TMR Surveying Standards

Schedule 1 – Codes, Linestyles and Examples

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Queensland Government

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Contents

1 Introduction

This document provides the current allowable feature coding and presentation linestyles for the department's geospatial product. This version of the Schedule introduces new feature codes and changes to the use of some existing codes. The information contained in this Schedule applies from the release of this document and *TMR 12d Model Customisation v11.2*. It will continue to be valid for subsequent versions of TMR's 12d Model customisation until this document advises otherwise.

2 Purpose

Schedule 1 supplies the current Survey Feature Code Library and their plotting linestyles for survey data feature points and line strings used by the Department of Transport and Main Roads from the release date of Schedule 1. This document lists the departmental standard for feature point and string codes, together with their relevant linestyles and symbols. It also includes instruction for locating points and sequential strings, as well as situational examples for the use of those points and strings.

3 Point Identifier, Codes and Models

3.1 Point Identifier

Each discrete point that represents a feature or part thereof, shall have a unique numeric point ID/number. The only exceptions to this requirement are survey marks whose feature code groups them in the Survey Datum and Survey Traverse models. These survey marks shall have a unique point ID/number that shall be alphanumeric. Examples include PM123456, STN4 and RM304.

3.2 Standard codes

The codes and models presented in Schedule 1 are the departmental standard for the representation of geospatial data. Variations to these codes and models will not be accepted. It is important that the provision of data is uniform across the department for the wider corporate needs and that the meaning of the data, as well as how it is presented, is consistent across the department so that all who use the geospatial information have an unambiguous and consistent definition.

3.3 Code structure

The types of feature data that can be coded are:

1. a POINT feature code – a single point of pickup for a discrete feature
2. a LINE feature code – minimum of two points connected by a visible segment, commonly called a 'string'
3. a TEXT comment code

The alpha portion of the codes is as follows:

- Point codes: four alphabetic characters – beginning with 'P'
- Line codes: one, two or three alphabetic characters – cannot start with 'P'.

The codes are assigned to related groups called MODELS. Users of geospatial information should reference *Section 3.4 – Alphabetic listing of codes* for information as to which particular MODEL a specific feature code belongs. *Section 3.5 MODEL* listing of codes with linestyles lists codes in their model groups. Codes may not be moved between models.

3.3.1 Point features

Point feature codes consist of four alphabetic characters, of which the first must be the letter ‘P’. Point features are located at one position only. The orientation of the resultant symbol is processor defined and is not meant to be descriptive of the actual orientation of the feature. It should be noted that while point features appear to be isolated points, 12D groups all like features codes into collections of points on a string connected by a non-visible segment. Be warned that when selecting an individual point on these non-visible strings, more than the individual point will be selected and highlighted. The consequence of which is that the operation will be performed on all selected points.

3.3.2 Line strings

Line string codes consist of one, two or three alphabetic characters. Note that line strings cannot start with ‘P’ as this denotes a point string. Any following characters, usually two numeric characters, are the string identifier (string number). These allow for a number of simultaneous separate occurrences of the line string feature.

Line strings are constructed by joining up points that have the same code and string number. They are connected in the order that they are encountered in the input file, e.g., if BL23 is the twenty-third discrete occurrence of a Bank Left string, then all points with this code name (BL) and string number (23) will be joined in the order they are found in the file. The coded points on the same string do not have to be consecutive in the file. If the first BL23 is at the start of the file and the second BL23 is in the middle of the file with a third point on the string, BL23 at the end of the file, they will still be joined first point to the second and that to the third point to make the string BL23. The BL23 string will not join to any other BL string with a different string number. Thus, multiple discrete bank left strings can exist at the same time and will not join to each other.

Line strings in the code listings have been displayed as BL_ where the ‘_’ refers to the particular string identifier.

There are two exceptions to these conventions for line strings, and they are:

1. Broken Line marking with 3 metre line and 9 metre spacing (L3_). This uses the letter ‘L’ with the number ‘3’ as the code followed by the string identifier.
2. Broken Line marking with 6 metre line and 6 metre spacing (L6_). This uses the letter ‘L’ with the number ‘6’ as the code followed by the string identifier

Note:

- There must be a minimum of two points on any line string.
- Some line strings are directional and some of those directional strings can only consist of exactly two points (vide Section 5.4.1 and 5.4.2).
- Whilst the department’s standard software 12d Model can handle multiple string characters, other processing may not be able to. If more than two characters are used to define the string occurrence identifier (usually the string number), when the geospatial information is imported into other processing packages – they may not be able to interpret the information or interpret it incorrectly.

3.3.3 Text comments

Text comments that are associated with a point feature or a line string are attached to the record of the shot in the data recorder when located in the field. When processed, the comment is attached to the point feature or line string.

To allow for the transfer of this vertex text to processing packages that don't utilise super strings, there are a host of text codes that accept the text attached to the vertex of a point, segment or line. These code names take the form of three alphabetic characters. Vertex text is coded as the letter 'X' for a comment or the letter 'Y' for a point number, followed by the first two letters of the MODEL name. These codes are assigned by 12d when preparing for output to a text file.

There is one code for field input of a text comment which is not associated with a point feature or a line string. This is the code PTXT. This allows for a position to be located at which a general comment can be attached in the field.

There are three other text comment codes that are not associated with particular features. These are:

1. CLP, a code to allow the placement of Lot on Plan Text in the Cadastral MODEL
2. DLP, a code to allow the placement of Lot on Plan Text in the DCDB MODEL
3. MET, a code to allow the recording of Metadata in the Metadata MODEL.

The codes above are written as *CLP, *DLP and *MET respectively when output as an *archive* file by 12d.

3.4 Alphabetic listing of codes

*Note:

The underscore (_) in the code column of the following table represents the distinct occurrence of that string code, i.e., the string code identifier (usually the string number).

Code	Description	Type	Model
AB_	Pier-footing/Pile-cap – top or bottom	Line	SURVEY STRUCTURES
AF_	Fuel line - above ground	Line	SURVEY FUEL
AW_	Awning/eaves on buildings	Line	SURVEY STRUCTURES
AFD_	DBYD Fuel Line – above ground	Line	DBYD FUEL
BB_	Bank - bottom	Line	SURVEY DTM
BD_	Bridge deck – crown/base of kerb or parapet	Line	SURVEY STRUCTURES
BE_	Bridge column/pier outline - top or bottom	Line	SURVEY STRUCTURES
BG_	Bridge centreline/Pier headstock - bearing	Line	SURVEY STRUCTURES
BH_	Pastoral boundary	Line	SURVEY CADASTRAL
BI_	Boundary of Interest site – e.g. cultural heritage	Line	SURVEY GENERAL
BJ_	Bridge expansion joint	Line	SURVEY STRUCTURES
BK_	Bridge kerb top/Parapet top	Line	SURVEY STRUCTURES
BL_	Top of bank - ground falls to left in direction of pickup	Line	SURVEY DTM

Code	Description	Type	Model
BN_	Boundary of Native title or claim – Boundary supplied by official process, not for pick-up in field	Line	SURVEY CADASTRAL
BP_	Property boundary	Line	SURVEY CADASTRAL
BR_	Top of bank – ground falls to right in direction of pickup	Line	SURVEY DTM
BS_	Big sign (two points – bottom edge of sign, right to left as you look at the face of sign)	Line	SURVEY ROAD
BT_	Parish boundary	Line	SURVEY CADASTRAL
BY_	Any boundary used for trimming	Line	SURVEY BOUNDARY
CC_	County boundary	Line	SURVEY CADASTRAL
CG_	Change of grade	Line	SURVEY DTM
CH_	Culvert headwall – top	Line	SURVEY DTM
CL_	Edge of Cultivation – cultivation to left of direction of pick-up	Line	SURVEY VEGETATION
CLP	Cadastral Lot on Plan text	Text	SURVEY CADASTRAL
CM_	Carriageway – material edge (for example, spray seal to asphalt)	Line	SURVEY ROAD
CQ_	State boundary	Line	SURVEY CADASTRAL
CR_	Edge of Cultivation – cultivation to right of direction of pick-up	Line	SURVEY VEGETATION
CS_	Shire boundary	Line	SURVEY CADASTRAL
CT_	Concrete barrier – top middle	Line	SURVEY ROAD
CU_	Culvert	Line	SURVEY DRAINAGE
CX_	Culvert – cross section	Line	SURVEY DRAINAGE
DB_	DCDB Boundary	Line	SURVEY DCDB
DD_	Drain - down (located in direction of flow)	Line	SURVEY DTM
DE_	DCDB Easement boundary	Line	SURVEY DCDB
DG_	Drainage – stormwater/culvert - pipe	Line	SURVEY DRAINAGE
DGD_	DBYD Drainage – stormwater/culvert - pipe	Line	DBYD DRAINAGE
DL_	Dwelling – left, on left of direction of pick-up	Line	SURVEY STRUCTURES
DLP	DCDB Lot On Plan text	Text	SURVEY DCDB
DR_	Dwelling – right, on right of direction of pick-up	Line	SURVEY STRUCTURES
DT_	Soil - demarcation line of change in type of soil	Line	SURVEY GENERAL
DU_	Drain - up (located against direction of flow)	Line	SURVEY DTM
DW_	Edge of driveway	Line	SURVEY DTM
DY_	Doorway (two point – stretched symbol)	Line	SURVEY STRUCTURES
EA_	Electricity line above ground - poles located	Line	SURVEY ELECTRICITY
EAD_	DBYD Electricity line above ground – poles indicated	Line	DBYD ELECTRICITY

Code	Description	Type	Model
EB_	Easement boundary	Line	SURVEY CADASTRAL
EC_	Edge of concrete – unspecified	Line	SURVEY GENERAL
EG_	Edge of garden bed	Line	SURVEY VEGETATION
EL_	Electricity line above ground – wires only	Line	SURVEY ELECTRICITY
ELD_	DBYD Electricity line above ground – wires only	Line	DBYD ELECTRICITY
EP_	Edge of pavement	Line	SURVEY DTM
ES_	Edge of shoulder – verge or drivable	Line	SURVEY DTM
ET_	Edge of track	Line	SURVEY DTM
EU_	Electricity line underground	Line	SURVEY ELECTRICITY
EUD_	DBYD Electricity – underground	Line	DBYD ELECTRICITY
EW_	Edge of water	Line	SURVEY DTM
FA_	Optical fibre above ground – wires only (Dual code with PTIP as needed)	Line	SURVEY COMMS
FAD_	DBYD Optic fibre – above ground	Line	DBYD COMMS
FB_	Safety barrier - W beam (two humps)	Line	SURVEY ROAD
FC_	Fence – chain wire	Line	SURVEY FENCES
FE_	Safety barrier - wire ropes	Line	SURVEY ROAD
FH_	Safety barrier - Thrie beam (three humps)	Line	SURVEY ROAD
FN_	Fence line – no posts, wire only	Line	SURVEY FENCES
FO_	Optic fibre - above ground, poles located	Line	SURVEY COMMS
FOD_	DBYD Optic fibre – above ground, poles indicated	Line	DBYD COMMS
FP_	Fence line – posts located	Line	SURVEY FENCES
FT_	Edge of Footpath	Line	SURVEY DTM
FU_	Optical fibre - underground	Line	SURVEY COMMS
FUD_	DBYD Optic fibre – underground	Line	DBYD COMMS
FW_	Fence – weldmesh	Line	SURVEY FENCES
GC_	Cattle grid (extents)	Line	SURVEY ROAD
GD_	Stream gradient down (in direction of flow)	Line	SURVEY STREAMS
GL_	Grate - longitudinal	Line	SURVEY DRAINAGE
GS_	Environment – grass coverage	Line	SURVEY VEGETATION
GU_	Stream gradient up (against direction of flow)	Line	SURVEY STREAMS
HB_	Headstock/Abutment – bottom	Line	SURVEY STRUCTURES
HT_	Headstock/Abutment – top	Line	SURVEY STRUCTURES
KB_	Kerb – back	Line	SURVEY DTM
KI_	Kerb – channel invert	Line	SURVEY DTM
KL_	Kerb – channel lip	Line	SURVEY DTM

Code	Description	Type	Model
KT_	Kerb – top	Line	SURVEY DTM
L3_	Linemarking – 3 m line with 9 m separation	Line	SURVEY LINEMARKING
L6_	Linemarking – 6 m line with 6 m separation	Line	SURVEY LINEMARKING
LA_	Linemarking – continuity line	Line	SURVEY LINEMARKING
LD_	Linemarking – unbroken double	Line	SURVEY LINEMARKING
LH_	Linemarking – hold/give way/crosswalk lines	Line	SURVEY LINEMARKING
LL_	Linemarking – broken on left	Line	SURVEY LINEMARKING
LM_	Street light with mast arm (two points - light to pole)	Line	SURVEY ROAD
LO_	Linemarking – chevron marking outline	Line	SURVEY LINEMARKING
LP_	Linemarking – centreline pedestrian crossing (two points)	Line	SURVEY LINEMARKING
LR_	Linemarking – broken on right	Line	SURVEY LINEMARKING
LS_	Swamp - limit	Line	SURVEY DTM
LT_	Linemarking – turning or straight through at intersections	Line	SURVEY LINEMARKING
LU_	Linemarking – unbroken single	Line	SURVEY LINEMARKING
LW_	Linemarking – stop bar	Line	SURVEY LINEMARKING
MET	Metadata text string	Text	SURVEY METADATA
NB_	Noise barrier – top	Line	SURVEY ROAD
NS_	Non-standard feature string	Line	SURVEY GENERAL
OC_	Manhole chamber outline - comms	Line	SURVEY COMMS
OD_	Manhole chamber outline – storm water	Line	SURVEY DRAINAGE
OE_	Manhole chamber outline – electricity	Line	SURVEY ELECTRICITY
OG_	Manhole chamber outline – gas	Line	SURVEY GAS
OI_	Oil line - underground	Line	SURVEY OIL
OID_	DBYD Oil line – underground	Line	DBYD OIL
OL_	Manhole chamber outline – fuel	Line	SURVEY FUEL
OO_	Manhole chamber outline – oil	Line	SURVEY OIL
OS_	Manhole chamber outline – sewer	Line	SURVEY SEWER
OU_	Manhole chamber outline – unspecified	Line	SURVEY UTILITIES
OW_	Manhole chamber outline – water main	Line	SURVEY WATER
PABH	Artesian bore	Point	SURVEY GENERAL
PBGR	Boom gate	Point	SURVEY RAIL
PBMK	Bench mark	Point	SURVEY TRAVERSE
PBPC	Bridge column centreline (axis)	Point	SURVEY STRUCTURES
PBPP	Bridge pile centreline (axis)	Point	SURVEY STRUCTURES
PBRP	Bridge rail post – centres (individual points)	Point	SURVEY STRUCTURES

Code	Description	Type	Model
PBSC	Bridge scuppers	Point	SURVEY STRUCTURES
PCAM	Camera - fixed	Point	SURVEY ROAD
PCBP	Traffic controller box	Point	SURVEY ROAD
PCHP	Cultural heritage point	Point	SURVEY GENERAL
PCPP	Chainage peg	Point	SURVEY TRAVERSE
PCRM	Cadastral reference mark	Point	SURVEY CADASTRAL
PCSM	Cadastral survey mark	Point	SURVEY CADASTRAL
PCTT	Cellular telephone transponder	Point	SURVEY COMMS
PDSP	Traffic sign – double-sided single pole	Point	SURVEY ROAD
PEJP	Elevated joint – telecommunications	Point	SURVEY COMMS
PELB	Inspection box/pit – electricity	Point	SURVEY ELECTRICITY
PELG	Electricity box – above ground	Point	SURVEY ELECTRICITY
PELM	Manhole – electricity	Point	SURVEY ELECTRICITY
PELP	Marker post – electricity	Point	SURVEY ELECTRICITY
PFDH	Fibre distribution hub	Point	SURVEY COMMS
PFDP	Flood debris/maximum flood height	Point	SURVEY STREAMS
PFHP	Fire hydrant	Point	SURVEY WATER
PFLR	Floor level of building	Point	SURVEY STRUCTURES
PFMK	Flood marker/height post	Point	SURVEY STREAMS
PFPP	Isolated post (fence post or support post)	Point	SURVEY FENCES
PFSC	Fixed survey control	Point	SURVEY DATUM
PGCP	Ground control point – photogrammetric	Point	SURVEY TRAVERSE
PGPP	Gully pit	Point	SURVEY DRAINAGE
PGRD	Regular grid of points (not for field use)	Point	SURVEY DTM
PGSB	Inspection box/pit – gas	Point	SURVEY GAS
PGSM	Manhole – gas	Point	SURVEY GAS
PGSP	Marker post – gas	Point	SURVEY GAS
PGSV	Valve – gas	Point	SURVEY GAS
PHCA	Utility height - communication	Point	SURVEY COMMS
PHEA	Utility height - electricity	Point	SURVEY ELECTRICITY
PHUA	Utility height - unspecified	Point	SURVEY UTILITIES
PILP	Invert level	Point	SURVEY DRAINAGE
PISO	Instrument Station – other mark	Point	SURVEY TRAVERSE
PISP	Instrument Station – primary mark	Point	SURVEY TRAVERSE
PLBX	Letter box	Point	SURVEY GENERAL
PMBH	Materials bore	Point	SURVEY GENERAL
PMRB	Inspection box/pit – Main Roads	Point	SURVEY ROAD

Code	Description	Type	Model
PNSP	Non-standard feature point	Point	SURVEY GENERAL
POFB	Inspection box/pit – optical fibre	Point	SURVEY COMMS
POFM	Manhole – optical fibre	Point	SURVEY COMMS
POFP	Marker post – optical fibre	Point	SURVEY COMMS
POIP	Marker post - oil	Point	SURVEY OIL
POPP	Offset/Recovery mark	Point	SURVEY TRAVERSE
PPBX	Post box	Point	SURVEY GENERAL
PPEU	Potholed - electricity	Point	SURVEY ELECTRICITY
PPFU	Potholed – fibre optic	Point	SURVEY COMMS
PPHO	Photo point	Point	SURVEY IMAGES
PPKM	Parking meter	Point	SURVEY ROAD
PPMK	Permanent survey mark	Point	SURVEY TRAVERSE
PPOI	Potholed – oil line	Point	SURVEY OIL
PPPP	Support pole – electricity	Point	SURVEY ELECTRICITY
PPRF	Road furniture post	Point	SURVEY ROAD
PPSS	Potholed – sewer	Point	SURVEY SEWER
PPSW	Potholed - stormwater	Point	SURVEY DRAINAGE
PPTU	Potholed - comms	Point	SURVEY COMMS
PPUF	Potholed – fuel line	Point	SURVEY FUEL
PPUG	Potholed – gas line	Point	SURVEY GAS
PPUN	Potholed - unspecified	Point	SURVEY UTILITIES
PPWM	Potholed – water main	Point	SURVEY WATER
PQAP	Quality assurance check point	Point	SURVEY QUALITY
PRAP	Rural address marker post	Point	SURVEY ROAD
PRFP	Permanent reference point – RPC	Point	SURVEY TRAVERSE
PRIM	RIM – telecommunications	Point	SURVEY COMMS
PRMP	Railway electric support mast	Point	SURVEY RAIL
PROP	Reference object	Point	SURVEY QUALITY
PSEB	Inspection box/pit – sewer	Point	SURVEY SEWER
PSEM	Manhole – sewer	Point	SURVEY SEWER
PSEP	Marker post – sewer	Point	SURVEY SEWER
PSEV	Valve – sewer	Point	SURVEY SEWER
PSHP	Shrub	Point	SURVEY VEGETATION
PSHT	Spot height	Line	SURVEY DTM
PSID	Sub-soil drain – inlet point (invert, top, etc.)	Point	SURVEY DRAINAGE
PSIL	Advertising sign (powered/illuminated)	Point	SURVEY ROAD
PSIP	Advertising sign	Point	SURVEY ROAD

Code	Description	Type	Model
PSLP	Street light	Point	SURVEY ROAD
PSMK	General survey mark	Point	SURVEY TRAVERSE
PSOD	Sub-soil drain – outlet point (invert, top, etc.)	Point	SURVEY DRAINAGE
PSWM	Manhole – stormwater	Point	SURVEY DRAINAGE
PTBX	Telephone box	Point	SURVEY COMMS
PTCB	Inspection box/pit – traffic control cabling	Point	SURVEY ROAD
PTDP	Telecommunications distribution pillar	Point	SURVEY COMMS
PTEB	Inspection box/pit – telecommunications	Point	SURVEY COMMS
PTEM	Manhole – telecommunications	Point	SURVEY COMMS
PTEP	Marker Post – telecommunications	Point	SURVEY COMMS
PTFP	Transformer on pole	Point	SURVEY ELECTRICITY
PTKP	Tank	Point	SURVEY GENERAL
PTIP	Support pole - comms	Point	SURVEY COMMS
PTLT	Traffic signal on pole	Point	SURVEY ROAD
PTRE	Tree - locate at centre of trunk	Point	SURVEY VEGETATION
PTRU	Centre of trunk of large tree (use with line code TR)	Point	SURVEY VEGETATION
PTSI	Traffic sign – small sign/s & pole (powered/illuminated)	Point	SURVEY ROAD
PTSP	Traffic sign – small sign/s & pole	Point	SURVEY ROAD
PTXT	Point for locating text	Point	SURVEY COMMENTS
PUFP	Marker post - fuel	Point	SURVEY FUEL
PUNB	Inspection box/pit – unspecified	Point	SURVEY UTILITIES
PUNM	Manhole – unspecified	Point	SURVEY UTILITIES
PUNP	Marker post – unspecified	Point	SURVEY UTILITIES
PUNV	Valve - unspecified	Point	SURVEY UTILITIES
PVSP	Traffic sign – variable speed (bottom centre of sign)	Point	SURVEY ROAD
PWAB	Inspection box/pit – mains water	Point	SURVEY WATER
PWAM	Manhole – mains water	Point	SURVEY WATER
PWAP	Marker Post – mains water	Point	SURVEY WATER
PWAT	Water tap	Point	SURVEY WATER
PWAV	Valve – water	Point	SURVEY WATER
PWLP	Water level	Point	SURVEY STREAMS
PWML	Windmill	Point	SURVEY GENERAL
PWMP	Water meter	Point	SURVEY WATER
QQ_	Check string (quality)	Line	SURVEY QUALITY
R__	Pavement surface	Line	SURVEY DTM

Code	Description	Type	Model
RB_	Bottom of retaining wall	Line	SURVEY DTM
RC_	Road crown (designed)	Line	SURVEY DTM
RG_	Environment – rock/gravel loose	Line	SURVEY VEGETATION
RK_	Edge of rock outcrop	Line	SURVEY DTM
RL_	Top of retaining wall – high side left	Line	SURVEY DTM
RM_	Bridge traffic rail post centres	Line	SURVEY STRUCTURES
RR_	Top of retaining wall – high side right	Line	SURVEY DTM
RT_	Railway track - centreline	Line	SURVEY RAIL
RW_	Railway line – top of rail	Line	SURVEY RAIL
SB_	Stay pole/Bollard (two points - bollard to pole)	Line	SURVEY ELECTRICITY
SD_	Subsoil drain down – with flow	Line	SURVEY DRAINAGE
SF_	Soffit line	Line	SURVEY STRUCTURES
SL_	Stream bank – stream on left	Line	SURVEY STREAMS
SP_	Edge of stone pitching	Line	SURVEY GENERAL
SR_	Stream bank – stream on right	Line	SURVEY STREAMS
SRM_	Sewer rising main	Line	SURVEY SEWER
SRD_	DBYD Sewer rising main	Line	DBYD SEWER
SS_	Sewer main	Line	SURVEY SEWER
SSD_	DBYD Sewer main	Line	DBYD SEWER
ST_	Stay wire (two points – anchor point then pole)	Line	SURVEY ELECTRICITY
STC_	Stay wire telecommunications (two points - anchor point then pole)	Line	SURVEY COMMS
SU_	Subsoil drain up – against flow	Line	SURVEY DRAINAGE
SX_	Stream bed cross-section	Line	SURVEY STREAMS
TA_	Telecommunication above ground - wires only (Dual code with PTIP as needed)	Line	SURVEY COMMS
TAD_	DBYD Telecommunication above ground - wires only	Line	DBYD COMMS
TC_	Tramway track – centreline	Line	SURVEY RAIL
TE_	Tower – electricity pylon	Line	SURVEY ELECTRICITY
TFB_	Sub-station / transformer – pad mounted	Line	SURVEY ELECTRICITY
TG_	Gate – stretched (two points)	Line	SURVEY FENCES
TL_	Traverse line	Line	SURVEY TRAVERSE
TLB_	Traffic light target board	Line	SURVEY ROAD
TM_	Traffic signal with mast arm (two points – signal light then support pole)	Line	SURVEY ROAD
TP_	Telecommunication above ground - poles located	Line	SURVEY COMMS

Code	Description	Type	Model
TPD_	DBYD Telecommunication above ground - poles indicated	Line	DBYD COMMS
TR_	Edge of tree foliage	Line	SURVEY VEGETATION
TS_	Transverse stressing bar	Line	SURVEY STRUCTURES
TU_	Telecommunications - underground	Line	SURVEY COMMS
TUD_	DBYD Telecommunications - underground	Line	DBYD COMMS
TW_	Tramway line – top of rail	Line	SURVEY RAIL
UA_	Unspecified feature – above ground	Line	SURVEY UTILITIES
UF_	Fuel line - underground	Line	SURVEY FUEL
UFD_	DBYD Fuel Line – underground	Line	DBYD FUEL
UG_	Gas line - underground	Line	SURVEY GAS
UGD_	DBYD Gas Line – underground	Line	DBYD GAS
USD_	DBYD Unspecified – above ground	Line	DBYD UTILITIES
UU_	Unspecified feature - underground	Line	SURVEY UTILITIES
UUD_	DBYD Unspecified – underground	Line	DBYD UTILITIES
VL_	Edge of Vegetation – vegetation area on left	Line	SURVEY VEGETATION
VMS_	Variable message sign (two points – bottom edge of sign, right to left as you look at the face of sign)	Line	SURVEY ROAD
VR_	Edge of vegetation – vegetation area on right	Line	SURVEY VEGETATION
WF_	Wind fence	Line	SURVEY FENCES
WM_	Water main	Line	SURVEY WATER
WMD_	DBYD Water main	Line	DBYD WATER
WP_	Environment – wetlands plant area	Line	SURVEY VEGETATION
XBO	Comments in SURVEY BOUNDARY	Text	SURVEY COMMENTS
XCA	Comments in SURVEY CADASTRAL	Text	SURVEY COMMENTS
XCO	Comments in SURVEY COMMENTS	Text	SURVEY COMMENTS
XDA	Comments in SURVEY DATUM	Text	SURVEY COMMENTS
XDC	Comments in SURVEY DCDB	Text	SURVEY COMMENTS
XDR	Comments in SURVEY DRAINAGE	Text	SURVEY COMMENTS
XDT	Comments in SURVEY DTM	Text	SURVEY COMMENTS
XEL	Comments in SURVEY ELECTRICITY	Text	SURVEY COMMENTS
XFE	Comments in SURVEY FENCES	Text	SURVEY COMMENTS
XFU	Comments in SURVEY FUEL	Text	SURVEY COMMENTS
XGA	Comments in SURVEY GAS	Text	SURVEY COMMENTS
XGE	Comments in SURVEY GENERAL	Text	SURVEY COMMENTS
XIM	Comments in SURVEY IMAGES	Text	SURVEY COMMENTS
XLI	Comments in SURVEY LINEMARKING	Text	SURVEY COMMENTS

Code	Description	Type	Model
XOI	Comments in SURVEY OIL	Test	SURVEY COMMENTS
XQU	Comments in SURVEY QUALITY	Text	SURVEY COMMENTS
XRA	Comments in SURVEY RAIL	Text	SURVEY COMMENTS
XRO	Comments in SURVEY ROAD	Text	SURVEY COMMENTS
XSE	Comments in SURVEY SEWER	Text	SURVEY COMMENTS
XSM	Comments in SURVEY STREAMS	Text	SURVEY COMMENTS
XST	Comments in SURVEY STRUCTURES	Text	SURVEY COMMENTS
XTE	Comments in SURVEY COMMS	Text	SURVEY COMMENTS
XTR	Comments in SURVEY TRAVERSE	Text	SURVEY COMMENTS
XUT	Comments in SURVEY UTILITIES	Text	SURVEY COMMENTS
XVE	Comments in SURVEY VEGETATION	Text	SURVEY COMMENTS
XWA	Comments in SURVEY WATER	Text	SURVEY COMMENTS
YBO	Point Numbers in SURVEY BOUNDARY	Text	SURVEY NUMBERS
YCA	Point Numbers in SURVEY CADASTRAL	Text	SURVEY NUMBERS
YCO	Point Numbers in SURVEY COMMENTS	Text	SURVEY NUMBERS
YDA	Point Numbers in SURVEY DATUM	Text	SURVEY NUMBERS
YDC	Point Numbers in SURVEY DCDB	Text	SURVEY NUMBERS
YDR	Point Numbers in SURVEY DRAINAGE	Text	SURVEY NUMBERS
YDT	Point Numbers in SURVEY DTM	Text	SURVEY NUMBERS
YEL	Point Numbers in SURVEY ELECTRICITY	Text	SURVEY NUMBERS
YFE	Point Numbers in SURVEY FENCES	Text	SURVEY NUMBERS
YFU	Point Numbers in SURVEY FUEL	Text	SURVEY NUMBERS
YGA	Point Numbers in SURVEY GAS	Text	SURVEY NUMBERS
YGE	Point Numbers in SURVEY GENERAL	Text	SURVEY NUMBERS
YIM	Point Numbers in SURVEY IMAGES	Text	SURVEY NUMBERS
YLI	Point Numbers in SURVEY LINEMARKING	Text	SURVEY NUMBERS
YOI	Point Numbers in SURVEY OIL	Text	SURVEY NUMBERS
YQU	Point Numbers in SURVEY QUALITY	Text	SURVEY NUMBERS
YRA	Point Numbers in SURVEY RAIL	Text	SURVEY NUMBERS
YRO	Point Numbers in SURVEY ROAD	Text	SURVEY NUMBERS
YSE	Point Numbers in SURVEY SEWER	Text	SURVEY NUMBERS
YSM	Point Numbers in SURVEY STREAMS	Text	SURVEY NUMBERS
YST	Point Numbers in SURVEY STRUCTURES	Text	SURVEY NUMBERS
YTE	Point Numbers in SURVEY COMMs	Text	SURVEY NUMBERS
YTR	Point Numbers in SURVEY TRAVERSE	Text	SURVEY NUMBERS
YUT	Point Numbers in SURVEY UTILITIES	Text	SURVEY NUMBERS
YVE	Point Numbers in SURVEY VEGETATION	Text	SURVEY NUMBERS

Code	Description	Type	Model
YWA	Point Numbers in SURVEY WATER	Text	SURVEY NUMBERS
*	Any invalid text string	Text	SURVEY UNKNOWN COMMENTS
?	Any invalid codes – string or point	Pt/Line	SURVEY UNKNOWN FEATURES

3.5 MODEL listing of codes with linestyles

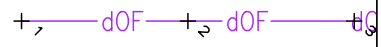
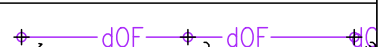
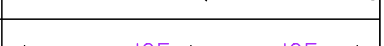
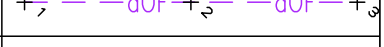
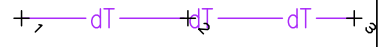
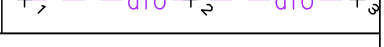
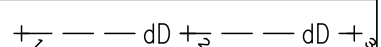
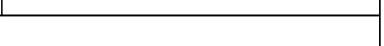
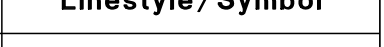
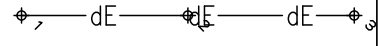
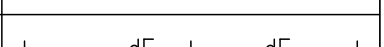
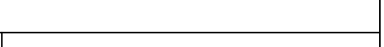
MODELS are a group of associated codes that are displayed together when the MODEL is turned on. Some features intrinsically define the shape of the surface, as well as belong with other like groups of features in a particular feature MODEL group. If a feature intrinsically defines the surface, then it will be in the 'SURVEY DTM' model group and not grouped with the like features in the feature MODEL group. Vide *Section 4.2 Surface Location* for further information about defining the ground surface.

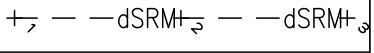
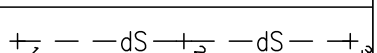
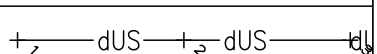
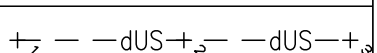
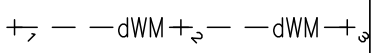
Numerous features could belong to a number of MODEL groups. These features have been assigned to a MODEL group based on the primary purpose of the feature.

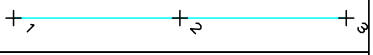
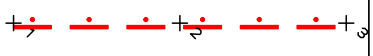
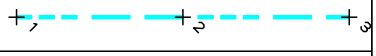
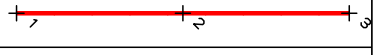
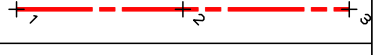
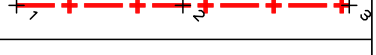
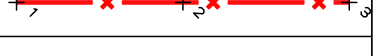
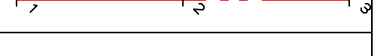
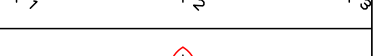
The allowable MODELS are listed in the following table. They are listed in alphabetic order and within each MODEL group, the allowable codes are also listed alphabetically along with their String Type and an example of the linestyle or point symbol.

* Note:

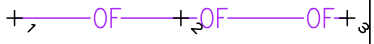
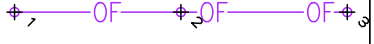
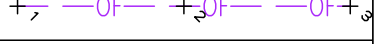
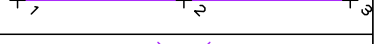
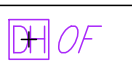
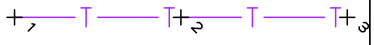
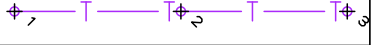
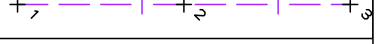
The underscore (_) in the code column of the following table represents the distinct occurrence of that string code, i.e., the string code identifier (usually the string number).

