DRAFT Surface Profile RCD Specification

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| **Description**  This document describes the data to be provided in the Surface Profile RCD |

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# Introduction

The purpose of the document is to provide a formal specification of the data to be provided in the Surface Profile RCD.

Section 2 describes the physical structure of the route file which will be required for the fitting of survey data to the network using MSP.

Section 3 describes the data to be provided in the Surface Profile RCD.

Section 4 describes the physical structure of the Surface Profile RCD.

# Route File Specification

## Introduction

The definition of a survey route shall be provided in a single file, logically divided into four sections:

* Route “header” data;
* Survey lanes comprising the route;
* “End of Route” Reference;
* Sections referred to within the survey lanes.

The file shall consist of sequential records, each containing printable ASCII characters terminated by ASCII “Carriage Return” and “Line Feed” characters. (See Appendix A for a formal definition.)

The file shall contain:

One record of type R1.1, followed by

one or more records of type R2.1, followed by

one record of type R3.1, followed by

none, one or more records of type R4.1.

as defined in the following sections.

The following generic conventions are used within the “Format” column:

“A*n*” indicates a text field of *n* characters, left justified and padded with spaces;

“I*n*” indicates an integer numeric field of up to *n* characters, including an optional leading sign (+ or -), right justified and padded with spaces;

“F*n.d*” indicates a real number field of up to *n* characters, including the decimal point and an optional leading sign (+ or -), with *d* digits after the decimal point, right justified and padded with spaces;

(See Appendix A for a formal definition of the various formats.)

## Route “header” data

**Record R1.1 (Single record)**

|  |  |  |  |
| --- | --- | --- | --- |
| Characters | Description | Format | Value range |
| 1-5 | ‘ROUTE’ | A5 |  |
| 6-13 | File format version | A8 |  |
| 14-63 | Route identifier | A50 |  |
| 64-68 | Number of survey lanes within the route | I5 | 1-99999 |

## Survey Lanes

**Record R2.1 (Repeated for each survey lane as defined in record R1.1, sorted in sequence through the route)**

|  |  |  |  |
| --- | --- | --- | --- |
| Characters | Description | Format | Value range |
| 1-30 | Section label (blank for a “dummy” survey lane – see note 1 below) | A30 |  |
| 31-32 | Lane direction indicator, i.e. direction of normal traffic flow on the lane (see note 2 below) | A2 | “NB”, “SB”, “EB”, “WB”, “CW”, “AC” |
| 33-52 | Lane name | A20 |  |
| 53-63 | Start chainage (within section), measured in metres | F11.3 | 0.000 to 9999999.999 |
| 64-74 | End chainage (within section), measured in metres | F11.3 | 0.000 to 9999999.999 |
| 75-94 | Start reference (marker) label | A20 |  |
| 95-105 | Start reference x co-ordinate (if known) | F11.3 | 0.000 to 9999999.999 |
| 106-116 | Start reference y co-ordinate (if known) | F11.3 | 0.000 to 9999999.999 |

Notes: 1. A “dummy” survey lane requires only a start reference (marker) label. Other data items may be provided (if known) or may be blank / zero as appropriate.

1. Lane direction indicator will be the same as, or opposite to, the section referencing direction indicator defined in the corresponding section record (see 2.5 below). Opposite pairs are: NB/SB, EB/WB, CW/AC.

## “End of Route” Reference

**Record R3.1 (Single record)**

|  |  |  |  |
| --- | --- | --- | --- |
| Characters | Description | Format | Value range |
| 1-20 | End reference (marker) label | A20 |  |
| 21-31 | End reference x co-ordinate (if known) | F11.3 | 0.000 to 9999999.999 |
| 32-42 | End reference y co-ordinate (if known) | F11.3 | 0.000 to 9999999.999 |

