Christchurch City Council

IDS Survey As-Built Guideline

Revision 1

Revision :	1.0
Date :	25/02/2016

Document Control

	Name	Date
Author Version Draft 1.0	Mayank Katira Claire Newman Michael Zhang	25/02/2016
Reviewer:	Chris Tredinnick Alan Ambury Carsten Joergensen	

Table of Contents

Appendices

Revision History

Revision	Date	Name	Brief Description
1.0	02/02/2016	Mayank Katira Claire Newman Michael Zhang	• Changed terminology to CCC terms • Added Appendix for Parks Assets • Split out WW and SW Assets

Background

Traditionally the Christchurch City Council's (CCC) 'Infrastructure Design Standard' (IDS) has specified the as-built recording process for the entire Christchurch City infrastructure. The IDS is an all-encompassing document providing for all situations and has allowed flexibility in delivery formats supplied by contractors and developers.

This document the 'IDS Survey As-built Guideline' (SAG) lays out a new process which aims to minimise the effort expended on as-built deliverables while not reducing the overall deliverable quality.

Executive Summary

The purpose of this document is to provide a technical guideline for as-built field surveying requirements and attribute information for wastewater, stormwater, water supply, parks and green space construction projects both internal and external to the CCC.

This Survey As-built Guideline defines the requirements of the Capital Program Group (CPG) as well as external contractors and details the deliverable format for wastewater and stormwater, and reticulated water networks.

Compliance with the Survey As-built Guideline is critical for the success of handover processes to CCC.

This Survey As-built Guideline will be revised and expanded as required to encompass the future as-built survey needs of the CCC.

All as-built surveys (and supporting documents) are to be submitted by document controller via CPMS under the project number.

1 Glossary

Regarding As-built:

- Asset – any item listed in Tables 1 to 9 (i.e. Manhole, Valve etc.).
- Asset Attribute (Asset Metadata) – refers to a particular detail or information describing the as-built asset.
- CCC – Christchurch City Council.
- IDS – CCC Infrastructure Design Standard, last reviewed May 2013.
- IRTSG – Infrastructure Recovery Technical Standards and Guidelines, issued 31/10/1013.
- Line Asset – An asset consisting of at least two X Y positions, such as a pipe/lateral (Figure 1). 
- Outline/Polygon Asset - consists of at least three X Y positions to form a polygon i.e. Pumping Station or Garden (Figure 1). Refer to chapter 3 Survey Control, 3.1 Accuracies, for further information on required points. 
- Point Asset – is any asset that can be defined by one X Y position i.e. manhole (Figure 1). 
- RL – reduced level.
- WS – water supply.
- CCC As-built Template (C.A.T.) – spreadsheet to collate as-built information about assets within one project.
- CCC Survey As-built Guideline (S.A.G) – this document.
- CCC Survey As-built Guideline (S.A.G) features – refers to as-built requirement tables in appendices D, E, F and G - categories of assets.
- SW – stormwater.
- UID – unique identifier = unique name (e.g. WWMH-19912), consisting of prefix and unique number.
- Vertex – a known point along a line, e.g. pipe start and end, bends, changes in grade or other known points; corner points or bends on outlines.
- WW – wastewater.
- *All measurements are to be entered in mm unless stated otherwise (except for coordinates and levels which are entered in meters).*