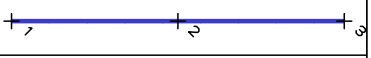
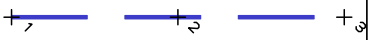
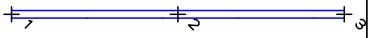
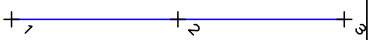
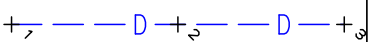
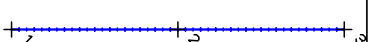
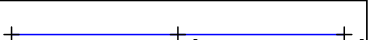
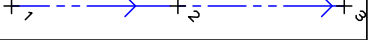
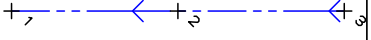
Model: DBYD COMMS			
Code*	**Description**	**Type**	**Linestyle/Symbol**
FAD_	DBYD Optic Fibre - above ground	Line	
FOD_	DBYD Optic fibre - above ground, poles indicated	Line	
FUD_	DBYD Optic Fibre - underground	Line	
TAD_	DBYD Telecommunication above ground - wires only	Line	
TPD_	DBYD Telecommunication above ground - poles indicated	Line	
TUD_	DBYD Telecommunications - Underground	Line	
Model: DBYD DRAINAGE			
Code*	**Description**	**Type**	**Linestyle/Symbol**
DGD_	DCDB Drainage - stormwater/culvert - pipe	Line	
Model: DBYD ELECTRICITY			
Code*	**Description**	**Type**	**Linestyle/Symbol**
EAD_	DBYD Power line above ground - poles indicated	Line	
ELD_	DBYD Power line above ground - wires only	Line	
EUD_	DBYD Electricity - underground	Line	
Model: DBYD FUEL			
Code*	**Description**	**Type**	**Linestyle/Symbol**
AFD_	DBYD Fuel Line - above ground	Line	
UFD_	DBYD Fuel Line - underground	Line	
Model: DBYD GAS			
Code*	**Description**	**Type**	**Linestyle/Symbol**
UGD_	DBYD Gas Line - underground	Line	
Model: DBYD OIL			
Code*	**Description**	**Type**	**Linestyle/Symbol**
OID_	DBYD Oil Line - underground	Line	

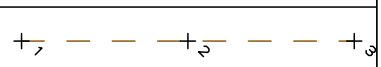
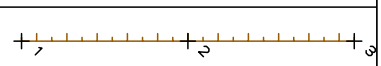
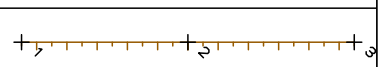
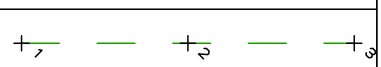
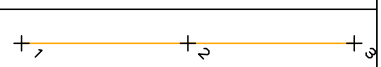
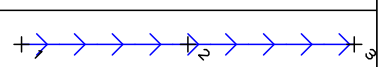
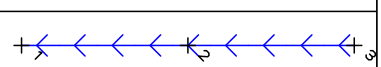
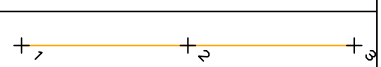
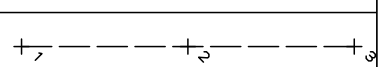
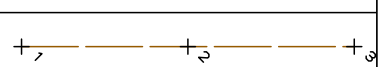
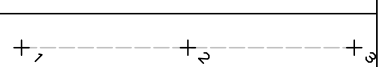
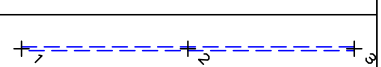
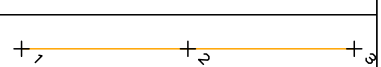
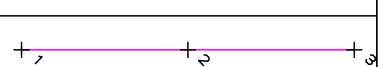
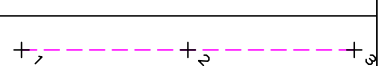
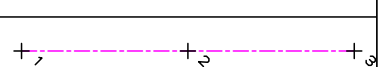
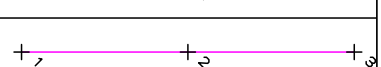
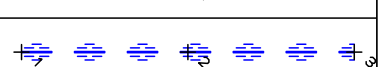
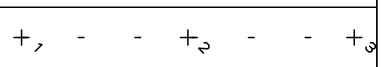
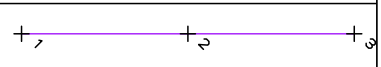
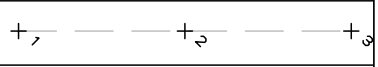
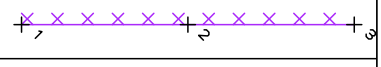
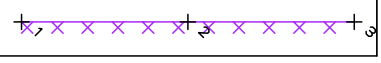
Model: DBYD SEWER			
Code*	**Description**	**Type**	
SRD_	DBYD Sewer Rising Main	Line	
SSD_	DBYD Sewer Main	Line	
Model: DBYD UTILITIES			
Code*	**Description**	**Type**	**Linestyle/Symbol**
USD_	DBYD Unspecified - above ground	Line	
UUD_	DBYD Unspecified - underground	Line	
DBYD WATER			
Code*	**Description**	**Type**	**Linestyle/Symbol**
WMD_	DBYD Water main	Line	

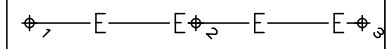
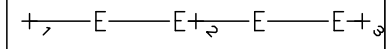
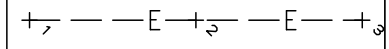
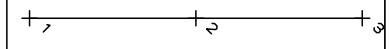
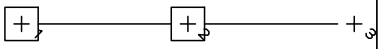
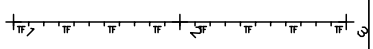
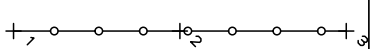
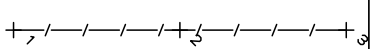
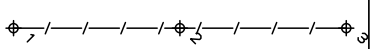
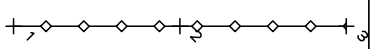
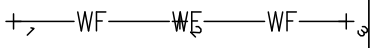
Model: SURVEY BOUNDARY			
Code*	**Description**	**Type**	**Linestyle/Symbol**
BY_	Any boundary used for trimming	Line	
Model: SURVEY CADASTRAL			
Code*	**Description**	**Type**	**Linestyle/Symbol**
BH_	Pastoral boundary	Line	
BN_	Boundary of Native title or claim - Boundary supplied by official process, not for pick-up in field	Line	
BP_	Property boundary	Line	
BT_	Parish boundary	Line	
CC_	County boundary	Line	
CQ_	State boundary	Line	
CS_	Shire boundary	Line	
EB_	Easement boundary	Line	
PCRM	Cadastral reference mark	Point	
PCSM	Cadastral survey mark	Point	
CLP	Cadastral Lot on Plan text	Text	
Model: SURVEY COMMENTS			
Code*	**Description**	**Type**	**Linestyle/Symbol**
PTXT	Point for locating text	Point	+
XBO	Comments in SURVEY BOUNDARY	Text	+
XCA	Comments in SURVEY CADASTRAL	Text	+
XCO	Comments in SURVEY COMMENTS	Text	+
XDA	Comments in SURVEY DATUM	Text	+
XDC	Comments in SURVEY DCDB	Text	+
XDR	Comments in SURVEY DRAINAGE	Text	+
XDT	Comments in SURVEY DTM	Text	+
XEL	Comments in SURVEY ELECTRICITY	Text	+
XFE	Comments in SURVEY FENCES	Text	+

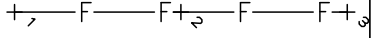
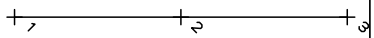
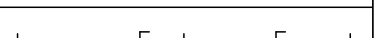
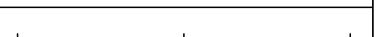
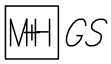
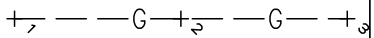
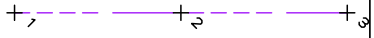
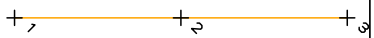
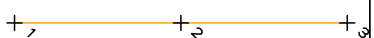
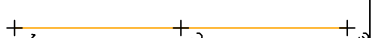
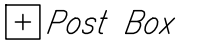
Model: SURVEY COMMENTS			
Code*	**Description**	**Type**	**Linestyle/Symbol**
XFU	Comments in SURVEY FUEL	Text	+
XGA	Comments in SURVEY GAS	Text	+
XGE	Comments in SURVEY GENERAL	Text	+
XIM	Comments in SURVEY IMAGES	Text	+
XLI	Comments in SURVEY LINEMARKING	Text	+
XOI	Comments in SURVEY OIL	Text	+
XQU	Comments in SURVEY QUALITY	Text	+
XRA	Comments in SURVEY RAIL	Text	+
XRO	Comments in SURVEY ROAD	Text	+
XSE	Comments in SURVEY SEWER	Text	+
XSM	Comments in SURVEY STREAMS	Text	+
XST	Comments in SURVEY STRUCTURES	Text	+
XTE	Comments in SURVEY COMMS	Text	+
XTR	Comments in SURVEY TRAVERSE	Text	+
XUT	Comments in SURVEY UTILITIES	Text	+
XVE	Comments in SURVEY VEGETATION	Text	+
XWA	Comments in SURVEY WATER	Text	+

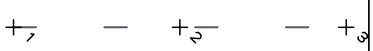
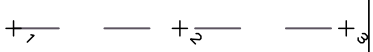
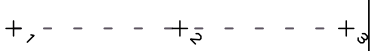
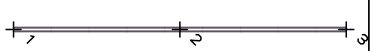
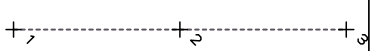
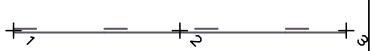
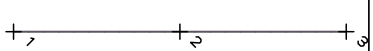
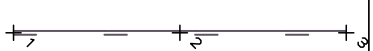
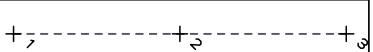
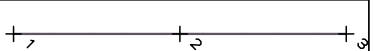
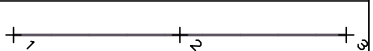
Model: SURVEY COMMS			
Code*	**Description**	**Type**	**Linestyle/Symbol**
FA_	Optical fibre above ground - wires only (Dual code with PTIP as needed)	Line	
FO_	Optic fibre - above ground, poles located	Line	
FU_	Optical fibre - underground	Line	
OC_	Manhole chamber outline - comms	Line	
PCTT	Cellular telephone transponder	Point	
PEJP	Elevated joint - telecommunications	Point	
PFDH	Fibre Distribution Hub	Point	
PHCA	Utility height - communication	Point	
POFB	Inspection box/pit - Optical Fibre	Point	
POFM	Manhole - Optical Fibre	Point	
POFP	Marker post - Optical Fibre	Point	
PPFU	Potholed - Fibre optic	Point	
PPTU	Potholed - comms	Point	
PRIM	RIM - telecommunications	Point	
PTBX	Telephone box	Point	
PTDP	Telecommunications distribution pillar	Point	
PTEB	Inspection box/pit - Telecommunications	Point	
PTEM	Manhole - Telecommunications	Point	
PTEP	Marker Post - Telecommunications	Point	
PTIP	Support pole - comms	Point	
STC_	Stay wire telecommunications (two points - anchor point then pole)	Line	
TA_	Telecommunication above ground - wires only (Dual code with PTIP as needed)	Line	
TP_	Telecommunication above ground - poles located	Line	
TU_	Telecommunications - underground	Line	

Model: SURVEY DATUM			
Code*	**Description**	**Type**	**Linestyle/Symbol**
PFSC	Fixed survey control	Point	
Model: SURVEY DCDB			
Code*	**Description**	**Type**	**Linestyle/Symbol**
DB_	DCDB Boundary	Line	
DE_	DCDB Easement boundary	Line	
DLP	DCDB Lot On Plan text	Text	
Model: SURVEY DRAINAGE			
Code*	**Description**	**Type**	**Linestyle/Symbol**
CU_	Culvert	Line	
CX_	Culvert - Cross section	Line	
DG_	Drainage - stormwater/culvert - pipe	Line	
GL_	Grate - longitudinal	Line	
OD_	Manhole chamber outline - storm water	Line	
PGPP	Gully pit	Point	
PILP	Invert level	Point	
PPSW	Potholed - stormwater	Point	
PSID	Sub-soil drain - inlet point (invert, top, etc.)	Point	
PSOD	Sub-soil drain - outlet point (invert, top, etc.)	Point	
PSWM	Manhole - Stormwater	Point	
SD_	Subsoil drain down - with flow	Line	
SU_	Subsoil drain up - against flow	Line	

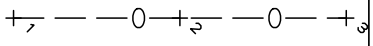
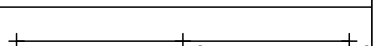
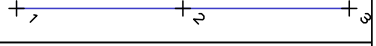
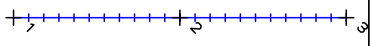
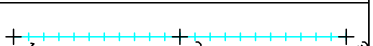
Model: SURVEY DTM			
Code*	**Description**	**Type**	**Linestyle/Symbol**
BB_	Bank - bottom	Line	
BL_	Top of bank - ground falls to left in direction of pickup	Line	
BR_	Top of bank - ground falls to right in direction of pickup	Line	
CG_	Change of grade	Line	
CH_	Culvert headwall - top	Line	
DD_	Drain - down (located in direction of flow)	Line	
DU_	Drain - up (located against direction of flow)	Line	
DW_	Edge of Driveway	Line	
EP_	Edge of pavement	Line	
ES_	Edge of shoulder - Verge or drivable	Line	
ET_	Edge of track	Line	
EW_	Edge of water	Line	
FT_	Edge of Footpath	Line	
KB_	Kerb - back	Line	
KI_	Kerb - invert of channel	Line	
KL_	Kerb - channel lip	Line	
KT_	Kerb - top	Line	
LS_	Swamp - limit	Line	
PGRD	Regular grid of points (not for field use)	Point	
PSHT	Spot height	Line	
R__	Pavement surface	Line	
RB_	Bottom of Retaining wall	Line	
RC_	Road crown (designed)	Line	
RK_	Edge of rock outcrop	Line	
RL_	Top of retaining wall - high side left	Line	
RR_	Top of Retaining wall - high side right	Line	

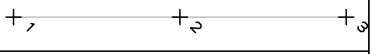
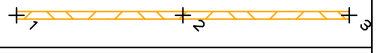
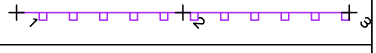
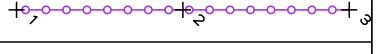
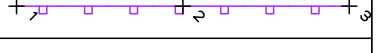
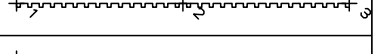
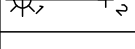
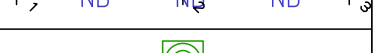
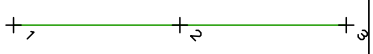
Model: SURVEY ELECTRICITY			
Code*	**Description**	**Type**	**Linestyle/Symbol**
EA_	Power line above ground - poles located	Line	
EL_	Power line above ground - wires only	Line	
EU_	Electricity line underground	Line	
OE_	Manhole chamber outline - electricity	Line	
PELB	Inspection box/pit - electricity	Point	
PELG	Electricity box - above ground	Point	
PELM	Manhole - electricity	Point	
PELP	Marker post - electricity	Point	
PHEA	Utility height - electricity	Point	
PPEU	Potholed - Electricity	Point	
PPPP	Support pole - electricity	Point	
PTFP	Transformer on pole	Point	
SB_	Stay pole/Bollard (two points - bollard to pole)	Line	
ST_	Stay wire (two points - anchor point then pole)	Line	
TE_	Tower - electricity pylon	Line	
TFB_	Sub-station / transformer - pad mounted	Line	
Model: SURVEY FENCES			
Code*	**Description**	**Type**	**Linestyle/Symbol**
FC_	Fence - chain wire	Line	
FN_	Fence line - no posts, wire only	Line	
FP_	Fence line - posts located	Line	
FW_	Fence - Weldmesh	Line	
PFPP	Isolated post (fence post or support post)	Point	
TG_	Gate - stretched (two points)	Line	
WF_	Wind fence	Line	

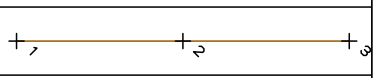
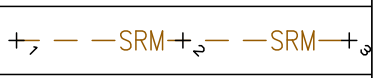
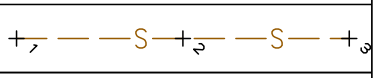
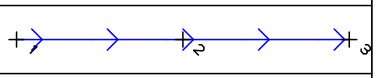
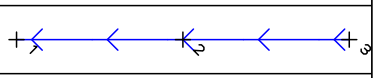
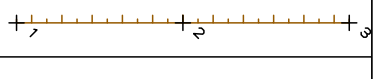
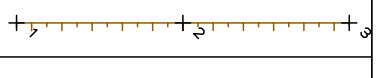
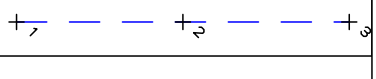
Model: SURVEY FUEL			
Code*	**Description**	**Type**	**Linestyle/Symbol**
AF_	Fuel line - above ground	Line	
OL_	Manhole chamber outline - fuel	Line	
PPUF	Potholed - fuel line	Point	
PUFP	Marker Post - fuel	Point	
UF_	Fuel line - underground	Line	
Model: SURVEY GAS			
Code*	**Description**	**Type**	**Linestyle/Symbol**
OG_	Manhole chamber outline - gas	Line	
PGSB	Inspection box/pit - Gas	Point	
PGSM	Manhole - Gas	Point	
PGSP	Marker post - Gas	Point	
PGSV	Valve - Gas	Point	
PPUG	Potholed - gas line	Point	
UG_	Gas line - underground	Line	
Model: SURVEY GENERAL			
Code*	**Description**	**Type**	**Linestyle/Symbol**
BI_	Boundary of Interest site - e.g. cultural heritage	Line	
DT_	Soil - demarcation line of change in type of soil	Point	
EC_	Edge of concrete - unspecified	Point	
NS_	Non-standard feature string	Point	
PABH	Artesian bore	Point	
PCHP	Cultural heritage point	Point	
PLBX	Letter box	Line	
PMBH	Materials bore	Point	
PNSP	Non-standard feature point	Point	
PPBX	Post box	Point	

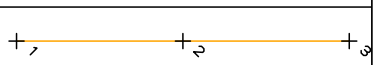
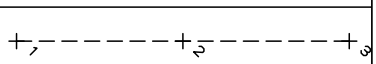
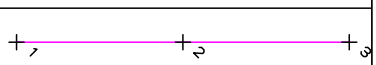
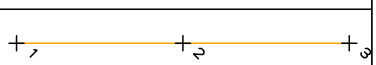
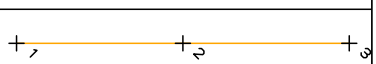
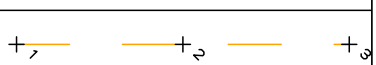
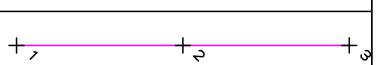
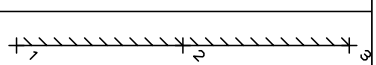
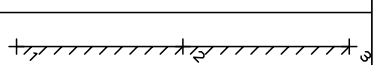
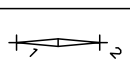
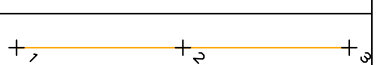
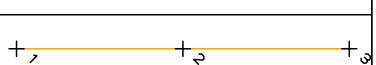
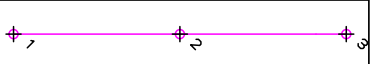
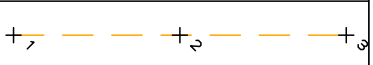
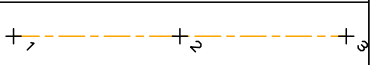
Model: SURVEY GENERAL			
Code*	**Description**	**Type**	**Linestyle/Symbol**
PTKP	Tank	Point	
PWML	Windmill	Point	
SP_	Edge of stone pitching	Line	
Model: SURVEY IMAGES			
Code*	**Description**	**Type**	**Linestyle/Symbol**
PPHO	Photo point	Point	
Model: SURVEY LINEMARKING			
Code*	**Description**	**Type**	**Linestyle/Symbol**
L3_	Linemarking - 3 m line with 9 m separation	Line	
L6_	Linemarking - 6 m line with 6 m separation	Line	
LA_	Linemarking - Continuity line	Line	
LD_	Linemarking - unbroken double	Line	
LH_	Linemarking - hold/Give Way/Crosswalk lines	Line	
LL_	Linemarking - broken on left	Line	
LO_	Linemarking - chevron marking outline	Line	
LP_	Linemarking - centreline pedestrian crossing (two points)	Line	
LR_	Linemarking - broken on right	Line	
LT_	Linemarking - turning or straight through at intersections	Line	
LU_	Linemarking - unbroken single	Line	
LW_	Linemarking - stop bar	Line	
Model: SURVEY METADATA			
Code*	**Description**	**Type**	**Linestyle/Symbol**
MET	Metadata text string	Text	

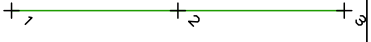
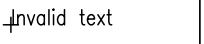
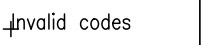
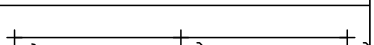
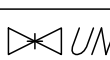
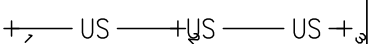
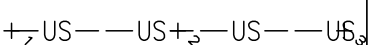
Model: SURVEY NUMBERS			
Code*	**Description**	**Type**	**Linestyle/Symbol**
YBO	Point Numbers in SURVEY BOUNDARY	Text	5042
YCA	Point Numbers in SURVEY CADASTRAL	Text	5042
YCO	Point Numbers in SURVEY COMMENTS	Text	5042
YDA	Point Numbers in SURVEY DATUM	Text	5042
YDC	Point Numbers in SURVEY DCDB	Text	5042
YDR	Point Numbers in SURVEY DRAINAGE	Text	5042
YDT	Point Numbers in SURVEY DTM	Text	5042
YEL	Point Numbers in SURVEY ELECTRICITY	Text	5042
YFE	Point Numbers in SURVEY FENCES	Text	5042
YFU	Point Numbers in SURVEY FUEL	Text	5042
YGA	Point Numbers in SURVEY GAS	Text	5042
YGE	Point Numbers in SURVEY GENERAL	Text	5042
YIM	Point Numbers in SURVEY IMAGES	Text	5042
YLI	Point Numbers in SURVEY LINEMARKING	Text	5042
YOI	Point Numbers in SURVEY OIL	Text	5042
YQU	Point Numbers in SURVEY QUALITY	Text	5042
YRA	Point Numbers in SURVEY RAIL	Text	5042
YRO	Point Numbers in SURVEY ROAD	Text	5042
YSE	Point Numbers in SURVEY SEWER	Text	5042
YSM	Point Numbers in SURVEY STREAMS	Text	5042
YST	Point Numbers in SURVEY STRUCTURES	Text	5042
YTE	Point Numbers in SURVEY COMMS	Text	5042
YTR	Point Numbers in SURVEY TRAVERSE	Text	5042
YUT	Point Numbers in SURVEY UTILITIES	Text	5042
YVE	Point Numbers in SURVEY VEGETATION	Text	5042
YWA	Point Numbers in SURVEY WATER	Text	5042

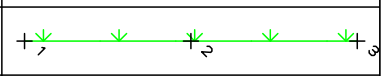
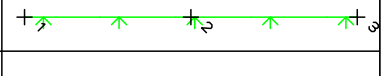
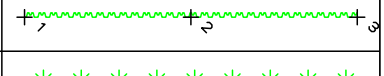
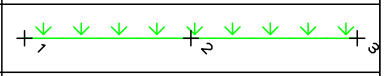
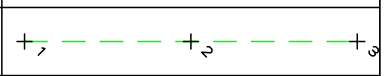
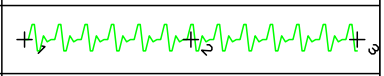
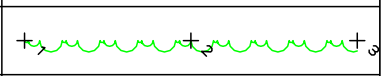
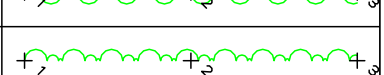
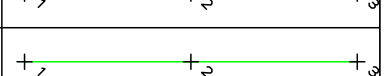
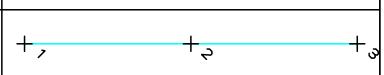
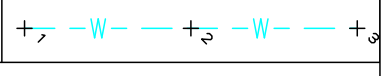
Model: SURVEY OIL			
Code*	**Description**	**Type**	**Linestyle/Symbol**
OI_	Oil line - underground	Line	
OO_	Manhole chamber outline - oil	Line	
POIP	Marker post - Oil	Point	
PPOI	Potholed - Oil Line	Point	
Model: SURVEY QUALITY			
Code*	**Description**	**Type**	**Linestyle/Symbol**
PQAP	Quality assurance check point	Point	
PROP	Reference object	Point	
QQ_	Check string (quality)	Line	
Model: SURVEY RAIL			
Code*	**Description**	**Type**	**Linestyle/Symbol**
PBGR	Boom Gate	Point	
PRMP	Railway electric support mast	Point	
RT_	Railway track - centreline	Line	
RW_	Railway line - Top of rail	Line	
TC_	Tramway track - centreline	Line	
TW_	Tramway line - top of rail	Line	

Model: SURVEY ROAD			
Code*	**Description**	**Type**	**Linestyle/Symbol**
BS_	Big sign (two points - right edge to left edge as you look at the face of sign)	Line	
CM_	Carriageway - material edge (for example, spray seal to asphalt)	Line	
CT_	Concrete barrier - Top middle	Line	
FB_	Safety barrier - W beam (two humps)	Line	
FE_	Safety barrier - wire ropes	Line	
FH_	Safety barrier - Thrie beam (three humps)	Line	
GC_	Grid (extents)	Line	
LM_	Street light with mast arm (two points light to pole)	Line	
NB_	Noise barrier - top	Line	
PCAM	Camera - fixed	Point	
PCBP	Traffic controller box	Point	
PDSP	Traffic sign - double-sided single pole	Point	
PMRB	Inspection box/pit - Main Roads	Point	
PPKM	Parking meter	Point	
PPRF	Road furniture post	Point	
PRAP	Rural address marker post	Point	
PSIL	Advertising sign (powered/illuminated)	Point	
PSIP	Advertising sign	Point	
PSLP	Street light	Point	
PTCB	Inspection box/pit - Traffic control cabling	Point	
PTLT	Traffic signal on pole	Point	
PTSI	Traffic sign - small sign/s & pole (powered/illuminated)	Point	
PTSP	Traffic sign - small sign/s & pole	Point	
PVSP	Traffic sign - variable speed (bottom center of sign)	Point	
TLB_	Traffic light target board	Line	
TM_	Traffic signal with mast arm (two points - signal light then support pole)	Line	
VMS_	Variable Message Sign(two points - right edge to left edge as you look at the face of sign)	Line	

Model: SURVEY SEWER			
Code*	**Description**	**Type**	**Linestyle/Symbol**
OS_	Manhole chamber outline - sewer	Line	
PPSS	Potholed - sewer	Point	
PSEB	Inspection box/pit - Sewer	Point	
PSEM	Manhole - Sewer	Point	
PSEP	Marker post - Sewer	Point	
PSEV	Valve - Sewer	Point	
SRM_	Sewer Rising Main	Line	
SS_	Sewer main	Line	
Model: SURVEY STREAMS			
Code*	**Description**	**Type**	**Linestyle/Symbol**
GD_	Stream gradient down (in direction of flow)	Line	
GU_	Stream gradient up (against direction of flow)	Line	
PFDP	Flood debris/maximum flood height	Point	
PFMK	Flood Marker/height post	Point	
PWLP	Water level	Point	
SL_	Stream bank - stream on left	Line	
SR_	Stream bank - stream on right	Line	
SX_	Stream bed cross-section	Line	

Model: SURVEY STRUCTURES			
Code*	**Description**	**Type**	**Linestyle/Symbol**
AB_	Pier-footing/Pile-cap - top or bottom	Line	
AW_	Awning/eaves on buildings	Line	
BD_	Bridge deck - crown/base of kerb or parapet	Line	
BE_	Bridge column/pier outline - top or bottom	Line	
BG_	Bridge centreline/Pier Headstock - bearing	Line	
BJ_	Bridge expansion joint	Line	
BK_	Bridge kerb top/Parapet top	Line	
DL_	Dwelling - left, on left of direction of pick-up	Line	
DR_	Dwelling - right, on right of direction of pick-up	Line	
DY_	Doorway (two point - stretched symbol)	Line	
HB_	Headstock/Abutment - bottom	Line	
HT_	Headstock/Abutment - top	Line	
PBPC	Bridge Column Centreline (axis)	Point	
PBPP	Bridge Pile Centreline (axis)	Point	
PBRP	Bridge rail post - centres (individual points)	Point	
PBSC	Bridge Scuppers	Point	
PFLR	Floor level of building	Point	
RM_	Bridge traffic rail post centres	Line	
SF_	Soffit line	Line	
TS_	Transverse stressing bar	Line	

Model: SURVEY TRAVERSE			
Code*	**Description**	**Type**	**Linestyle/Symbol**
PBMK	Bench mark	Point	
PCPP	Chainage peg	Point	
PGCP	Ground control point - Photogrammetric	Point	
PISO	Instrument Station - other mark	Point	
PISP	Instrument Station - primary mark	Point	
POPP	Offset/Recovery mark	Point	
PPMK	Permanent mark	Point	
PRFP	Permanent reference point - RPC	Point	
PSMK	General survey mark	Point	
TL_	Traverse line	Line	
Model: SURVEY UNKNOWN COMMENTS			
Code*	**Description**	**Type**	**Linestyle/Symbol**
*	Any invalid text string	Text	
Model: SURVEY UNKNOWN FEATURES			
Code*	**Description**	**Type**	**Linestyle/Symbol**
?	Any invalid codes - string or point	Pt/Line	
Model: SURVEY UTILITIES			
Code*	**Description**	**Type**	**Linestyle/Symbol**
OU_	Manhole chamber outline - unspecified	Line	
PHUA	Utility height - unspecified	Point	
PPUN	Potholed - unspecified	Point	
PUNB	Inspection box/pit - unspecified	Point	
PUNM	Manhole - unspecified	Point	
PUNP	Marker Post - unspecified	Point	
PUNV	Valve - unspecified	Point	
UA_	Unspecified feature - above ground	Line	
UU_	Unspecified feature - underground	Line	

Model: SURVEY VEGETATION			
Code*	**Description**	**Type**	**Linestyle/Symbol**
CL_	Edge of Cultivation - cultivation to left of direction of pick-up	Line	
CR_	Edge of Cultivation - cultivation to right of direction of pick-up	Line	
EG_	Edge of garden bed	Line	
GS_	Environment - grass coverage	Line	
PSHP	Shrub	Point	
PTRE	Tree trunk - one size	Point	
PTRU	Centre of trunk of large tree	Point	
RG_	Environment - rock/gravel loose	Line	
TR_	Edge of tree foliage	Line	
VL_	Edge of Vegetation - vegetation area on left	Line	
VR_	Edge of Vegetation - vegetation area on right	Line	
WP_	Environment - wetlands plant area	Line	
Model: SURVEY WATER			
Code*	**Description**	**Type**	**Linestyle/Symbol**
OW_	Manhole chamber outline - water main	Line	
PFHP	Fire hydrant	Point	
PPWM	Potholed - water main	Point	
PWAB	Inspection box/pit - mains water	Point	
PWAM	Manhole - Mains Water	Point	
PWAP	Marker Post - Mains Water	Point	
PWAT	Water tap	Point	
PWAV	Valve - water	Point	
PWMP	Water meter	Point	
WM_	Water main	Line	

4 Location

4.1 Feature Location

Features, unless otherwise specified, shall be located where the feature meets the ground. Situational examples detail the position and where relevant, the order of points to be located.

4.2 Surface Location

The department requires a dedicated terrain model to represent the ground surface by the use of specific breakline strings and spot heights. The feature codes within the SURVEY DTM model (vide Section 3.5) form the ground surface to be modelled. Only information with codes from SURVEY DTM are to be used to create the Triangular Irregular Network (TIN) which represents the ground surface.

No other feature codes may be added to SURVEY DTM model.

5 Linestyles, point symbols and textstyles

5.1 Introduction

The linestyles, point symbols and text-styles are used by the department for survey presentation on screen and in hardcopy. They are specific to surveys and may not agree with those on the screen when in the design environment or when using a different customisation than the Transport and Main Roads 12D Survey Customisation or processing in packages other than the recommended 12D model used by the department

The following sections give information on how text is displayed both on the screen and in hardcopy. They also describe the pick-up point for the point features and warn about the orientation of the point symbols. As well, they explain about directional strings and asymmetric linestyles and how these features are to be represented.

5.2 Textstyles

Text is displayed as an off-yellow colour on the 12D screen, but is printed as black when output to a printer or plotter. There are exceptions to this for the CADASTRAL and DCDB model text. This is displayed and printed as red text and blue text respectively.

See the following sections for a full listing of the allowable codes for this text.

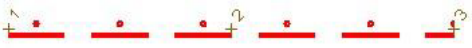
5.3 Point symbols

Point symbols are located at one point only. The small brown plus sign in the symbols shows where the pick-up point is in relation to the drawn symbol. This is usually the centre of the symbol. The orientation of the resultant symbol on the screen and on the plot is arbitrary and is processor defined.

E.g., Traffic sign – double-sided single pole (PDSP) 

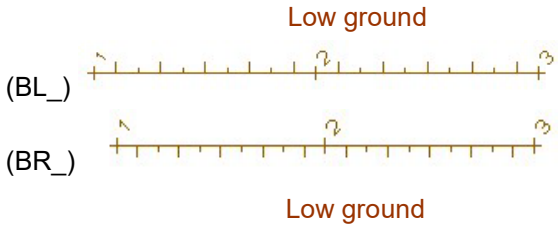
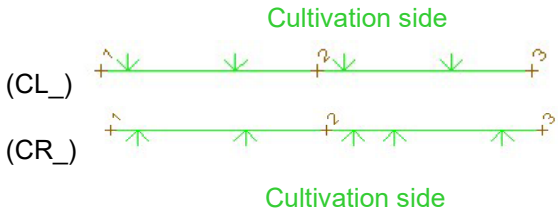
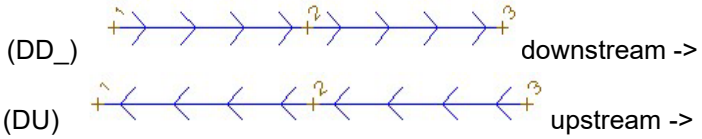
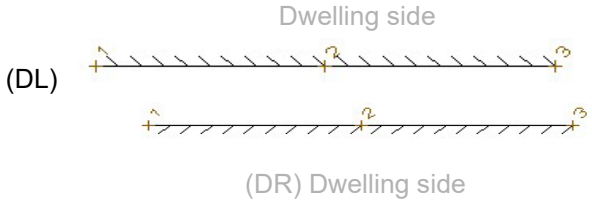
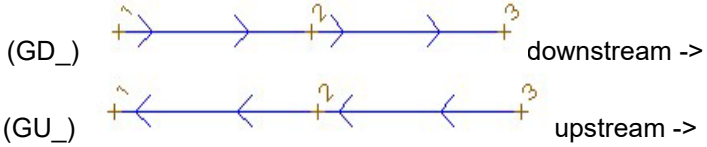
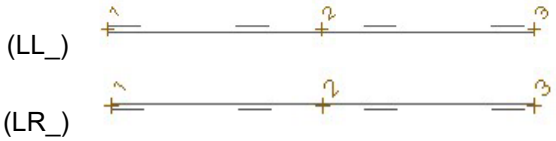
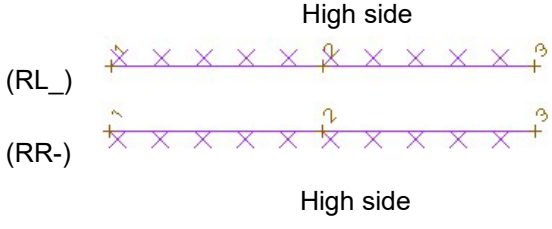
5.4 Linestyles

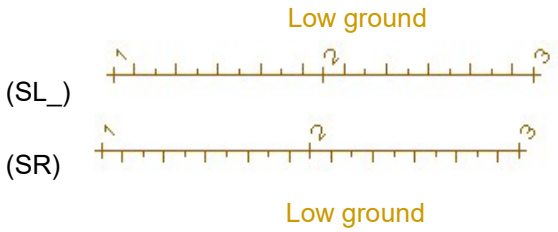
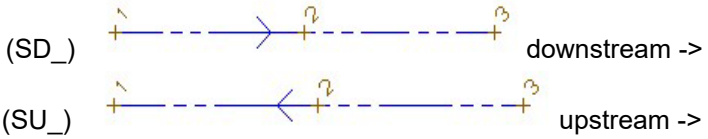
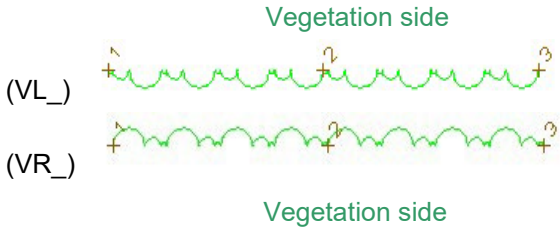
The line string plot styles are shown as if the string was located left to right in the diagrams. The vertices have been numbered in the order of the pick-up and the crosses indicate the pick-up point in relation to the drawn linestyle (the numbers and crosses do not appear in the resultant linestyle).

E.g., Pastoral Boundary Holding (BH_) is 

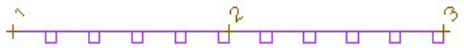
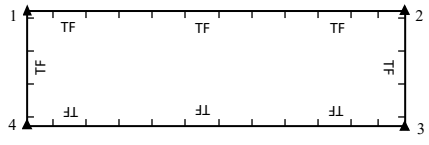
5.4.1 Directional linestyles

Many linestyles are asymmetrical and, as such, they have a different linestyle depending on which direction the pickup proceeded. They are:

• Bank Left and Bank Right – Proceeding along the top of a bank with the low ground to the left – Proceeding along the top of a bank with the low ground to the right	
• Cultivation Left and Cultivation Right – Proceeding along the edge of cultivation with cultivation to the left – Proceeding along the edge of cultivation with cultivation to the right	
• Drain Down and Drain Up – Proceeding along a drain in the direction of the flow – Proceeding along a drain against the direction of the flow	
• Dwelling Left and Dwelling Right – Proceeding along a building with the building on the left – Proceeding along a building with the building on the right	
• Stream Gradient Down and Stream Gradient Up – Proceeding along a stream in the direction of the flow – Proceeding along a stream against the direction of the flow	
• Linemarking Broken on Left and Linemarking Broken on Right – Proceeding along a double line with the broken line on the left – Proceeding along a double line with the broken line on the right	
• Retaining Wall Left and Retaining Wall Right – Proceeding along the top of a Retaining Wall with the high ground to the left – Proceeding along the top of a Retaining Wall with the high ground to the right	

• Stream Bank Left and Stream Bank Right – Proceeding along the top of a stream bank with the low ground to the left – Proceeding along the top of a stream bank with the low ground to the right	
• Subsoil Drain Down and Subsoil Drain Up – Proceeding along a subsoil Drain in the direction of the flow – Proceeding along a Subsoil Drain against the direction of the flow	
• Vegetation Left and Vegetation Right – Proceeding along the edge of vegetation with the vegetation to the left – Proceeding along the edge of vegetation with the vegetation to the right	

Note: There are five Asymmetric strings that do not have a corresponding other-hand linestyle. The two guardrail strings both only have the posts on the right of the direction of pick-up. Also, the edge of grass cover only has the grass on the left of the direction of pick-up. Care should be taken in the field pick-up of these features, so that an unambiguous representation of the features can be made. That is the direction of pick-up is important to have the feature attribute on the correct side. With the fourth feature, Pastoral Boundary (BH_), the asymmetrical linestyle has no significant meaning and so can be run in any direction.

Safety Fence – W beam (two humps)	(FB_) 
Safety Fence – Thrie beam (three humps)	(FH_) 
Environment – Grass coverage (GS_)	(GS_) 
Pastoral Boundary	(BH_) 
Sub-station / transformer – pad mounted • Locate clockwise, keeping the pad on the right	(TFB_) 

It may be necessary to reverse the first three feature strings either by using a control code during pick-up or at the processing stage. If the string is reversed, care should be taken when joining the string to others.

5.4.2 Two point strings

Several line features are designed to have the linestyle dynamically stretched between successive location points. They are usually used as two point strings. These two point strings are drawn as stretched linestyles, that is the linestyle is not repeated at some drawing interval between successive pick-up points, but stretched from the first point to the second. The linestyle is dynamically stretched from the first pick-up point to the second pick-up point. Those two point strings that have a symbol at the start of the linestyle and finish as an end point on a line must be located in the correct order, which is from the symbol to the end point.

While it is possible to have more than two points on these strings, care should be taken to make the spacings of the points on the string approximately equal, so as to avoid large differences in scale of the segments.

The two point strings are:

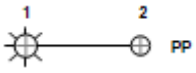
- Multi-posted signs (BS_). These are always located from right to left as you look at the face of the sign so that the symbol has the footings on the back side of the sign. The pickup points are from OUTSIDE EDGE to OUTSIDE EDGE of the sign face (not the support footings), e.g.,

  Big Sign (BS_) 

- Doorway (Stretched) (DY_). This is a two point string that is not directional, but the linestyle is dynamically stretched to fit the two pickup points, e.g.,

  Doorway (DY_) 

- Street light with mast arm (two points light to pole (LM_)). This two point string has direction in that it must be picked up in the order light to pole (note the LM_ linestyle does not have a symbol at point 2). If the light arm is attached to a pole, then point 2 should be dual coded with the appropriate code for the situation (possibilities include PPRF, PPPP and EA_).