## 

## Sections

**Record R4.1 (Repeated for each (non-dummy) section referred to in records R2.1, sorted alphabetically by section label)**

|  |  |  |  |
| --- | --- | --- | --- |
| Characters | Description | Format | Value range |
| 1-30 | Section label | A30 |  |
| 31-41 | Section start date (dd-mmm-yyyy, e.g. “01‑apr‑1998”) | A11 | Valid date |
| 42-52 | Section end date (dd-mmm-yyyy, e.g. “01‑apr‑1999”) | A11 | Valid date or blank if undefined |
| 53-63 | Section length, measured in metres | F11.3 | 0.000 to 9999999.999 |
| 64-65 | Section referencing direction indicator | A2 | “NB”, “SB”, “EB”, “WB”, “CW”, “AC” |
| 66-69 | Section Function | A4 | E.g. “MAIN”, “SLIP”, “RBT” |

# Data to be provided in the Surface Profile RCD

## Survey “header” data

The following “header” data shall be provided for a survey:

* Machine identifier/version,
* Output file format version,
* Date at the start of the survey;
* Time at the start of the survey;
* Date at the end of the survey;
* Time at the end of the survey;
* Survey identifier and other textual information;
* Co-ordinates (x, y and z) at the start of the survey data;
* Chainage at the end of the survey data;
* Co-ordinates (x, y and z) at the end of the survey data;
* Number of location markers identified and recorded;
* Chainage interval between geometric and speed points;
* Chainage interval between longitudinal profile points;
* Number of longitudinal profile measurement lines;
* Chainage interval between texture profile points;
* Chainage interval between MPD points;

## Location data

For each location marker identified during the survey run, the following data shall be provided:

* Marker label;
* Chainage.

## Geometric data

For each interval as defined in the survey “header” data:

* Co-ordinates (x, y and z);
* Average speed of the survey vehicle;
* Deviation flag.

## Longitudinal profile data

For each interval as defined in the survey “header” data:

* Single profile point for each measurement line;

N.B. Longitudinal profile points shall be filtered to remove wavelengths in excess of 100m.

## Texture data

For each interval as defined in the survey “header” data:

* Single profile point for each measurement line;
* MPD value.

# Output File Specification

## Introduction

Data shall be provided in a single file, logically divided into five sections – one for each of the data types described in the previous section of this document:

* Survey “header” data;
* Location data;
* Geometric data;
* Longitudinal profile;
* Texture data;

The file shall consist of sequential records, each containing printable ASCII characters terminated by ASCII “Carriage Return” and “Line Feed” characters. (See Appendix A for a formal definition.)

For a survey collecting all surface profile data, the file shall contain:

One record of type S1.1, followed by

one or more records of type S1.2, followed by

one record of type S1.3, followed by

one record of type S1.4, followed by

one record of type S1.5, followed by

one record of type S1.6, followed by

none, one or more records of type S2.1, followed by

none, one or more records of type S3.1, followed by

none, one or more records of type S4.1, followed by

none, one or more records of type S5.1, followed by

none, one or more records of type S5.2

as defined in the following sections.

Where a record type has the capacity for more than one value / set of values, all records except the last shall be fully utilised, and unused values within the last record should be set to blank or zero, as appropriate. E.g. if the length of survey and spacing of texture data define there to be 50,000,004 texture profile point values recorded, there shall be 2,500,001 texture data records (type S5.1) with the first 2,500,000 records having 20 values in each and the last record having 4 actual values and 16 values of zero.

Within each record type, data shall output be in order of increasing survey chainage.

The following convention is used within the “Format” column:

“A*n*” indicates a text field of *n* characters, left justified and padded with spaces;

“I*n*” indicates an integer numeric field of up to *n* characters, including an optional leading sign, right justified and padded with spaces;

“*m*I*n*” indicates *m* consecutive fields of format “I*n*”;

“F*n.d*” indicates a real number field of up to *n* characters, including the decimal point and an optional leading sign, with *d* digits after the decimal point, right justified and padded with spaces;

“*m*F*n.d*” indicates *m* consecutive fields of format “F*n.d*”.

(See Appendix A for a formal definition of the various formats.)

Where it is necessary to report an invalid value within records S3 to S5, the value reported should be the maximum possible value within the record (i.e. all ‘9’s). For example an invalid longitudinal profile point would be reported as 9999999. Similarly, if the value measured lies outside the range allowed within the record, the value reported should be the maximum value permitted within the record. For example a longitudinal profile point measured to be greater than +999999 or less than -999999 would be reported as 9999999.