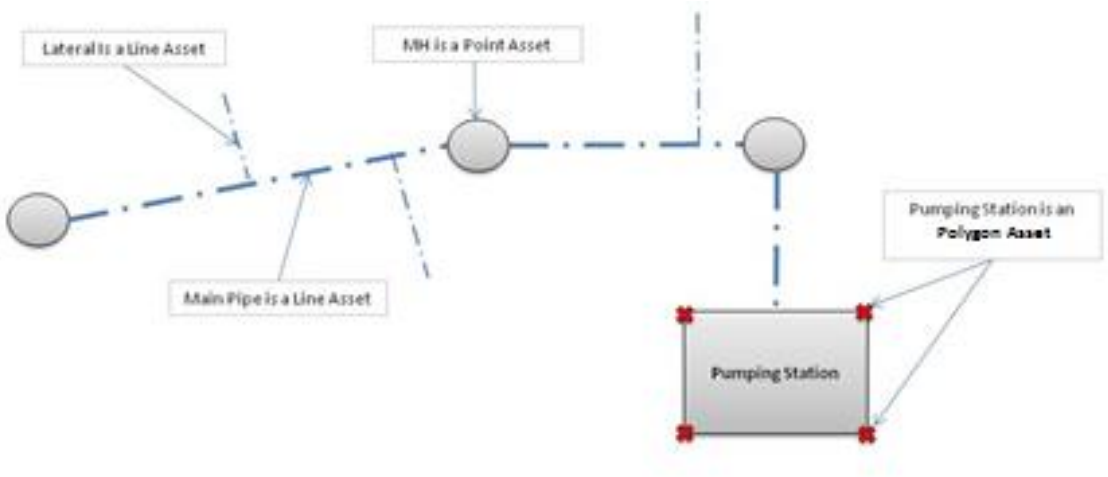


Figure 1: Point, Line or Polygon Asset

2 Asset Category

2.1 Roading

Formal roading and pavement as-built requirements are specified by the IRTSG. Additional survey as-built information may be required where there is a significant modification to road alignment, or where construction deviates from the design construction documentation.

Note: For the purposes of this guideline any Stormwater drainage within the road corridor is considered part of the Stormwater system contrary to other CCC asset management systems.

2.2 Retaining Walls

Retaining wall requirements are specified by IRTSG.

2.3 WW, WS & SW Pump Station Equipment

All equipment contained in pump stations (and treatment plants) are to be captured using the Stations Asset Pickup Sheet

2.4 Stormwater Drainage

All relevant Stormwater assets are to be surveyed according to this Survey As-Built Guideline. Appendix D lists and details the SW assets (and asset attributes) that are likely to be encountered and required to be recorded.

2.4.1 Stormwater Line Assets

Table 1 lists the SW line assets to be surveyed – see Appendix E for all features and attributes required.

Table 1: SW Line Assets

Line Asset (UID Prefix)	Feature to be Surveyed	SAG Feature No
Main Pipes (SwPipe)	Location and invert level of each end and bend of the pipe [X, Y, Z]	**E17**
Lateral Pipes (SwLateral)	X and Y position of each end and bend of the pipe	**E19**
Repair/Relay Dig (SwRepair)	MH distance of start and end of the pipe repair	**E20**
Pipe Lining (SwRepair)	MH distance of start and end of the lining patch	**E21**
Thrust Block [Outline] (SwStructure)	X and Y of corners of the feature	**E26**
Pump Station or Structure [Outline] (SwStructure)	X and Y of corners of the feature	**E27, E36-E38**
Culverts (SwPipe)	Location and invert of each end of the structure [X, Y, Z]	**E31**
Structural Pipe Protection (PipeProtection)	X and Y of each end of the protection	**E34**
Electrical	X and Y position of each end and bend	**F10**

2.4.2 Stormwater Point Assets

Table 2 lists the SW point assets to be surveyed – see Appendix E for all features and attributes required.