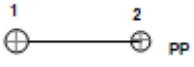
  Light Mast (LM_) 

- The Linemarking for a pedestrian zebra crossing is located along the centreline of the crossing at either end of the crossing, e.g.,

  Linemarking – Pedestrian Crossing (LP_) 

  Note: This is a code for a zebra crossing only, it is not to be used for a pedestrian cross walk controlled by traffic lights. The code to use for this is the Holding Line LH_)

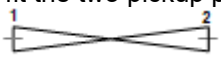
- Stay Bollard (two points – bollard to pole) (SB_). This two point string has direction in that it must be picked up in the order bollard (or anchor) to the Stayed object, which would be dual coded with the appropriate code. If the bollard anchored a pole, then point 2 would be dual coded with EA_ or PPPP, e.g.,

  Stay Bollard (SB_) 

- Stay Wire (two points – anchor to pole (ST_). This is a two point string that must be picked up in the direction of the ground anchor to the pole. The second point is usually dual coded with the string code EA_ or point code PPPP, e.g.,

  Stay Wire (ST_) 

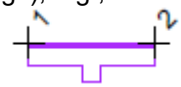
- Gate (Stretched) – (TG_).This is a two point string that is not directional, but the linestyle is dynamically stretched to fit the two pickup points, e.g.,

  Gate (Stretched) (TG_) 

- Traffic Light with Mast arm (two points – traffic light to pole) (TM_). This two point string has direction in that it must be picked up in the order - traffic light pivot point to the support object. If the light arm is attached to a pole, then point 2 could be dual coded with the appropriate code for the situation (possibilities include PPRF and PTLT). e.g.,

  Traffic Light Mast arm (TM_) 

- Variable Message Sign (VMS_). This are a two point string and always located from right to left as you look at the face of the sign so that the symbol has the footings on the back side of the sign. The pickup points are from OUTSIDE EDGE to OUTSIDE EDGE at the bottom of the sign face (not the support footings), e.g.,

  Variable Message Sign (VMS_) 

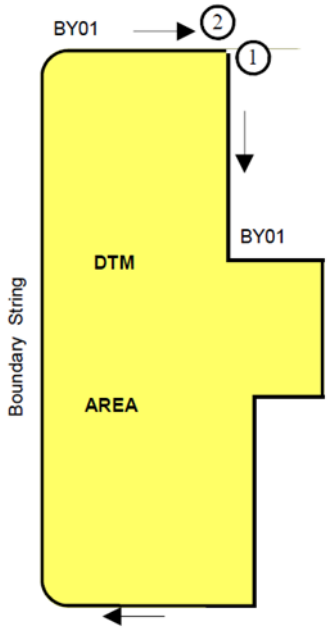
6 Coding examples by MODEL

The following are situational examples of how to use point and string codes. Not every code has a situational example.

The principles and requirements presented in the situational examples are to be applied to codes of similar intention. For example, the principles and requirements presented in *Section 6.4.9 Manhole chamber outline – stormwater* are to be applied to all other manhole chamber outline feature string codes.

6.1 MODEL – SURVEY BOUNDARY

6.1.1 BY_ – Boundary string

BY_	**Boundary String (for trimming or excluding)**
A sequential boundary string (BY_) shall be run to define the edge of the ground surface model data (SURVEY DTM). This boundary string will then be used to trim the triangulation, allowing only the area enclosed within the boundary string to be included in the ground surface model. The reason for including this boundary string in the submitted survey data is to clearly define that data that is to be triangulated for a different user other than the original surveyor. The boundary string should be added by the surveyor who is in the best position to locate it correctly. A boundary string (BY_) is usually added interactively at the time of job edit. Each and every point on the boundary string shall be a duplicate of a valid point within the SURVEY DTM model. A BY string may also be used as an internal boundary to exclude an area that isn't to be triangulated, e.g., a body of water or inside the bounds of a dwelling.	
Boundary created during job edit  	
Commonly used with Any point/string in SURVEY DTM	Create a continuous boundary string (BY_) by duplicating all points at the extremities of the SURVEY DTM as the boundary string in either a clockwise or anti-clockwise direction. An alternative method is to triangulate the SURVEY DTM, and then create a Boundary string (BY_) around the triangulation extents. Edit the string as necessary to correctly define the edge of the ground surface model and prevent erroneous edge triangles. Retriangulate the SURVEY DTM model using the edited BY_ string to limit or trim the resultant triangulation.

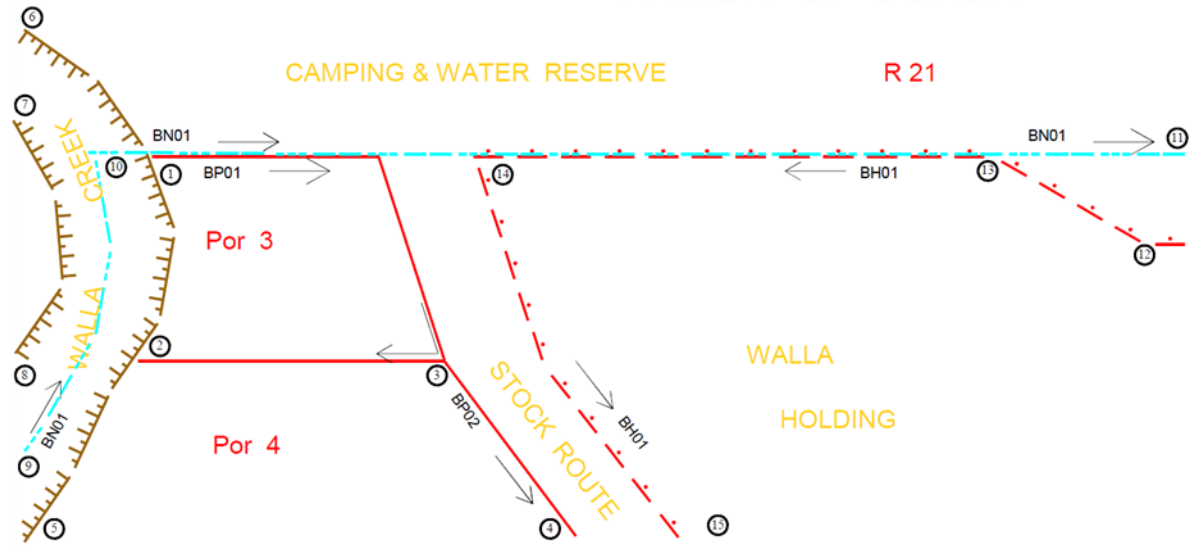
6.2 MODEL – SURVEY CADASTRAL

6.2.1 BH_ / BN_ / BP_ Pastoral Boundary, Property Boundary, Boundary of Native Title

BH_	**Pastoral Boundary**
BP_	**Property Boundary**
BN_	**Boundary of Native Title or Claim**

A sequential boundary string (BN_) should be run to define the limit of a Native Title or Native Claim in order for the data users to be aware of such encumbrances on property of interest. This BN_ boundary string may follow a real property boundary or natural feature and the string will be assigned to the SURVEY CADASTRAL model.

Parish of Bunda



Commonly used with

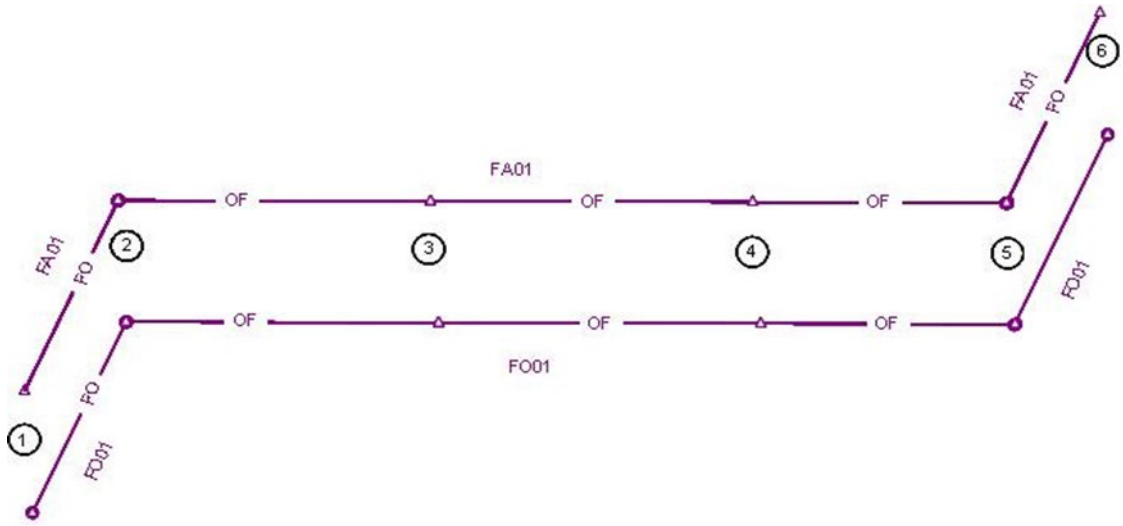
BP_ Property boundary
BH_ Pastoral boundary
BL_ Bank left

Add a boundary string (BN_) by duplicating points along a property boundary or a natural feature where such a property boundary or feature defines the Native Title or Claim.

Property boundary (BP01)	=	1 to 2
Property boundary (BP02)	=	3 to 4
Pastoral holding (BH01)	=	12 to 15
Top of bank – ground falls on left (BL01 & BL02)	=	5 to 6 & 7 to 8
Boundary of Native Title Claim (BN01)	=	9 to 11

6.3 MODEL _ SURVEY COMMS

6.3.1 FA_ / FO_ / FU_ – Optical Fibre – Aboveground / Underground

FA_ / FO_ / FU_	**Optical Fibre Aboveground – Wires only/Posts included and Fibre Optics Underground**
There are two feature types for Fibre Optics aboveground. They are FA_ and FO_. The FA_ code draws the cable only. If a pole exists at the point of pick-up, it must be coded with the PTIP point feature. The FO_ code draws the cable with a pole symbol at pick-up points. This code was introduced for Photogrammetrists as they are only able to see the wires as evidenced by the pole and its shadow.	
	
Commonly used with PTIP Isolated telecommunication pole FA_ Optical Fibre Aboveground (poles located) FO_ Optical Fibre Aboveground (poles located) FU_ Optical Fibre Underground	The default location position of Fibre Optic Cables is the height of the lowest wire at the support pole, as well as the clearance of the lowest wire above the carriageway. The Survey Brief will state any variation to this requirement. The poles are a separate feature. The crucial aspect of the pole is clearance to the driving lanes. The pick-up location for poles is at the base of the pole (adjusted for offset to the centre of the pole). The diameter must be commented. In the scenario above, Point 1 is located at the extremity of the survey area. If at this point there is only the cable, the code would be FA01 taken at the height of the cable. If this point has a pole, another feature, PTIP, must be located. This will be at the base of the pole, corrected for offset to the centre of the pole, with the diameter of the pole, and height if needed, commented. If a pole does not exist at Point 1, the code FO_ is not appropriate as it will show a pole at the point. If poles exist at both Point 1 and Point 2, then FO01 could be used, located at the base of the pole, adjusted for offset to the centre of the pole with the height of the cable commented. At the first bend, the pole is located as a separate PTIP point taken at the base of the pole and adjusted for offset to the centre of the pole. The FA01 code is taken at the cable as a separate point or dual coded with the PTIP and the height of the cable commented along with the height of the pole if required. Points 3 and 4 are picked-up to supply clearances to the ground for the wires. They are coded as FA01. They are picked-up at the height of the cable or if required by the Survey Brief at the ground and annotated with a height to the cable. Point 5 is located similarly to Point 2 and Point 6 similar to Point 1.

6.3.2 OC_ - Manhole chamber outline – comms

To locate an OC_ feature string, apply the principles and requirements presented in *Section 6.4.8 OD_ Manhole chamber outline – stormwater*.

6.3.3 PFDH – Fibre distribution hub

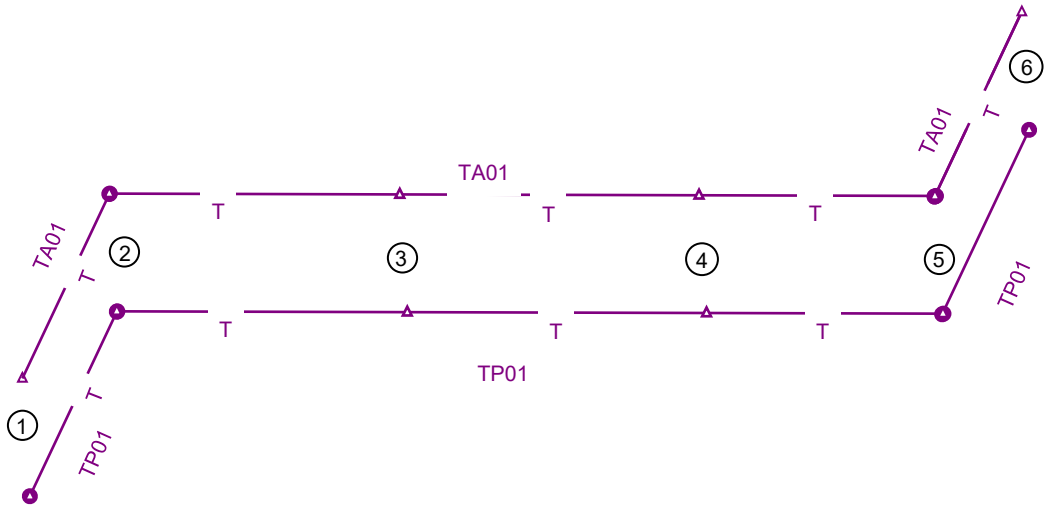
PFDH	**Fibre distribution hub**
The feature point for a fibre distribution hub (PFDH) is located at the top centre of the cabinet and should be commented with the cabinet size and cabinet identifier (shown on right below).	
 	
Commonly used with EC_ Edge of concrete NS_ Non-standard feature string	Locate PFDH at centre top of the cabinet. If the clearances are required, NS_ may be used to locate the hub cabinet corners at the level of the concrete pad. Some hub cabinets sit on a concrete pad that protrudes past the cabinet extents and may be require to be located. Use edge of concrete feature string (EC_) and change of grade (CG_) as necessary.

6.3.4 PRIM – RIM Telecommunication

PRIM	RIM - Telecommunications
A Remote Integrated Multiplexer (RIM) is a device that is used to provision telecommunication services in areas where there is no existing copper lines, or the existing copper lines in the ground cannot support the demand for services in the area. The feature code PRIM is located at the top centre of the cabinet and should be commented with the cabinet size and cabinet identifier.	
	
Commonly used with EC_ Edge of concrete NS_ Non-standard feature string	Locate PRIM at centre top of the cabinet. If the clearances are required, NS_ may be used to locate the RIM cabinet corners at the level of the concrete pad. Some RIM cabinets sit on a concrete pad that protrudes past the cabinet extents and may be require to be located. Use edge of concrete feature string (EC_) and change of grade (CG_) as necessary.

6.3.5 TA_/ TP_ – Telecommunication (above ground)

TA_	**Telecommunication above ground - wires only**
TP_	**Telecommunication above ground - with poles**
There are two feature types for Telecommunication above ground. The TA_ code draws the wires only. If a pole exists at the point of pick-up, it must be coded with the PTIP point feature. The TP_ code draws the wires with a pole symbol at each pick-up point.	



Commonly used with

PTIP	Isolated telecommunications pole
PHCA	Utility height - Comms

The default location position of Telecommunication lines is the height of the lowest wire at the pole, as well as the clearance of the lowest wire above the carriageway. The Survey Brief will state any variation to this requirement. The poles are a separated feature. The crucial aspect of the pole is clearance to the driving lanes. The pick-up location for poles is at the base of the pole (adjusted for offset to the centre of the pole). The diameter must be commented. The length of the pole aboveground can be obtained and commented if required in the Survey Brief.

In the scenario above, Point 1 is located at the extremity of the survey area. If at this point there are only wires, the code would be TA01 taken at the lowest wire. If this point has a pole another feature, PTIP must be located. This will be at the base of the pole, corrected for offset to the centre of the pole, with the diameter of the pole, and height if needed, commented. If a pole does not exist at Point 1, the code TP_ is not appropriate as it will show a pole at the point. If poles exist at both Point 1 and Point 2, then TP01 could be used, located at the base of the pole, adjusted for offset to the centre of the pole with the height of the lowest wire commented.

At the first bend, the pole is located as a separate PTIP point taken at the base of the pole and adjusted for offset to the centre of the pole. The TA01 code is taken at the lowest wire as a separate point or dual coded with the PTIP and the height of the lowest wire commented along with the height of the pole if required.

Points 3 and 4 are picked-up to supply clearances to the ground for the wires. They are coded as TA01. They are picked-up at the height of the lowest wire or if required by the Survey Brief at the ground and annotated with a height to the lowest wire.

Point 5 is located similarly to Point 2 and Point 6 similar to Point 1.

6.4 MODEL – SURVEY DRAINAGE

6.4.1 CU_ – Culvert (single)

CU_	**Culvert**
PILP	**Invert Level**

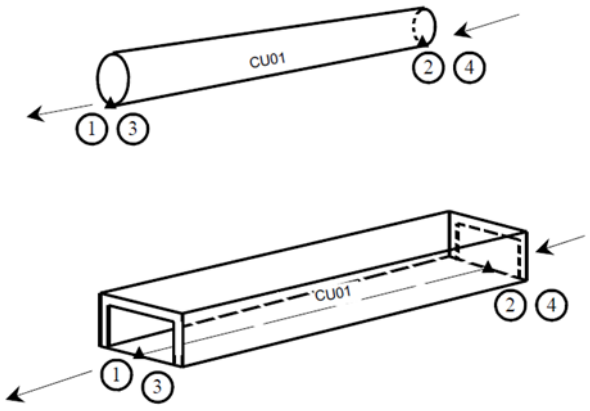
Whilst a CU_ sequential string only represents the X, Y position of the culvert, the CU_ string shall locate the culvert at the invert. The Z value of an inlet or outlet is represented by the PILP feature point. Normal practice is to locate the invert and dual code as CU_ and PILP.

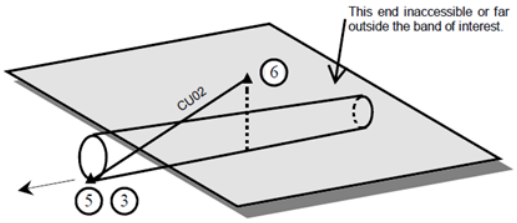
In some situations, it may be impossible to locate invert level points directly. The obvert of the culvert may be located with the vertical measurement to the invert added to the target height of the pick-up point so that the resultant position represents the invert of the culvert.

Where either the inlet or outlet of the pipe is inaccessible, not able to be found or far outside the band of interest, a point on the CU_ string may be located on the ground surface vertically above the line of the culvert. This point shall be commented “line only” with other comments as necessary for explanation.

The size, type, material, subjective rating and a descriptive comment of each culvert is required. Comments are to be added to the CU string and **NOT** to PILP. These details are to be added to the point descriptions in the field survey data. For more complex culvert structures these comments may be noted on a plan sketch of the culverts, and suitably cross-referenced. A photo must be taken of each culvert where silting or deterioration is present to help clarify the condition.

Subjective rating	**Description**
Good (‘as new’)	Free of defects with little or no deterioration
Fair	Free of defects affecting structural performance, integrity and durability. Deterioration of a minor nature in the protective coating and/or parent material is evident
Poor	Defects affecting the durability/serviceability which may require monitoring and/or remedial action or inspection by a structural engineer. Component or element shows marked and advancing deterioration including loss of protective coating and minor loss od section from the parent material is evident. Intervention is normally required.





Commonly used with PILP, CH	Culvert (CU01) = 1 to 2 Invert level (PILP) = 3 & 4 Culvert (CU02) = 5 to 6 Where 6 is a point on the ground surface vertically above the line of the culvert with “line only” comment. Example comment: *600RCP Poor 70% silting*

6.4.2 CU_ – Culvert (multi)

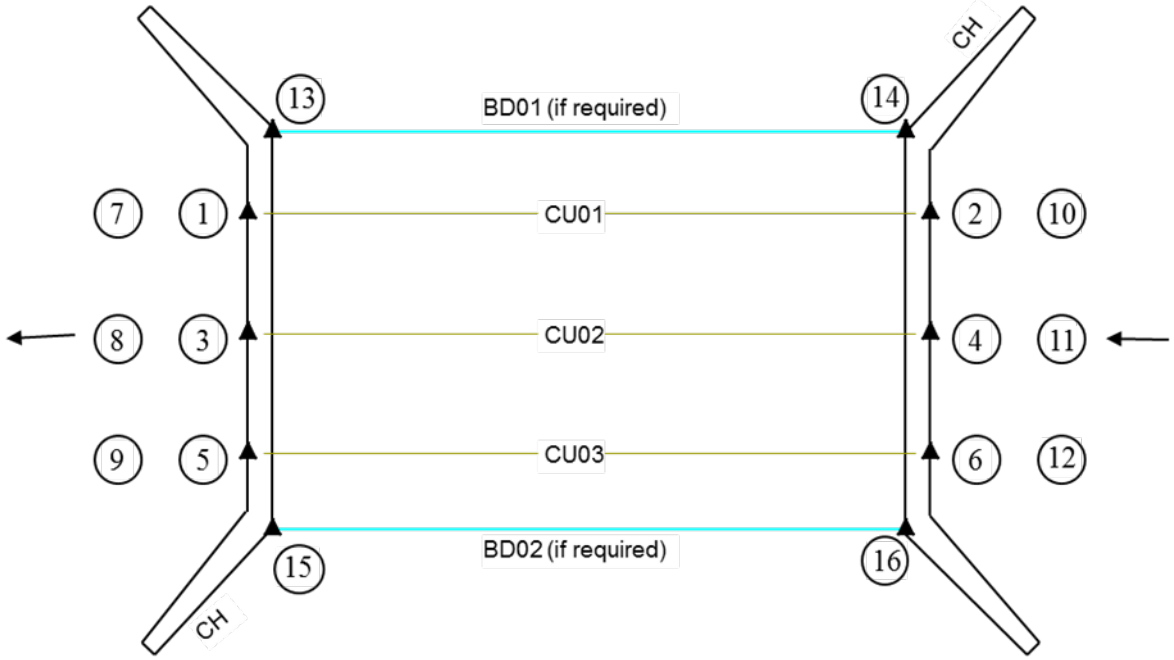
CU_	Culvert
PILP	**Invert Level**

For a multi cell culvert structure, each cell must have the inlet and outlet inverts located as PILP and also be strung individually as CU_ sequential strings at the invert of the extents.

In a situation where the detailed extent or shape of a cell cluster must be defined, the non-contourable codes BD_ or BK_ (Structures model), NS_ (non-standard) or EC_ (edge of concrete) may be used, along with the contourable codes CH (culvert headwall), KT (kerb top) etc., where appropriate.

In addition, an elevation diagram may be required – (vide 6.5.2 CH_ Culvert Headwall).

The size, type, material, subjective rating (vide 6.4.1) and a descriptive comment of each culvert is required on the CU string and **NOT** to PILP. These details are to be added to the point descriptions in the field survey data. For more complex culvert structures these comments may be noted on a plan sketch of the culverts, and suitably cross-referenced. A photo must be taken of each culvert inlet and outlet to help clarify the condition.



Commonly used with
PILP, CH_

Culvert (CU01)	= 1 to 2,	Invert Level (PILP)	= 7 & 10
Culvert (CU02)	= 3 to 4,	Invert Level (PILP)	= 8 & 11
Culvert (CU03)	= 5 to 6,	Invert Level (PILP)	= 9 & 12
Bridge Deck (BD01)	= 13 to 14,	Bridge Deck (BD02)	= 15 to 16

For the location of multiple-cell culverts, each cell or pipe requires an individual CU_ string at the invert along the culvert centreline. The invert levels of the inlet and outlet of each individual cell or pipe shall be located using the code PILP.

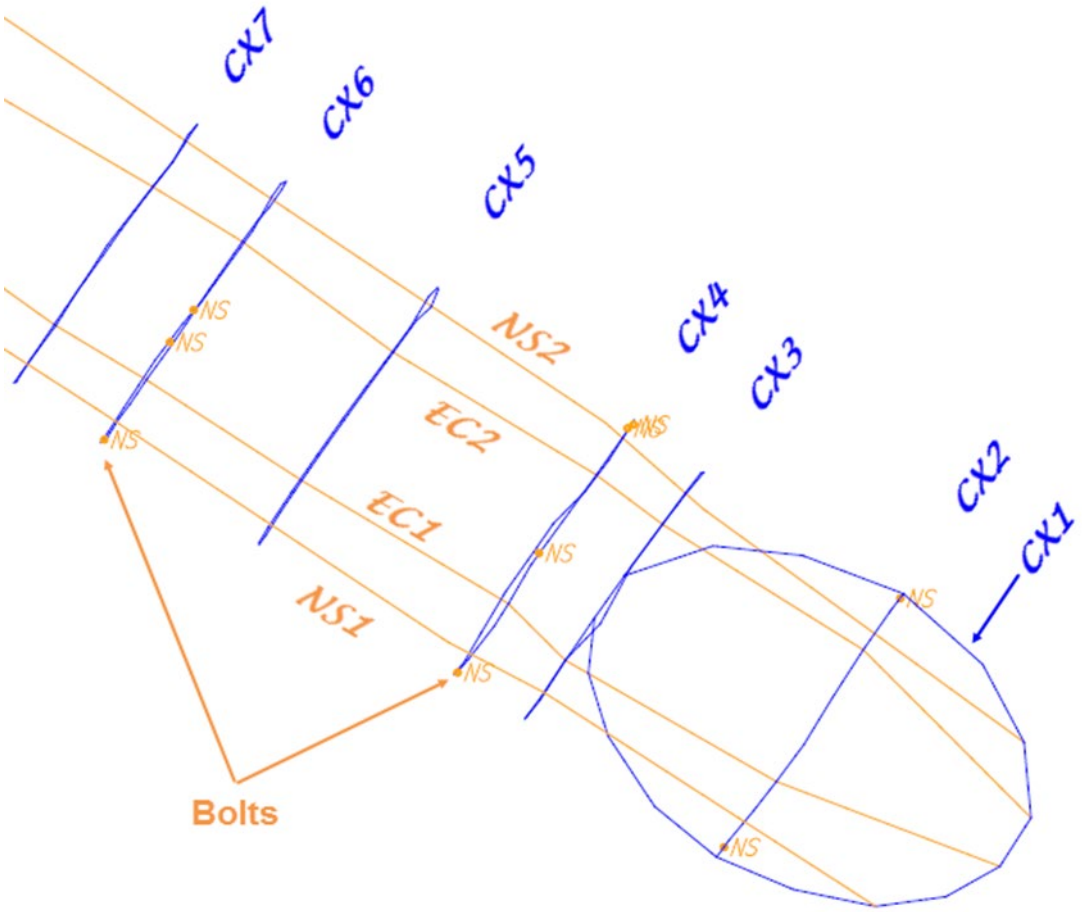
Example comment: *1200x750 RCBC good 5% silting*

6.4.3 CX_ – Culvert Cross-section

CX_	Culvert Cross-section – Circular Corrugated Metal Culverts

Survey for rehabilitation of a Circular Corrugated Metal Culvert (CCMC)

Accurate assessment of the geometry of the existing culvert is essential to determine the finished geometry of any liners prior to construction. Culvert 'cross-section' strings must be run around the inner corrugation profile at centres of less than 2 m, with a minimum of 8 points per cross-section. The survey should include the bevel ends, and deliberately target points that potentially limit the diameter of the liner to be fitted. These points may be bolts, bulges or deformation. If the CCMC has invert protection in the form of a concrete liner, it must be accurately located.

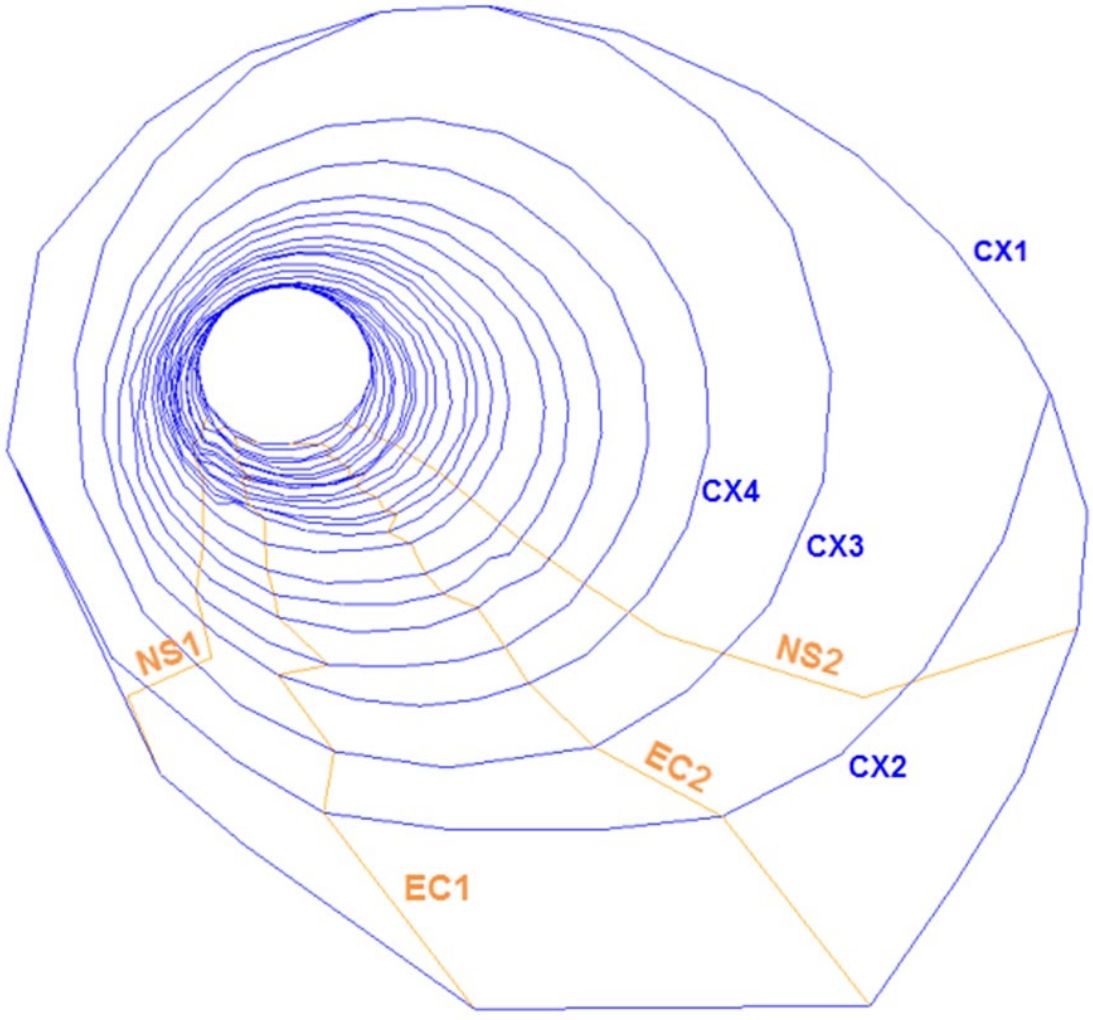


In the example, locate CX1 string around the elliptical (bevel) end of the CCMC inlet. CX2 is run around a ring approximately half way to full pipe size. CX3 is located around the first full ring. Subsequent CX_ strings are run at less than 2 m centres for the length of the pipe before picking up the last full ring, another half ring, like CX2, and the outlets elliptical end. CX_ strings must locate any deformed areas of the pipe.

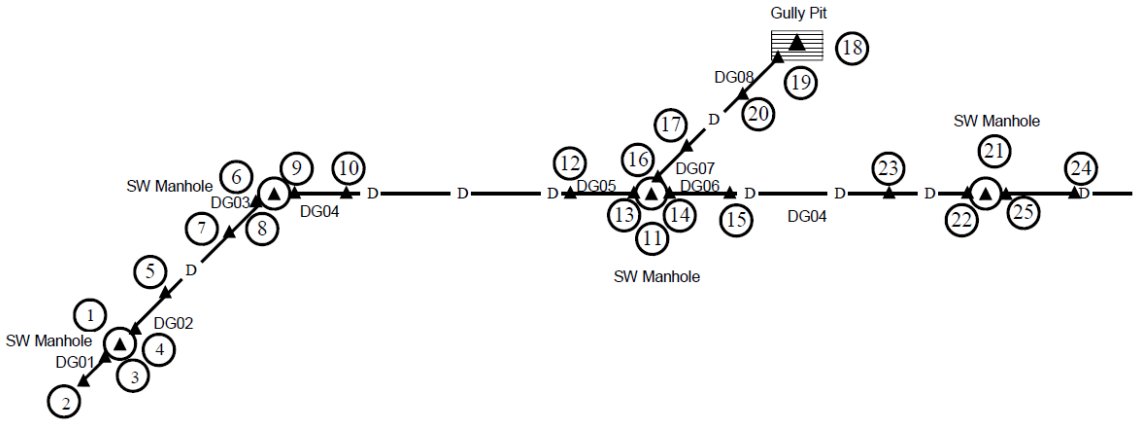
In the example, the pipe has a concrete liner. Each side is located using an EC_ string. NS_ strings are used to locate the extents of rust in the pipe. Locate any extruding bolts as PNSP points with comments.

A CU_ string and PILP points shall also be located as with any culvert.

CX_	Culvert Cross-section – Circular Corrugated Metal Culverts
Commonly used with CU_ Culvert EC_ Edge of concrete PILP Invert level PNSP Non-standard feature point NS_ Non-standard string	Survey headwall, apron and void information as necessary. Survey at least 20 m of the road surface on either side of the culvert with sufficient information to identify the minimum cover to pipes. Stream and embankment details may be required to provide sufficient information to enable the hydraulic and environmental considerations to be accurately addressed. The surveyor will annotate points with comments as necessary. The profile of pipe corrugations (pitch and height) and wall thickness should be noted. Comments are to be added to the CX string and **NOT** to PILP. Photos must be taken to show the condition of the culvert and its hydraulic capacity. **Note:** Assessment needs to take place to determine if the CCMC is considered a 'Confined Space'.



6.4.4 DG_ – Drainage line

DG_	Drainage line
The feature line code DG_ is used for locating Drainage Lines. The Survey Brief will indicate if connecting drainage between chambers is required. The pick-up point is to be the invert of the drainage line unless specified otherwise in the Survey Brief. **Note:** WH&S procedures restrict access to enclosed spaces. Special equipment and access procedures are required to lift chamber access covers and enter underground chambers. If the Survey Brief requires access to the chamber, then suitably qualified persons must be engaged to co-ordinate this access.	
	
Commonly used with PSWM Stormwater Manhole PILP Invert Level PGPP Gully Inlet OD_ Manhole chamber outline – Storm water **Note:** Any feature that is underground should not be assumed to go in a straight line from the surface outcrops of the chambers. The restrictions imposed by WH&S also apply to other types of chambers. Codes that may be affected are: EU_, FU_,TU_, UF_ , UG_, UU_	Point 1 – The chamber access lid as PSWM. Once the lid is lifted, measurements are taken to position the centre of the inlet and outlet pipes of the drainage chamber and to indicate the direction of the drainage stubs of each pipe. Point 2 – Surface level of the direction on the inlet pipe as DG01 with comment ‘Line Only’. Point 3 – Invert level of inlet pipe as PILP duplicated as DG01 Point 4 – Invert level of outlet pipe as DG02 duplicated as PILP Point 5 – Surface level of direction of outlet pipe as DG02 commented as ‘Line Only’. Points 6 to 10, 11 to 15 and 21 to 25 are located similarly to points 1 to 5 Point 16 – Invert level of pipe inlet to chamber as PILP duplicated as DG07 Point 17 – Surface level of pipe direction as DG07 with comment ‘Line Only’ Point 18 – Centre of inlet as PGPP (grate in this example) Mark inlet position, depth and direction of pipe stubs. Point 19 – Invert level of outlet pipe as PILP duplicated as DG08 Point 20 – Surface level of pipe direction commented as ‘Line Only’ Comments are to be added to the DG string and **NOT** to PILP. **Note:** If sure that the drainage directly connects the chambers, then the drainage line between chambers can be coded as the one occurrence of the drainage line, e.g., from the first manhole to the second, both points 4 and 8 can be DG02 and points 5 and 7 omitted. If not, further investigation will be required to ascertain the exact location of the drainage line between the chambers.

6.4.5 GL_ - Grate longitudinal

GL_	Grate longitudinal
PILP	Invert level

Longitudinal grates are found in a number of different scenarios to remove water from pavement and driveways. These include in kerbing to allow additional opportunity for water to access an underground drainage structure (example A below) and in the pavement outside the driving lanes (example B below) so water doesn't pool on the pavement.

The longitudinal grate feature string is located at the centre of the top of the grate. An invert level (PILP) of the chamber floor at each end of the chamber is required. SURVEY DTM feature strings may be required to represent the terrain surface correctly around the longitudinal grate (e.g edge of pavement EP_).

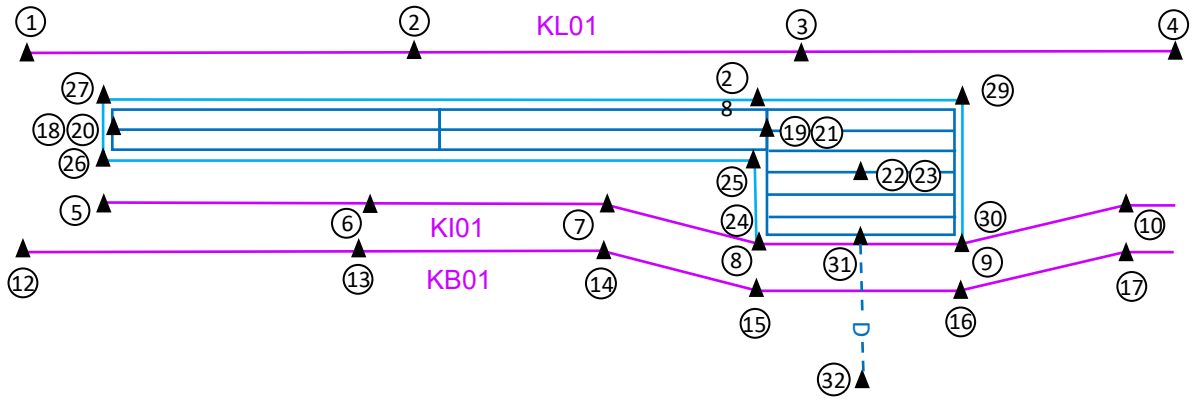
Where more comprehensive drainage information is required, longitudinal grate string and invert level points may be complemented by Drainage Line (DG_) and Manhole chamber outline – storm water (OD_) feature strings.

See the following page for situational example of feature coding.

Example A

Example B

GL_	Grate longitudinal
PILP	Invert level



For a basic survey where detailed drainage is not required: in addition to standard pickup of the kerb lip (KL01) and kerb back (KB01), a short section of kerb channel invert (KI01) is to be located around the drainage structure. This will help define the hydraulic capacity and water entry points to the underground chambers.

Pickup the longitudinal grate (GL01, pts 18 to 19) on the top of the grate at each end with a comment for width of grate. Locate the chamber invert level (PILP, pts 20 & 21) at each end of the chamber floor.

Pickup the gully pit (PGPP, pt 22) at the centre top of the pit entrance (centre of grate in this example) with a minimum comment of entrance type and size (grate 900x600). Locate the invert level (PILP, pt 23) at the centre of gully pit floor.

Locate the gully pit outlet drainage line by picking up the invert level (PILP, pt 31) and dual code as a drainage line (DG01). Complete by picking up the invert of the outlet dual coded as PILP (pt 32) and DG01.

