RECOMMENDED PROCEDURES

FOR THE

INTERCHANGE OF SMALL AND MEDIUM SCALE

DIGITAL VECTOR TOPOGRAPHIC MAPPING DATA

NOVEMBER 1985

PREPARED BY THE

NATIONAL MAPPING COUNCIL OF AUSTRALIA

RECOMMENDED PROCEDURES

FOR THE

INTERCHANGE OF SMALL AND MEDIUM SCALE

DIGITAL VECTOR TOPOGRAPHIC MAPPING DATA

NOVEMBER 1985

PREPARED BY THE

NATIONAL MAPPING COUNCIL OF AUSTRALIA

CONTENTS

PREFACE

This document is a revision of the 1982 NMC publication titled:
'Recommended Procedures for the Interchange of Digital Mapping
and Charting Data on Magnetic Tape'.

The purpose of this revision is to:

(a) Incorporate changes made to Australian Standard 2482 -
'Interchange of Feature Coded Digital Mapping Data' - since 1981.
(The revised Standard has been published as AS2482-1984.)

(b) Reflect comments made by NMC organisations as a result of their
experience with AS2482.

CHANGES TO AS2482

The changes made to AS2482-1981 and incorporated in AS2482-1984 are
relatively minor. The most significant of these are:

(a) Table 4 which defines a Feature Record Detail Segment: Identification/
Name has been extended to include:
- State/Territory code (as per Appendix D of AS2482-1984)
- Organisation code (see Appendix E of AS2482-1984)
- Format Name

(b) Table 5 which defines a Feature Record Detail Segment: Point Symbol
has been extended to allow inclusion of symbol dimensions

(c) Table 6 which defines a Feature Record Detail Segment: Map Annotation
has been extended to allow inclusion of annotation dimensions

(d) Table 8 which defines a Definition Record Detail Segment: Essential
Information has been extended to permit use of further horizontal
co-ordinate systems including the Integrated Survey Grid (ISG)

(e) Table 9 which defines a Definition Record Detail Segment: Descriptive
Information has been extended in a similar manner to Table 4.

COMMENTS BY NMC ORGANISATIONS

Through their use of AS2482, NMC member organisations believe it to be:

(a) Unnecessarily complex - this is due more to the large range of
options that are permitted by the Standard rather than the
complexity of the data format

(b) Not suitable as an all embracing standard for the interchange of
'digital mapping data' but suitable only for the interchange of
'small and medium scale vector, unstructured digital topographic
mapping data'.

The 1982 NMC 'Recommended Procedures' document went some way towards solving
these problems for the exchange of data between NMC members. As a result of
the 1985 National Mapping Council and Technical Advisory Committee meetings,
however, the revised procedures contained in this publication go a step
further in limiting the use of options available in AS2482.

The exchange format described in this publication is a true subset of
AS2482-1984. This document is not designed as a 'stand alone' publication
but should be read in conjunction with AS2482-1984 and AS1068-1980
'Information Processing - Magnetic Tape Labelling and File Structuring for
Information Interchange'.

1. SCOPE

This document specifies the recommended format for the interchange of digital topographic data between NMC member organisations. The recommended format is a subset of AS2482-1984 and this document should be read in conjunction with AS2482-1984 and AS1068-1980.

It should be noted that AS2482 has been designed for, and should only be used for, the exchange of data which is:

(a) vector (not raster)

(b) small and medium scale (AS2482 feature codes are unsuited to larger scales)

(c) unstructured (AS2482 cannot explicitly retain topological information).

This document attempts to simplify the task of organisations trying to read AS2482 formats by specifying a single procedure where the Standard offers several alternatives.

2. EXCHANGE MEDIUM

The exchange medium shall be 9-track 12.7mm wide magnetic tape. Hence, in this publication, 'volume' refers to a single reel of magnetic tape.

3. OVERALL VOLUME FORMAT

3.1   FILE SEQUENCE

Exchange data may consist of one or more files on a single volume.
Note that:

(a) A volume must only contain COMPLETE files - no file may be split between two volumes. Files that are too large to fit onto the remainder of a tape are to be split into two or more separate files, each with their own labels.