Table 2: SW Point Assets

Point Asset (UID Prefix)	Feature to be Surveyed	SAG Feature No
Single Sump (SwInlet/SwOutlet)	Centre of Chamber [X , Y and Z at lid and base]	**E01**
Double Sump (SwInlet/SwOutlet)	Centre of Chamber [X , Y and Z at lid and base]	**E02**
Corner Sump (SwInlet/SwOutlet)	Centre of Chamber [X , Y and Z at lid and base]	**E03**
Triple Sump (SwInlet/SwOutlet)	Centre of Chamber [X , Y and Z at lid and base]	**E04**
Hillside Sump (SwInlet/SwOutlet)	Centre of Chamber [X , Y and Z at lid and base]	**E05**
Inspection Chamber (SwStructure)	Centre of Chamber [X , Y and Z at lid and base]	**E06**
Small Trafficable Sump (SwInlet/SwOutlet)	Centre of Chamber [X , Y and Z at lid and base]	**E07**
House Drain Sump (SwInlet/SwOutlet)	Centre of Chamber [X , Y and Z at lid and base]	**E08**
Manholes (SwAccess)	Centre of Chamber [X , Y and Z at lid and base]	**E09 to E12**
Junction (SwJunction)	X and Y position	**E22**
Lateral Junction (SwJunction)	X and Y position	**E23**
Inspection Point (SwAccess)	X and Y position	**E24**
End Cap (SwEndCap)	X and Y position	**E25**
Thrust Block [Point] (Pipe Restraint)	X and Y position	**E26**
Water Stop [Point] (Pipe Restraint)	X and Y position	**E26?**
Outlet (SwOutlet)	X, Y and Z position	**E29**
Valve (SwValve)	Centre of Valve [X , Y and Z]	**E30**
Headwall (SwInlet/SwOutlet)	X, Y and Z position	**E32**
Flow Restriction (SwFlowRestriction)	X, Y and Z position	**E33**
Vent (SwVent)	Centre of Vent [X and Y]	**E35**

2.5 Wastewater Drainage

All relevant Wastewater assets are to be surveyed according to this Survey As-Built Guideline. Appendices D, E and G list and detail the Wastewater assets (and asset attributes) that are likely to be encountered and required to be recorded.

2.5.1 Wastewater Line Assets

Table 3 lists the WW line assets to be surveyed – see Appendices D, F and H for all features and attributes required.

Table 3: WW Line Assets

Line Asset (UID Prefix)	Feature to be Surveyed	SAG Feature No
Flush Tank [Outline] (WwFlushTank)	X and Y of corners of the surrounding feature	**D14**
Main Pipes (WwPipe)	Position and invert of each end and bend of the pipe [X, Y, Z]	**D17**
Collector Pipes (WwPipe)	Position and invert of each end and bend of the pipe [X, Y, Z]	**D18**
Lateral Pipes (WwLateral)	X and Y position of each end and bend of the pipe	**D19**
Repair/Relay Dig (WwRepair)	MH distance of start and end of the pipe repair	**D20**
Pipe Lining (WwRepair)	MH distance of start and end of the lining patch	**D21**
Thrust Block [Outline] (WwStructure)	X and Y of corners of the surrounding feature	**D26**
Pump Station or Structure [Outline] (WwStructure)	X and Y of corners of the surrounding feature	**D27, D36-D39**
Structural Pipe Protection (PipeProtection)	X and Y of each end of the protection	**D34**
WW Pressure Main (WwPipe)	Position and invert of each end and bend of the pipe [X, Y, Z]	**E02**
WW Pressure Lateral (WwLateral)	X and Y position of each end and bend of the pipe	**E08**
Electrical	X and Y position of each end and bend	**F10**
Vacuum Lateral (WwLateral)	X and Y position of each end, bend and lift of pipe	**H03**
Vacuum Main (WwPipe)	Position and invert of each end, bend and lift of the pipe [X, Y, Z]	**H04**

2.5.2 Wastewater Point Assets

Table 4 lists the WW point assets to be surveyed – see Appendices D, F and H for all features and attributes required.