Optional: Where additional drainage information is required, a storm water chamber outline string (OD01) can be located around the top of the internal chamber walls. The outline of the chamber floor could also be located using a second OD string (OD02). A drainage line (DG02) may be located below the longitudinal grate on the chamber floor.

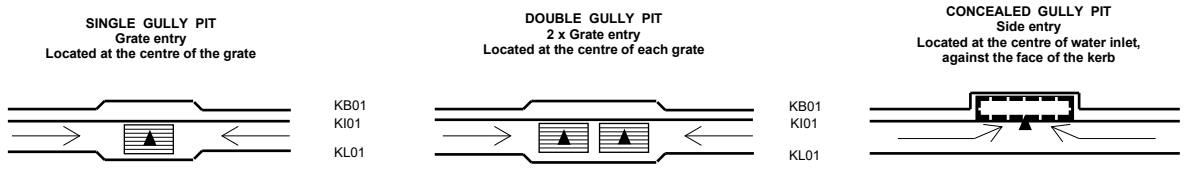
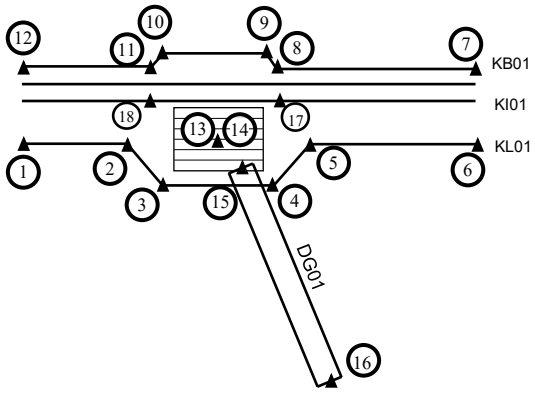
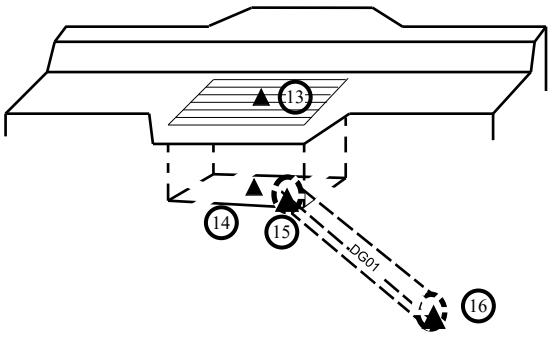
Commonly used with

PILP	Invert level
PGPP	Gully pit
OD_	Manhole chamber outline – Storm Water
DG_	Drainage line
KL_	Kerb - channel lip
KI_	Kerb - channel invert
KB_	Kerb - back

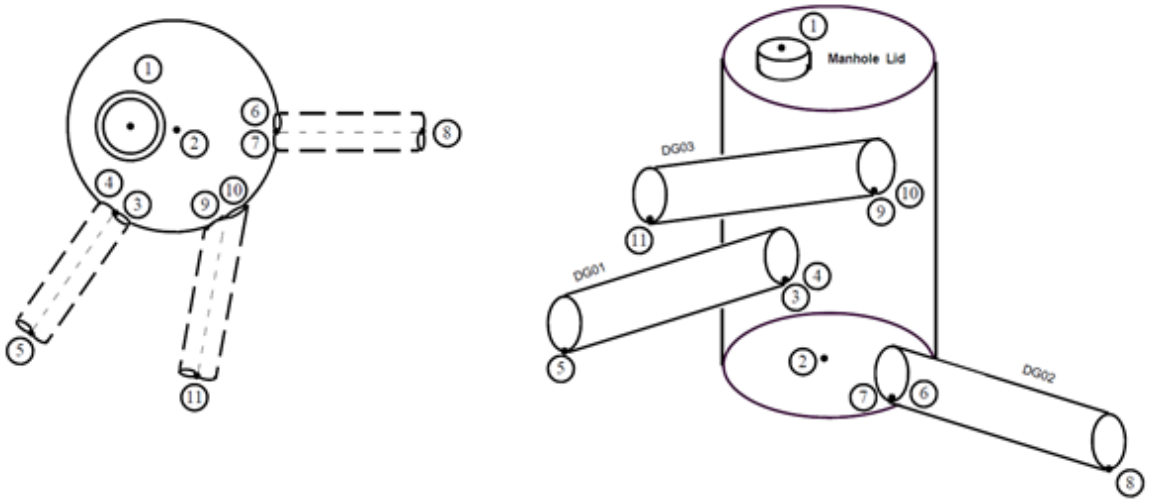
In the example above:

Kerb - channel lip	(KL01)	= 1 to 4
Kerb - channel invert	(KI01)	= 5 to 10
Kerb - back	(KB01)	= 12 to 17
Longitudinal Grate	(GL01)	= 18 to 19
Gully Pit	(PGPP)	= 22
Invert level	(PILP)	= 20, 21, 23, 31, 32
Drainage line	(DG01)	= 31 to 32
Drainage line (optional)	(DG02)	= 20 to 21
Manhole chamber outline – storm water (optional)	(OD01)	= 24 to 30, close to 24 (closed string)

6.4.6 PGPP – Gully pit

PGPP	Gully pit
Each gully pit must be located as a single feature point. Gully pits are generally top entry with a grate or concealed side entry types. The level of detail required is dependent on the reason for the survey and the complexity of the structure. Basic requirements are the centre of gully pit entry, invert level of the chamber floor and pipes, and kerb strings. Diagrams may be required showing the detailed dimensions of the gully pit structure. In situations which require the shape of a gully pit to be defined, use manhole chamber outline – storm water (OD_).	
	
	
Commonly used with CU_ Culvert KB_ Kerb back KI_ Kerb Invert KT_ Kerb top PILP Invert level OD_ Manhole chamber outline – stormwater DG_ Drainage - stormwater pipe/culvert PSWM Manhole – stormwater	Top entry (grate) gully pits shall be located as PGPP at centre of the grate with dimensions commented. Concealed side entry gully pits shall be located as PGPP at the centre of the water inlet, at kerb invert level against the face of the kerb structure. The invert level (PILP) of the centre of the gully chamber floor and invert of pipe/s shall be located. A kerb invert string (KI) shall be located and cover at least the length of the gully pit. Kerb top (KT) string may be required to show the shape of the non-standard kerb. Kerb lip (KL01) = 1 to 6 Kerb back (KB01) = 7 to 12 Kerb invert (KI01) = 17 to 18 Gully Pit (PGPP) = 13 Invert level of gully chamber floor = 14 Invert level of stormwater inlet (PILP) = 15 Stormwater pipe (DG01) = 15 to 16 Invert level of stormwater outlet (PILP) = 16

6.4.7 PSWM – Stormwater manhole

PSWM	Stormwater manhole (non-contourable)
Each stormwater manhole chamber must be located as a single feature point using the PSWM code at the centre of the stormwater manhole. Generally, the shape of individual standard underground stormwater chambers is not picked up unless required. In a situation where the detailed position of an underground stormwater chamber needs to be located, measurements may be taken in relation to the PSWM feature point and/or other key feature points. Either a diagram needs to be produced, showing the details of those measurements related to the pick-up points or the measurements need to be entered interactively into the X,Y,Z job data during the job edit using non-standard feature strings (NS_).	
	
Commonly used with NS Non-standard feature string PILP Invert level DG Drain line	The location and size of all stormwater pipes entering (DG01, DG02) and exiting (DG03) the stormwater chamber are required. The invert level (PILP) of the bottom of the stormwater chamber at 2, plus the invert levels of all stormwater pipes entering and exiting the chamber are required. In situations where it is impossible to locate invert level points (PILP) directly, vertical measurements from the stormwater manhole pick-up point or other pick-up points can be observed. Such measurements must be converted to X,Y,Z coded feature points (PILP) within the job data, either by field calculation or interactively during the job edit. It is not necessary to locate stormwater pipe (or culvert CU_) string pick-up points directly. A DG_ or CU_ string only represents the X,Y position of the pipe or culvert. The Z value of an inlet or outlet is represented by the PILP feature point. Pipes can be located by stringing points vertically above the DG_ or CU_ inlets and outlets. Stormwater manhole (PSWM) = 1 Invert level – chamber (PILP) = 2, 3, 9 Invert level – outlet (PILP) = 6 Drain Line (DG01, DG02 & DG03) = 4 to 5, 7 to 8 and 10 to 11

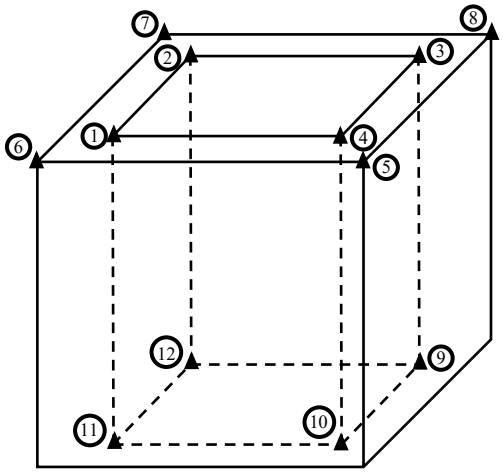
6.4.8 OD_ - Manhole chamber outline - storm water

OD_	Manhole chamber outline- storm water

If required by the Survey Brief, the manhole chamber outline feature string (OD_) is used to locate the internal and/or external extents of the manhole. This code may be used to locate the inside top, outside top, inside bottom or outside bottom of the chamber. It may also be used to define the outside of the lid and the outline of the access hole. In addition to manholes, this code may be used to show gully pit outlines.

The string must be appropriately commented as to which feature outline it represents. Depending on which outlines have been located, other important comments may be depth of chamber and wall thickness.

The OD_ feature string is to be used in conjunction with stormwater manhole point code (PSWM).



Commonly used with

PSWM	Manhole – stormwater
PILP	Invert level
PGPP	Gully pit
DG_	Drainage line
CU_	Culvert

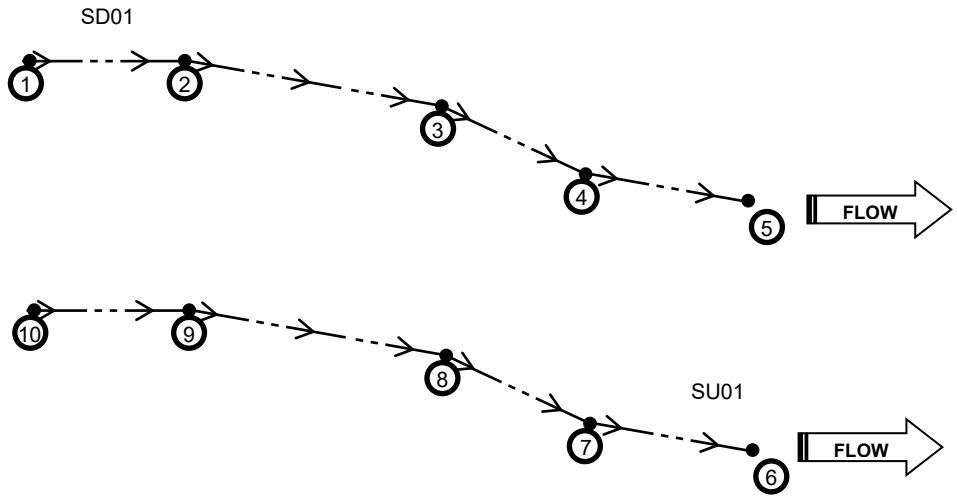
The Survey Brief will specify which chamber outlines are required. Strings must be closed, preferably using an op code in the field or in software during processing. Example comments are: inside top, outside top, inside bottom, outside bottom, lid extent and access extent.

Manhole chamber outline – stormwater (OD01)	= 1 to 4 “inside top”
Manhole chamber outline – stormwater (OD02)	= 5 to 8 “outside top”
Manhole chamber outline – stormwater (OD03)	= 9 to 12 “inside bottom”

The principles presented in this situational example will also be used with the following codes:

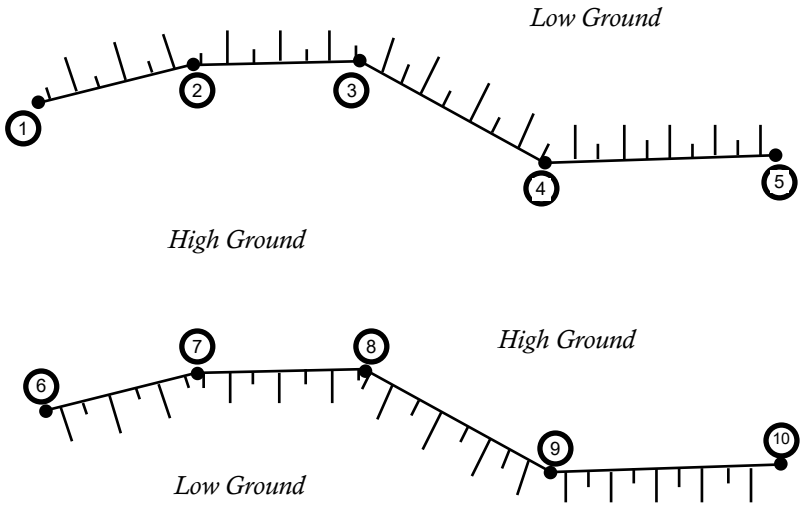
Model	Description	Code
SURVEY COMMS	Manhole chamber outline – comms	(OC_)
SURVEY ELECTRICITY	Manhole chamber outline – electricity	(OE_)
SURVEY FUEL	Manhole chamber outline – fuel	(OL_)
SURVEY GAS	Manhole chamber outline – gas	(OG_)
SURVEY OIL	Manhole chamber outline – oil	(OO_)
SURVEY SEWER	Manhole chamber outline – sewer	(OS_)
SURVEY UTILITIES	Manhole chamber outline – unspecified	(OU_)
SURVEY WATER	Manhole chamber outline – water main	(OW_)

6.4.9 SD_ / SU_ – Subsoil drain (Down/Up)

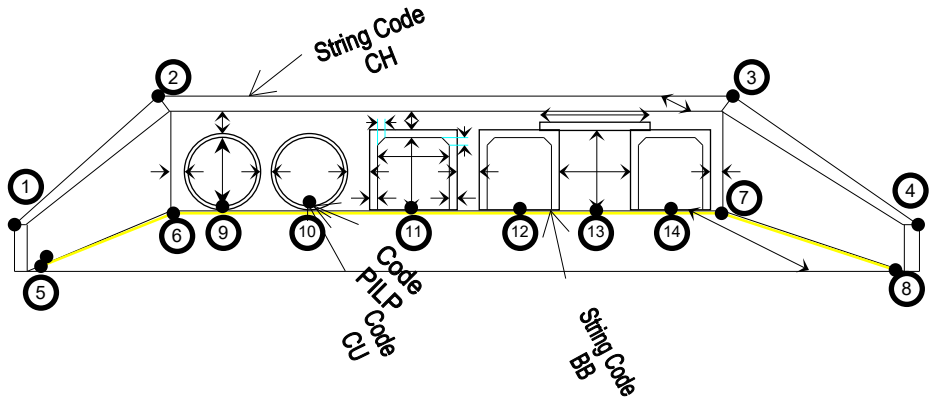
SD_ / SU_	**Subsoil Drain Down – In direction of flow (directional string)** **Subsoil Drain Up – Against the flow (directional string)**
The string for Subsoil Drain Down (SD_) is located in the sequence 1 to 5 in the direction of flow. The string for Subsoil Drain Up (SU_) is located in the sequence 6 to 10 against the direction of flow	
	
Commonly used with PSID Sub-soil drain inlet PSOD Sub-soil drain outlet	These are directional strings. The linestyle is directional so that the flow arrows are in the direction of flow. If the pick-up is in the direction of flow, use the subsoil drain down code else if the pick-up is against the flow, then use subsoil drain up code. No matter which code is used, the flow arrows should always point in the direction of flow. Subsoil Drain Down (SD01) is picked-up in the sequence 1 to 5. Subsoil Drain Up (SU01) is picked-up in the sequence 6 to 10.

6.5 MODEL – SURVEY DTM

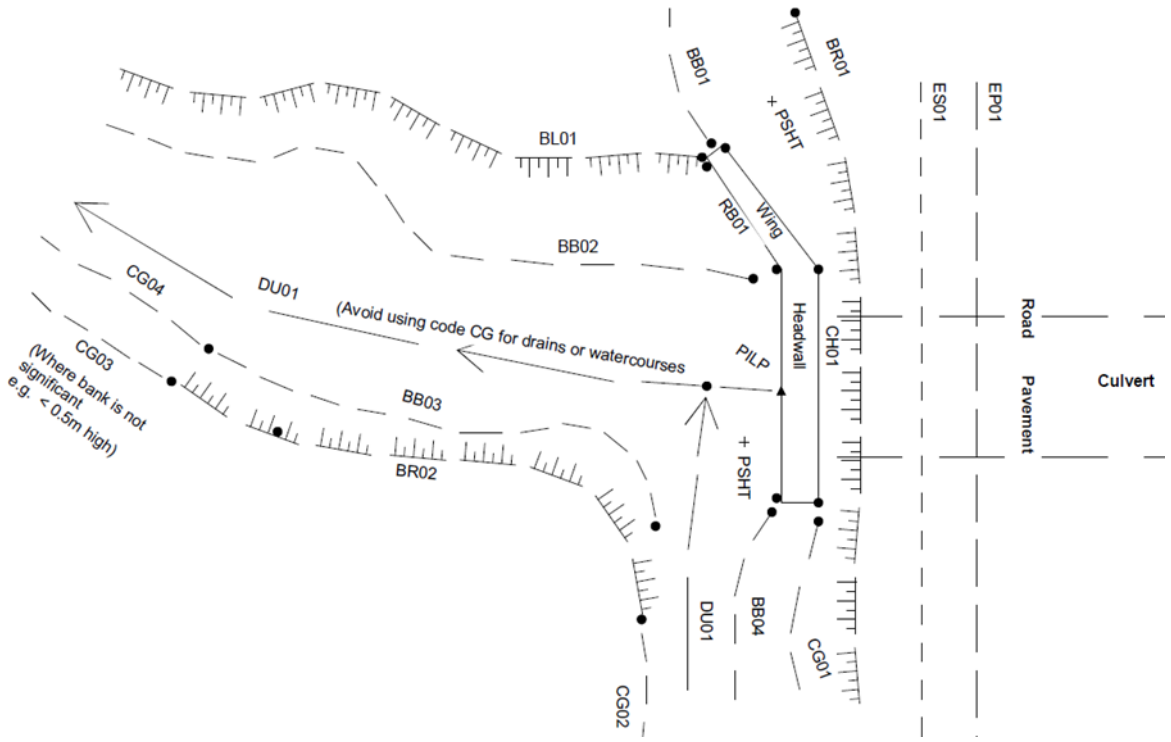
6.5.1 BL_ / BR_ – Bank top – Left or Right

BL_ / BR_	**Top of bank – Left/Right (directional strings)**
A top of bank left (BL_) string is located with the low ground to the left and the high ground to the right. Conversely a top of bank right (BR_) string is located with the low ground to the right and the high ground to the left.	
	
Commonly used with BB_ Bottom of bank CG_ Change of grade DD_ Drain down DU_ Drain up	These are directional strings. The linestyle is asymmetrical so that the slope ticks are on the low side of the line. Bank Left (BL01) is picked up in the sequence 1 to 5 Bank Right (BR01) is picked-up in the sequence 6 to 10 **Note:** This feature represents a 'crease' in the terrain surface and, as such, the primary function of the string is to define the terrain surface so it will be in the SURVEY DTM Model and not in the survey drainage model.

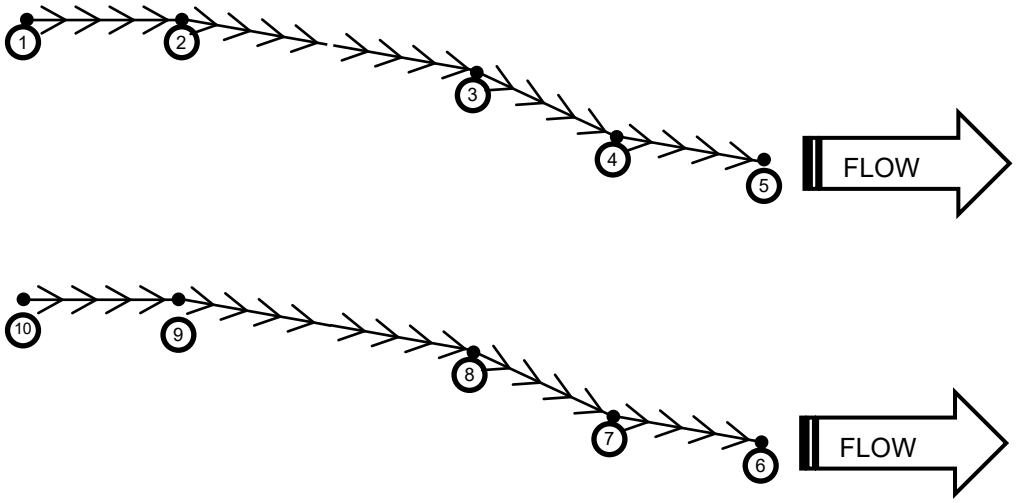
6.5.2 CH_ – Culvert Headwall

CH_	Culvert Headwall
The string (CH_) for the culvert headwall 1 to 4 can be located on the top front edge or the top back edge of the headwall with the comment of "FRONT FACE" or "BACK FACE" and include headwall width. This linestyle is symmetrical, so it can be run in either direction. In addition to the culvert headwall string, for multiple cell culverts, an elevation diagram may be required to provide detailed dimensions to facilitate design. The required dimensions are noted on this diagram. Vide 6.4.1 and 6.4.2 for requirements for locating CU_ strings and PILP points.	
	
Commonly used with BB_ Bottom of bank CU_ Culvert PILP Invert level	Culvert headwall (CH_) = 1 to 4 Bottom of bank (BB_) = 5 to 8 Invert level (PILP) = 9 to 14 Culvert (CU_) = one instance for each waterway (usually dual coded with the PILPs) **Note:** This feature represents a 'crease' in the terrain surface and, as such, the primary function of the CH string is to define the terrain surface so it will be in the SURVEY DTM model and not in the SURVEY STRUCTURE model.

6.5.3 Gully pickup at a Culvert

	Gully drain and bank location
Extra care is to be taken when modelling the inlet and outlet areas of a culvert. This terrain information can be critical in designing culvert extensions. The string and feature points (CU_ and PILP) used to locate a culvert are non-contourable. They cannot be used to define the terrain.	
	
Commonly used with PILP Invert level BB_ Bottom of bank CH_ Culvert headwall CG_ Change of grade DU_ Drain up BL_ Bank left BR_ Bank right RB Bottom of retaining wall	See Section 6.5.2 for location of the top of the headwall. The bottom of the culvert headwall can be defined using either BB_ or RB_. Do not use the CH_ code to define the bottom of the headwall. When locating banks and drains, the appropriate code must be selected depending on the current direction of string location. Use directional string codes BL_/BR_ and DD_/DU_ where appropriate to define these breaklines. Using the codes DD_/DU_ to define watercourses and drains assists road designers to analyse hydraulic data. The use of generic strings, such as CG_, for this purpose is not recommended.

6.5.4 DD_ / DU_ – Drain – Down or Up

DD_ / DU_	Drain – Down/Up (directional strings)
The string for Drain Down (DD_) is located in the sequence 1 to 5 in the direction of flow. The string for Drain Up (DU_) is located in the sequence 6 to 10 against the direction of flow.	
	
Commonly used with BL_ Bank left BR_ Bank right	These are directional strings. The linestyle is directional so that the flow arrows are in the direction of flow. If the pick-up is in the direction of flow use the drain down code else if the pick-up is against the flow, then use Drain up. No matter which code is used, the flow arrows should always point in the direction of flow. Drain Down (DD01) is picked-up in the sequence 1 to 5 Drain Up (DU01) is picked-up in the sequence 6 to 10 **Note:** This feature represents a 'crease' in the terrain surface and, as such, the primary function of the string is to define the terrain surface so it will be in the SURVEY DTM Model and not in the survey drainage model.

6.5.5 KB_ / KI_ / KL_ / KT_ – Kerb and Channel, V-drains and barrier kerbs

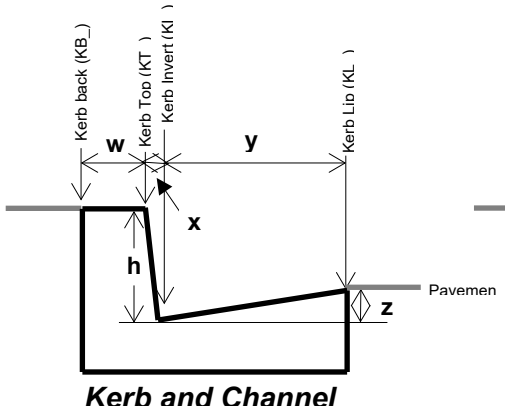
KB_	**Kerb - back**
KI_	**Kerb - channel invert**
KL_	**Kerb – channel lip**
KT_	**Kerb – top**

Kerb back (KB_), Kerb top (KT_), channel invert (KI_) and channel lip (KL_) may be located sequentially in either direction. The pick-up points in relation to the feature are set out in the accompanying diagrams. The Kerb or Drain Type from the Transport and Main Roads Standard Drawings must be referenced and the following dimensions confirmed.

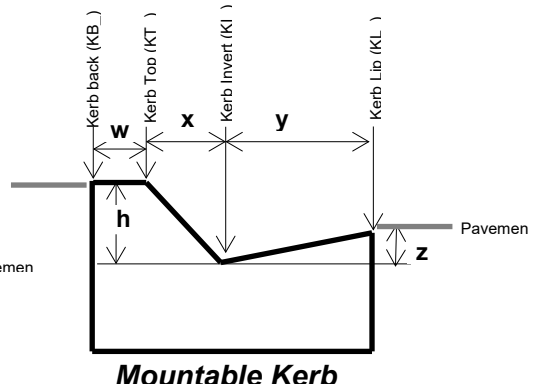
The dimensions w, x, y, z and h from the standard drawings must be confirmed else any differences shown in the Guide for Designers in the front of the Survey Book.

The standard strings for location of kerbs shall be kerb back (KB_) and kerb lip (KL_) except for V drain which shall be both kerb lip's (KL_) and the kerb invert (KI_). Other kerb strings may be located if required by the Survey Brief.

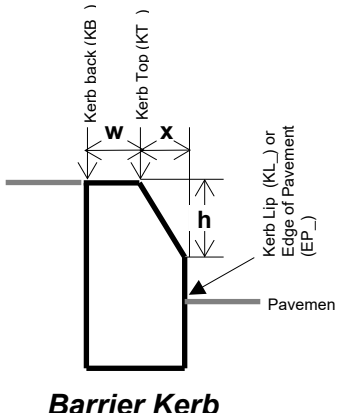
Edge of pavement (EP_) may be used in lieu of kerb lip (KL_) where the pavement is raised above or overlapping the kerb lip.



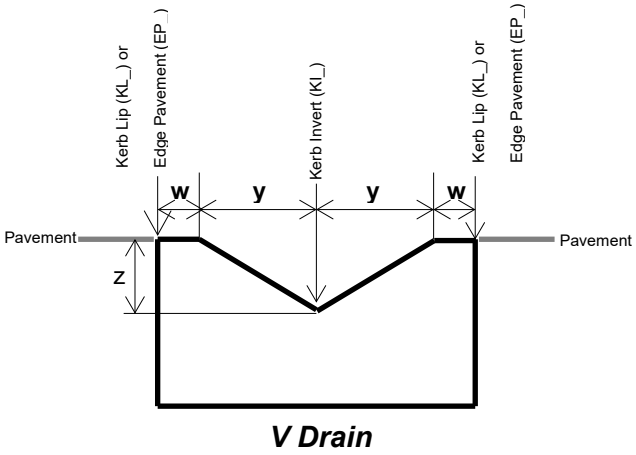
Kerb and Channel



Mountable Kerb



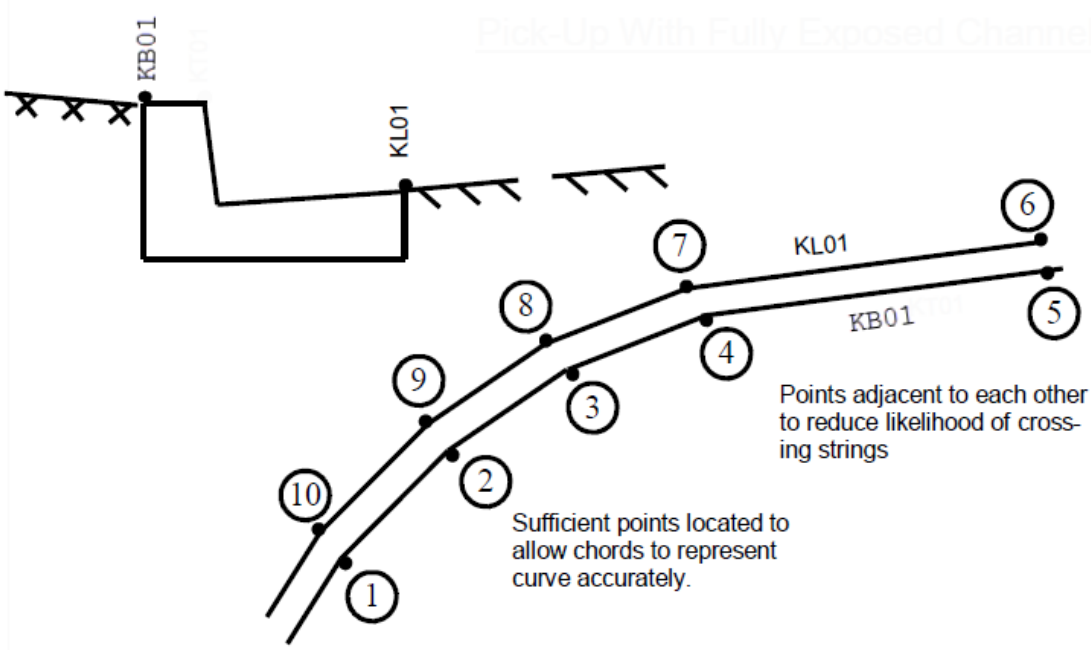
Barrier Kerb



V Drain

KB_	**Kerb - back**
KI_	**Kerb - channel invert**
KL_	**Kerb – channel lip**
KT_	**Kerb – top**

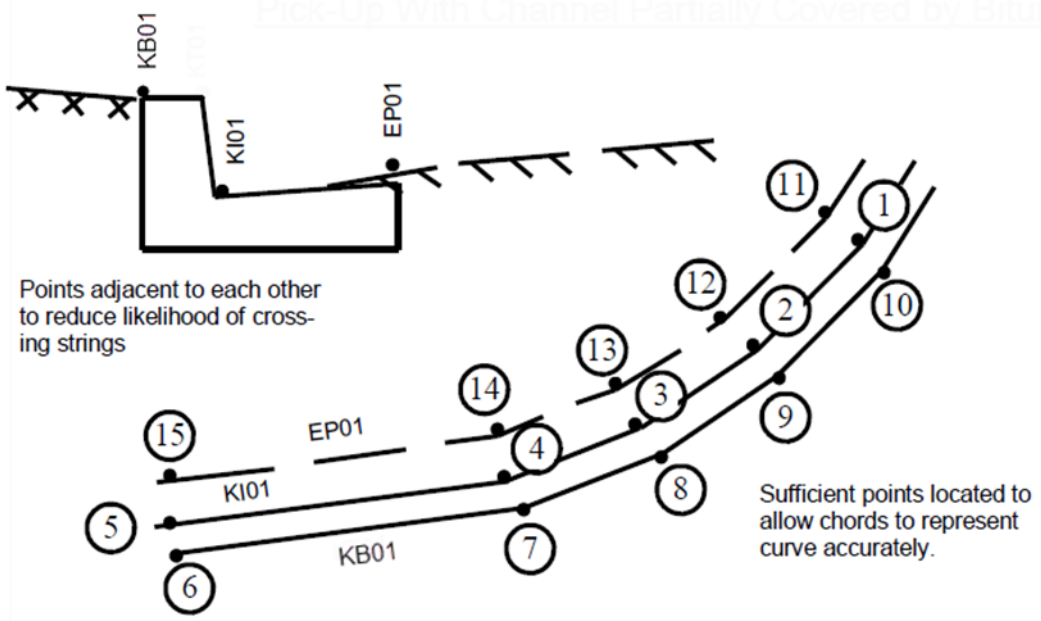
Pick-up with fully exposed channel



Commonly used with LO _ Chevron marking outline LU_ Linemarking – single unbroken	Locate pick-up points on each kerb string adjacent to each other to avoid crossing strings around curves. Locate sufficient points around curves to cause string chords to plot a fair representation of the curve. Edge of pavement (EP_) may be used in lieu of kerb lip (KL_) where the pavement is raised above or overlapping the kerb lip. Kerb – channel lip (KL01) = 6 to 10 Kerb Back (KB01) = 1 to 5

KB_	**Kerb - back**
KI_	**Kerb - channel invert**
KL_	**Kerb – channel lip**
KT_	**Kerb – top**

Pick-up with Channel Partially Covered by Bitumen
(Pick-up edge of pavement)



Commonly used with

LU_ Linemarking – single unbroken

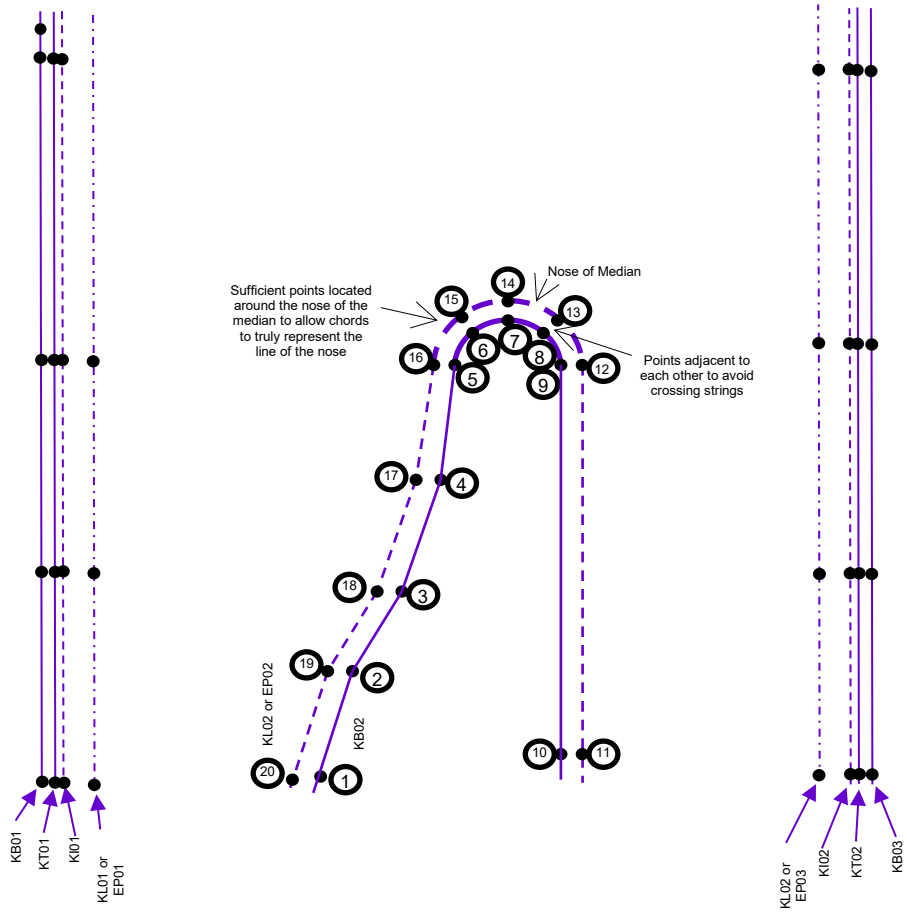
Where the pavement edge covers the kerb channel lip, an edge of pavement string (EP_) should be used in lieu of kerb lip. In this situation, consideration should be given to locating the kerb channel invert (KI_) to help show the hydraulic capacity of the kerb structure.

Locate pick-up points on each kerb string adjacent to each other to avoid crossing strings around curves.

Locate sufficient points around curves to cause string chords to plot a fair representation of the curve.

Kerb - back (KB01)	= 6 to 10
Edge of Pavement (EP01)	= 11 to 15
Kerb –channel invert (KI01) {optional}	= 1 to 5

KB_	**Kerb - back**
KI_	**Kerb - channel invert**
KL_	**Kerb – channel lip**
KT_	**Kerb – top**



Commonly used with

EP_ edge of pavement

ES_ road shoulder

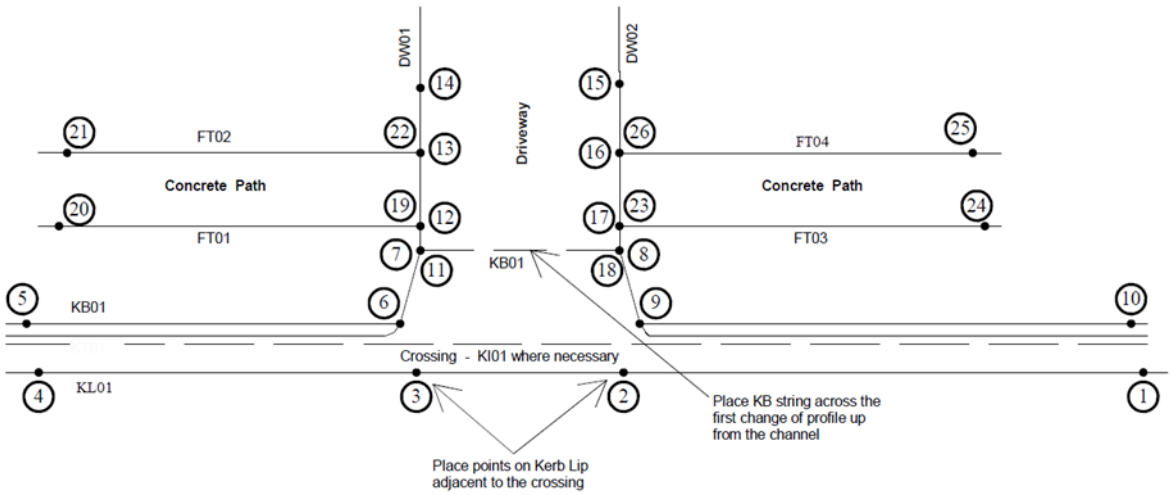
The usual practice when locating Kerb & Channel, Barrier and Mountable Kerbs is to pick-up the Kerb Lip (KL_) and Kerb Back (KB_) only. The usual pick-up points for Concrete V-Drains are the Kerb Lips (KL_) and the Kerb Invert (KI_).