(b) No file may be empty.

3.2   BLOCK LENGTH

A fixed block length of 2048 characters is to be used for all data.

3.3   PADDING

The fixed length blocks may contain complete variable length records.
Where a block needs to be padded out to 2048 characters:

EITHER the method shown in Appendix B of AS2482-1984 (where a dummy 'N' segment filled with spaces is appended to the final record in a block)

OR   the method shown in section 9.5 of AS1068-1980 (where after the final record in a block the remaining space is filled with circumflexes) may be used.

The 'circumflex' method is preferred, however, since many operating systems have facilities to perform this task automatically.

3.4   TAPE LABELLING SEQUENCE

A minimum form of tape labelling is specified which should be suitable for use by all organisations, irrespective of whether they have label generation and reading facilities. Information contained in the header labels is repeated and amplified in the definition records. Thus, header labels may be skipped over (as a file) by those users who cannot or do not wish to use them.

The labelling sequence accords with AS1068 except for the added restriction that a double tape mark must appear ONLY after the final file on a volume. This provides an unambiguous indication of end of data.

Figure 1 illustrates the tape labelling sequence for a typical volume.

```
                    VOL1
                    HDR1
                    HDR2
         ********tape mark*******

                  ┌──────┐
                  │FILE 1│
                  └──────┘

         ********tape mark*******
                    EOF1
                    EOF2
         ********tape mark*******
                    HDR1
                    HDR2
         ********tape mark*******

                  ┌──────┐
                  │FILE 2│
                  └──────┘

         ********tape mark*******
                    EOF1
                    EOF2
         ********tape mark*******
                    HDR1
                    HDR2
         ********tape mark*******

                  ┌──────┐
                  │FILE 3│
                  └──────┘

         ********tape mark*******
                    EOF1
                    EOF2
         ********tape mark*******
         ********tape mark*******
```
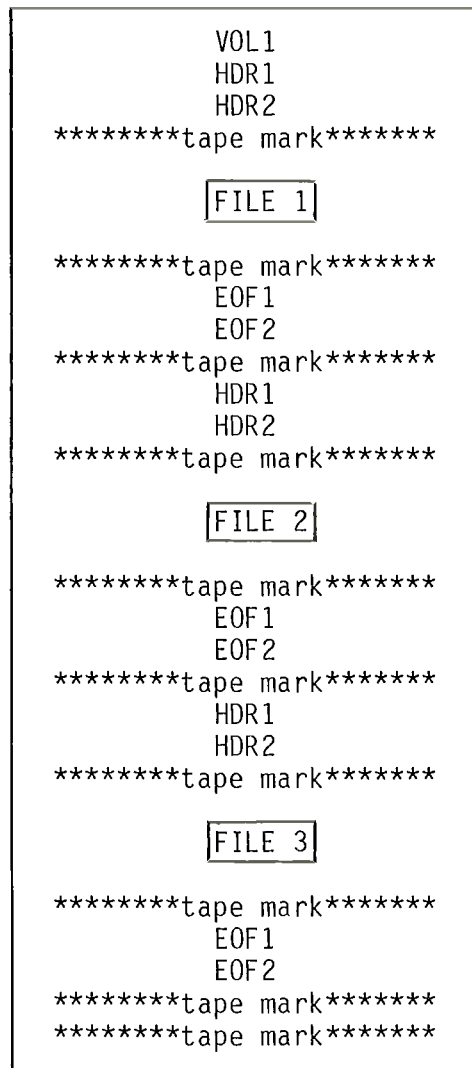
Figure 1. - Volume Containing 3 Data Files

Note that each volume commences with a VOL1 label and ends with a double tape mark. Each file begins with two HDR labels and ends with two EOF labels. Files and label sets are separated by single tape marks.

3.5   TAPE LABEL FORMAT

Labels are 80 characters in length and conform to AS1068-1980.

Figures 2-6 indicate the required contents for labels VOL1, HDR1, HDR2, EOF1 and EOF2 respectively. Figure 7 contains a sample set of labels.