Table 4: WW Point Assets

Point Asset (UID Prefix)	Feature to be Surveyed	SAG Feature No
Inspection Chamber (WwAccess)	Centre of Chamber [X , Y and Z at lid and base]	**D06**
Manholes (WwAccess)	Centre of Chamber [X , Y and Z at lid and base]	**D09 to D12**
Flush Manhole (WwAccess)	Centre of Chamber [X , Y and Z at lid and base]	**D13**
Junction (WwJunction)	X and Y position	**D22**
Lateral Junction (WwJunction)	X and Y position	**D23**
Inspection Point (WwAccess/)	X and Y position	**D24**
End Cap (WwEndCap)	X and Y position	**D25**
Thrust Block [Point] (Pipe Restraint)	X and Y position	**D26?**
Water Stop [Point] (Pipe Restraint)	X and Y position	**D26?**
Outfall (WwOutfall)	X, Y and Z position	**D29**
Valve (WwValve)	Centre of Valve [X , Y and Z]	**D30**
Vent (WwVent)	Centre of Vent [X and Y]	**D35**
Pressure Sewer System Tank (WwLocalPressureTankSystem)	Centre of Pressure Tank [X , Y and Z]	**F01**
Pressure Sewer System Boundary Kit (WwLocalPressureBoundaryKit)	Centre of Boundary Kit [X , Y and Z]	**F03**
Flushing Point Access (WwAccess)	Centre of Flushing Point [X , Y and Z at lid and base]	**F04**
Isolation Valve (WwValve)	Centre of Isolation Valve [X , Y and Z]	**F05**
Reducing Coupler (WwChange)	X and Y position	**F06**
Pressure Sewer System Control Panel (WwLocalPressureControlPanel)	X and Y position	**F07**
Vacuum Chamber (WwVacuumChamber)	Centre of Vacuum Chamber [X , Y and Z at lid and base]	**H01**
Division Valve (WwValve)	Centre of Valve [X , Y and Z]	**H02**

2.6 Water Supply Systems

All relevant water supply assets are to be surveyed according to this Survey As-Built Guideline. Appendices D, E and F lists and details the WS assets (and asset attributes) that are likely to be encountered and required to be recorded.

2.6.1 Water Supply Line Assets

Table 5 lists the WS line assets to be surveyed - see Appendix G for all features and attributes required.

Table 5: WS Line Assets

Line Asset (UID Prefix)	Feature to be Surveyed	SAG Feature No
WS Thrust Block [Outline] (WsStructure)	X and Y of corners of the surrounding feature	**G03**
WS Pipes – Mains (WsPipe)	Location and invert of each end and bend of the pipe [X, Y, Z]	**G04**
WS Pipes – Sub Mains (WsPipe)	Location and invert of each end and bend of the pipe [X, Y, Z]	**G04**
WS Pipes - Crossover (WsPipe)	Location and invert of each end and bend of the pipe [X, Y, Z]	**G04**
WS Pipes - Lateral (WsLateral)	X and Y position of each end and bend of the pipe	**G04**
WS Reservoir [Outline] (WsReservoir)	X and Y of corners of the surrounding feature, Z at base	**G09**
WS Structure [Outline] (WsStructure)	X and Y of corners of the surrounding feature	**G11**
Electrical	X and Y position of each end and bend	**F10**
Flush Tank Water Supply Pipes (WsPipe)	X and Y position of each end and bend of the pipe	**G15**
Structural Pipe Protection (PipeProtection)	X and Y of each end of the protection	**G16**

2.6.2 Water Supply Point Assets

Table 6 lists the WS point assets to be surveyed - see Appendix F and D for all features and attributes required.

Table 6: WS Point Assets

Point Asset (UID Prefix)	Feature to be Surveyed	SAG Feature No
WS Fire Hydrant (WsHydrant)	Centre of Asset [X, Y, Z]	**G01**
WS Valve (WsValve)	Centre of Asset [X, Y, Z]	**G02**
WS Thrust Block [Point] (WsStructure)	X and Y position	**G03**
Water Stop [Point] (Pipe Restraint)	X and Y position	**G26?**
WS End Cap (WsEndCap)	X and Y position	**G05**
WS Connector (WsConnector)	X and Y position	**G07**
WS Meter (WsMeter)	X and Y position	**G08**
WS Reservoir Inlet/Outlet WaterSupplyInlet/Outlet ()	X and Y position	**G10**
WS Restrictor (WsRestrictor)	X and Y position	**G12**
Air Gap Separator (WsAirGapSeparator)	X and Y position	**G17**

2.7 Parks and Green Space

All relevant parks and greenspace assets are to be surveyed according to this Survey As-Built Guidline. Appendices J,K,L,M,N,O and P lists and details the Parks and Green Space assets (and asset attributes) that are likely to be encountered and required to be recorded.