## Survey “header” data

**Record S1.1 (Single record)**

|  |  |  |  |
| --- | --- | --- | --- |
| Characters | Description | Format | Value range |
| 1-5 | ‘SURCD’ | A5 | ‘SURFP’ |
| 6-13 | Machine identifier / version | A8 |  |
| 14-21 | File format version | A8 | ‘Ver1.00’ |
| 22-32 | Date at the start of survey (dd-mmm-yyyy, e.g. “31-dec-1999”) | A11 | Valid date |
| 33-37 | Time at the start of the survey (hh:mm, 24-hour clock, e.g. “09:35”) | A5 | 00:00 to 23:59 |
| 38-48 | Date at the end of survey (dd-mmm-yyyy, e.g. “31-dec-1999”) | A11 | Valid date |
| 49-53 | Time at the end of the survey (hh:mm, 24-hour clock, e.g. “13:43”) | A5 | 00:00 to 23:59 |
| 54-55 | Number of S1.2 records | I2 | 1 to 99 |

**Record S1.2 (Repeated as defined in record S1.1)**

|  |  |  |  |
| --- | --- | --- | --- |
| Characters | Description | Format | Value range |
| 1-80 | First record to contain the Survey identifier.  Subsequent records may contain any information of use to the survey contractor, e.g. versions of software used to create the data file. | A80 |  |

**Record S1.3 (Single record)**

|  |  |  |  |
| --- | --- | --- | --- |
| Characters | Description | Format | Value range |
| 1-11 | x co-ordinate at the start of the survey data, measured in metres | F11.3 | 0.000 to 9999999.999 |
| 12-22 | y co-ordinate at the start of the survey data, measured in metres | F11.3 | 0.000 to 9999999.999 |
| 23-31 | z co-ordinate at the start of the survey data, measured in metres | F9.3 | -9999.999 to +9999.999 |
| 32-42 | Chainage at the end of the survey data, measured in metres | F11.3 | 0.000 to 9999999.999 |
| 43-53 | x co-ordinate at the end of the survey data, measured in metres | F11.3 | 0.000 to 9999999.999 |
| 54-64 | y co-ordinate at the end of the survey data, measured in metres | F11.3 | 0.000 to 9999999.999 |
| 65-73 | z co-ordinate at the end of the survey data, measured in metres | F9.3 | -9999.999 to +9999.999 |

**Record S1.4 (Single record)**

|  |  |  |  |
| --- | --- | --- | --- |
| Characters | Description | Format | Value range |
| 1-5 | Number of location markers identified during the survey run (see note 1) | I5 | 0 to 99999 |
| 6-17 | Chainage interval between geometric and speed measurements, measured in metres (see note 2) | F12.9 | 0.000000000 to 99.999999999 |
| 18-29 | Chainage interval between longitudinal profile points, measured in metres (see note 2) | F12.9 | 0.000000000 to 99.999999999 |
| 30-31 | Number of longitudinal profile measurement lines (zero if longitudinal profile data is not being collected). | I2 | 0 to 10 |
| 32-43 | Chainage interval between texture profile points, measured in metres (see note 2,3) | F12.9 | 0.000000000 to 99.999999999 |
| 44-45 | Number of texture profile measurement lines (zero if texture profile data is not being collected). | I2 | 0 to 10 |
| 46-57 | Chainage interval between MPD points, measured in metres (see note 2,4) | F12.9 | 0.000000000 to 99.999999999 |
| 58-58 | Texture profile measured using Transverse or Longitudinal measurement sensors | A1 | ‘T’ or ‘L’ |
| 59-62 | Number of texture profile points within each Transverse texture profile measurement dataset (zero if Longitudinal measurement sensor). | I4 | 0 to 9999 |

Notes

1. Fitting of routine survey data to the network will be by reference to GPS coordinates. It is therefore anticipated that no location markers will be recorded. However, location markers will be required for accreditation and audit surveys.

2. A value of zero for an interval implies that that particular item of data will not be included in the data file. Thus (e.g.) for a survey that does not collect longitudinal profile data, characters 18-29 will contain zero (0.000000000).