A description of the standard feature type from the appropriate Standard Drawing type and its dimensions are required to be commented on a located point and in the 'Notes for Designers' section of the Survey Book.

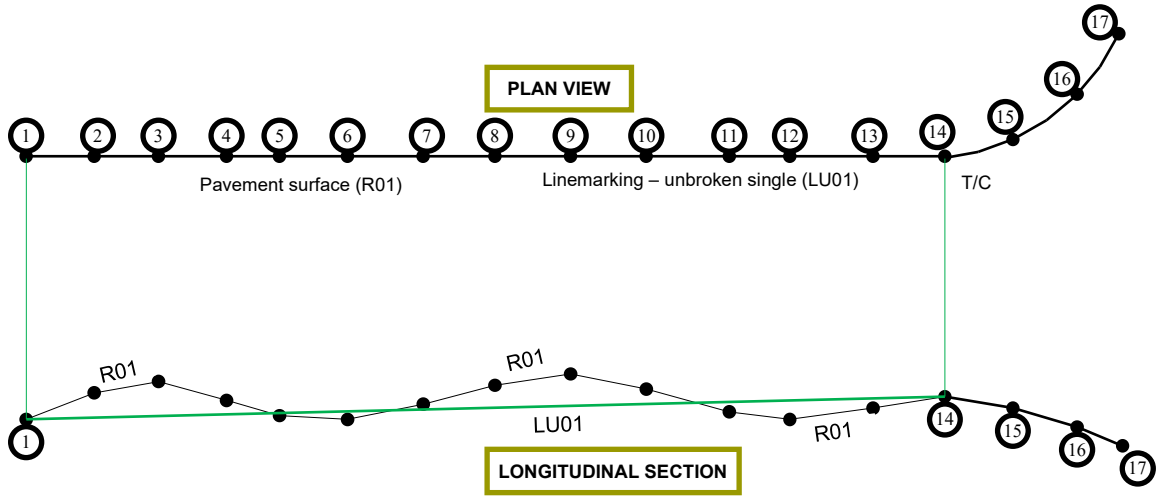
Edge of pavement (EP_) may be used in lieu of kerb lip (KL_) only where the pavement is raised above or overlapping the kerb lip.

Note: These features represents a 'crease' in the terrain surface and, as such, the primary function of the string is to define the terrain surface so they will be in the SURVEY DTM model and not in the SURVEY ROAD model.

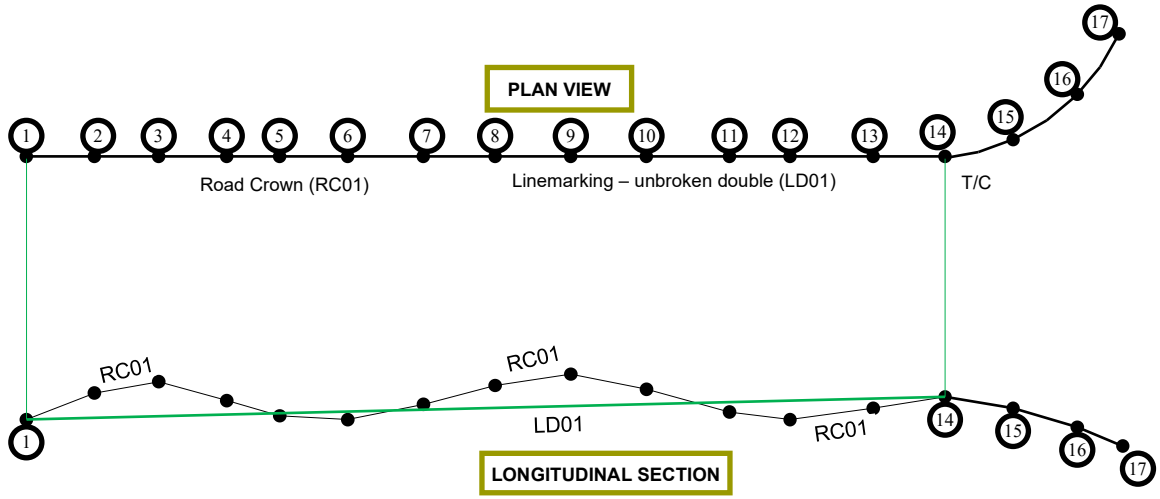
6.5.6 KB_ – Kerb crossing at Driveway

KB_	Kerb Crossing (contourable)	
Kerb strings should be run continuously through every driveway crossing. Do not stop them each side of a driveway crossing.		
		
Commonly used with DW_ Driveway FT_ Edge of footpath KB_ Kerb back KL_ Kerb Invert KI_ Kerb Invert KT_ Kerb Top	The footpath sequential string code (FT_) should be used to locate footpaths, not the driveway code (DW_) or the edge of concrete string (EC_). Use dual coding where possible to prevent crossing breaklines (e.g., points 16 and 26) Kerb lip (KL01) Kerb back (KB01) Kerb top Invert of kerb and channel adjacent to driveway (KI01) Driveway (DW01) Driveway (DW02) Footpath (FT01) Footpath (FT02) Footpath (FT03) Footpath (FT04)	 = 1 to 4 = 5 to 10 = if necessary = recommended = 11 to 14 = 15 to 18 = 19 to 20 = 21 to 22 = 23 to 24 = 25 to 26

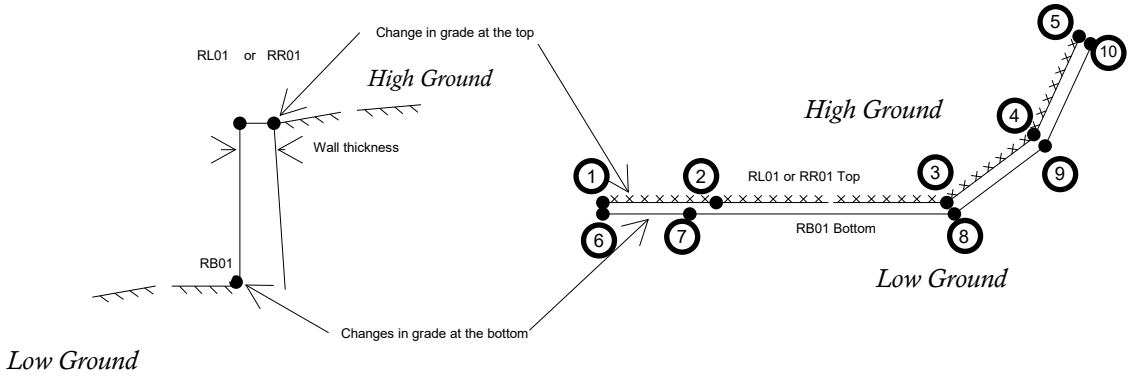
6.5.7 R__ - Pavement surface

R__	Pavement surface
The pavement surface string (R_) is a breakline used to define the road pavement surface. The R__ string is to be used in two different ways: • To define any grade change on the pavement surface that was not designed to be there (subsidence, wheel rutting etc), • Automatic extraction of parallel longitudinal breaklines along a road (typically from MLS). Please see *Section 6.5.9 Carriageway* examples for diagrams of feature coding including R_ strings for common carriageways. *Note: CG_ is not to be used on the road pavement surface* *Note: RC_ is only to be used to locate the designed road crown*	
	
Commonly used with L6_/ L3_, LD_, LL_, LR_,LU_, LO_,LT_, LA_	If the breakline R_ string follows the painted line exactly, it may be duplicated as the linemarking string. To do the reverse, i.e., to duplicate a linemarking string as a R_ breakline string, sufficient points will need to be located along the linemarking string to correctly profile all changes in grade along the breakline.

6.5.8 RC_ – Road crown (occurring with linemarking)

RC_	Road crown
The Road crown string (RC_) is only to be used to define the designed crown of the road. All other grade changes or breaklines on the pavement surface are to use the pavement surface (R_) string. Linemarking may run along this breakline as well. All sequential strings defining linemarking are non-contourable and will not be included in the SURVEY DTM model/layer. A linemarking string only defines the plan position (X,Y) of a painted line. Sufficient points along the painted line need be picked up to locate its plan position, both in plan view and longitudinal view.	
	
Commonly used with L6_/ L3_, LD_, LL_, LR_,LU_, LO_,LT_, LA_	If the painted line follows the RC_ breakline string exactly, the RC_ may be duplicated as the linemarking string. To do the reverse, i.e., to duplicate a linemarking string as a RC_ breakline string, sufficient points will need to be located along the linemarking string to correctly profile all changes in grade along the breakline.

6.5.9 RB_ / RL_ / RR_ – Retaining wall – Bottom/Left or Right of retaining wall

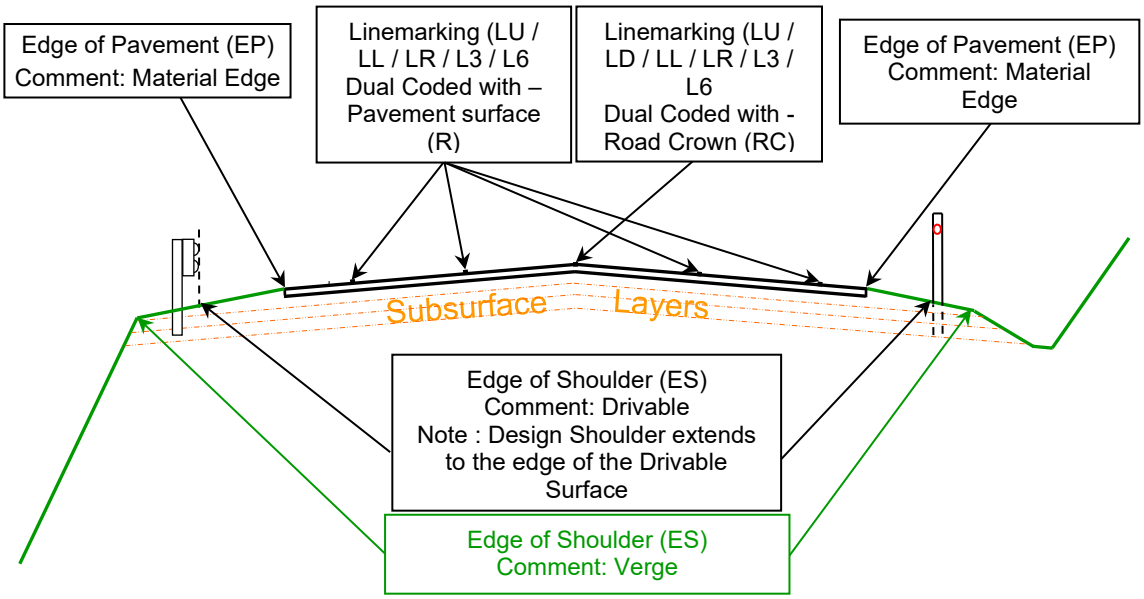
RB_	**Bottom of retaining wall**
RL_/RR_	**Top of retaining wall – Left/Right (directional strings)**
The bottom of the retaining wall (RB_) can be run in either direction as it is a symmetrical line style. The top of retaining wall left (RL_) is located in the sequence 1 to 5 at the BACK of the wall or in the sequence 6 to 10 at the front of the wall. In both cases, with the high ground to the left and the low ground to the right. Using retaining wall right (RR_) requires the sequence to be 5 to 1 at the BACK of the wall or in the sequence 10 to 6 at the front of the wall. In both cases, with the high ground to the right and the low ground to the left. The top of the retaining wall must be commented 'front' or 'back' and the width.	
	
Commonly used with	These top of retaining wall strings are directional. The linestyle is asymmetrical so that the x's are on the high side (retained material) of the string. The RR_ and RL_ strings may be run along the front (Vertical face) side or the back (Retained material) side of the wall. Comment 'back' or 'front'. To avoid crossing strings with the Retaining Wall Bottom (RB_) string, run the top string along the back of the wall, include comment of 'back and width'.

6.5.10 Carriageway examples

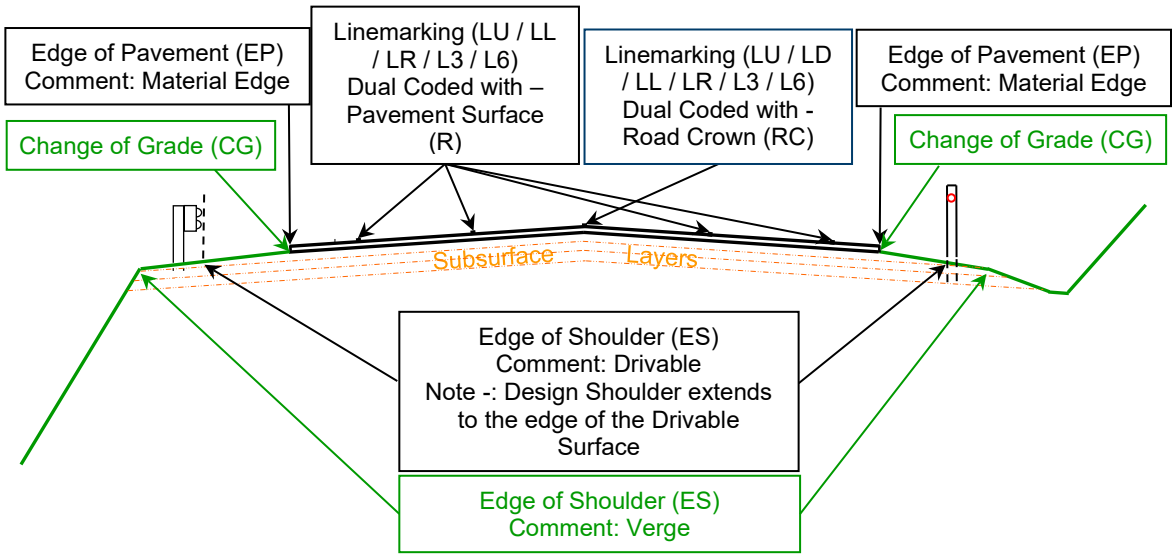
Single carriageways

From a design point of view, a carriageway consists of the formation which carries the road traffic. If there is no physical separation between opposing traffic flows, then it is considered a single carriageway.

1 – Pavement area : Single Carriageway, one or more lanes each direction



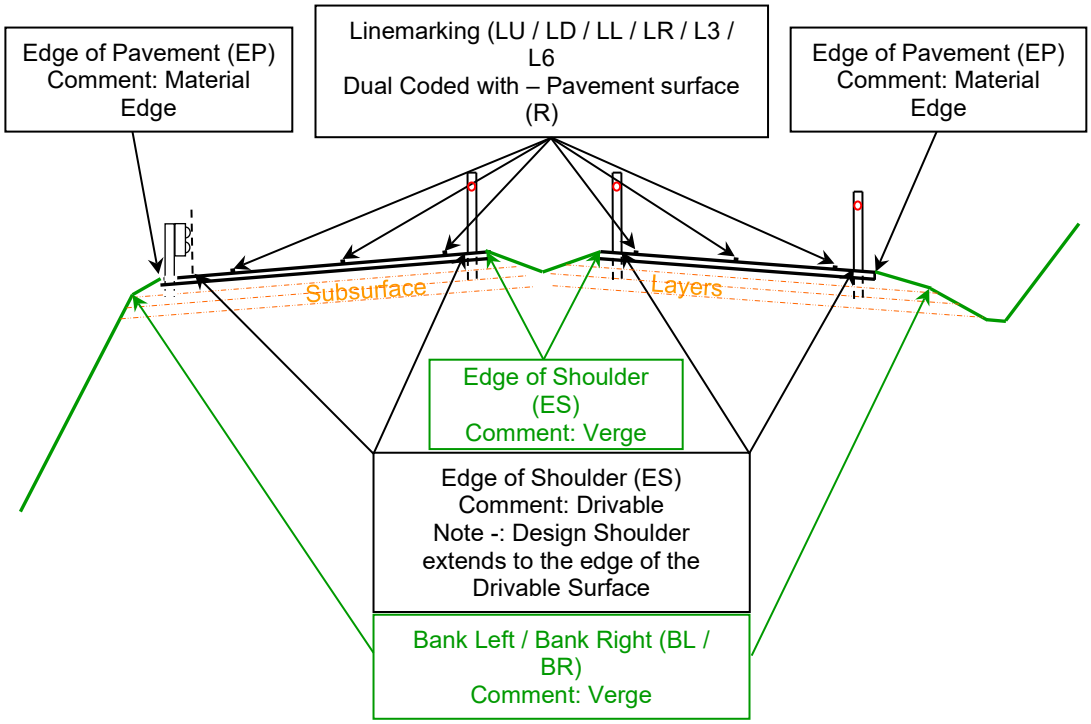
2 – Pavement area -: Single Carriageway, (pavement proud) one or more lanes each direction



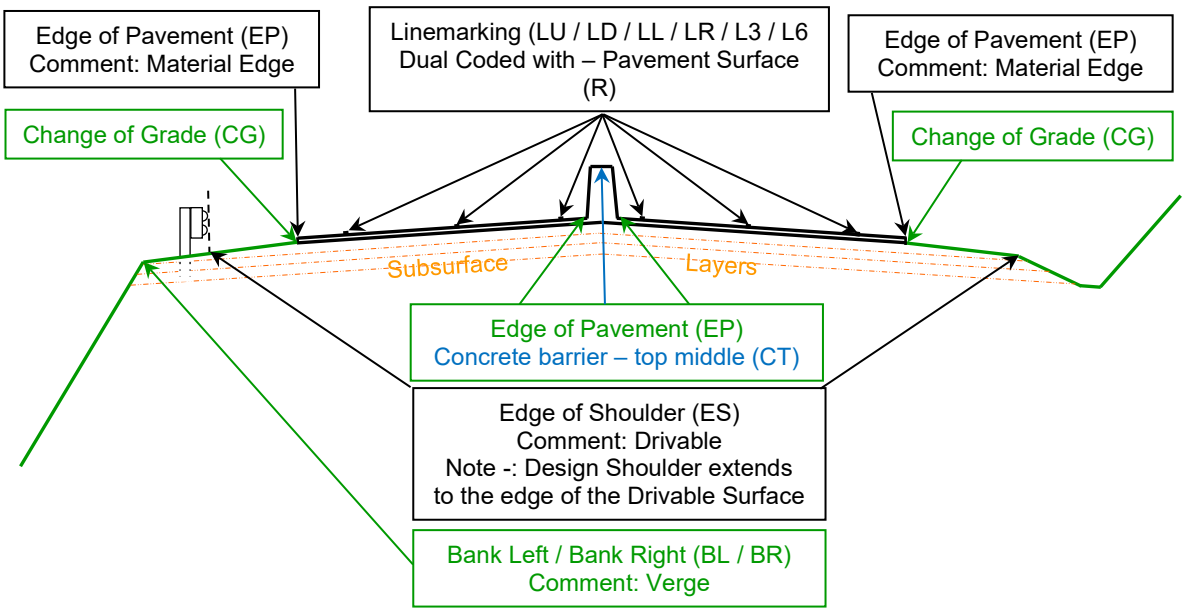
Dual carriageway diagrams

If there is a physical separation between opposing traffic flows, then it is considered a dual carriageway.

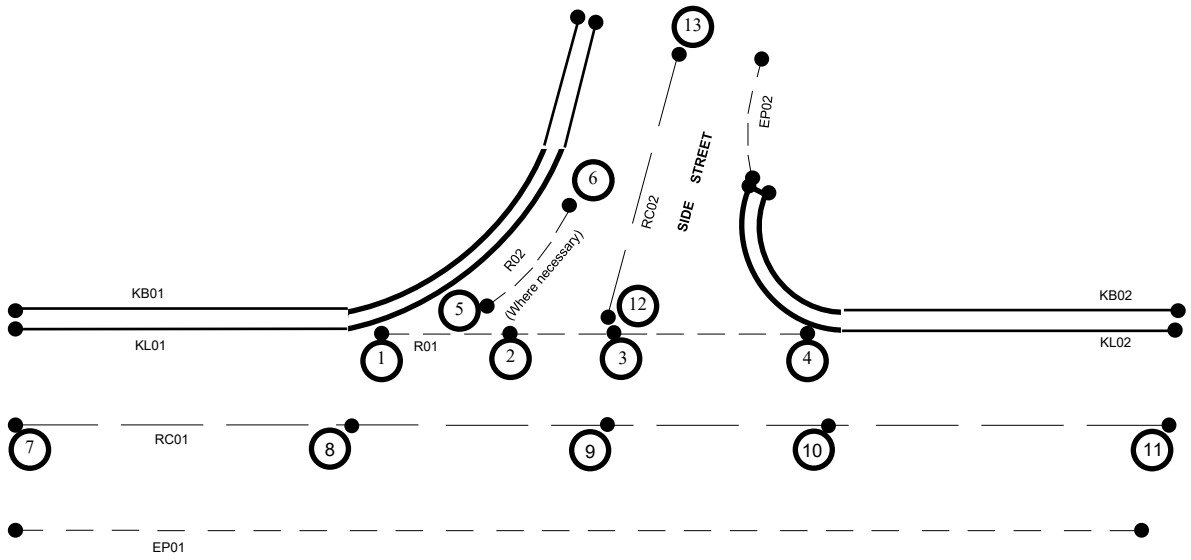
1- Pavement area -: Dual Carriageway ("VEE" drain Median), one or more lanes each direction



2- Pavement area -: Dual Carriageway (Concrete Barrier), Pavement proud one or more lanes each direction



6.5.11 Side street definition

	Side street (contourable)
To define side streets, always run a pavement surface (R_) string across the road junction (R01) below), even if no change of grade is present. This will help create a better triangulation by preventing long, potentially erroneous, triangles.	
	
Commonly used with R_ Pavement surface EP_ Edge of pavement ES_ Edge of shoulder KB_ Kerb back KL_ Kerb lip KT_ Kerb top RC_ Road crown	Any road crown string from the side street (RC02) should stop at this pavement surface string (R01) and not be joined to the road crown (RC01) of the main road pavement. Pavement surface (R_) = 1 to 4 Pavement surface (R_) = 5 to 6 Road crown – designed (RC_) = 7 to 11 Road crown – designed (RC_) = 12 to 13

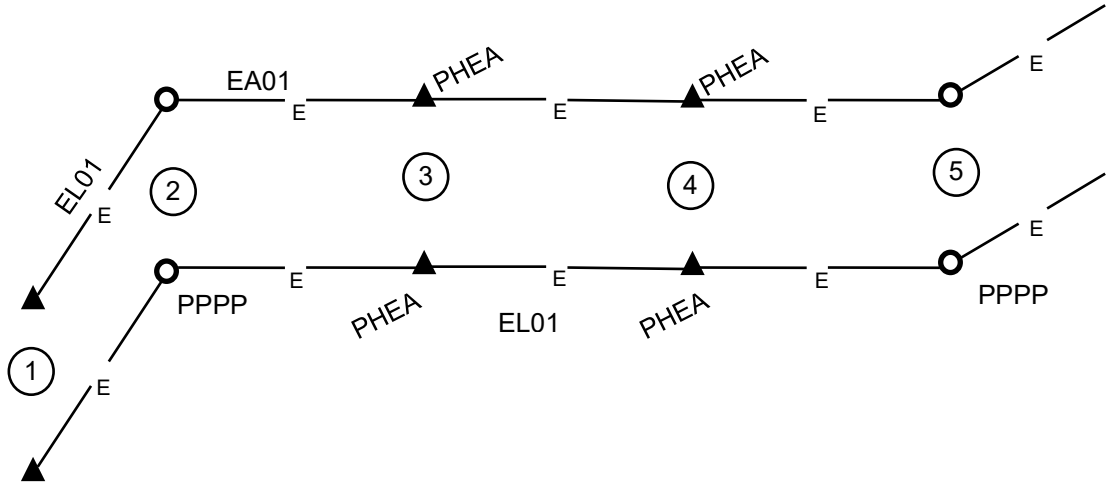
6.6 MODEL – SURVEY ELECTRICITY

6.6.1 EA_ / EL_ / PHEA – Electricity wires above ground - Wires only- wire height

EA_	**Electricity Wires aboveground – with posts**
EL_	**Electricity Wires aboveground – Wires only**
PHEA	**Utility height - electricity**

There are two feature types for Electricity Wires aboveground. They are EA_ and EL_. The EA_ code draws the wires with a pole symbol at each pick-up point. The EL_ code draws the wires only; therefore, if a pole exists at the point of pick-up, it must be coded with the PPPP point feature.

The crucial aspect of the pole (EA or PPPP) is clearance to the driving lanes.



Commonly used with

PPPP	isolated pole
PSLP	Street light on pole
SB_	Stay bollard
ST_	Stay wire

In the first (top) scenario above, Point 1 is located at the extremity of the survey area. It would be captured at ground level directly under the middle of the wires and coded EL01 as there is no pole. Point 2 would be captured at ground level (adjusted for offset to the centre of the pole) and dual coded EL01 and EA01. If the height of wires above the pavement is required (points 3 and 4), PHEA points are picked up on the lowest wire with appropriate comments annotated. Point 5 would then be located at ground level (adjusted for offset to the centre of the pole) and coded EA01.

The default location position of EL power lines is the height of the lowest wire at the pole, as well as the clearance of the lowest wire above the carriageway. The poles are a separated feature. The crucial aspect of the pole is clearance to the driving lanes. The pick-up location for poles is at the base of the pole (adjusted for offset to the centre of the pole).

In the second (bottom) scenario above, Point 1 is located at the extremity of the survey area. If at this point there are only wires, the code would be EL01 taken at the lowest wire.

At the first bend (Point 2), the pole is located as a separate PPPP point taken at the base of the pole and adjusted for offset to the centre of the pole. The EL01 code is taken at the lowest wire as a separate point or dual coded with the PPPP and the height of the lowest wire commented along with the height of the pole if required.

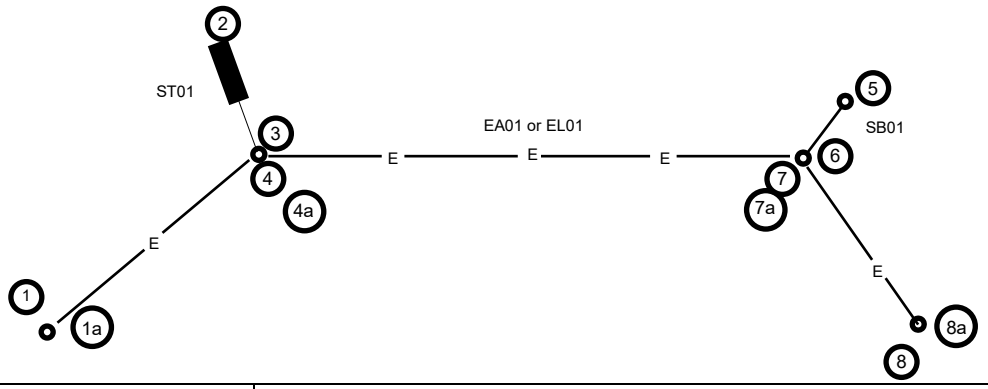
Points 3 and 4 are picked-up to supply clearances to the ground for the wires. They are coded as PHEA (may be dual coded to EL01) and are picked-up at the height of the lowest wire.

Point 5 is located similarly to Point 2.

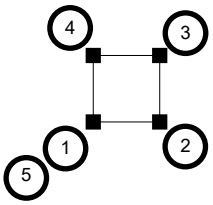
6.6.2 OE_ - Manhole chamber outline – electricity

To locate an OE_ feature string, apply the principles and requirements presented in *Section 6.4.8 OD_ Manhole chamber outline – stormwater*.

6.6.3 SB_ / ST_ – Stay Bollard/Stay Wire

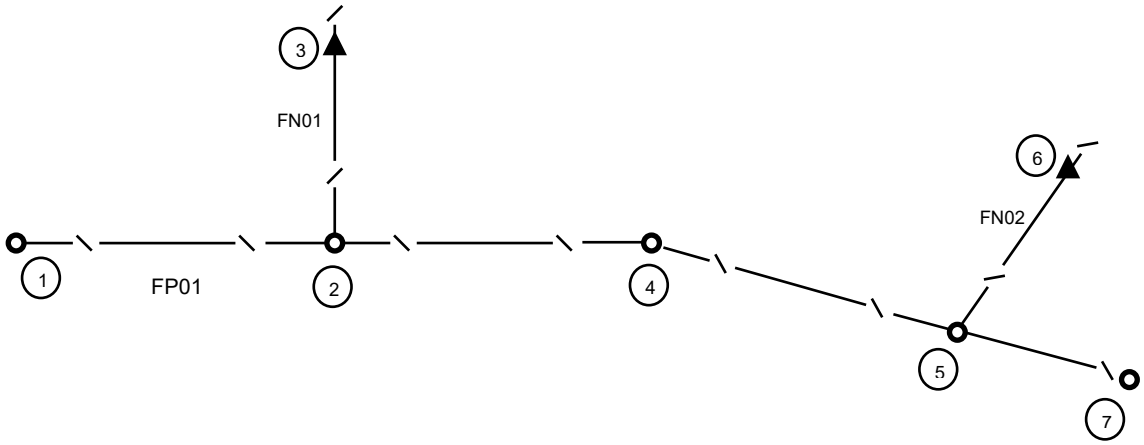
SB_/ST_	Stay Bollard/Stay Wire (two point directional strings only)
These are two-point directional strings. The Stay Bollard string must be run from the bollard pole to the pole. This will produce the correct linestyle for the stay bollard. The Stay Wire string must be run from the anchor point of the stay wire to the pole. This will produce the correct linestyle for the stay wire.	
	
Commonly used with PPPP isolated pole EL_ Electricity Aboveground (Wires only) EA_ Electricity Aboveground (poles located) PHEA Utility height - Electricity	A typical sequence for the above situation would be to firstly locate point 1 as EA01. Since the EA code creates a pole and wires, all EA points are located at ground level in the centre of the post. At the first bend, locate the anchor end of the staywire on the ground at point 2 and code as ST01. Moving to point 4, dual code it as ST01 and EA01. If the power line crosses the road and clearances are needed, then locate a utility height - electricity (PHEA) at the lowest clearance. The next bend has a stay bollard. The sequence will be to locate the base of the bollard pole as SB01 at point 5 and continuing to the pole, locate the stay wire and pole as point 7 on the ground by dual coding ST01 and EA01. The sequence would finish by coding EA01 at the centre of the pole on the ground at point 8. The Survey Brief may require the power to be located at the power line height. The same sequence as described above would be followed; however, the coding would change. A PPPP support pole would be located at ground level at point 1. At point 1a, code EL01 where the lowest wire meets the support pole. At the first bend, locate the anchor end of the stay wire as ST01 at point 2 on the ground. Continue to the pole and code point 3 as ST01 located at the attachment position of the stay wire to the pole. Code the base of the pole at point 4 as PPPP then pick-up the power line at the height of the lowest power wire as EL01 at point 4a. If the power line crosses the road and clearances are needed, then a utility height electricity (PHEA) point (may be dual coded as EL01) at the lowest clearance is required. At the next bend locate the base of the bollard pole as SB01 at point 5 and continuing to the pole, locate the stay wire attachment as SB01 at point 6 and code the base of the pole as PPPP at point 7, then code the lowest wire as EL01 at point 7a. The location of the wire at the edge of the survey area at point 8 is treated similarly to point 1.

6.6.4 TE_ – Tower – electricity pylon

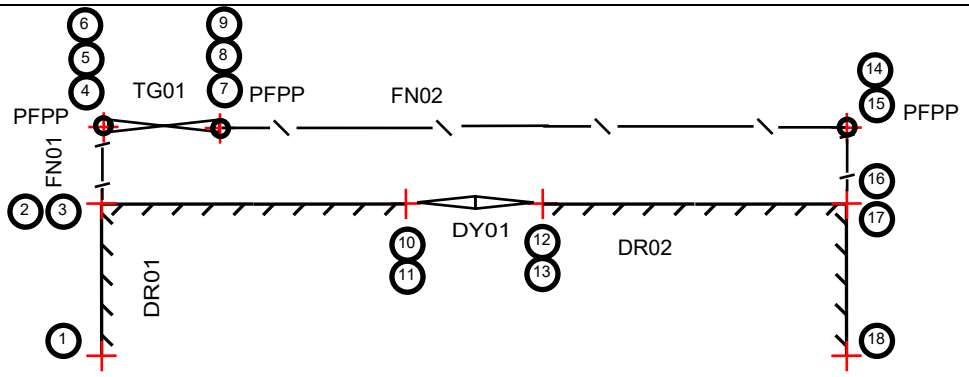
TE_	Tower - electricity (pylon)
The string for Electricity tower (TE_) is located by picking-up at ground level the four corners of the tower sequentially in either direction.	
	
Commonly used with EL_ Electricity Aboveground – wires only PHEA Utility height – electricity	The example shows the pick-up in an anti-clockwise direction in the sequence 1 to 4 and closed back to 1. The string can be closed during office processing or a control code can be used at the time of pick-up. Alternately, the first point can be re-located as Point 5 to close the string.

6.7 MODEL – SURVEY FENCES

6.7.1 FC_ / FN_ / FW_ – Fence line (no posts) FP_ – Fence line (posts located)

FC_ / FN_ / FW_	**Fence line (No posts located)**
FP_	**Fence line (posts located**
Side fences can be located using either the sequential string code FN_ where only the fence line is located or the code FP_ where actual posts are located. All fence posts are to be located at ground level, centre of the post (unless stated otherwise in the Survey Brief).	
	
Commonly used with FP _ Fence line (posts located) FN_ Fence line no posts PFPP Isolated post	Side fences can be observed by either: • Directly during data pick-up by first duplicating the side fence branch point from the main fence as the first point of the side fence string. A second point along the side fence is then picked up to complete the side fence string. • Taking a compass bearing (corrected for job datum) and estimated distance along the fence line, this side fence may be interactively added during job edit procedures. This option is useful where property access is restricted or for extending a fence line outside the DTM area. When stringing a fence line where fence posts are being picked up, use sequential string code FP_ to code the string. Suggested sequence for the example would be to locate Point 1 as FP01 at ground level centre of post. Move to Point 2 and dual code the fencepost as FP01 and FN01. Pick-up the side fence at Point 3 as FN01 at ground level. Locate Point 4 as FP01, and then pick-up Point 5 dual coded as FP01 and FN02. Locate Point 6 as FN02 and finish by picking up Point 7 as FP01.

6.7.2 TG_ – Gate (stretched)

TG_	Gate (stretched) {two point string only}
TG_ strings are two point stretched line symbols for gates. All gates are to be located at ground level, centre of the support post (unless stated otherwise in the Survey Brief).	
	
Commonly used with DR_/DL_ Dwelling (right or left) FP_ Fence line with posts drawn FC_ Fence - Chainwire PFPP Isolated post FN_ Fence line – line only	A suggested sequence for coding the strings to allow the correct joining of the respective strings is as follows: Point 1 is the start of the dwelling right DR01 string. At the corner of the dwelling, point 2 is coded as DR01 to continue the dwelling string and it is also dual-coded with FN01 as point 3 to start the fence string. Continue along the fence to point 4 with the FN01 code and triple code with fence post PFPP as point 5 and the gate string TG01 as point 6. Next, the other side of the gate is located as TG01 at point 7, which is triple coded with the fence post PFPP as point 8 and the next fence string FN02 as point 9. Now the dwelling string DR01 is continued at point 10 and dual-coded with the doorway code DY01 at point 11. The doorway is continued as DY01 at point 12, which is dual-coded with the next string occurrence of dwelling right, DR02 at point 13. Now the fence string FN02 is continued at point 14, which is dual-coded as fence post PFPP as point 15. FN2 fence string is continued at Point 16, which is dual-coded to continue string DR02 as point 17. Finally, the end of the dwelling string DR02 is located at point 18. The sequence is located in this way so that the related string occurrences are in the correct order in the file to be joined correctly.

6.8 MODEL – SURVEY FUEL

6.8.1 OL_ - Manhole chamber outline – fuel

To locate an OL_ feature string, apply the principles and requirements presented in *Section 6.4.8 OD_ Manhole chamber outline – stormwater*.

6.9 MODEL – SURVEY GAS

6.9.1 OG_ - Manhole chamber outline – gas

To locate an OG_ feature string, apply the principles and requirements presented in *Section 6.4.8 OD_ Manhole chamber outline – stormwater.*

6.10 MODEL – SURVEY GENERAL

6.10.1 BI_ / PCHP - Boundary of interest site – Cultural heritage point

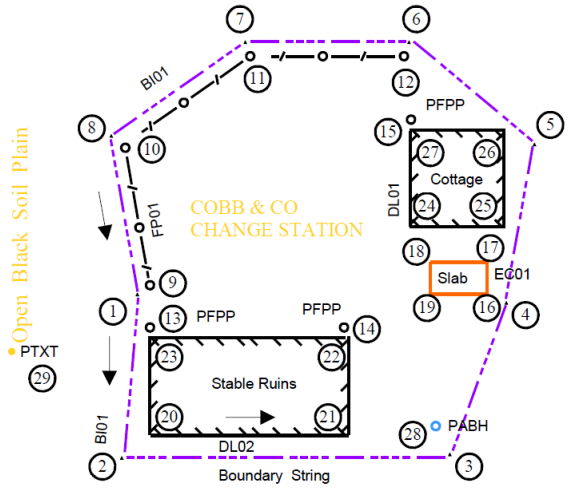
BI_	**Boundary of Interest**
PCHP	**Cultural heritage point**
PTXT (SURVEY COMMENTS)	**Point for locating text**

A sequential boundary string (BI_) may be run to define the edge of a site of interest, such as a cultural heritage site. This boundary may be created either during data pick-up for a specific site (e.g., an aboriginal midden) or during editing to include a number of features in a site (e.g., a number of structures and other features in an old Cobb & Co change station). The string (BI_) is included in the SURVEY GENERAL model, irrespective of the fact that features enclosed may be assigned to other models.

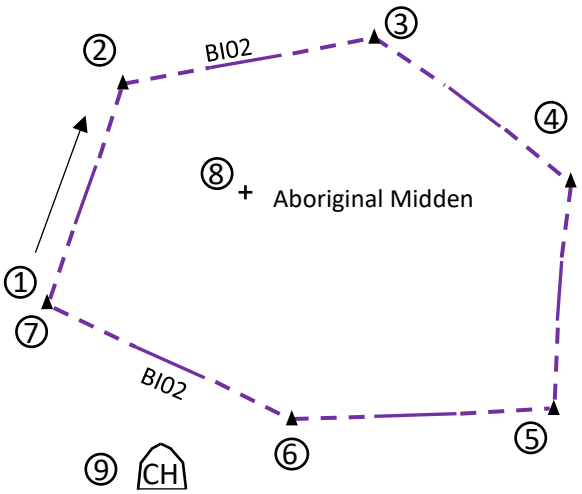
BI_ strings may be used by Photogrammetrist's to enclose an area where doubt exists if sufficient information has been obtained to give a true representation of the terrain.

