Plan is to be lodged with the Department within 28 days after the date of discontinuance or abandonment.

4.12.3.3 Survey of a mine and lodgement of the Mine workings Plan can be directed by the Chief Inspector at any time

4.13 Supply of copy of the Mine Workings Plan

4.13.1 Electronic messages (Email) as a notice for the issue and receipt of the copy of Mine Workings Plans is acceptable.

4.13.2 The copy of the Mines Workings Plan shall be sent to the Director General, Department of Mineral Resources unless otherwise advised.

4.13.3 The Mine Manager or the Mine Surveyor shall forward a notice to the Director General advising the date the copy of the Mines Workings Plan has been sent from the mine and by what means of transport.

4.13.4 On receipt of the copy of the Mines Workings Plan from the Mine, the Director General shall notify the Mine Manager or the Mine Surveyor, in writing within 7 days of receipt that the copy of the Mines Workings Plan has been received.

4.13.5 The Mine Manager or the Mine Surveyor shall notify the Director General in writing within at least 7 days prior to the scheduled return/lodgement date of the Mines Workings Plan if an extension of time is required to update the Mines Workings Plan.

5. MINE WORKINGS PLAN FORMAT & INFORMATION

5.1 Sheet Format

5.1.1 Plan Sheet

Each Mine Working Sheet shall show the following detail:

5.1.1.1 In the sheet heading:

i. The name of the Mine e.g. *Baron Rocks Gold Mine*.
ii. The number of the level or mine horizon according to the adopted mine nomenclature.

5.1.1.2 In the sheet surround:

i. The reduction ratio and a graphical (bar) scale together with a statement that all measurements are in metres,
ii. A north point indicating true north in relation to the local grid and Map grid of Australia (MGA94)
iii. A schedule of symbols used on the particular sheet,
iv. A sheet index showing all the sheets necessary to cover the mine holding and the number of each sheet with the particular sheet shown by a heavy outline
v. A schedule of survey dates and certifications
vi. The origin of levels and the grid bearing and terminal survey stations of the Mine Baseline,
vii. A schedule or schedules of survey marks and bench marks containing their identification, coordinates and height,

5.1.1.3 In the plan area:

All detail shall be plotted at a scale of 1:500 and the following detail will be shown:

i. Cadastral boundaries and property identifier annotated in 'background'.
ii. A grid showing co-ordinates
iii. The position of survey stations or bench marks and their identification.
iv. Cross section lines indicative of the position of the cross sections shown on the Cross Section Sheets.
v. Mining lease boundaries
vi. All abandoned or historical workings within 30 metres of the current workings.

5.1.2 Section Sheets

5.1.2.1 Separate cross section sheets shall be provided in order to adequately represent the form and extents of mine workings.

5.1.2.2 Where a mine can fully explain the extents and detail of its workings in plan only, then section sheets may not be produced. An application for

an exemption from Clause 5.1.2.1 may be made in writing to the Chief Inspector

5.1.2.3 Each cross section shall be compiled from information gained from the actual workings and not from borehole information.

5.1.2.4 Each section sheet is to be updated at the end of the quarterly survey.

5.1.2.5 Each Cross Section Sheet shall show the following detail:-

In the heading:

i. The name of the mine.
ii. The Grid coordinate or reference line to which the section refers.

In the map surround:

i. The reduction ratio and a graphical (bar) scale together with a statement that all measurements are in metres.

5.2 Mine Workings Plan Information

5.2.1 General

5.2.1.1 This section sets out the type of detail to be shown on the Mine Workings Plan. The detail includes both planned and built environment and natural features. It is expected that the plans will be as comprehensive as practicable in terms of detail shown.

5.2.1.2 The types of information listed as to be shown on the Mine Workings Plan are the minimum requirements only and it is at the discretion of the mine general manager or mining surveyor whether any additional information is shown.

5.2.1.3 Where applicable, the standard for Mine Workings Plan symbols shall be to Australian Standard AS4368 and AS1100. Geological symbols shall be to the Australian Standard for Geological Symbols (AS-2916) and AGSO 'Symbols used on Geological Maps'. If no symbol is available for a data theme, then a non-standard symbol may be used and an appropriate explanation shown on the Plan sheet.

5.2.1.4 It is expected that in a digital document the various types of data listed in this section will be each assigned a theme layer or grouped according to category, to allow flexibility in plotting and reporting.