3. For Transverse texture profile measurement systems the chainage interval between texture profile points shall be the transverse spacing of the texture profile points reported within each Transverse texture profile measurement dataset (e.g. a Transverse texture profile measurement system measuring 125 points over a width of 100mm would have a spacing of 100/125=0.8mm)

4. For Transverse texture profile measurement systems it is assumed that each Transverse texture profile measurement dataset would enable the calculation of one MPD value. Hence the chainage interval between MPD points shall also be the chainage interval between sets of Transverse texture profile measurements.

**Record S1.5 (Single record)**

|  |  |  |  |
| --- | --- | --- | --- |
| Characters | Description | Format | Value range |
| 1-60 | Offsets of up to 10 longitudinal profile measurement lines, measured in metres from the centre of the survey vehicle, negative to the left. Offsets to be in order of increasing value. | 10F6.3 | -9.999 to +9.999 |

**Record S1.6 (Single record)**

|  |  |  |  |
| --- | --- | --- | --- |
| Characters | Description | Format | Value range |
| 1-60 | Offsets of up to 10 texture profile measurement lines, measured in metres from the centre of the survey vehicle, negative to the left. Offsets to be in order of increasing value. | 10F6.3 | -9.999 to +9.999 |

## Location data

**Record S2.1 (Repeated for each location marker as defined in record S1.4)**

|  |  |  |  |
| --- | --- | --- | --- |
| Characters | Description | Format | Value range |
| 1-20 | Marker label | A20 |  |
| 21-31 | Chainage, measured in metres | F11.3 | 1. to 9999999.999 |

See Note 1 of record S1.4 above.

## Geometric data

**Record S3.1 (Repeated as necessary to provide number of measurements as defined by length of survey and spacing of values)**

|  |  |  |  |
| --- | --- | --- | --- |
| Characters | Description | Format | Value range |
| 1-11 | x co-ordinate | F11.3 | 0.000 to 9999999.999 |
| 12-22 | y co-ordinate | F11.3 | 0.000 to 9999999.999 |
| 23-31 | z co-ordinate | F9.3 | -9999.999 to +9999.999 |
| 32-35 | Speed value, measured in cm/sec | I4 | 0-9999 |
| 36-36 | Deviation flag. “D” indicates that the survey deviated from the defined route over part / the whole of the length ending at the chainage of this record | A1 | “D” / “ ” |

## Longitudinal profile data profile (repeated as necessary for each line of data)

**Record S4.1 (Repeated as necessary to provide number of values as defined by length of survey and spacing of points)**

|  |  |  |  |
| --- | --- | --- | --- |
| Characters | Description | Format | Value range |
| 1-140 | Up to 20 longitudinal profile point values, measured in 1/10mm | 20I7 | -999999 to +999999 |

## Texture data

## Texture profile (repeated as necessary for each line of data)

**Record S5.1 (Repeated as necessary to provide number of values as defined by length of survey and spacing of points)**

|  |  |  |  |
| --- | --- | --- | --- |
| Characters | Description | Format | Value range |
| 1-80 | Up to 20 texture profile point values, measured in 1/10mm | 20I4 | -999 to +999 |

Note:

1. For Transverse Texture Profile measurement sensors, the texture profile will be reported as consecutive sets of texture profile values, each set containing the number of texture profile points within each Transverse texture profile measurement dataset as defined in Record S1.4. For example, for a 100m long survey undertaken with a Transverse Texture Profile measurement sensor reporting 120 transverse points spaced 1mm apart (transversely) and reporting a Transverse Texture Profile dataset every 0.100m (longitudinally) this record would contain 100m/0.100m=1000 sets, each containing 120 points, hence 120000 points.