The feature point Cultural heritage point (PCHP) is used to locate a point of cultural heritage value.

Boundary created during job edit



Boundary Created during data pick-up



Commonly used with

FP_	Fence line – posts located
EU_	Edge of concrete
DL_	Dwelling left
EC_	Edge of concrete
PCHP	Cultural heritage point

Add a continuous boundary string (BI_) by creating points to enclose the features to be included for the site. In the above example, the Boundary of Interest string 1 to 7 has been created to enclose a number of features.

The PTXT point (8) provides a co-ordinate location for field comments that do not relate to a feature string, e.g., soil types, street names and resides in SURVEY COMMENTS model.

Boundary of interest (BI02)	= 1 to 7
Artesian bore (PABH_)	= 28
Edge of concrete (EC01)	= 16 to 19
Point located to attach text (PTXT)	= 8 & 29
Cultural heritage point (PCHP)	= 9

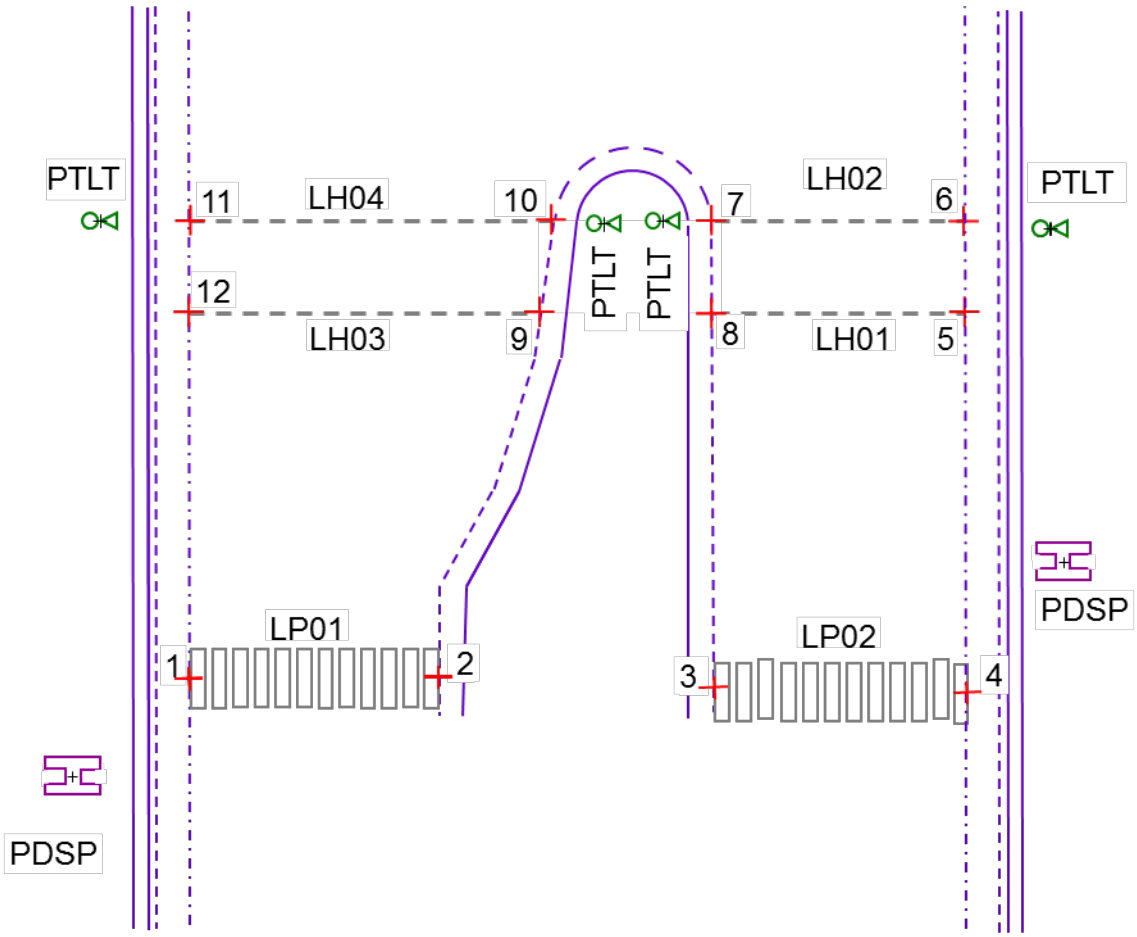
6.11 MODEL – SURVEY LINEMARKING

6.11.1 LH_ / LP_ – Holding line / Pedestrian crossing (zebra crossing only)

LH_	**Holding line (signalised pedestrian crossing)**
LP_	**Pedestrian crossing (Zebra crossing) {two point string only}**

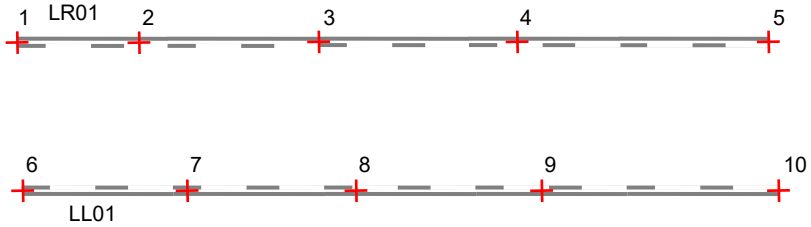
For signalised pedestrian crossings the white lines demarking the crossing must be strung as a holding line (LH_).

A pedestrian crossing (Zebra crossing) is a two point string. The pick-up points are the longitudinal centreline. This is a stretched linestyle.

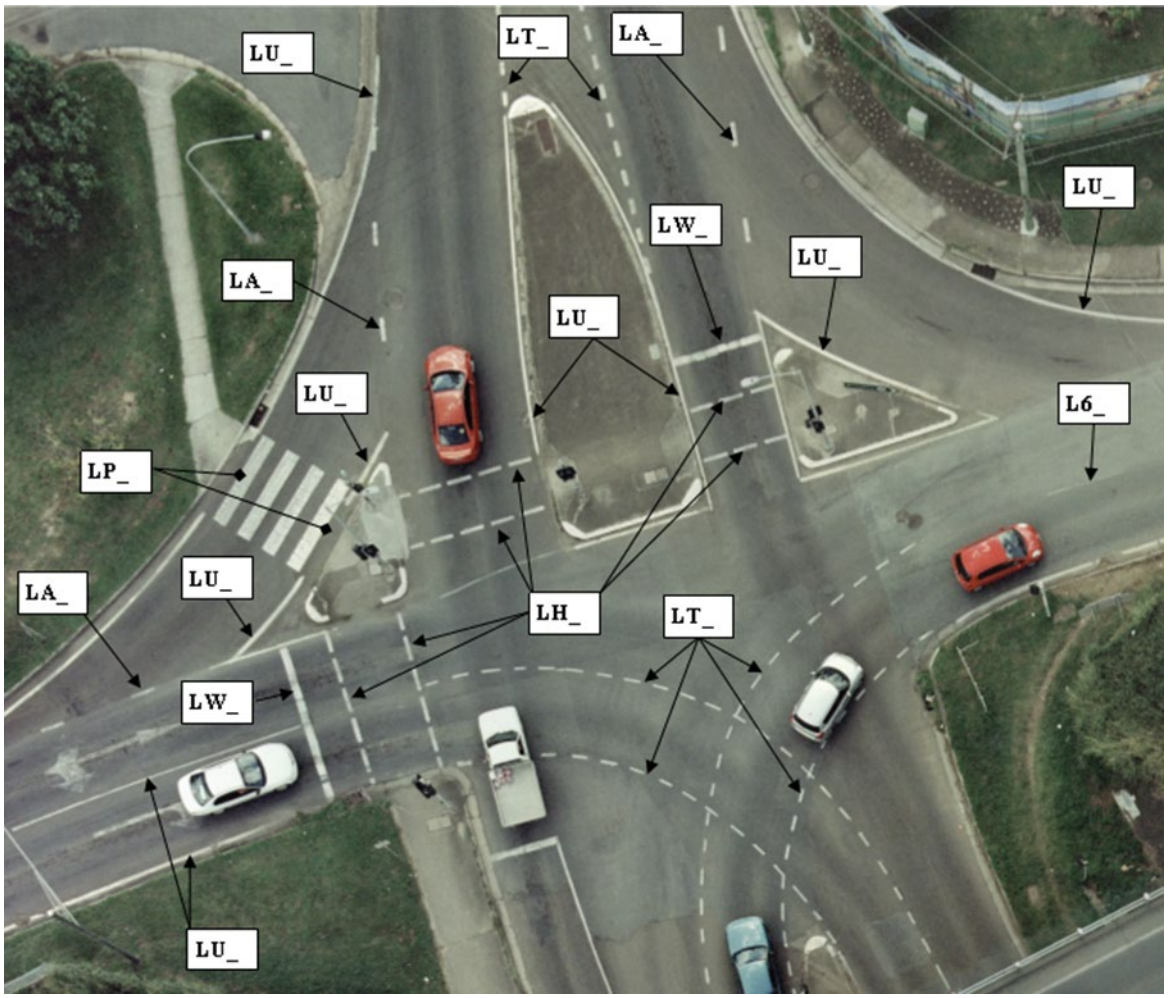


Commonly used with KL_, KI_, KB_, EP_, PTLT, PDSP and PTSP	In the diagram above, LP01 is located in the order 1 to 2 and the next string, LP02, in the order 3 to 4. Point 5 is located as LH01, then point 6 is located as LH02, proceeding to point 7 as LH02, then point 8 as LH01. This is one suggested order of pick-up, so that crossing the road is reduced to a minimum.

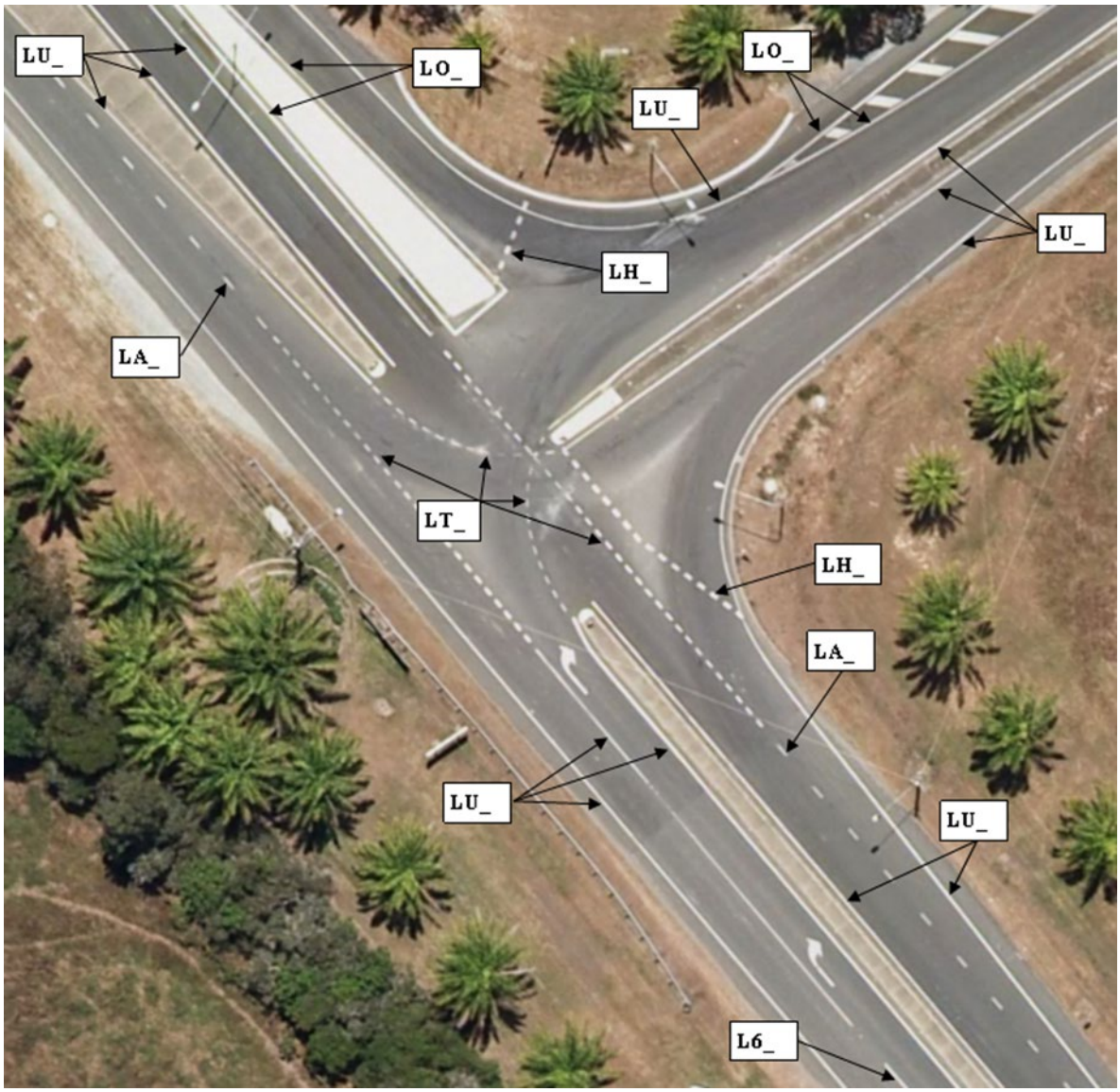
6.11.2 LL_ / LR_ – Double linemarking – Broken on Left/Broken on Right

LL_ / LR_	Linemarking – Broken on Left/Broken on Right (directional strings)
The centre of a double line which is broken on one side to allow overtaking. The location position is the centre of the double line. A double line which is broken on the Right is located in the sequence 1 to 5. A double line which is broken on the Left is located in the sequence 6 to 10.	
	
Commonly used with LD_ Linemarking – Double Unbroken LU_ Linemarking – Single Unbroken L3_ Linemarking – Single Broken (9x3) L6_ Linemarking – Single Broken (6x6)	These are directional strings. The linestyle is asymmetrical so that the broken line is on the Left of the direction of pick-up for a Linemarking – broken on Left (LL_) string and on the Right of the direction of pick-up for a Linemarking – broken on Right (LR_) string.

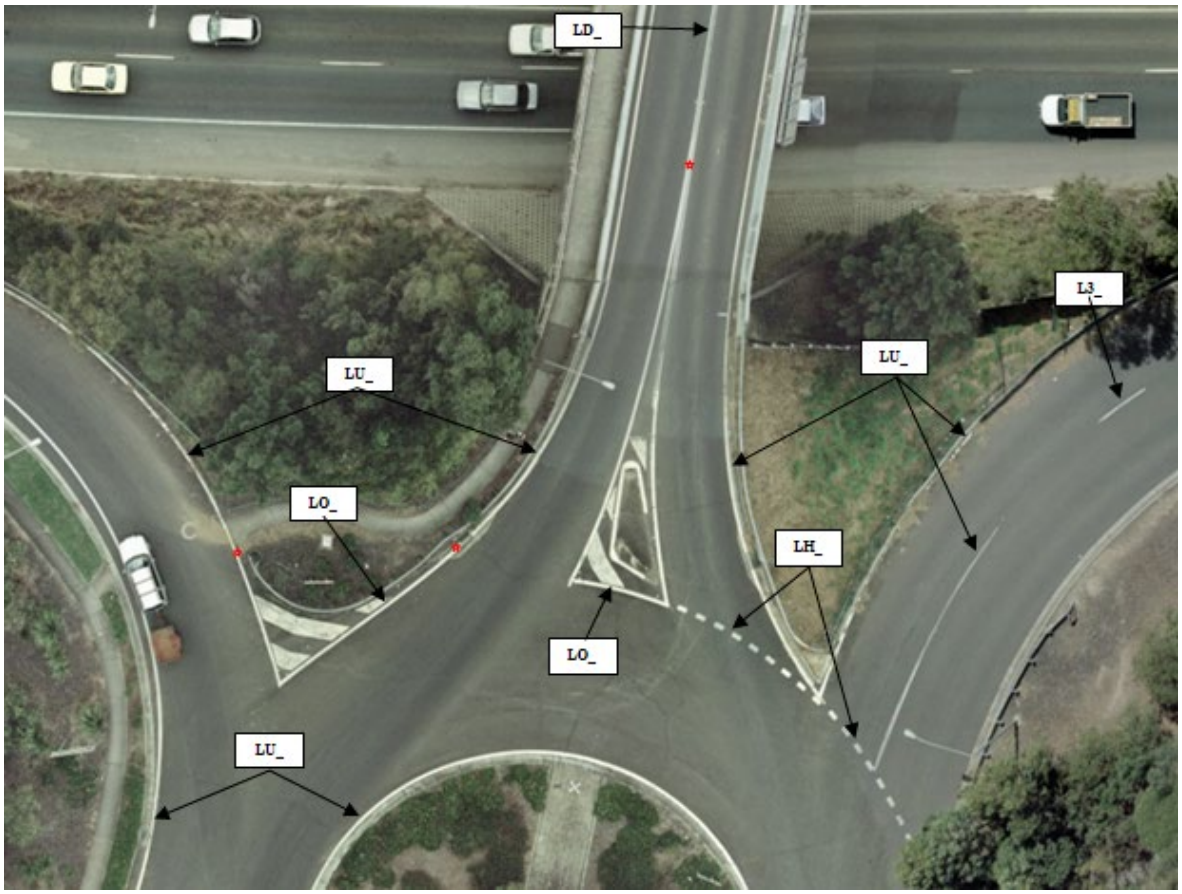
6.11.3 Linemarking examples (1)



6.11.4 Linemarking examples (2)



6.11.5 Linemarking examples (3)



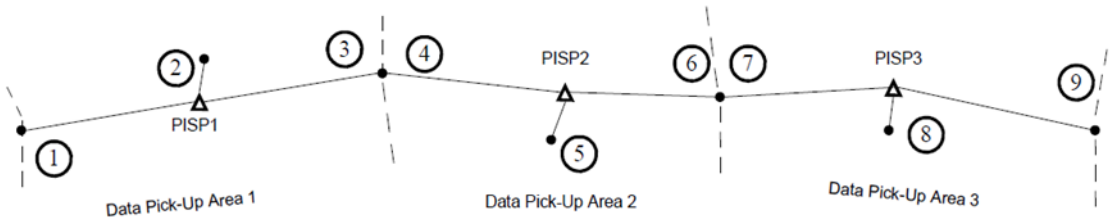
6.12 MODEL – SURVEY OIL

6.12.1 OO_ - Manhole chamber outline – oil

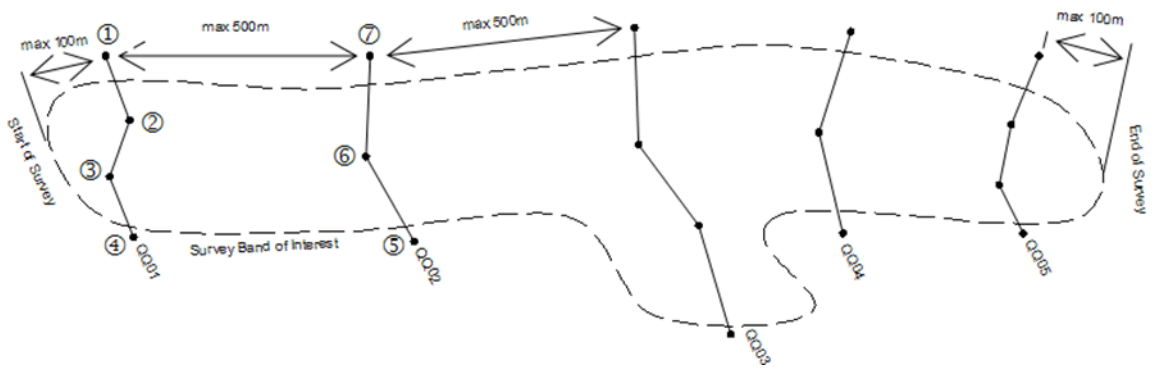
To locate an OO_ feature string, apply the principles and requirements presented in *Section 6.4.8 OD_ Manhole chamber outline – stormwater*.

6.13 MODEL – SURVEY QUALITY

6.13.1 PQAP – Quality assurance checkpoint

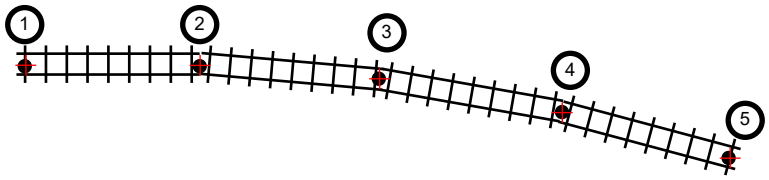
PQAP	**Quality assurance check point**
Quality assurance check points (PQAP) are points selected by the surveyor from each instrument station used for data pick-up. Each PQAP must be located again from another instrument station (except for the first and last occurrence – points 1 and 9 below) and levelled by the same independent level runs used to establish the heights of the instrument stations. Quality assurance check points form part of the quality check of the survey data, both for the surveyor completing the job and the user of the survey data. All check points are compared against the independent level runs used to establish height datum. Before the completed survey data is submitted, each PQAP should be compared to verify that the accuracies of the data pick-up as stated in the survey specifications have been met.	
	
Commonly used with PISP_ Instrument Station	A minimum of three PQAPs are required per instrument station. Two of these PQAPs should be located at the back and forward extremities of the range of data picked up from that instrument station. The other PQAP should be placed within 5 to 10 metres of the occupied instrument station. PQAPs can be selected from defined feature points that have a defined centre and high point (e.g PCRM screw in kerb) but preference should be given to marks placed specifically for the purpose, such as S/H nails driven in the pavement. Quality assurance check points (PQAP) from PISP1 = 1, 2, 3 (3=4) Quality assurance check points (PQAP) from PISP2 = 4, 5, 6 (6=7) Quality assurance check points (PQAP) from PISP3 = 7, 8, 9

6.13.2 QQ_ – Check string

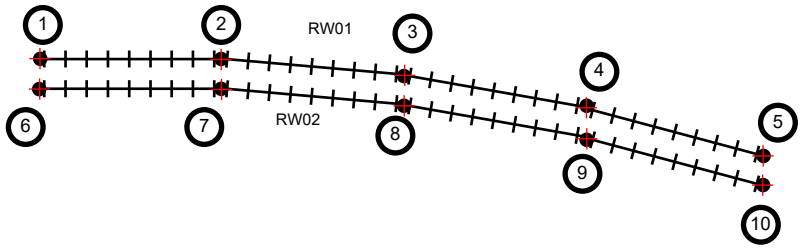
QQ_	Check string (quality)
Quality check strings (QQ_) are random check strings through the job band of interest, independent of the job data. A minimum of three quality check string shall be included with all submitted survey data. The check strings are compared against the triangulation model, generated from the survey data as a check on the accuracy of the TIN interpolation. They shall be observed within 100 metres of the start and end of the surveyed DTM area. Additional check strings shall be run no further than every 500 metres apart throughout the DTM area	
	
Commonly used with PQAP and PROP	Check string (QQ01) = 1 to 4, (QQ02) = 5 to 7 (Locating all terrain grade changes along the string)

6.14 MODEL – SURVEY RAIL

6.14.1 RT_ / TC – Railway centreline/tramway centreline

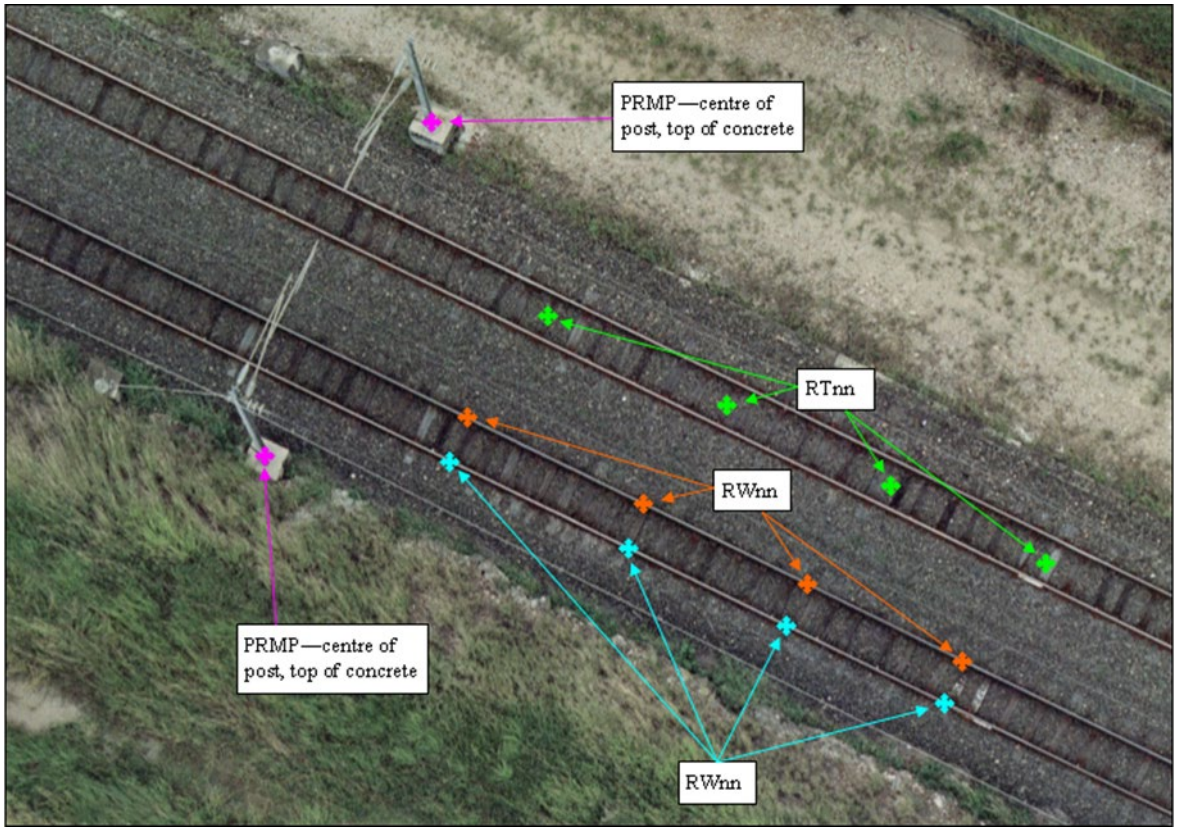
RT_ / TC_	**Centreline – Railway tracks/Tramway tracks**
The linestyles for Railway Track and Tramway Track are the same, except that they are allocated different colours. The Railway Track or Tramway Track centreline may be located in either direction with the pick-up points mid-way between the two rails on the ballast or sleepers.	
	
Commonly used with RW_ Top Line – Railway TW_ Top Line – Tramway BR_ Top Bank – Right BL_ Top Bank – Left	These codes are located at the centre of the tracks and plot a symbol of BOTH TRACKS. If the top of the rails are required by the Survey Brief, then the strings Railway/Tramway Line – top of rail (RW_, TW_) should be used. See the next situational example for descriptions of these codes.

6.14.2 RW_ / TW_ – Railway/Tramway – top of rail

RW_ / TW_	**Railway/Tramway – top of rail**
The linestyles for Railway – top of rail and Tramway – top of rail are the same except that they are allocated different colours. These strings may be located in either direction with the pick-up points on top of the steel rails.	
	
Commonly used with	Track 1 would be coded as RW01 and picked-up in the order 1 to 5 Track 2 would be coded as RW02 and picked-up in the order 6 to 10 Note: Refer to the Survey Brief to see if the top of rails are required or just the location of the centreline.

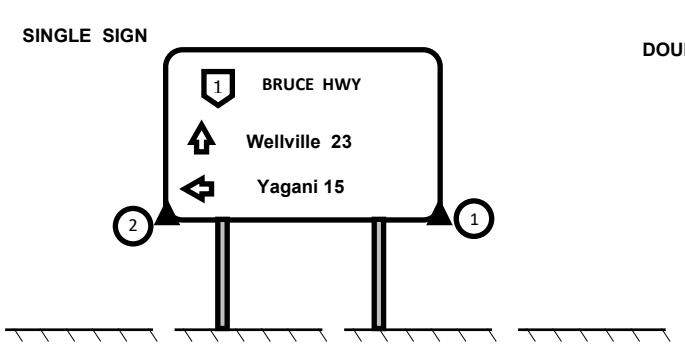
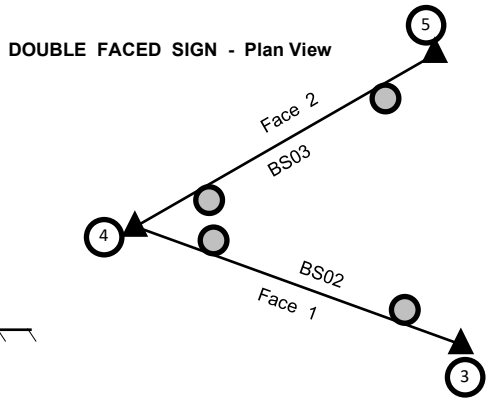
6.14.3 Railway Tracks and Masts Examples

Sample String Codes for railway tracks, railway line and railway electric support mast

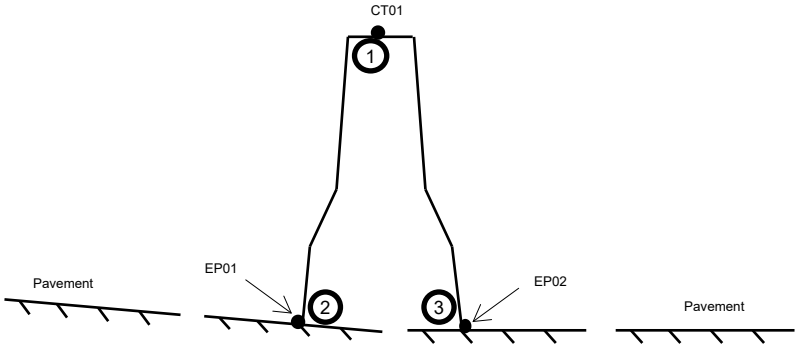


6.15 MODEL – SURVEY ROAD

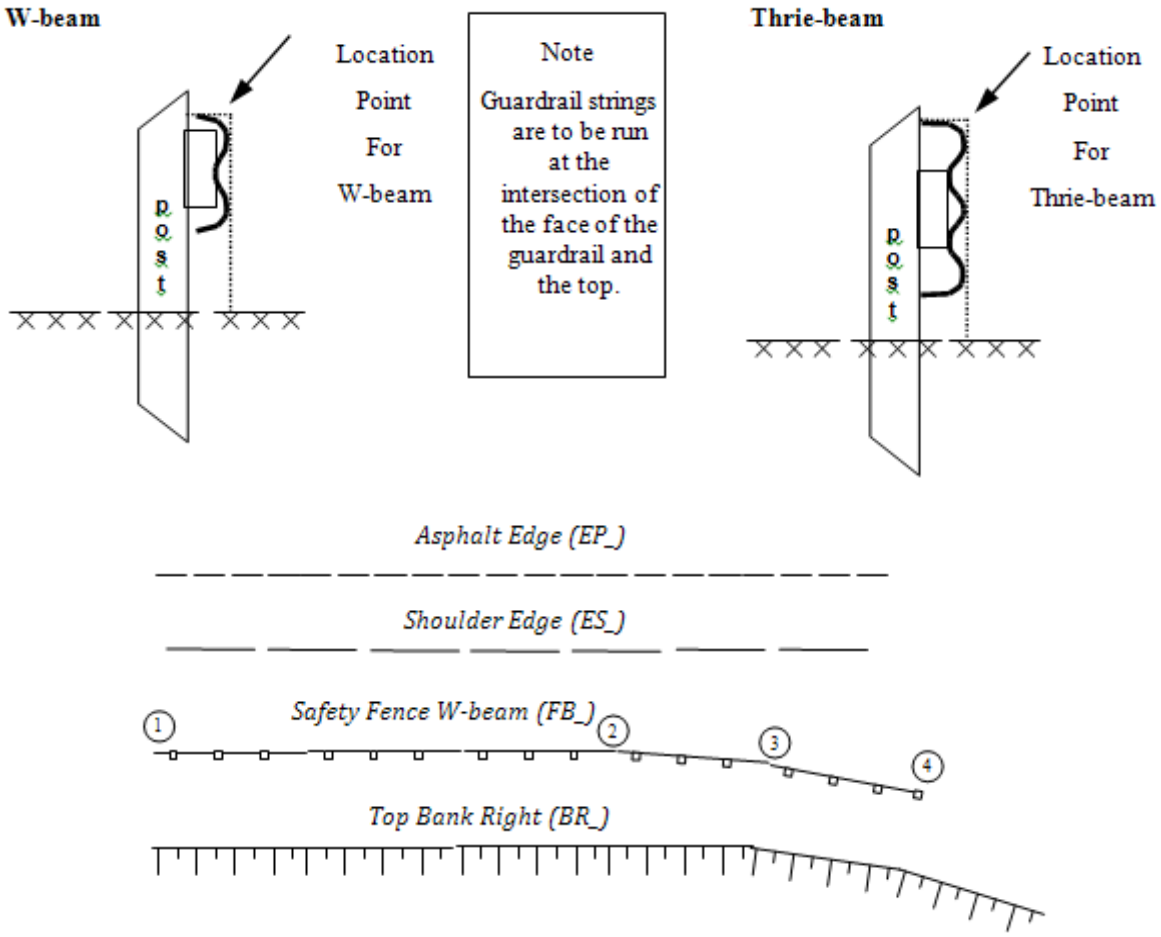
6.15.1 BS_ – Big Sign

BS_	**Big Sign (two point directional string only)**
The string Big Sign (BS_) is the only sequential string available for stringing signs, whether they are traffic, street or advertising signs. All other codes for traffic, street or advertising signs are feature point codes where only a single point at a sign can be located. BS strings are always located from right to left at the bottom edge of the sign extremities as you look at the face of the sign.	
 	
Commonly used with **NS_** Non-standard string **PRFP** Road furniture post	The extremities of the sign should be located in the sequence 1 to 2 at the bottom of the sign, not the support posts. These are required by designers to calculate clearances. The content of the sign shall be commented. Big Sign (BS1) = 1 to 2 A double faced sign can be located in the sequence 3 to 5 if they share a common edge and the face of the signs are as shown above. Big Sign (BS2) = 3 to 4 Big Sign (BS3) = 4 to 5 Photographs should be taken of the sign especially where the content is unusual or contains too much content to adequately field comment. Some projects may require a diagram to be drawn showing size and sign information. A Non-Standard (NS) string may be run along the top and sides of the sign, as appropriate, to show the size and clearances. If the posts are required to be located, use the road furniture post code (PPRF) to pickup at ground level centre of the posts. Photogrammetry projects may alternatively locate the extremities of the sign directly below at ground level.

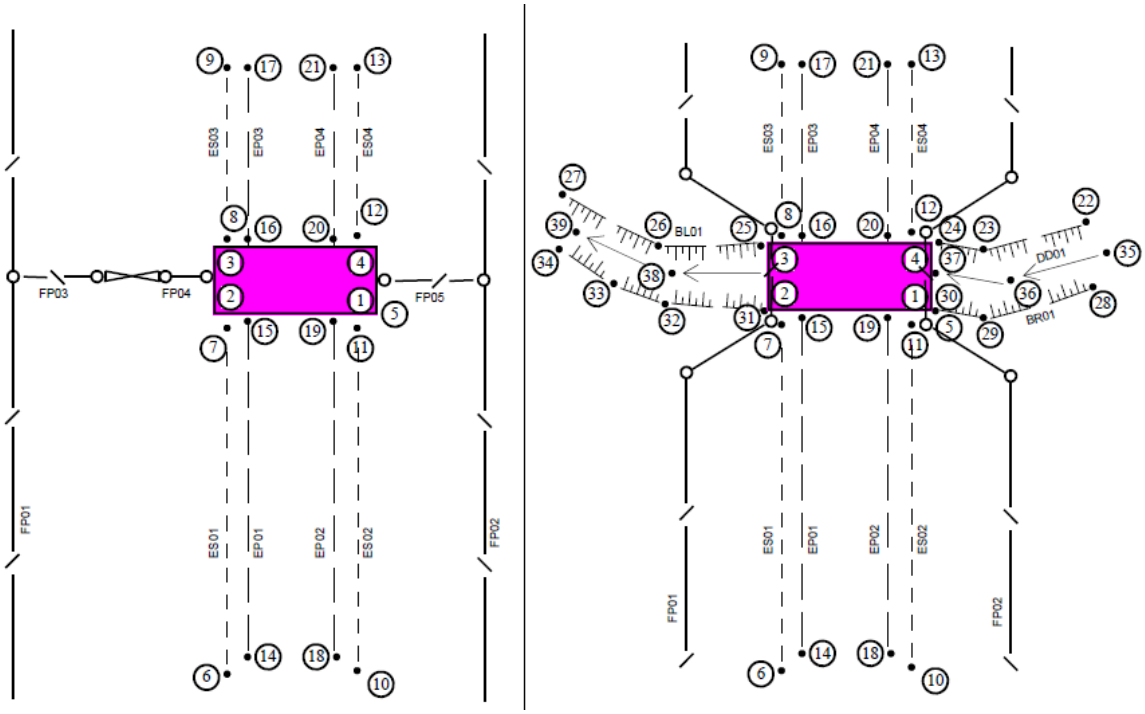
6.15.2 CT_ – Concrete Barrier – Top Mid

CT_	Concrete Barrier – Top Mid
The key point of interest on a concrete barrier is the top. These barriers must be strung along the centre of the top using the non-contourable sequential string CT_, with sufficient points picked to allow a true profile of the top of the barrier. If it is required to include the concrete barrier in the DTM, both left and right top must be strung using the sequential string code KT_ (kerb top). However, in this situation, the CT_ string must also be included for feature location purposes. The base of the concrete barrier should be located using the appropriate DTM sequential string code, e.g., EP_ or KI_.	
	
Commonly used with EP_ Edge of Pavement KT_ Kerb Top	Concrete Barrier String (CT01) = 1 Bottom of Barrier String (EP01) = 2 Bottom of Barrier String (EP02) = 3 **Note:** Diagrams are to be produced showing the detailed dimensions of each concrete barrier type if required by the Survey Brief.

6.15.3 FB_ / FH_ – Safety fence (W-beam/Thrie-beam)

FB_ / FH_	Safety Fence - W-beam/Thrie-beam (directional strings)
The Safety Fence string is located in the direction 1 to 4 along the face of the barrier with the barrier on the right or, if located from 4 to 1, the string direction must be reversed in post-processing or use a field control code to reverse the string. The location point is the intersection of the projections of the top and face of the beam as shown in the diagrams below.	
	