5.2.2 Mine Plans - Underground Mines

5.2.2.1 Surface Plan

A surface plan of the mining lease showing the true position of the following features:

i. Mining lease boundaries
ii. Mine holdings boundary (DCDB)
iii. All buildings, both fixed and portable including offices, workshops, warehouses, power stations, crushing and grinding plant, metallurgical plant, storage and loading facilities.
iv. Access roads and car parks
v. The position of haulage (brace level) and ventilation shafts and ventilation fans
vi. Conveyors and stockpile areas including reclaim tunnels
vii. Transformer yards
viii. Overhead and underground power transmission lines
ix. Explosives and detonator magazines
x. ANFO plants and storage
xi. Rail sidings
xii. Bulk chemical storage bins and process vessels
xiii. Fuel storage tanks and fuelling areas
xiv. The extents of open shafts, stopes or open pits at the surface
xv. The extents of caved ground due to underground mining
xvi. Decline portals and access roads
xvii. Site fencing and gates
xviii. Tailings dams
xix. Waste dumps
xx. Drainage and water retention structures, dams, water tanks
xxi. Surface and underground Pipelines
xxii. Drainage and service boreholes
xxiii. Boreholes which may affect the safety of the mine
xxiv. Natural features including water courses and lakes
xxv. Any disused buildings, plant or shafts from older or defunct mine workings within the mining lease or claim area
xxvi. Surface spot levels or contours
xxvii. Survey reference marks and baseline
xxviii. Adjoining portions of the DCDB

5.2.2.2 Underground Level plans

These plans shall show development at each primary haulage or drilling level. The plans shall show the correct positions of the following:

i. The position of man, haulage and ventilation shafts
ii. All development drives and crosscuts, and position of working faces
iii. Stope outlines at the level
iv. Winzes, raises, ore passes, fill passes, ladderways, chutes
v. Electrical substations
vi. Rail track

vii. Crib rooms, offices
viii. Workshops – show overhead cranes and monorails
ix. Explosives and detonator magazines
x. Skip loading pockets
xi. Ore bins
xii. Conveyor drives and crushing stations
xiii. Pumping stations and sumps
xiv. Boreholes which may affect the safety of the mine
xv. The outline of development or stoping within 5 metres of a mine level
xvi. Ramps and access declines

A composite plan showing ramps or access declines/inclines between levels shall be provided where these are not partially shown on the level plans.

5.2.3 Mine Plans - Open Cut Mines

5.2.3.1 Surface Plan

A surface plan of the mining lease showing the true position of the following features:

i. Mining lease boundaries
ii. Mine holdings boundary (DCDB)
iii. All buildings, both fixed and portable including offices, workshops, warehouses, power stations, crushing and grinding plant, metallurgical plant, storage and loading facilities.
iv. Access roads and car parks
v. The position of haulage (brace level) and ventilation shafts and ventilation fans
vi. Conveyors and stockpile areas including reclaim tunnels
vii. Transformer yards
viii. Overhead and underground power transmission lines
ix. Explosives and detonator magazines
x. ANFO plants and storage
xi. Rail sidings
xii. Bulk chemical storage bins and process vessels
xiii. Fuel storage tanks and fuelling areas
xiv. The extents of open shafts, stopes or open pits at the surface
xv. The extents of caved ground due to underground mining
xvi. Decline portals and access roads
xvii. Site fencing and gates
xviii. Tailings dams
xix. Waste dumps
xx. Drainage and water retention structures, dams, water tanks
xxi. Surface and underground Pipelines
xxii. Drainage and service boreholes
xxiii. Boreholes which may affect the safety of the mine
xxiv. Natural features including water courses and lakes
xxv. Any disused buildings, plant or shafts from older or defunct mine workings within the mining lease or claim area
xxvi. Surface spot levels or contours

xxvii. Survey reference marks and baseline
xxviii. Adjoining portions of the DCDB

5.2.3.2 Open Cut Plans

The open pits may be shown on the surface plan, however where site facilities, ie. crushing, milling, administration, are at a distance from the open cuts or pits, then a series of plans should be provided to show the relevant detail. This detail includes the positions of the following:

i. Position of the tops and toes of all batters
ii. The position of berms and benches
iii. Haulage and access ramps between berms
iv. In-pit crushing plant and storage bins
v. Spot height levels of berms or benches
vi. Pumps and sumps
vii. The position of overhead powerlines
viii. The position of adjacent underground workings (current or abandoned) in relation to the open cut

5.2.4 Accident Plans

5.2.4.1 Section 4.10.4 sets out the circumstances requiring the production of an Accident Plan. An Accident Plan shall be surveyed and drafted according to the clauses of this section.