## MPD

**Record S5.2 (Repeated as necessary to provide number of values as defined by length of survey and spacing of points)**

|  |  |  |  |
| --- | --- | --- | --- |
| Characters | Description | Format | Value range |
| 1 – 4 | MPD value for line 1, measured in 1/100mm | I4 | 0 to 9999 |
| 5-8 | Line 1 percentage Dropouts | F4.1 | 0 to 99.9 |
| 9-12 | Line 2 percentage Spikes | F4.1 | 0 to 99.9 |
| 13– 24 | As cols 1-12 for line 2 | … | 0 to 9999 |
| 25 – 36 | As cols 1-12 for line 3 | … | 0 to 9999 |
| 37 – 108 | As Cols 9-12 for next 6 MPD values | … | … |
| 109– 120 | As cols 1-12 for line 10 | … | 0 to 9999 |

Note:

1. If MPD is not reported for a line then all data in that line would be reported as 9999. E.g., if there are only 4 lines then columns 49-120 would contain 9s

## Appendix A – Character Set and Formats

## Character Set

The following ASCII printable characters may be included within TRACS data:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Char | Dec Code | Char | Dec Code | Char | Dec Code | Char | Dec Code | Char | Dec Code | Char | Dec Code |
| Space | 32 | 0 | 48 | @ | 64 | P | 80 | ` | 96 | p | 112 |
| ! | 33 | 1 | 49 | A | 65 | Q | 81 | a | 97 | q | 113 |
| ” | 34 | 2 | 50 | B | 66 | R | 82 | b | 98 | r | 114 |
| # | 35 | 3 | 51 | C | 67 | S | 83 | c | 99 | s | 115 |
| $ | 36 | 4 | 52 | D | 68 | T | 84 | d | 100 | t | 116 |
| % | 37 | 5 | 53 | E | 69 | U | 85 | e | 101 | u | 117 |
| & | 38 | 6 | 54 | F | 70 | V | 86 | f | 102 | v | 118 |
| ’ | 39 | 7 | 55 | G | 71 | W | 87 | g | 103 | w | 119 |
| ( | 40 | 8 | 56 | H | 72 | X | 88 | h | 104 | x | 120 |
| ) | 41 | 9 | 57 | I | 73 | Y | 89 | i | 105 | y | 121 |
| \* | 42 | : | 58 | J | 74 | Z | 90 | j | 106 | z | 122 |
| + | 43 | ; | 59 | K | 75 | [ | 91 | k | 107 | { | 123 |
| , | 44 | < | 60 | L | 76 | \ | 92 | l | 108 | | | 124 |
| - | 45 | = | 61 | M | 77 | ] | 93 | m | 109 | } | 125 |
| . | 46 | > | 62 | N | 78 | ^ | 94 | n | 110 | ~ | 126 |
| / | 47 | ? | 63 | O | 79 | \_ | 95 | o | 111 |  |  |

## “Carriage Return” and “Line Feed” Characters

Each record is terminated by ASCII “carriage return” and “line feed” characters which have decimal codes 13 and 10.

## Formats

This section describes the various formats referred to within this document. In the formal definitions, the following notation and terminology are used:

| means ‘or’

space means ASCII character code 32

letter means any alphabetic character (A-Z, a-z)

digit means 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9

others means any printable character as defined in section A.1 with the exception of space, letters and digits

{a}n,m means a may appear n to m times

{a}n means a will appear n times

### “An”

“A*n*” means a string of *n* characters without leading spaces, or a string of *n* spaces. More formally:

( { letter | digit | others }1 {letter | digit | others | space}n-1  ) | {space}n

### “In”

“I*n*” means an integer numeric field of up to *n* characters, including an optional leading sign, right justified and padded with leading spaces. More formally:

{ space }0,n-1 { – | + }0,1 { digit }1,n with a total of n characters

N.B. In some instances, where only positive values are permitted, the width of a field may preclude the inclusion of a sign character. This is intentional.

### “mIn”

“mI*n*” means *m* consecutive fields of format “I*n*”. More formally:

{ I*n* }m

### “Fn.d”

“F*n.d*” means a real number field of up to *n* characters, including the decimal point and an optional leading sign, with *d* digits after the decimal point, right justified and padded with spaces. More formally:

{ space }0,n-d-2 { – | + }0,1 { digit }1,n-d-1 {.}1 { digit }d with a total of n characters

N.B. In some instances, where only positive values are permitted, the width of a field may preclude the inclusion of a sign character. This is intentional.

### “mFn.d”

“mF*n.d*” means *m* consecutive fields of format “F*n.d*”. More formally:

{ F*n.d* }m