Commonly used with BL_ Bank left BR_ Bank right EP_ Edge of pavement ES_ Edge of shoulder	The FB_ and FH_ strings are directional strings. The linestyle is asymmetrical so that the posts are on the right of the direction of pick-up.

6.15.4 GC_ - Cattle Grid (extents)

GC_	Cattle Grid (extents)
Cattle grids are generally non-permanent structures and are located horizontally and vertically to meet the requirements of the approach pavement. The grid is to be located as a string at the four corners of the grid and should be a closed string. This string is not included in the terrain model.	
	
Commonly used with BL_/BR_ Bank left or right DD_/DD_ Drain down or up EP_ Edge of pavement ES_ Edge of shoulder FP_ Fence - posts located BL_ Bank left BR Bank right DD_ Drain down	The Cattle Grid is located as GC01 by points 1 to 4 and closed back to 1. Alternatively point 5 may be picked up at point 1. The pavement strings (e.g., edge of pavement (EP_), edge of shoulder (ES_), etc.) are not to continue across the grid. The string approaching the grid should stop at the grid, and then continued as a separate string after the grid. Where the grid is used as a drain crossing, the terrain below the grid is to be continuous and contourable as if the grid was not present. In the example above right, the Bank Left string (BL1) at point 24 joins 25, bank right (BR01) point 30 joins 31 and drain down (DD01) point 37 joins 38 as continuous contourable strings.

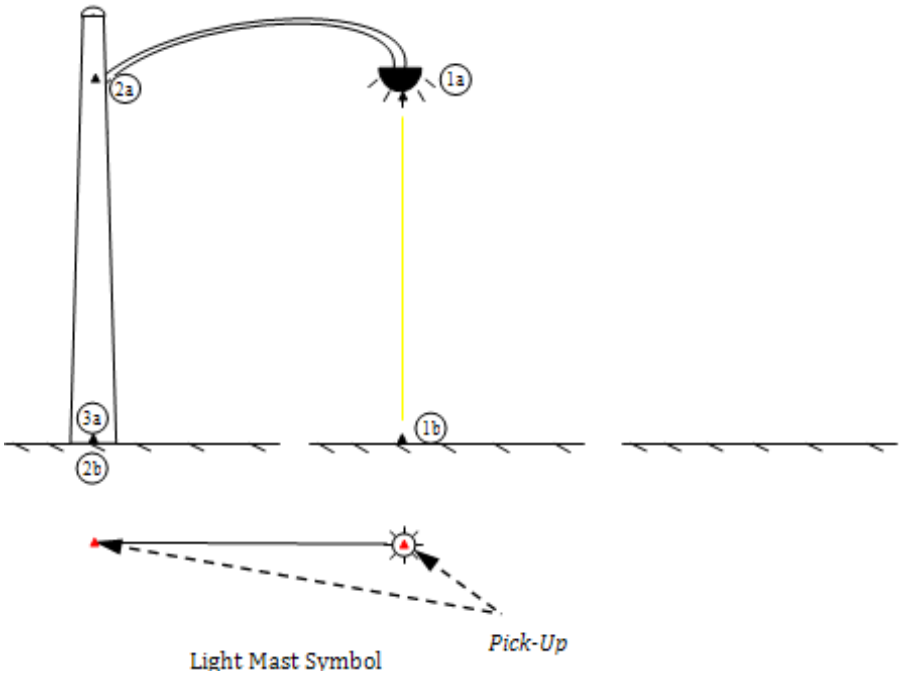
6.15.5 LM_ / PPRF – Street light with mast arm – Road furniture post

LM_	**Street light with mast arm (two point directional string only)**
PPRF	**Road furniture post**

Street light with mast arm (LM_) is a two point string and must be picked-up in the order light first and support second.

The pole must also be coded to be plotted as a pole. An isolated pole shall be coded as a road furniture post (PPRF).

If the primary purpose of the pole is only to provide street lighting, PPRF shall be used. If the primary purpose is otherwise, use code PPPP or EA_.



Light Mast Symbol

Commonly used with

PPPP	isolated pole
EA_	powerline (poles located

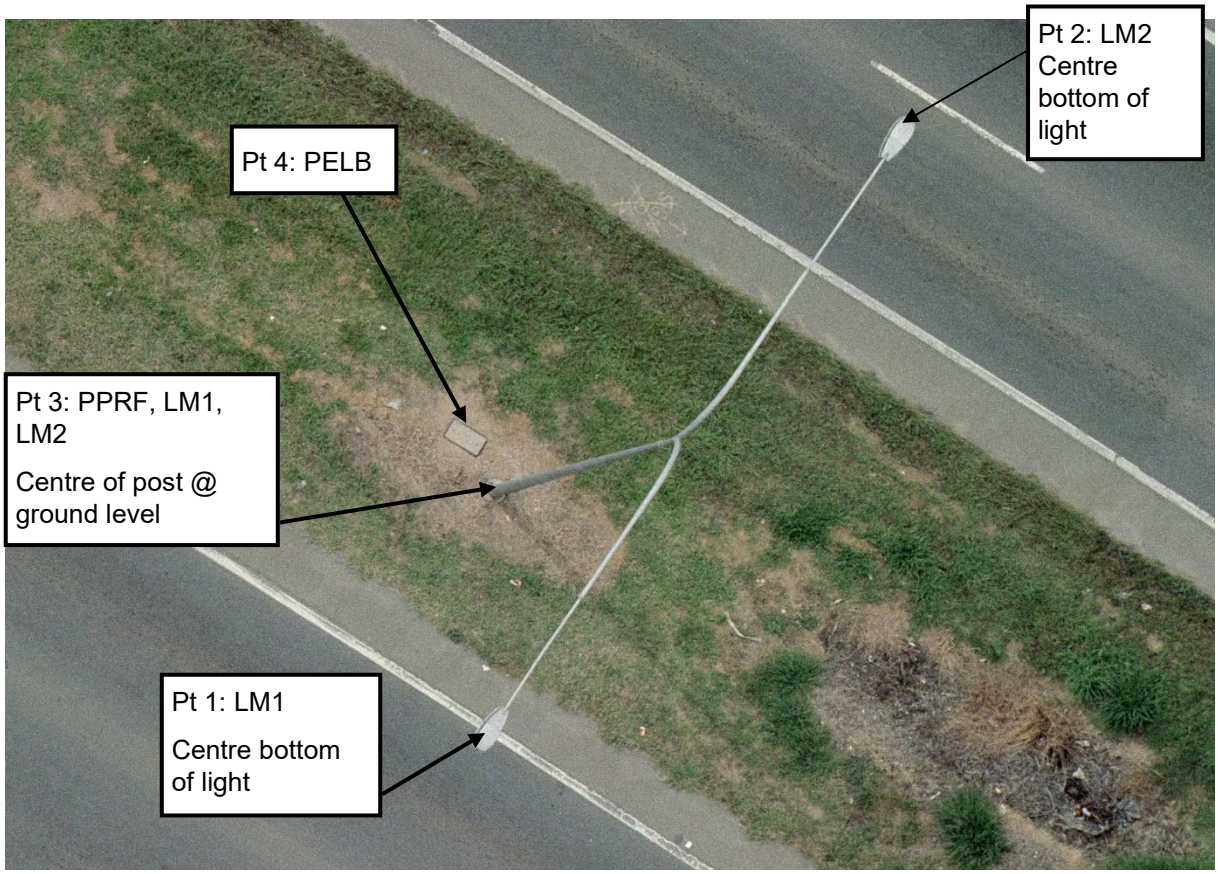
In the example above, the light is to be located as LM_ at the underside of the centre of the light at 1a. If the measurement is taken at ground directly below the light at point 1b, the vertical angle must be adjusted to the underside of the light (1a).

The second point on the Light Mast (LM_) string will be located either at the attach point 2a, or on the ground at 2b (and dual-coded with PPRF in this example at the centre of the pole).

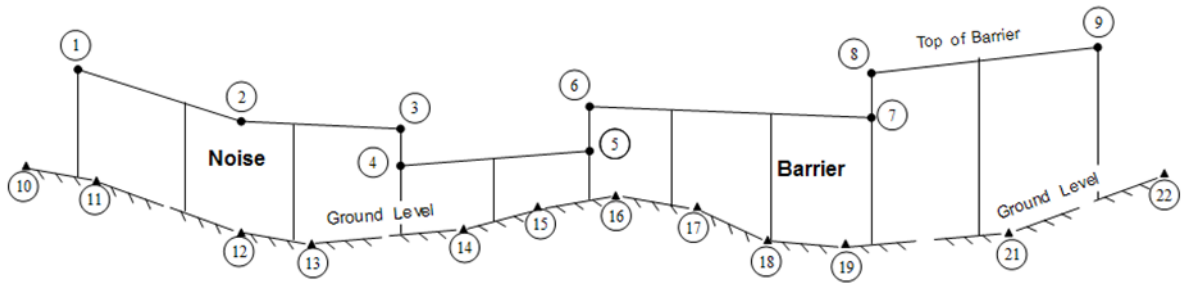
If the second point is captured at the attach point 2a, the support pole will have to be coded as a separate point at 3a by locating another point, coded as PPRF at the ground centre of pole.

6.15.6 Double street lights with masts example

Sample String Codes for double street light with mast arm and support pole. The inspection box/pit beside the pole will generally be marked ‘electricity’ and should be located as PELB. Some will be marked as Main Roads (MR) and should be located as PMRB.



6.15.7 NB_ – Noise barrier (top)

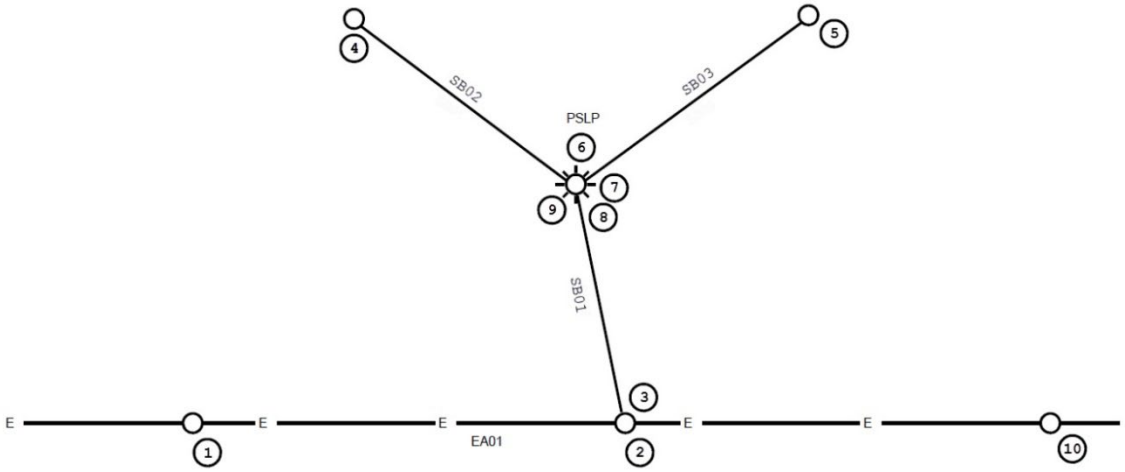
NB_	Noise barrier (top)
The key point on noise barriers of interest to designers and environmentalists is the top. Noise barriers must be strung along the top using the sequential string code NB_ using sufficient located points to allow a true profile of the fence top.	
	
Commonly used with CG_ Change of Grade (Breakline)	The top of the noise barrier is to be located as string code NB01 in the example above from points 1 to 9 (care should be taken so that the steps at 3/4, 5/6 and 7/8 truly represent the top profile of the noise barrier). This string is not a TERRAIN string, so it is of no consequence if the string crosses itself. Sufficient TERRAIN strings must be captured along the base of the barrier to generate an accurate profile of the ground so that height may be deduced.

6.15.8 PPRF – Road furniture post

The PPRF code should be used when locating signage, traffic signals and street lighting (where the primary purpose of the pole is to provide street lighting. If the primary purpose of the pole is to convey power use code PPPP).

For examples of how and when to use the road furniture post (PPRF) code vide S*ections 6.15.1 Big Sign, 6.15.5 Street Light with mast arm*, *6.15.6 double street light*, *6.15.12 traffic signals* and *6.15.13 Variable message sign*.

6.15.9 PSLP – Street light (suspended)

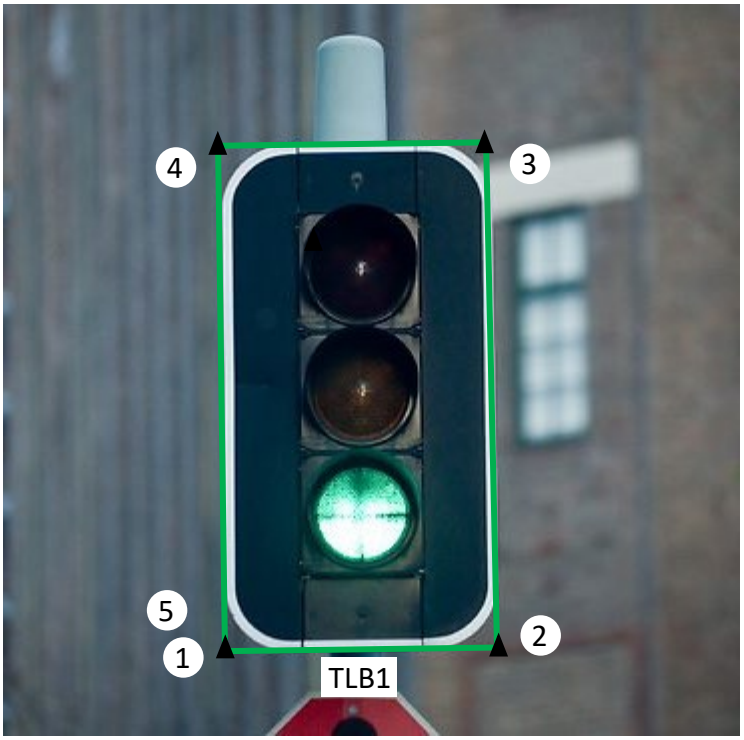
PSLP	Street light (suspended)
The feature point PSLP can occur in a number of different situations. It can be attached to an existing powerline pole, on its own pole or suspended across the road.	
	
Commonly used with EA_ Powerlines (poles located) PPPP Isolated power pole SB Stay/Bollard	Where the suspension wire is attached to a power pole, that pole must be picked up twice. Once as a stay pole shown at 3 and again as a power pole shown at 2 above. The sequential string SB01 must be run from the stay pole to the suspended light or a point beneath the light (which must have the vertical angle is wound up to the light). Only two points are allowed per string, and the first must be the stay pole. Street light (PSLP) = 6 Stay pole/Bollard (SB01) = 3 & 8 Stay pole/Bollard (SB02) = 4 & 9 Stay pole/Bollard (SB03) = 5 & 7 Powerline - poles located (EA01) = 1 & 2 & 10 A practical field sequence for the example would be to firstly locate the centre of the pole at ground level at point 1 and code it EA01 before repeating the process at point 2, which would be dual coded as SB01 for Point 3. Points 4 and 5 would be located at centre of bollard at ground level and coded SB02 and SB03 respectively. Points 6, 7, 8, and 9 would then be multi-coded as PSLP, SB03, SB01 and SB02 by locating a single point on the bottom of the light. Point 10 could then be picked up and coded EA01.

6.15.10 PVSP – Traffic sign (Variable speed)

PVSP	Traffic sign – variable speed
PVSP is a feature point string for locating variable speed traffic signs. The location point is different to a normal single traffic sign (centre of pole at ground level) in that it is the bottom centre of the sign. This to allow for the common occurrence of this type of sign not being pole based.	

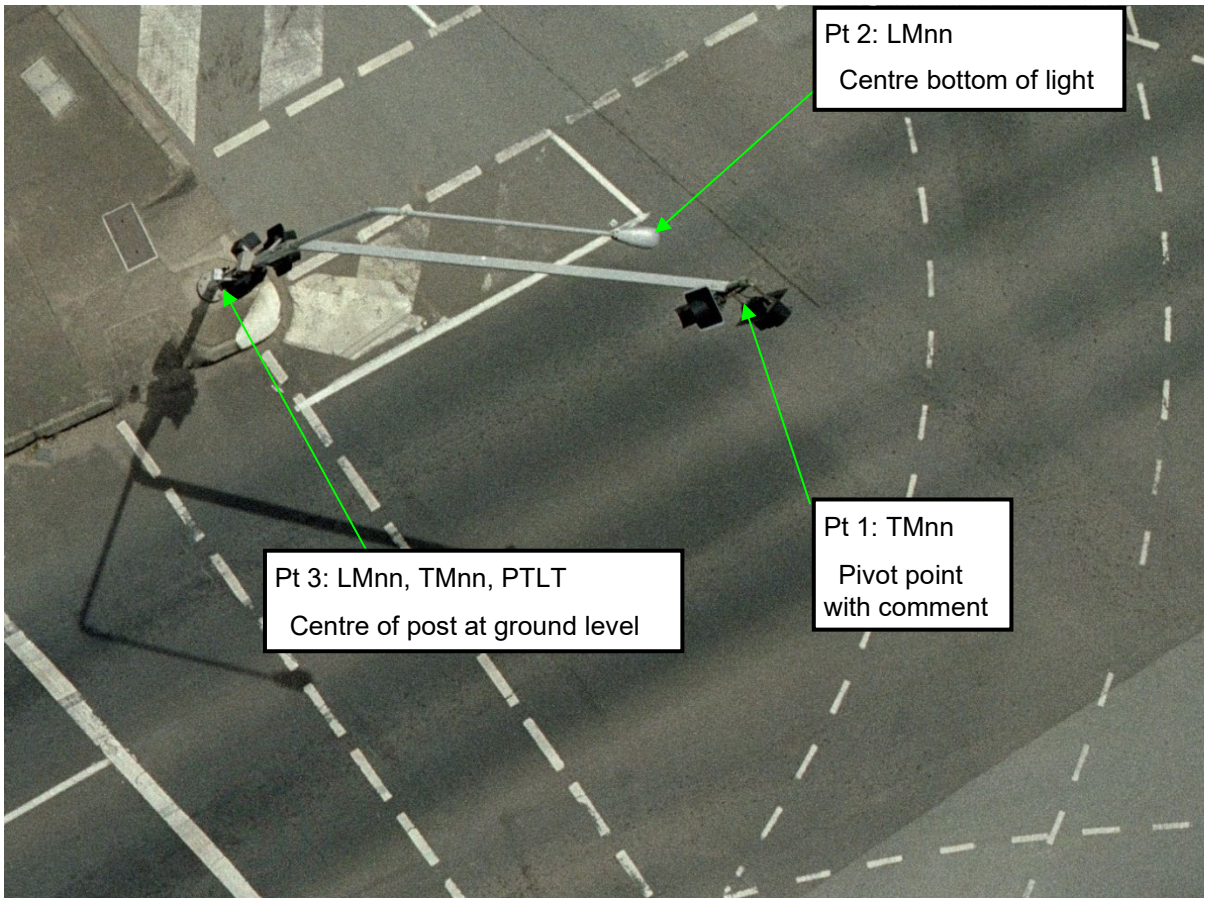
Commonly used with		The variable message sign is to be located at the centre bottom of the sign.	
PTSP	Traffic sign – single sign single post	Traffic sign – variable speed (PVSP)	= 1
		Traffic sign (PTSP)	= 2

6.15.11 TLB_ Traffic light board

TLB_	Traffic light board
The feature string traffic light board (TLB_) is used to locate the extremities of the backing board that surrounds a set of traffic lights. This feature only needs to be located when specifically requested in the Survey Brief to enable clearances to other road furniture and the pavement to be calculated.	
	
Commonly used with TM_ Traffic sign with mast arm PTLT Traffic signal on pole PPRF Road furniture post	Extremities (corners) are usually circular. To correctly represent the side of the board, the located point must be positioned at the intersection of the projected edges of the sign as shown in example above. The minimum pickup points for a TLB_ are the bottom two corners of the light board (1 & 2 above). The string can be extended to show all sides of the traffic light board as shown. Traffic Light Board (TLB1) = 1 to 4 and closed to 1 (or locate pt 5 at 1)

6.15.12 Traffic Signals and Street Lights with mast arm Examples

Sample String Codes for traffic signal and street lights with mast arm. If there wasn't a PTLT - Traffic signal on pole, the pole would be located as a PPRF – Road furniture post.



6.15.13 VMS_ – Variable Message Sign

VMS_	Variable Message Sign (two point directional string only)
The string Variable Message Sign (VMS_) is a directional two point string. Variable message signs may either be for TMR traffic information purposes or a variable digital billboard for advertising purposes. VMS strings are always located from right to left at the bottom front edge of the sign extremities as you look at the face of the sign.	
	
Commonly used with PPRF Road furniture post	The extremities of the sign shall be located in the sequence 1 to 2 at the bottom of the sign, not the support post/s. These are required by designers to calculate clearances. Support posts/s (at point 3 above) shall be located at ground level at the centre of the post and coded as road furniture post (PPRF). The post diameter shall be commented on the point. A Non-Standard (NS) string may be run along the vertical sides and top of the sign to show the size and clearances if required. Variable message sign (VMS1) = 1 to 2 Road furniture post (PPRF) = 3 **Photogrammetry** projects shall locate the extremities of the top middle of the sign and code as Non-standard (NS_) string. VMS_ is NOT to be used by photogrammetrists as the clearance to the pavement below may be misinterpreted.

6.16 MODEL – SURVEY SEWER

6.16.1 OS_ - Manhole chamber outline – sewer

To locate an OS_ feature string, apply the principles and requirements presented in *Section 6.4.8 OD_ Manhole chamber outline – stormwater*.

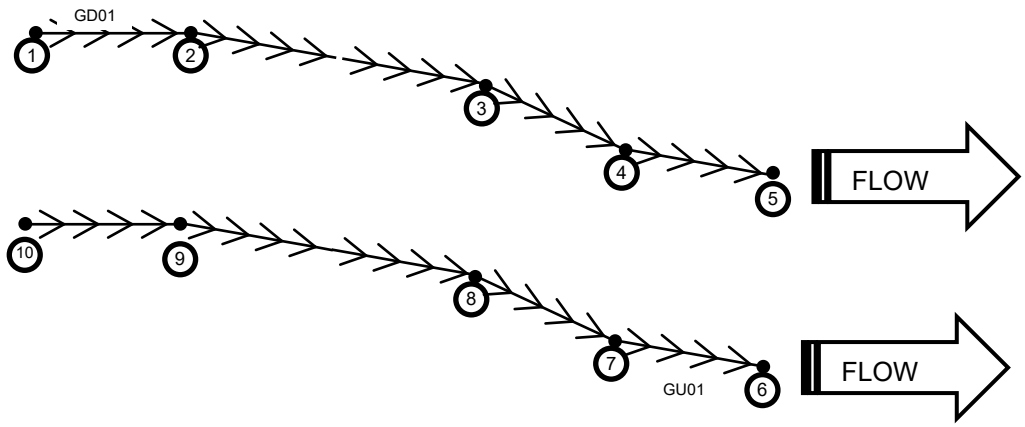
6.16.2 SS_ - Sewer main

To locate an SS_ feature string, apply the principles and requirements presented in *Section 6.4.4 DG_ Drainage line*.

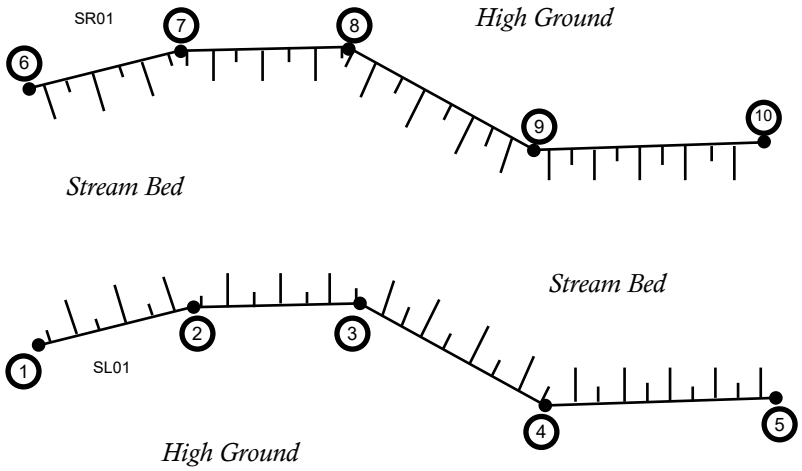
6.17 MODEL – SURVEY STREAMS

6.17.1 GD_ / GU_ – Stream Gradient – Down or Up

<table>
<tr><td>GD_ / GU_</td><td>Stream Gradient – Down (with flow)/Up (against flow) {directional strings}</td></tr>
<tr><td colspan="2">The string for Stream Gradient Down (GD_) is located in the sequence 1 to 5 in the direction of flow.

The string for Stream Gradient Up (GU_) is located in the sequence 5 to 1 against the direction of flow.</td></tr>
<tr><td colspan="2"> 
</td></tr>
<tr><td>Commonly used with
SL_ Stream Bank left
SR_ Stream Bank right</td><td>These are directional strings. The linestyle is directional so that the flow arrows are in the direction of flow. If the pick-up is in the direction of flow, use the drain down code else if the pick-up is against the flow, then use Drain up. No matter which code is used, the flow arrows should always point in the direction of flow.
Stream Gradient Down (GD01) is picked-up in the sequence 1 to 5.
Stream Gradient Up (GU01) is picked-up in the sequence 6 to 10.
Note: Although these features represent a ‘crease’ in the terrain surface, the strings are provided to capture feature information that is to be in the SURVEY STREAMS model. They are not to be used for creating the terrain surface, hence they will not be used in the triangulation.</td></tr>
</table>

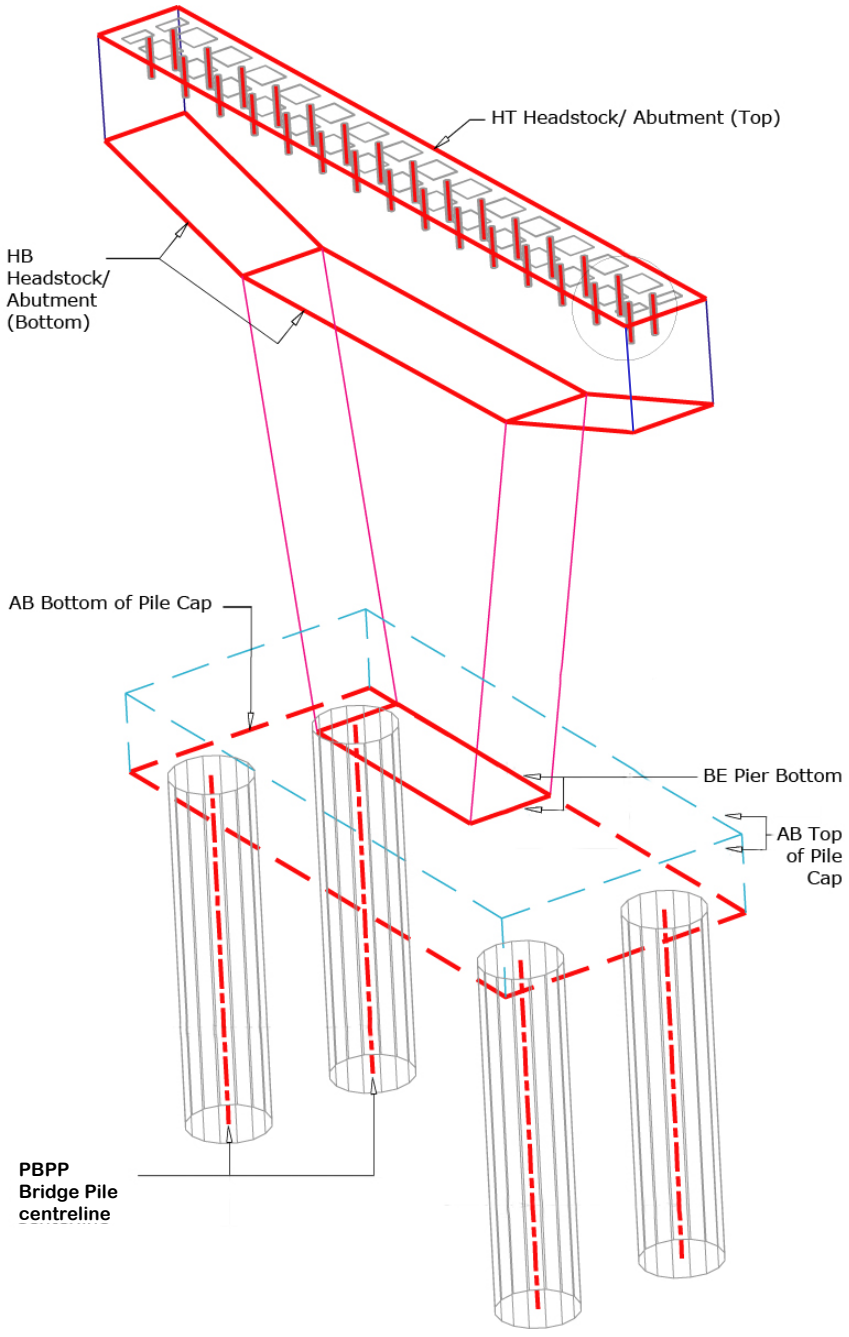
6.17.2 SL_ / SR_ – Stream bank top – Left or Right

SL_ / SR_	Top of stream bank – Left/Right (directional strings)
The top of stream bank left (SL_) is located in the sequence 1 to 5, with the stream to the left of the direction of pick-up and the high ground to the right. The top of stream bank right (SR_) is located in the sequence 6 to 10, with the stream to the right of the direction of pick-up and the high ground to the left.	
	
Commonly used with SX_ Stream Bed X-Section GD_ Stream Gradient down GU_ Stream Gradient up	These are directional strings. The linestyle is asymmetrical so that the slope ticks are on the low side of the line. Stream Bank Left (SL_) is picked-up in the sequence 1 to 5. Stream Bank Right (SR_) is picked-up in the sequence 6 to 10. **Note:** Although these features represent a 'crease' in the terrain surface, the strings are provided to capture feature information that is to be in the SURVEY STREAMS model. They are not to be used for creating the terrain surface, hence they will not be used in the triangulation.

6.18 MODEL – SURVEY STRUCTURES

6.18.1 AB_ / BE_ / HB_ / HT_ / PBPP – Bridge superstructure (non-contourable)

AB_	**Pier footing/Pile-cap – top or bottom**
BE_	**Bridge column/pier outline – top and bottom**
HB_	**Headstock /Abutment – bottom**
HT_	**Headstock/Abutment – top**
PBPP	**Bridge pile centreline (axis)**

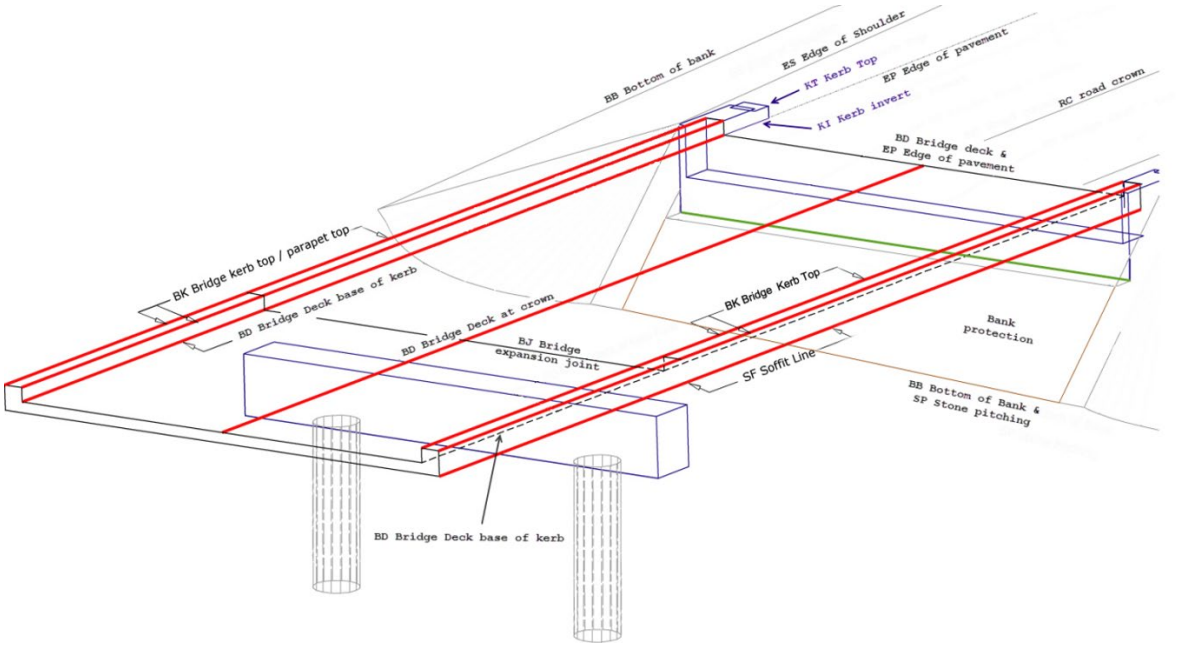


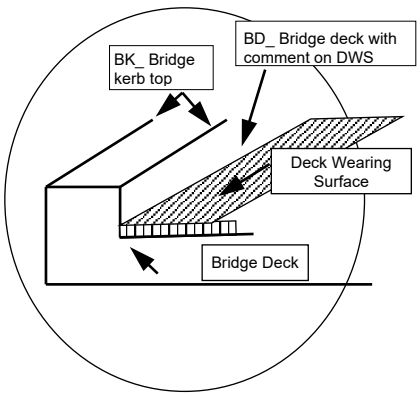
6.18.2 BD_ / BK_ / BJ_ /HB_ / HT_ / SF_ – Bridge superstructure (non-contourable)

BD_	**Bridge deck – crown/ base of kerb or parapet**
BK_	**Bridge Kerb top/Parapet top – non contourable**
BJ_	**Bridge expansion joint**
HB_	**Headstock/Abutment - bottom**
HT_	**Headstock/Abutment - top**
SF_	**Soffit line**

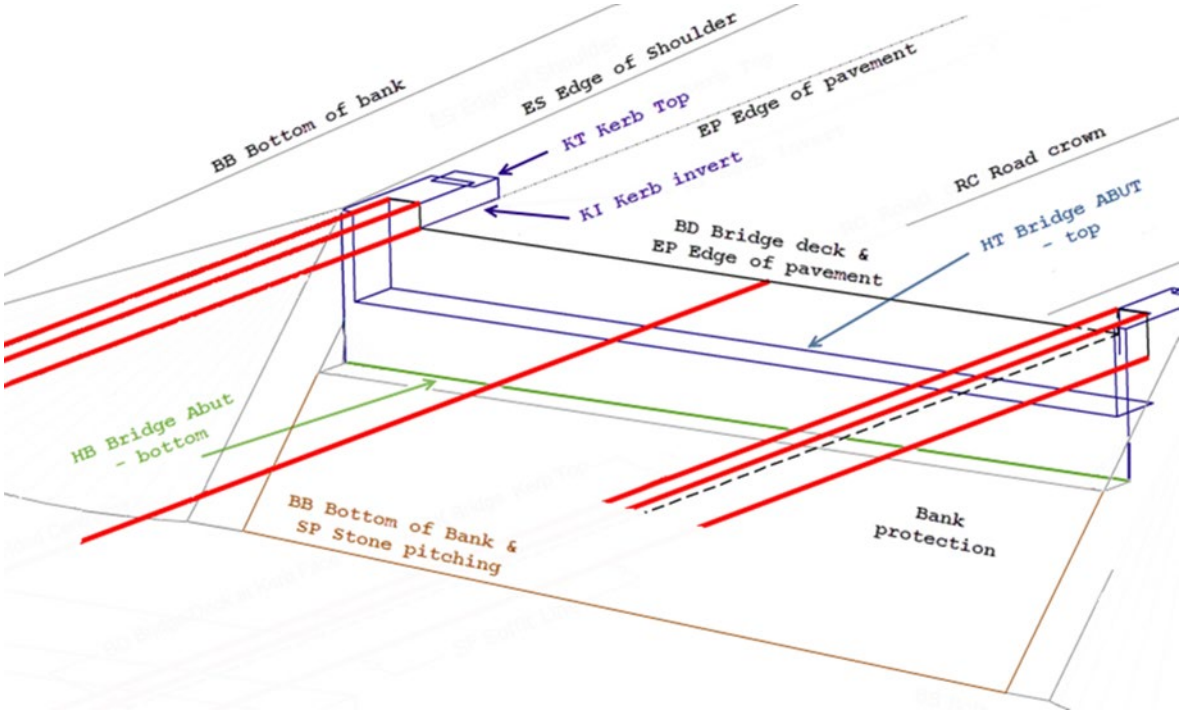
Do not continue any terrain model (SURVEY DTM) strings across the bridge structure. End them at the abutments. Parts of the structure, however, such the bank protection and relieving slabs, may need to be duplicated for inclusion in both the SURVEY STRUCTURES and SURVEY DTM models.

The true Bridge Deck is usually inaccessible below the Deck Wearing Surface (DWS). Strings along the crown and base of the kerb at the level of the deck-wearing surface (bituminous concrete) may be coded BD_. However, these strings must be commented to state the pickup point, for example ‘top of DWS’.