In figures 2-6 the following abbreviations are used:

"n"   means any set of numeric characters (0-9)
"a"   means any set of numeric, alphabetic or special characters selected
       from: !%&()*+,-./0123456789:; = ?ABCDEFGHIJKLMNOPQRSTUVWXYZ
"s"   means a set of spaces

Character Position	Field Name	Length of Field	Content	Format
1-3	Label identifier	3	VOL	-
4	Label number	1	1	-
5-10	Volume identifier	6	eg tape number	"a"
11	Accessibility	1	space	"s"
12-37	Reserved	26	spaces	"s"
38-51	Owner identifier	14	eg short name	"a"
52-79	Reserved	28	spaces	"s"
80	Label Standard Version	1	3	-

Figure 2. - System Label VOL1

Character Position	Field Name	Length of Field	Content	Format	Default
1-3	Label identifier	3	HDR	-	-
4	Label number	1	1	-	-
5-21	File identifier	17	Map name/no./theme	"a"	"s"
22-27	File set identifier	6	Volume label	"a"	"s"
28-31	File section number	4	0001	-	-
32-35	File sequence number	4	0001,0002...	"n"	-
36-39	Generation number	4	0001	-	-
40-41	Generation version no.	2	00	-	-
42-47	Creation date	1	space	-	-
		2	year	"n"	00
		3	day (001 to 366)	"n"	000
48-53	Expiration date	6	as per creation date	"n"	00000
54	Accessibility	1	space	-	-
55-60	Block count	6	000000	-	-
61-73	System code	13	inserted by system	"a"	"s"
74-80	Reserved	7	spaces	-	-

Figure 3. - System Label HDR1

Character Position	Field Name	Length of Field	Content	Format	Default
1-3	Label identifier	3	HDR	-	-
4	Label number	1	2	-	-
5	Record format	1	D	-	-
6-10	Block length	5	02048	-	-
11-15	Max. record length	5	02048	-	-
16-50	Reserved(for system)	35	inserted by system	"a"	"s"
51-52	Buffer offset length	2	00	-	-
53-80	Reserved	28	spaces	-	-

Figure 4. - System Label HDR2

Character Position	Field Name	Length of Field	Content	Format	Default
1-3	Label identifier	3	EOF	-	-
4	Label number	1	1	-	-
5-54	Same as HDR1----------50-------------------------------------				
55-60	Block count	6	no.of data blocks	"n"	"s"
61-80	Same as HDR1----------20-------------------------------------				

Figure 5. - System Label EOF1

Character Position	Field Name	Length of Field	Content	Format	Default
1-3	Label identifier	3	EOF	-	-
4	Label number	1	2	-	-
5-80	Same as HDR2----------76-------------------------------------				

Figure 6. - System Label EOF2

```
         1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890

VOL1NM2345                        NATMAP                                        3

HDR1CANBERRA-CULTURE NM234500010001000100 85260 00000 000000DECFILE11A

HDR2D0204802048                                  00

EOF1CANBERRA-CULTURE NM234500010001000100 85260 00000 000215DECFILE11A

EOF2D0204802048                                  00

         1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
```

Figure 7. - Example of System Labels VOL1, HDR1, HDR2, EOF1, EOF2

6.

4. INTERNAL FILE STRUCTURE

4.1   GENERAL

Files contain two types of information record:

- Definition Records, which contain essential and descriptive information
  about the internal file format, co-ordinate system etc, and

- Feature Records, which contain data.

4.2   DEFINITION RECORDS

AS2482 allows many options for the frequency and placement of definition
records. In order to simplify the automatic processing of files, however,
this document specifies a single method only, as follows:

The FIRST record in each file MUST be a definition record containing an
essential information segment as per AS2482-1984 Table 8.

The next 6 records must also be definition records containing descriptive
information in accordance with Table 9 of AS2482-1984 and Figure 9 below.