5.2.4.2 The Accident Plan means one or more plan sheets, section sheets or other plan provided to correctly describe the accident location.

5.2.4.3 A locality plan or sketch must be included showing the area described by the Accident Plan in relation to the whole of the mine workings.

5.2.4.4 The scale of the plan shall be chosen to adequately show the detail. This would typically be a scale of no more than 1:50. A sheet of the Mine Workings Plan may be used as a base provided the scale is adequate for the purpose of showing the detail. The current position of working faces must be shown.

5.2.4.5 The following Information will be shown in the sheet surround of every sheet used:

i. The mine name, level name and such information as to accurately describe the area of the mine where the accident occurred
ii. The reduction ratio and a graphical (bar) scale together with a statement that all measurements are in metres,
iii. A north point indicating mine grid north, true north, and MGA94 Grid north
iv. A schedule of symbols used on the particular sheet

v. The label 'ACCIDENT PLAN', shall be written prominently in the sheet surround to clearly differentiate the plan from of any sheet of the Mine Workings Plan

5.2.4.6 The Accident Plan Title Block shall include the following information:

i. Scene of (fatal) accident to (name)
ii. (location) (shift) (date)
iii. (company name)
iv. Drawing No.
v. Scale
vi. Mining surveyor's certification and annotation as to accuracy and completeness
vii. Field or Level Book Numbers used in Accident Plan survey

5.2.4.7 The Plan must show all detail that existed just prior to the accident, together with any detail that has been positioned as a result of the accident. All detail must be accurately labelled.

5.2.4.8 One section or sectional elevation is to be drawn to the same scale as the plan view and the section's position must be shown on that plan. The same level of detail is to be shown on the section as required for the Accident Plan.

5.2.4.9 The detail shown must include the following:

i. The real or assumed position of the injured person or persons – it would be expected that the injured or fatally injured person will have been removed from the scene
ii. The positions of other personnel at the time of the accident
iii. The position of articles of protective clothing – ie helmet, gloves etc
iv. Equipment used in rescue operations.
v. General environment and position of mining equipment & plant
vi. Positions from which photographs were taken.
vii. Other relevant information as directed by an Inspector

5.2.4.10 The mining surveyor shall maintain a register of the number of prints made of each plan and the allocation of such prints.

5.2.4.11 The plans concerning fatal accidents should not be viewed or made available to any person other than:

i. an Inspector of Mines,
ii. an authorised member of the Department's Investigations Unit
iii. the mine general manager
iv. the Coroner
v. a Board of Inquiry into the accident

5.2.4.12 The Accident Plan shall be stored in a secure place under the direct control of the mining surveyor.

5.2.5 Emergency Plans

5.2.5.1 Section 4.10.5 sets out the basic requirements for the production of an Emergency Plan. An Emergency Plan shall be produced in a format according to the clauses of this Section.

5.2.5.2 An Emergency Plan shall be produced using the updated Mine Workings Plan as its basis.

5.2.5.3 The label 'EMERGENCY PLAN', shall be written prominently in the sheet surround of every sheet.

5.2.5.4 A copy of the Emergency Plan must be maintained on view in a prominent place at the mine, with an up-to-date copy kept in an accessible place in case of emergency.

5.2.5.5 The Emergency Plan shall be at a scale of not less than 1:1250, and consist of a number of plan sheets adequately describing the major mine workings.

5.2.5.6 All symbols used shall be in accordance with AS 4368 and AS2916. Where the mine uses an approved set of local symbols, these may be used provided that a full explanation is contained on each sheet of the Emergency Plan.