BD_	**Bridge deck – crown/ base of kerb or parapet**
BK_	**Bridge Kerb top/Parapet top – non contourable**
BJ_	**Bridge expansion joint**
HB_	**Headstock/Abutment - bottom**
HT_	**Headstock/Abutment - top**
SF_	**Soffit line**



Commonly used with

Survey structures (non-contourable)

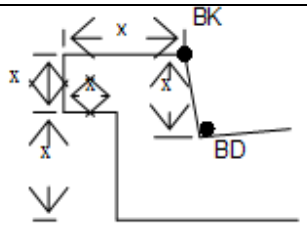
AB_	Pier footing/ Pile – cap
BD_	Bridge deck
BE_	Bridge column/pier outline
BK_	Bridge kerb
HB_	Headstock/abutment – bottom
HT _	Headstock/ abutment – top
PBRP	Bridge rail post – centres (individual points)
PBSC	Bridge scuppers
RM_	Bridge traffic rail post centres
SF_	Soffit line
TS_	Transverse stressing bar

Survey DTM (contourable)

BB_	Bottom of bank
BL_/BR_	Bank left/right
CG_	Change of grade
EP_	Edge of pavement
ES_	Edge of shoulder
KI_	Kerb – Invert of channel
KT_	Kerb– top
RC_	Road crown

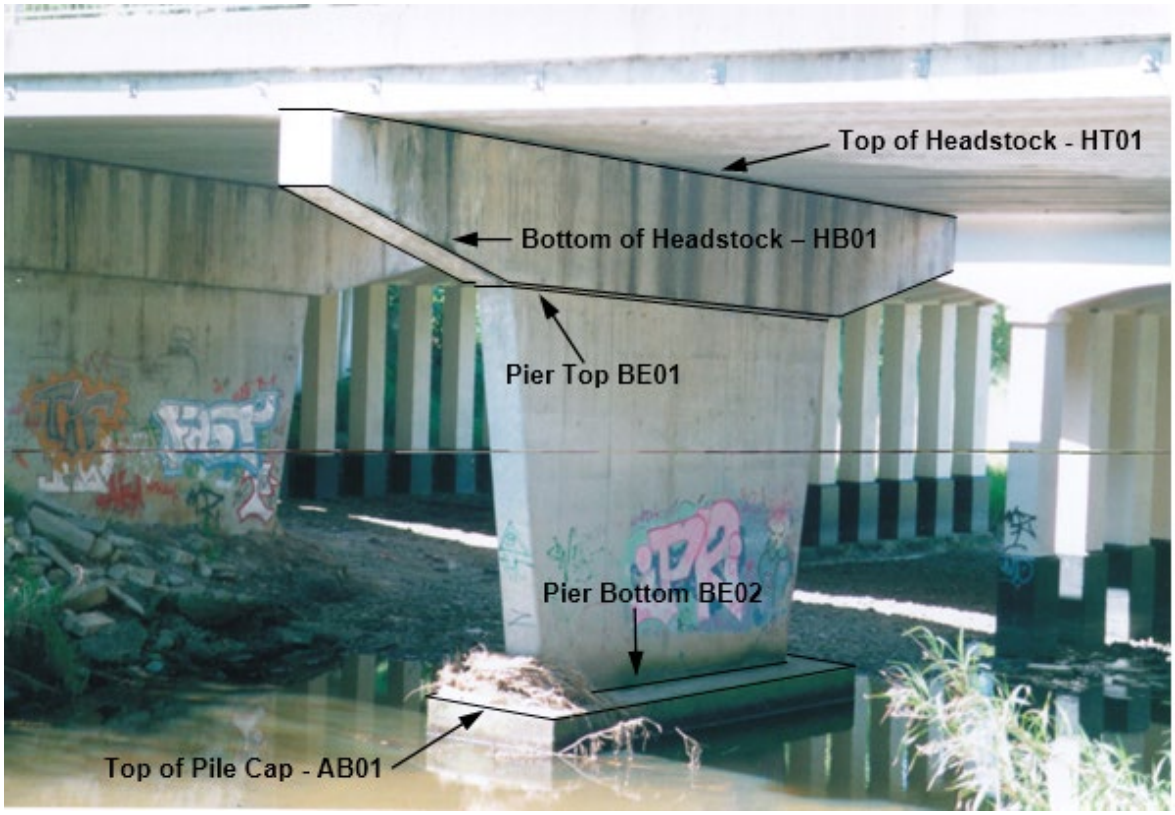
Survey general (non-contourable)

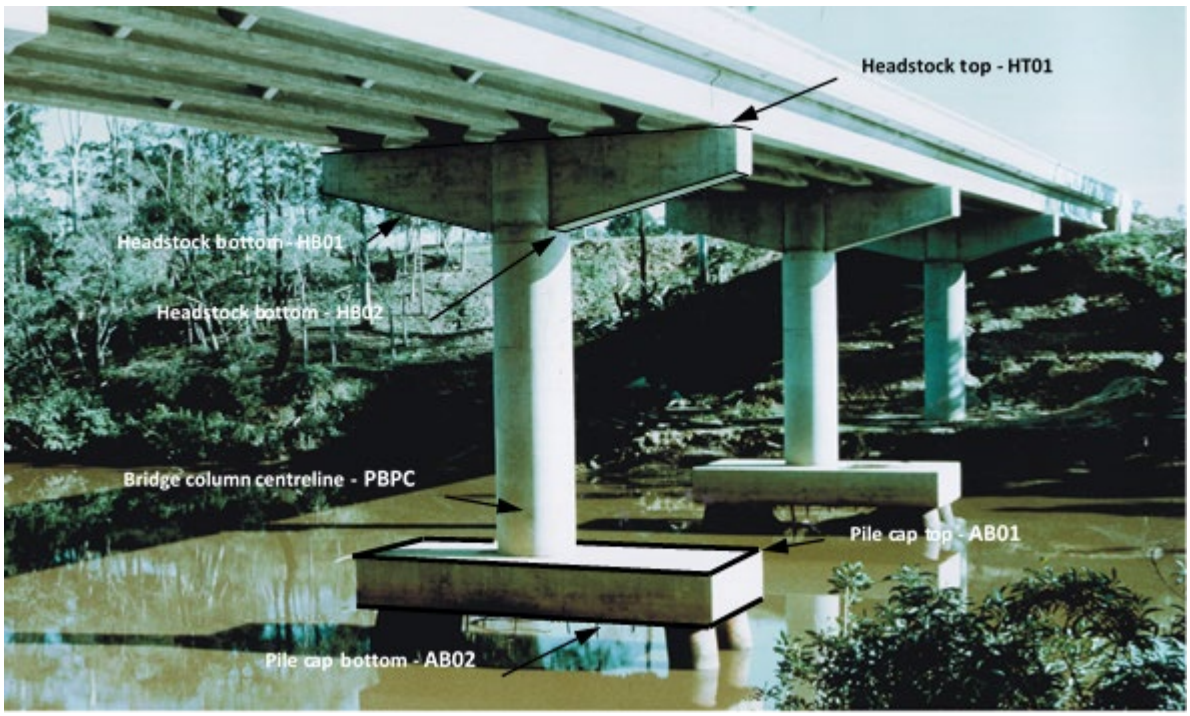
SP_	Edge of stone pitching
PNSP	Non-standard feature



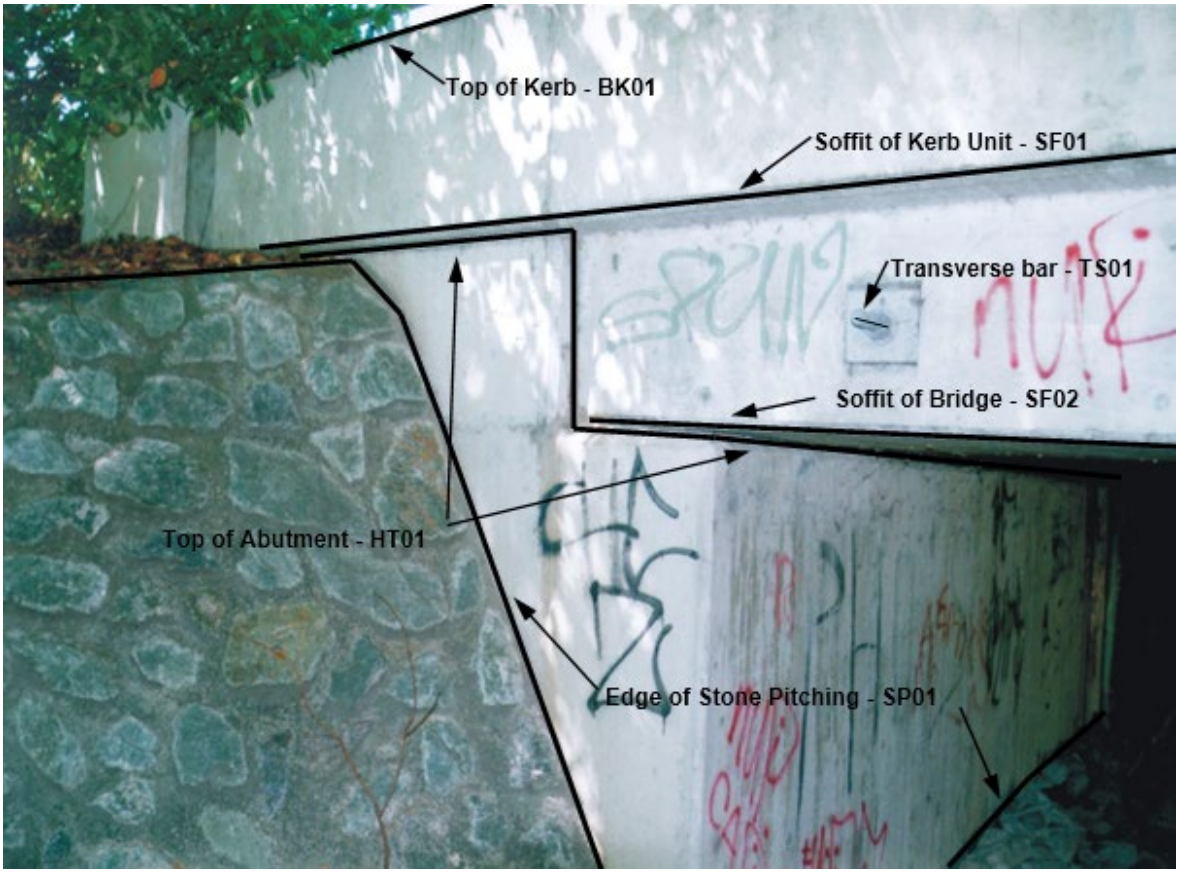
When a bridge widening is being considered, the Survey Brief will request additional detail of the existing structure. Diagrams are to be produced showing the detailed dimensions of the bridge structure; bridge kerb/ parapet, abutment and pier, together with the location of each string relative to those dimensions.

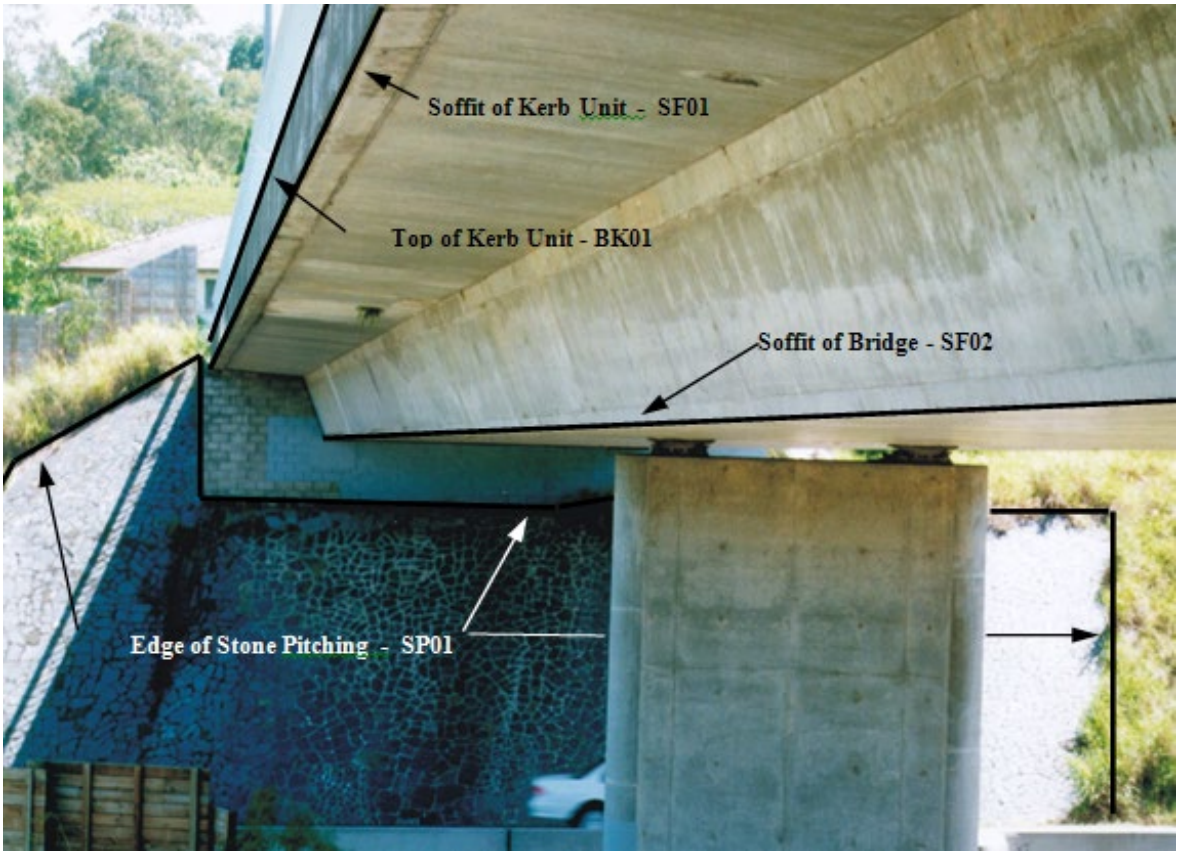
6.18.3 Bridges – String Codes for Headstocks, Piers and Pile Caps

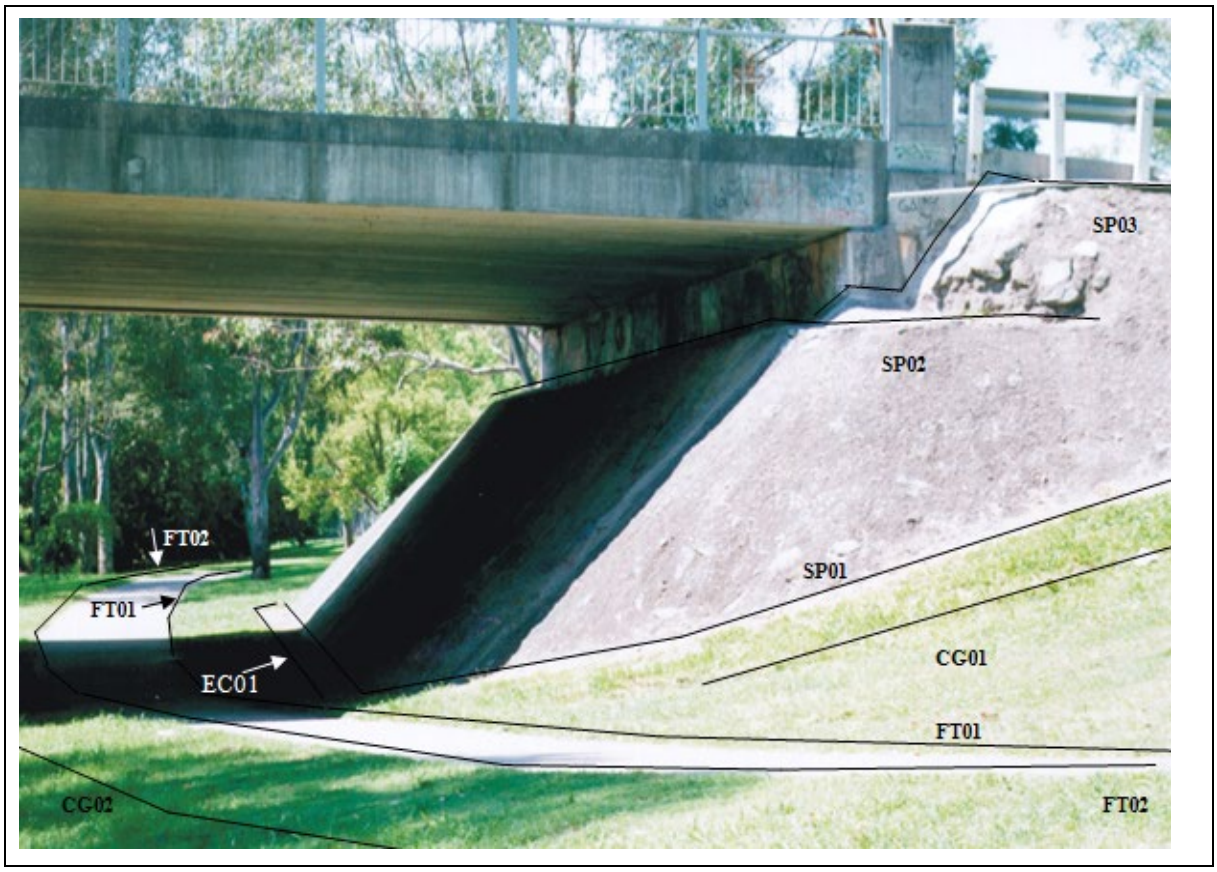




6.18.4 Bridges – String Codes for Kerbs, Bridge Soffit, Abutment and Stone Pitching

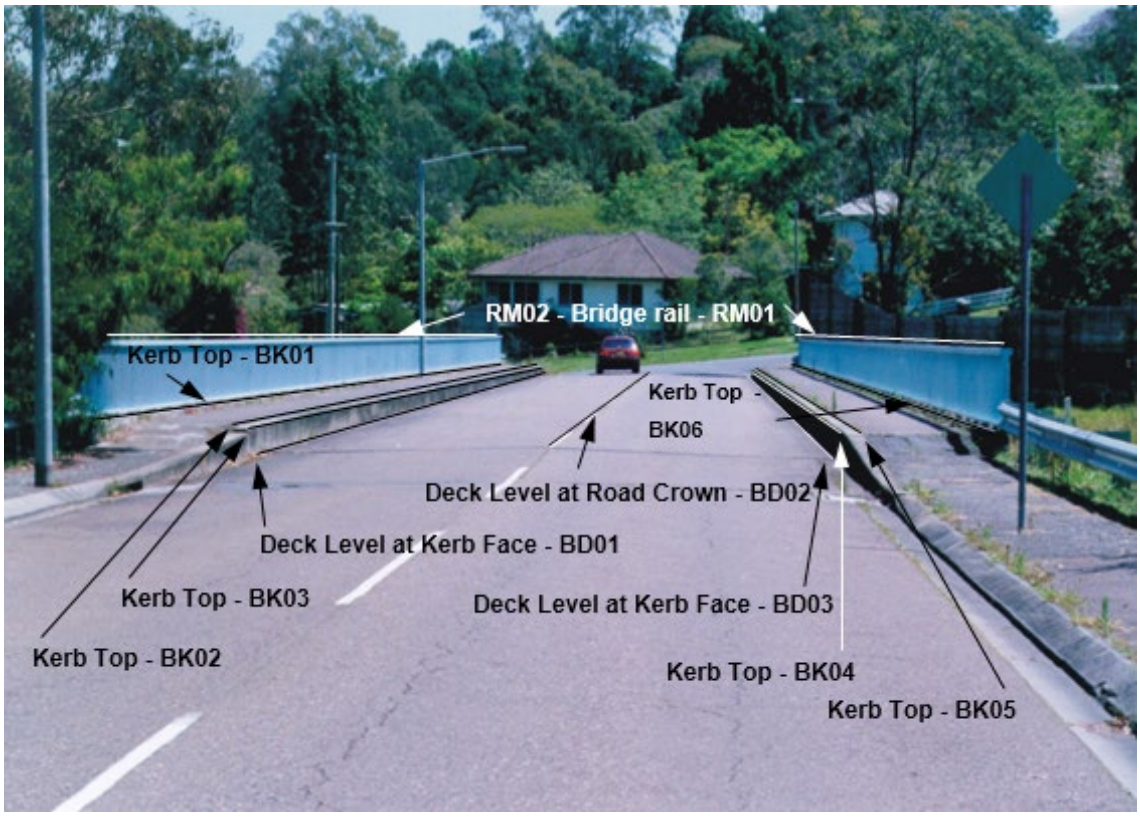






In the example above, SP and EC strings require dual coding as CG_ Change of grade to correctly model the terrain.

6.18.5 Bridges – String Codes for Kerbs and Deck Levels

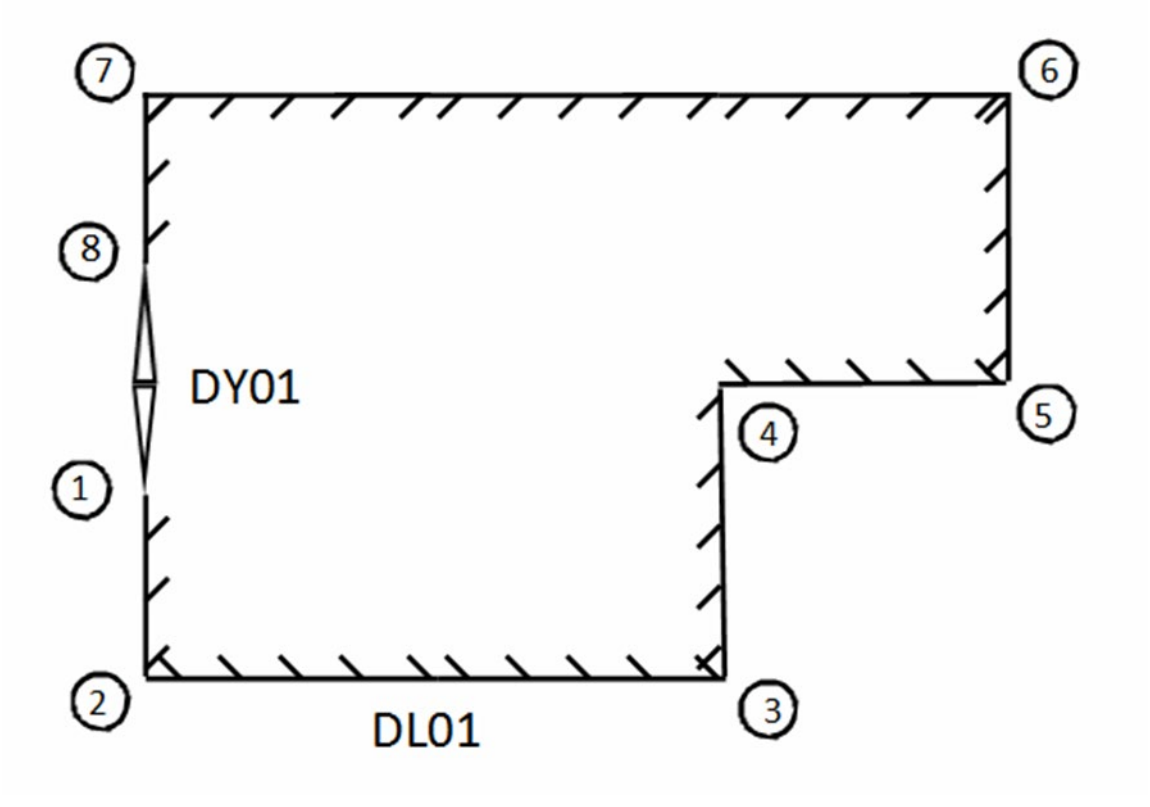


6.18.6 DL_ / DR_ – Dwelling – Left / Right, DY_ - Doorway

DL_ / DR_	Dwelling – Left / Right (directional strings)
DY_	Doorway (stretched) {two point string only}

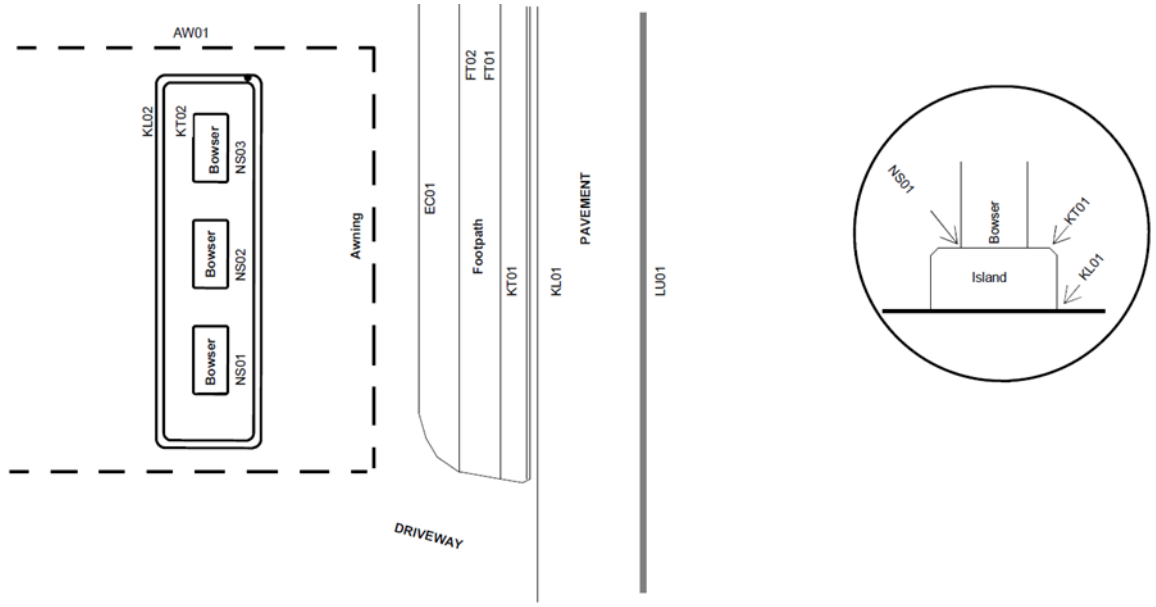
Dwelling – Left/Right are directional strings. The linestyle is asymmetrical so that the building hatching is on the left of the pick-up direction for Dwelling Left and on the right of the pick-up direction for the Dwelling Right.

Doorway DY strings are not directional. The linestyle is dynamically stretched to fit the two pickup points.



Commonly used with		In the example, the dwelling would be located by starting at point 1 and dual coding it DL01 & DY01 for the doorway. Points 2 to 7 would be picked up and coded DL01. Point 8 would be dual coded as DL01 & DY01.
AW_	awning/eaves	
DY_	doorway	

6.18.7 Service station example with AW – Awning

AW_ / NS_	Service station bowsers and awnings
Should details of a service station be required, diagrams are to be produced showing the layout of the bowsers on the concrete islands. The option can then be taken to locate the bowsers as a non-standard feature string (NS_) by running the string around the bowser or by locating the centre of the bowser as a non-standard feature point (PNSP) with the dimensions provided in the comments.	
	
Commonly used with AW_ Awning DW_ Driveway EC_ Edge of concrete FT_ Footpath KL_ Kerb channel lip KT_ Kerb Top NS_ Non-standard feature (Bowser)	The awning should be located as AW01 at the underside of the edge of the awning. The concrete island should be located using the kerb top (KT02) and kerb lip (KL01) strings around the island. If the concrete island is only required as a feature and is not to be included in the terrain model, substitute the non-standard feature string code (NS_) for the KT02 and KL02 strings.

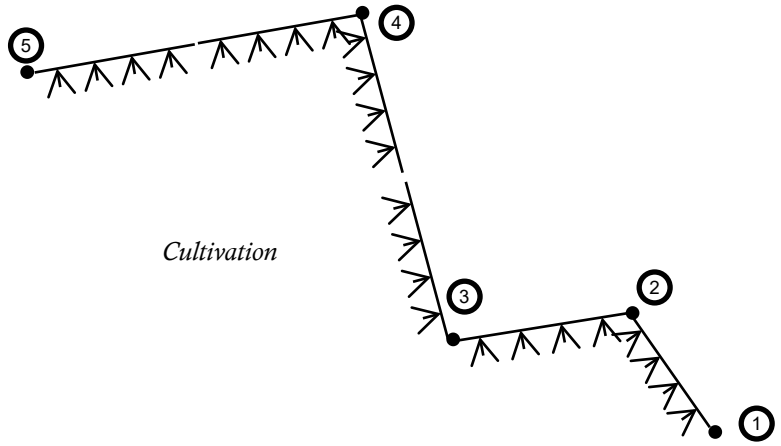
6.19 MODEL – SURVEY UTILITIES

6.19.1 OU_ - Manhole chamber outline – unspecified

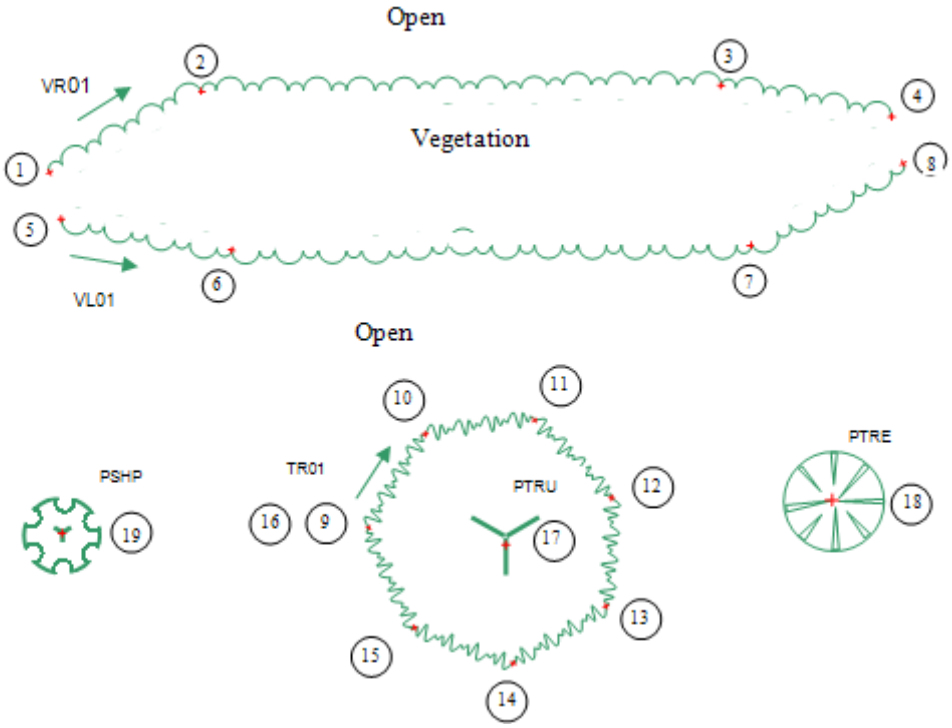
To locate an OU_ feature string, apply the principles and requirements presented in *Section 6.4.8 OD_ Manhole chamber outline – stormwater*.

6.20 MODEL – SURVEY VEGETATION

6.20.1 CL_ / CR_ – Cultivation Left or Right

CL_ / CR_	**Cultivation – Left/Right (directional strings)**
The string for Cultivation Left (CL_) is located in the sequence 1 to 5, with the cultivation to the left and the open ground to the right. The string for Cultivation Right (CR_) is located in the sequence 5 to 1, with the cultivation to the right and the open ground to the left.	
	
Commonly used with VL_ Vegetation Left VR_ Vegetation Right	These are directional strings. The linestyle is asymmetrical so that the cultivation symbol is on the left side of the direction of pick-up for a CL_ string and on the right side of the direction of pickup for a CR_ string. **Note:** The cultivation string is to enclose the entire cultivation area and not just the planted area. If it is needed to define a planted strip within a cultivated area, use the appropriate hand Vegetation string with an annotation of the type of crop.

6.20.2 VL_ / VR_ / TR_ / PTRE / PTRU / PSHP – Vegetation

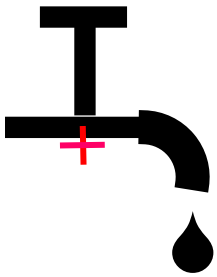
VL_/VR_	**Vegetation – Left/Right (directional strings)**
TR_	**Tree Foliage**
PTRE / PTRU / PSHP	**Tree/Trunk/Shrub**
The string for Vegetation Right (VR01) is located in the sequence 1 to 4, with vegetation to the right and open ground to the left. Similarly, the string for Vegetation Left (VL01) is located in the sequence 5 to 8, with vegetation to the left and open ground to the right The string for Tree Foliage TR01 can be located in the sequence 9 to 16 or 16 to 9. The tree Trunk is located as feature PTRU at point 17. An isolated tree is located as PTRE at point 18 and an isolated shrub is located as PSHP at point 19.	
	
Commonly used with TR_ Edge of Tree Foliage PTRE Tree PTRU Tree Trunk VL_ Vegetation Left VR_ Vegetation Right	The Vegetation strings (VL_, VR_) are directional, but the string for Tree Foliage (TR_) can be picked-up sequentially in either direction. It is used when the Survey Brief specifies that the spread of the trees are to be located and the spread is irregular in shape. The example shows the edge of the foliage located in a clockwise direction from point 9 to point 15, with the initial point re-located as point 16 to make the string appear to close. The trunk of the tree is located as a feature point coded PTRU at point 17. **Note:** If using 12d with TMR Customization, a control code may be applied to the TR_ string to automatically close the string. A control code may also be added to a PTRU code to give the diameter of the trunk, which will then plot the symbol the size of the trunk

6.21 MODEL – SURVEY WATER

6.21.1 OW_ - Manhole chamber outline – water

To locate an OW_ feature string, apply the principles and requirements presented in *Section 6.4.8 OD_ Manhole chamber outline – stormwater.*

6.21.2 PWAT – Water outlet valve (tap)

PWAT	**Water outlet valve (tap)**
The feature point code PWAT for a water outlet valve (tap) is intended to cover most situations with the inclusion of a comment to define the type of 'tap', e.g., drink fountain, stand pipe, hose point, etc.	
	
Commonly used with WM - Water Main	On the plan, the actual pick-up point occurs at the junction of the handle stem and the horizontal line in the symbol. This code can be used for any water outlet valve with appropriate annotation.

7 Location of underground assets

7.1 Introduction

Underground assets may be located using a variety of methods and quite often will be a combination of those methods. Correctly identifying the location method and positioning the discrete point at the correct position are vitally important to the information being used correctly in the design and construction stages. Attribute information is a very important part of the location of underground assets.

To correctly identify the location method and enable output in SUI format, a commenting system has been developed within the Standards and 12d customisation. When comment information is entered as detailed below, some attributes will automatically be assigned to the located points. These attributes may then be used to map out to the SUI Standard format.

Vide Part 2 Section 1.7 of these Standards for more information on Underground Assets.

7.1.1 Locating methods

Location methods are: direct occupation of exposed assets (e.g in an inspection box), potholing, backfilled pothole, cable located, cable located horizontal and ground penetrating radar. The positional quality level is related to the locating method and will be attributed automatically if the system is followed.

The location method is entered into the located points comment as an attribute description label:

- Potholing (& direct occupation) - PH
- Backfilled Pothole - BP
- Cable located - CL
- Cable located horizontal - CLH
- Ground penetrating radar - GPR

Directly occupied assets that don't require potholing, are to be commented PH to enable correct attributing. An example is picking up the cable inside an inspection box.

7.1.2 Point Comments

Points are to be commented in the following format, consisting of a minimum of *three words* with a space between the words. Additional *words* may be added, however the three required words must be entered first and in the correct order for the automatic attributing to work. If the point is dual coded with a pothole feature code, ensure the pothole code is the second code. All depth and size descriptions are to be in millimetres.

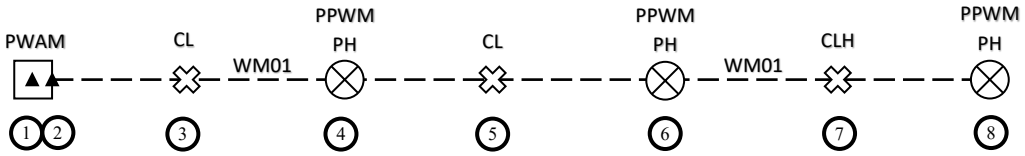
	Word 1	**Word 2**	**Word 3**	**Word 4 etc**
Comment	Locating_method+depth	Size+Material	Asset owner	Other comments
example	PH900	150DICL	BCC	pipe top
example	CLH	100PVC	Telstra	line only

7.2 Example A

Underground assets except Telstra - Cable locator & pot holing

Underground assets may be located using a variety of methods and usually can be a combination of those methods. The example below features pickup done directly in a manhole, cable location with depth applied, potholing of the asset and cable location where the depth was not able to be obtained.

This example may be used for other services like stormwater and sewerage. It is not to be used for Telstra assets (vide example B).



When dual coding discrete points with a pothole code, the asset string must come first and the pothole code second. This will ensure the comments are assigned to the feature not the pothole.

Manhole – water main	(PWAM)	= 1	{Comment: D700}
Water main	(WM01)	= 2	{Comment: PH900 150DICL BCC pipe top}
Potholed – water main	(PPWM)	= 2	
Water main	(WM01)	= 3	{Comment: CL980 150DICL BCC pipe top}
Water main	(WM01)	= 4	{Comment: PH1030 150DICL BCC pipe top}
Potholed – water main	(PPWM)	= 4	
Water main	(WM01)	= 5	{Comment: CL1060 150DICL BCC pipe top}
Water main	(WM01)	= 6	{Comment: PH1050 150DICL BCC pipe top}
Potholed – water main	(PPWM)	= 6	
Water main	(WM01)	= 7	{Comment: CLH 150DICL BCC pipe top}
Water main	(WM01)	= 8	{Comment: PH1030 150DICL BCC pipe top}
Potholed – water main	(PPWM)	= 8	

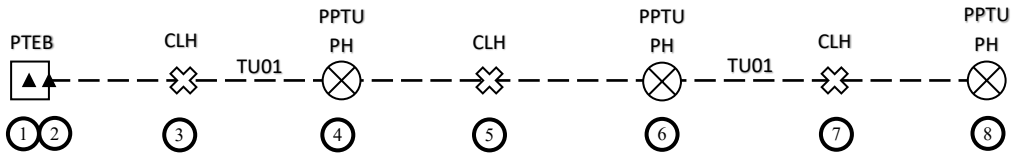
7.3 Example B

Cable location horizontal & potholing for Telstra underground assets

Accredited Telstra locators are NOT permitted to give depths to Telstra assets unless potholing is to occur at that discrete location. Telstra assets located by electromagnetic field technology (commonly called cable locators) shall be positioned at ground level within the survey data.

The example below features pickup done directly in an inspection box, cable location with NO depth applied, and potholing of the asset.

The CLH attribute code may also be used on other assets when the cable locator is unable to give a depth.



When dual coding discrete points with a pothole code, the asset string must come first and the pothole code second. This will ensure the comments are assigned to the feature not the pothole.

Inspection box/pit – telecommunications	(PTEB)	= 1 {Comment: 650x350}
Telecommunications - underground	(TU01)	= 2 {Comment: PH600 100PVC Telstra in pit}
Potholed – comms	(PPTU)	= 2
Telecommunications - underground	(TU01)	= 3 {Comment: CLH 100PVC Telstra line only}
Telecommunications - underground	(TU01)	= 4 {Comment: PH650 100PVC Telstra pipe top}
Potholed – comms	(PPTU)	= 4
Telecommunications - underground	(TU01)	= 5 {Comment: CLH 100PVC Telstra line only}
Telecommunications - underground	(TU01)	= 6 {Comment: PH630 100PVC Telstra pipe top}
Potholed – comms	(PPTU)	= 6
Telecommunications - underground	(TU01)	= 7 {Comment: CLH 100PVC Telstra line only}
Telecommunications - underground	(TU01)	= 8 {Comment: PH610 100PVC Telstra pipe top}
Potholed – comms	(PPTU)	= 8