These 6 records can be followed by any number of definition records each
containing one segment of descriptive information. Such records should
contain any additional comments or amplifications that the donor
wishes to make, such as:

- list of non standard feature codes and explanations
- explanations for any modifiers used
- description of any symbol definition table referred to
- details of donor-defined co-ordinate systems

The remainder of the file must consist ONLY of feature records.

```
        1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
0055D0050EG    080000150080000-34000100000DA40000000001M
```

Figure 8. – Example of 'Essential Information' Definition Record

EXPLANATION: X/Y co-ordinate system is longitude/latitude on the AGD
             divide field by 100000 to get whole degrees
             longitude offset of 150 degrees, latitude offset of -34 degrees
             length of field for both latitude and longitude is 8 characters

             Z co-ordinate system is metres on the AHD
             no co-ordinate scaling or offsets
             length of field is 4 characters

In Figure 9 (opposite) the following abbreviations are used:

"n" means any set of numeric characters (0-9)
"a" means any set of numeric, alphabetic or special characters selected
     from: ABCDEFGHIJKLMNOPQRSTUVWXYZ !"#$%&'()*+,-./0123456789:; = ?
            abcdefghijklmnopqrstuvwxyz
"s" means a set of spaces

Record Number	Character Position	Field Name	Length of Field	Content
2-7	1-4	Record length	4	0100
	5	Record type	1	D
	6-9	Segment length	4	0095
	10	Segment type	1	D
	11-20	Reserved	10	spaces
2	21-45	Descriptive info	25	MAP NAME:"a"
	46-65	Descriptive info	20	MAP NO:"a"
	66-82	Descriptive info	17	SCALE:"a"
	83-100	Descriptive info	18	THEME:"a"
3	21-50	Descriptive info	30	OWNER:"a"
	51-75	Descriptive info	25	CONTACT:"a"
	76-100	Descriptive info	25	PHONE:"a"
4	21-50	Descriptive info	30	SOURCE:"a"
	51-75	Descriptive info	25	SOURCE SCALE:"a"
	76-100	Descriptive info	25	SOURCE DATE:"a"
5	21-60	Descriptive info	40	DATE DIGITISED:"a"
	61-100	Descriptive info	40	DATE LAST REVISED:"a"
6	21-60	Descriptive info	40	ESTIMATED X/Y RMSE:"a"
	61-100	Descriptive info	40	ESTIMATED Z RMSE:"a"
7	21-60	Descriptive info	40	CAMERA FOCAL LENGTH:"a"
	61-100	Descriptive info	40	FLYING HEIGHT AMGL:"a"

Figure 9. - Format of Compulsory 'Descriptive Information' Definition Records

```
                                             1         2
                                    12345678901234567890
Each record is identical in fields 1-20:
                                    0100D0095D

2         3         4         5         6         7         8         9
123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
MAP NAME:CANBERRA        MAP NO:8727           SCALE:1:100000    THEME:CULTURE

OWNER:NATMAP                  CONTACT:PAUL TREZISE      PHONE:(062) 525981

SOURCE:REPROMAT               SOURCE SCALE:1:100000     SOURCE DATE:10/1/82

DATE DIGITISED:15/8/85         DATE LAST REVISED:10/1/82

ESTIMATED X/Y RMSE:50 METRES   ESTIMATED Z RMSE:10 METRES

CAMERA FOCAL LENGTH:N/A         FLYING HEIGHT AMGL:N/A

2         3         4         5         6         7         8         9
123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
```

Figure 10 - Examples of Compulsory 'Descriptive Information' Definition Records

4.3   FEATURE RECORDS

AS2482-1984 permits many different contructions of feature records using practically any combination of Tables 2-6. For the purposes of this document, however, a much more restricted definition is used.

A Feature Record consists of:

ONE Feature Record Header Segment (AS2482-1984 Table 2) FOLLOWED BY EITHER

(a) ONE Feature Record Detail Segment: Line Definition (AS2482-1984 Table 3) for a line or simple point feature, OR

(b) ONE Feature Record Detail Segment: Point Symbol (AS2482-1984 Table 5) for a complex point symbol, OR

(c) ONE Feature Record Detail Segment: Map Annotation (AS2482-1984 Table 6) for map annotation to be used for graphical presentation,

OPTIONALLY FOLLOWED BY

ONE Feature Record Detail Segment: Identification/Name (AS2482-1984 Table 4) for textual information concerning a feature (eg its name or identification) or as an alternative means of padding a block out to 2048 characters as per the example in Appendix B of AS2482-1984.