2.7.1 Parks and Green Space Line Assets

Table 7 lists the park line assets to be surveyed – see Appendices J, K, N and P for all features and attributes required.

Table 7: PRK Line Assets

Line Asset (UID Prefix)	Feature to be Surveyed	SAG Feature No
Hedge	X and Y position of each end and bend	**J02**
Gate	X and Y position of each end and bend	**K09**
Fence	X and Y position of each end and bend	**N06**
Retaining Wall	X and Y position of each end and bend	**N07**
Safety Barrier	X and Y position of each end and bend	**N08**
Parks Cable	X and Y position of each end and bend	**P05**

2.7.2 Parks and Green Space Outline/Polygon Assets

Table 8 lists the park outline/polygon assets to be surveyed – see Appendices J, K, L, M, N and O for all features and attributes required.

Table 8: PRK Outline/Polygon Assets

Outline Asset (UID Prefix)	Feature to be Surveyed	SAG Feature No
Garden	X and Y of corners and bends of the area feature	**J01**
Natural Area	X and Y of corners and bends of the area feature	**J03**
Turf	X and Y of corners and bends of the area feature	**J04**
Stand of Trees	X and Y of corners and bends of the area feature	**J06**
Pool	X and Y of corners and bends of the area feature	**K14**
Car Park	X and Y of corners and bends of the area feature	**L01**
Ramp	X and Y of corners and bends of the area feature	**L03**
Track	X and Y of corners and bends of the area feature	**L04**
Terraces	X and Y of corners and bends of the area feature	**L05**
Dog Exercise Area	X and Y of corners and bends of the area feature	**M01**
Playground Surface	X and Y of corners and bends of the area feature	**M03**
Boardwalk	X and Y of corners and bends of the area feature	**N01**
Boat Ramp	X and Y of corners and bends of the area feature	**N02**
Bridge	X and Y of corners and bends of the area feature	**N03**
Jetty	X and Y of corners and bends of the area feature	**N05**
Shelter	X and Y of corners and bends of the area feature	**N09**
Stairs	X and Y of corners and bends of the area feature	**N10**
Stockyard	X and Y of corners and bends of the area feature	**N12**
Sports Area	X and Y of corners and bends of the area feature	**O01**
Sports Field	X and Y of corners and bends of the area feature	**O02**

Parks and Green Space Point Assets

Table 9 lists the park point assets to be surveyed – see Appendices J, K, M, N, O, and P for all features and attributes required.

Table 9: PRK Point Assets

Outline Asset (UID Prefix)	Feature to be Surveyed	SAG Feature No
Tree	X and Y position	**J05**
Artwork	X and Y position	**K01**
Bin	X and Y position	**K02**
BBQ	X and Y position	**K03**
Bollard	X and Y position	**K04**
Clock	X and Y position	**K05**
Cycle Equipment	X and Y position	**K06**
Flagpole	X and Y position	**K07**
Fountain	X and Y position	**K08**
Light	X and Y position	**K10**
Light Pole	X and Y position	**K11**
Picnic Table	X and Y position	**K12**
Plaque	X and Y position	**K13**
Seat	X and Y position	**K15**
Shower	X and Y position	**K16**
Sign	X and Y position	**K17**
Tree Cage	X and Y position	**K18**
Tree Grate	X and Y position	**K19**
Tree Planter	X and Y position	**K20**
Water Feature	X and Y position	**K21**
Weather Station	X and Y position	**K22**
Judder Bar	X and Y position	**K23**
Dog Exercise Equipment	X and Y position	**M02**
Play Equipment	X and Y position	**M04**
Play Modular Unit	X and Y position	**M05**
Cattle Stop	X and Y position	**N04**
Stile	X and Y position	**N11**
Viewing Platform	X and Y position	**N13**
Water Tower	X and Y position	**N14**
Water Trough	X and Y position	**N15**
Sports Equipment	X and Y position	**O03**
Parks Tank	X and Y position	**P01**
Parks Pump	X and Y position	**P02**
Irrigation System	X and Y position	**P03**
Parks Backflow Preventer	X and Y position	**P04**
Parks Electrical System	X and Y position	**P06**

3 Survey Control

Every survey as-built is to be completed in terms of the project specific benchmark control (detailed on the construction drawings) - these are in Mt Pleasant 2000 projection (New Zealand Geodetic Datum 2000).