5.2.5.7 The information contained on the Emergency Plan shall be as follows:

5.2.5.7.1 Mine Egress information

i. Shafts, ramps and the outline of the main level development,
ii. the means of egress from each part of the mine to the surface, including ladderways, Plats, emergency hoists
iii. Underground telephone stations.
iv. Non accessible areas of the mine
v. Fresh air stations

5.2.5.7.2 Firefighting System and Appliances information

i. Alarm and smoke warning systems
ii. Fire pipe mains
iii. Water mains & valves (general)
iv. hydrants
v. isolation valves
vi. fire substations
vii. fire depots
viii. stoppings, trapdoors, regulators, seals, prepared seal sites, air crossings, ventilation doors
ix. belt conveyors
x. main electric supply cables, fixed electrical apparatus
xi. telephones
xii. direction of ventilation in the main development headings.

5.2.5.7.3 **Mine Rescue and Safety information**

i. First aid Stations,
ii. telephone locations
iii. air quality or gas monitoring points together with the route of such monitoring
iv. bad or inaccessible ground,
v. accumulations of water
vi. filled voids
vii. any other information identified as necessary for the dealing with an emergency at the mine.

ANNEXURE B
DIGITAL PLAN FORMATS FOR CONVERSION

The Directions allow for digital documents to be provided which can be scanned or directly imported into the Department's database TAS2. This means the Department of Mineral Resources does not have to tag various attributes to points, arcs or polygons. The digital information shall be recorded on a write once read many Compact Disc.

The file format to be used for the transfer of digital Mine Workings Plan will be compatible with the Department of Mineral Resources' GIS software.

Currently, a Drawing Exchange File (DXF) or ArcInfo™ file are the preferred formats.

Theme layers from the digital Mine Workings Plan should be named and allocated attributes in the following manner:-

LAYER	NAME	ATTRIBUTES
Mine Holdings	holding	Mine Name
Primary development	work1	Ore body Name Mine Name Level Number Period worked (date)
Stoping outlines	work2	Ore body Name Mine Name Level Number Period worked (date)
Date lines/Polygons	dateline	Date
Surface contours	contour	Height
Survey Stations	survey	Name Symbol Type (number) XYZ co-ordinates
Grid Lines	grid	Value ie easting/northing
Cadastre	cadastre	Lot number/DP number Source (DCDB, own survey, compilation from original plans)
Barriers/Protective Pillars (protective, special etc)	barrier	Type (external, adjacent workings, water)

Restricted Zones		Ore body
Foreshore Protection Zone		Approval (Order) date
Angle of Draw Zones		File number
		Approval (Order) date
		File number
Geology	geology	Symbol type
		Displacement
Shafts	minfra	Name_ID
Declines		Borehole log file?
Boreholes (from surface)		
Surface Structures		
Transmission lines		
Pipelines		
Major structures		
Plant		
Roads etc		

ANNEXURE C
LIST OF WEB SITES FOR REFERENCE DATA

Web addresses are subject to change. The following listing is indicative only, not exhaustive and the mining surveyor should check periodically for updates and additional information.

Geodetic Datum (GDA94)
GDA Technical Manual, Version 2.0
http://www.anzlic.org.au/icsm/gdatm/index.html

Coordinate and Grid System (MGA94)
GDA Technical Manual, Version 2.0
http://www.anzlic.org.au/icsm/gdatm/index.html

Australian Height Datum (AHD)
GDA Technical Manual, Version 2.0
http://www.anzlic.org.au/icsm/gdatm/index.html

Survey Standards of Accuracy and Practice
(SP1) Standards & Practices for Control Surveys, Version 1.4 December 2000
http://www.anzlic.org.au/icsm/publications/sp1/s

Permanent Marks
NSW Surveyor Generals Direction No.1
http://www.lpi.nsw.gov.au/publications/sgdir1w.pdf

Mine Symbols
Australian Standard AS-4368
http://www.standards.com.au

Geological Symbols
Australian Standard AS-2916
http://www.standards.com.au
AGSO Symbols used on Geological Maps
http://www.agso.gov.au/information/symbols.html
ISO 710 Geological Symbols

Drawing Standards
Australian Standard AS-1100 (various)
http://www.standards.com.au

ANNEXURE D
REFERENCE COVER SHEETS

1) GDA Technical Manual, Version 2.0

2) Standards & Practices for Control Surveys, Version 1.4 December 2000

3) Australian Standard AS-4368 - Mine Plans - Preparations and Symbols

4) AGSO Symbols used on Geological Maps

5) Australian Standard AS-1100 (various)

6) NSW Surveyor Generals Direction No.1 - Approved Permanent Marks