4.4   BLOCK LENGTH AND PADDING

A fixed block length of 2048 characters is to be used for all data. Since the fixed length blocks may contain only complete records (ie records must not span blocks) it will usually be necessary to pad blocks out to 2048 characters (see Section 3.3 'Padding').

```
          1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890

0070F00130000B230054L1-0112650-0200100-0112601-0199614-0112580-0199586
(simple line feature)

0038F38000000P230022L100300000-0200000
(simple point feature)

0042F50090000P330026L100292048-00347231767
(X/Y/Z feature - spot height)

0067F10000000P230051S 00420000000046000000046  0374   0029500000033960
(point symbol - oriented building)

0080F00010000P230064A 00000000016000000000200   0013   -0080000-0129166COOMA AIRPORT
(map annotation - 'Cooma Airport')

0070F16530000P230022L1-0079850-01305000032N            DUNDEE HOMESTEAD
(name segment used in conjunction with feature - 'Dundee Homestead')

          1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
```

Figure 11. - Examples of Feature Records

```
         1         2         3         4         5         6         7         8
1234567890123456789012345678901234567890123456789012345678901234567890

0118F00130000B230102L1-0112650-0200100-0112601-0199614-0112580-0199586-0112550-0
199420-0112523-0199203-0112501-01990530182F00130000B230166L1-0113660-0199130-011
3604-0198634-0113590-0198581-0113543-0198425-0113513-0198213-0113521-0198053-011
3400-0197925-0113501-0197614-0113480-0197586-0113455-01974200038F38000000P230022
L100300000-02000000038F38000000P230022L1-0300000-02000000038F38000000P230022L100
300000002000000038F38000000P230022L1-0300000002000000042F50090000P330026L1002920
48-003472317670042F50090000P330026L100292312-003452017800042F50090000P330026L100
292600-003473017530042F50090000P330026L100292568-003492618000042F50090000P330026
L100292040-003482918030042F50090000P330026L100292048-003472317670042F50090000P33
0026L100292048-003472317670042F50090000P330026L100200048-003462017600042F5009000
0P330026L100292134-003460518200042F50090000P330026L100291997-003470017610042F500
90000P330026L100292053-003410217050042F50090000P330026L100292932-003450317500042
F50090000P330026L100292753-003470517990067F10000000P230051S 00420000000460000004
6  0374  00295000000339600067F10000000P230051S 00900000000460000046  0374  0029
5123000339340067F10000000P230051S 00650000000460000046  0374  00295050000339500
067F10000000P230051S 01350000000460000046  0374  00295346000339690067F10000000P
230051S 00540000000460000046  0374  00295460000334050067F10000000P230051S 00050
0000000460000046  0374  00295080000337750080F00010000P230064A 009000000160000000
200  0013  -0080000-0129166COOMA AIRPORT0077F00010000P230061A 004000000160000000
200  0010  -0190000-0124005NAAS RIVER0079F00010000P230063A 00900000016000000200
  0012  -0080500-0124006TAYLORS BORE0076F00010000P230060A 009000000160000000200
  0009  -0085600-0128326BLUE LAKE0070F16530000P230022L1-0079850-01305000032N
        DUNDEE HOMESTEAD0070F16530000P230022L1-0108350-02065000032N        CULL
EN HOMESTEAD0069F16530000P230022L1-0079850-01305000031N        HAPPY HOMESTEA
D0074F16530000P230022L1-01459830-02105000036N        GARRABARRA HOMESTEADΛΛΛΛ
ΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛΛ

         1         2         3         4         5         6         7         8
1234567890123456789012345678901234567890123456789012345678901234567890
```

Figure 12. - Example of a Complete Block, Padded with Circumflexes