The benchmarks are project specific (based upon the Christchurch Drainage Datum).

The benchmarks used for As-builting are to be the same as those used for construction set out.

If these benchmarks are destroyed please contact the CCC Project Manager for advice on which benchmarks to use. Do not source benchmarks from elsewhere as each project is in terms of specific project benchmarks.

3.1 Accuracies

This document frequently refers to an accuracy margin i.e. +/- X [mm]. X is typically 10mm, 30mm, 50mm or 100mm depending on the feature surveyed. It defines X as representing 2 standard deviations from the mean (or at a 95% confidence interval). For example, if the Survey As-built Guideline requires an accuracy of +/- 10mm, the delivered value will be within +/- 10mm 95% of the time.

The required accuracy is determined by the type and nature of the asset. The Tables 10 and 11 detail the required accuracies.

3.1.1 Location Certainty 'Survey Accurate'

All assets are to be surveyed to the accuracies are outlined in Table 10. The attribute 'Location Certainty' is to be set accordingly to 'Survey Accurate'.

Table 10: Accuracies required for survey as-built (Survey Accurate)

Required survey as-built accuracy (±mm)				
	mmN	mmE	Height	Height Type
Pipe Invert	50	50	10	Invert
Manhole Lid	100	100	30	Lowest Corner
Manhole Base	100	100	30	Centre of Chamber Lowest Point
Lateral Pipe	100	100	N/A	N/A
All assets (unless specified above)	100	100	30	

Note: these accuracies cannot be reached using GPS devices.

3.1.2 Location Certainty 'Approximate'

In some cases if the asset is not directly accessible to be surveyed, it may not be possible to survey it to the required accuracy as specified above. These cases could be one of the following:

- Pipes laid without trench (e.g. directional drilling, pipe bursting) if pipe start/end not accessible
- Lined pipes (incl. laterals) without manhole access
- Assets within structures (e.g. pumps inside wet wells)
- Lining or repair patches where the start and end distance from the upstream manhole is given

These assets may be surveyed to the accuracies in Table 11 and the attribute 'Location Certainty' is to be set to one of the options in section 4.1.5.3 (except 'survey accurate').

If any asset was not surveyed to survey accuracy and location certainty 'approximate' has been used, the contractor/sub-contractor needs to supply justification for not meeting the survey requirements. This is to be supplied in the survey report.

Table 11: Accuracy definitions for assets which are not surveyed to survey standard (Approximate)

Location Certainty 'Approximate' (±mm)				
	mmN	mmE	Height	Height Type
Pipe Invert	1000	1000	150	Invert
Manhole Lid	1000	1000	150	Lowest Corner
Manhole Base	1000	1000	150	Centre of Chamber Lowest Point
Lateral Pipe	1000	1000	N/A	N/A
All assets (unless specified above)	1000	1000	150	

3.2 Design Change

A design change is any deliberate decision to not do the construction in the way specified by the construction drawings. This may cover:

- Any additional assets installed
- Where the asset material or size differs from the design.
- Any other attribute that differs from design including positional information that the project engineer or surveyor considers a significant change from design.

4 Deliverables

This section specifies which documents are to be provided and the format for delivery.

To satisfy this document there are four deliverables to the survey as-built:

- CCC As-built Template (CAT) (4.1)
- Red Line Marked Up Drawings (4.2)
- Survey As-built Report (4.3)
- Stations/Treatment Plant Asset Pickup Sheet (4.5)

4.1 CCC As-built Template file (.xlsx) 'CAT'

All required coordinate data, level data and asset attributes (metadata) are to be captured within the latest version of the CCC As-built Template (CAT) at the commencement of the survey.

There are 2 CAT versions and they should only be used for the appropriate networks

- CAT RETIC - For all Reticulation related assets (WW, WS, SW)
- CAT Parks & Greenspace - For all Parks & Greenspace related assets

The CAT has been separated into two input sheets and two reference sheets (Figure 2).

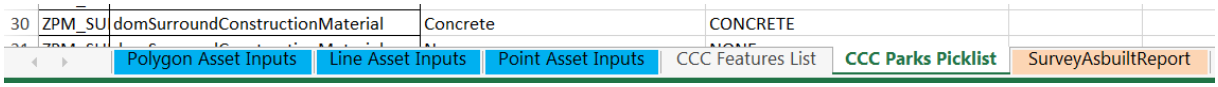


Figure 2: C.A.T. Sheets

4.1.1 Feature Templates Sheet

The CAT tab 'Feature_Templates' contains template rows for all SAG features (Figure 3). The templates are sorted by feature number (D01, D03 etc.) in column A. In order to use the template rows in the point, line or outline/polygon asset input sheets, simply copy the respective row with the correct SAG feature number in column A and paste it into the point, line or outline/polygon asset input sheet.

All cells highlighted in green contain pick lists which refer to the 'PickLists' tab (section 4.1.2). All other fields are to be completed or, if containing 'LEAVE BLANK', to be left blank or unchanged.

Refer to the individual feature descriptions for fields which may not need to be completed for all assets.

	A	B	C	D	E	F	G	H
1								
2	**Garden**							
3	*Type of polygon feature*	*Specific type of Asset*	*Differs from design (yes/no)*	*Unique identifier from drawing*	*Polygon Vertex Easting coordinate*	*Polygon Vertex Northing coordinate*	*Order of vertex / point along polygon*	*Date of commission*
4	J01	Specific type of Garden	Differs from design (yes/no)	Unique identifier from drawing	Polygon Vertex Easting coordinate	Polygon Vertex Northing coordinate	Order of vertex / point along polygon	Date of commission
5	**Hedge**							
6	*Type of line feature*	*Leave Blank*	*Differs from design (yes/no)*	*Unique identifier from drawing*	*Line Vertex Easting coordinate*	*Line Vertex Northing coordinate*	*Order of vertex / point along Line*	*Date of commission*
7	J02	Leave Blank	Differs from design (yes/no)	Unique identifier from drawing	Line Vertex Easting coordinate	Line Vertex Northing coordinate	Order of vertex / point along Line	Date of commission
8	**Natural Area**							
9	*Type of polygon feature*	*Specific type of Natural Area*	*Differs from design (yes/no)*	*Unique identifier from drawing*	*Polygon Vertex Easting coordinate*	*Polygon Vertex Northing coordinate*	*Order of vertex / point along polygon*	*Date of commission*
10	J03	Specific type of Natural Area	Differs from design (yes/no)	Unique identifier from drawing	Polygon Vertex Easting coordinate	Polygon Vertex Northing coordinate	Order of vertex / point along polygon	Date of commission
11	**Turf**							
12	*Type of polygon feature*	*Specific type of Turf*	*Differs from design (yes/no)*	*Unique identifier from drawing*	*Polygon Vertex Easting coordinate*	*Polygon Vertex Northing coordinate*	*Order of vertex / point along polygon*	*Date of commission*
13	J04	Specific type of Turf	Differs from design (yes/no)	Unique identifier from drawing	Polygon Vertex Easting coordinate	Polygon Vertex Northing coordinate	Order of vertex / point along polygon	Date of commission
14								
15	**Artwork**							
16	*Type of point feature*	*Specific type of Artwork*	*Differs from design (yes/no)*	*Unique identifier from drawing*	*Centre of Structure in Easting coor*	*Centre of Structure in Northing coordinate*	*Leave Blank*	*Date of commission*
17	K01	Specific type of Artwork	Differs from design (yes/no)	Unique identifier from drawing	Centre of Structure in Easting coor	Centre of Structure in Northing coordinate	Leave Blank	Date of commission
18	**Bin**							
19	*Type of point feature*	*Specific type of Bin*	*Differs from design (yes/no)*	*Unique identifier from drawing*	*Centre of Structure in Easting coor*	*Centre of Structure in Northing coordinate*	*Leave Blank*	*Date of commission*
20	K02	Specific type of Bin	Differs from design (yes/no)	Unique identifier from drawing	Centre of Structure in Easting coor	Centre of Structure in Northing coordinate	Leave Blank	Date of commission
21	**BBQ**							
22	*Type of point feature*	*Leave Blank*	*Differs from design (yes/no)*	*Unique identifier from drawing*	*Centre of Structure in Easting coor*	*Centre of Structure in Northing coordinate*	*Leave Blank*	*Date of commission*
23	K03	Leave Blank	Differs from design (yes/no)	Unique identifier from drawing	Centre of Structure in Easting coor	Centre of Structure in Northing coordinate	Leave Blank	Date of commission
24	**Bollard**							
25	*Type of point feature*	*Leave Blank*	*Differs from design (yes/no)*	*Unique identifier from drawing*	*Centre of Structure in Easting coor*	*Centre of Structure in Northing coordinate*	*Leave Blank*	*Date of commission*
26	K04	Leave Blank	Differs from design (yes/no)	Unique identifier from drawing	Centre of Structure in Easting coor	Centre of Structure in Northing coordinate	Leave Blank	Date of commission
27	**Clock**							
28	*Type of point feature*	*Leave Blank*	*Differs from design (yes/no)*	*Unique identifier from drawing*	*Centre of Structure in Easting coor*	*Centre of Structure in Northing coordinate*	*Leave Blank*	*Date of commission*
29	K05	Leave Blank	Differs from design (yes/no)	Unique identifier from drawing	Centre of Structure in Easting coor	Centre of Structure in Northing coordinate	Leave Blank	Date of commission
30	**Cycle Equipment**							
31	*Type of point feature*	*Specific type of Cycle Equipm*	*Differs from design (yes/no)*	*Unique identifier from drawing*	*Centre of Structure in Easting coor*	*Centre of Structure in Northing coordinate*	*Leave Blank*	*Date of commission*
32	K06	Specific type of Cycle Equipr	Differs from design (yes/no)	Unique identifier from drawing	Centre of Structure in Easting coor	Centre of Structure in Northing coordinate	Leave Blank	Date of commission
33	**Flagpole**							
34	*Type of point feature*	*Leave Blank*	*Differs from design (yes/no)*	*Unique identifier from drawing*	*Centre of Structure in Easting coor*	*Centre of Structure in Northing coordinate*	*Leave Blank*	*Date of commission*
35	K07	Leave Blank	Differs from design (yes/no)	Unique identifier from drawing	Centre of Structure in Easting coor	Centre of Structure in Northing coordinate	Leave Blank	Date of commission
36	**Fountain**							
37	*Type of point feature*	*Leave Blank*	*Differs from design (yes/no)*	*Unique identifier from drawing*	*Centre of Structure in Easting coor*	*Centre of Structure in Northing coordinate*	*Leave Blank*	*Date of commission*
38	K08	Leave Blank	Differs from design (yes/no)	Unique identifier from drawing	Centre of Structure in Easting coor	Centre of Structure in Northing coordinate	Leave Blank	Date of commission

Figure 3: Feature Templates Tab in the CCC As-built Template

4.1.2 Pick Lists Sheet

A table of all valid pick list values can be found in the CAT tab 'PickLists'. The table can be filtered by list name, value or description (Figure 4).

The version number of the CAT can be found in cell E2. Please ensure to always use the latest CAT version when starting a new survey.

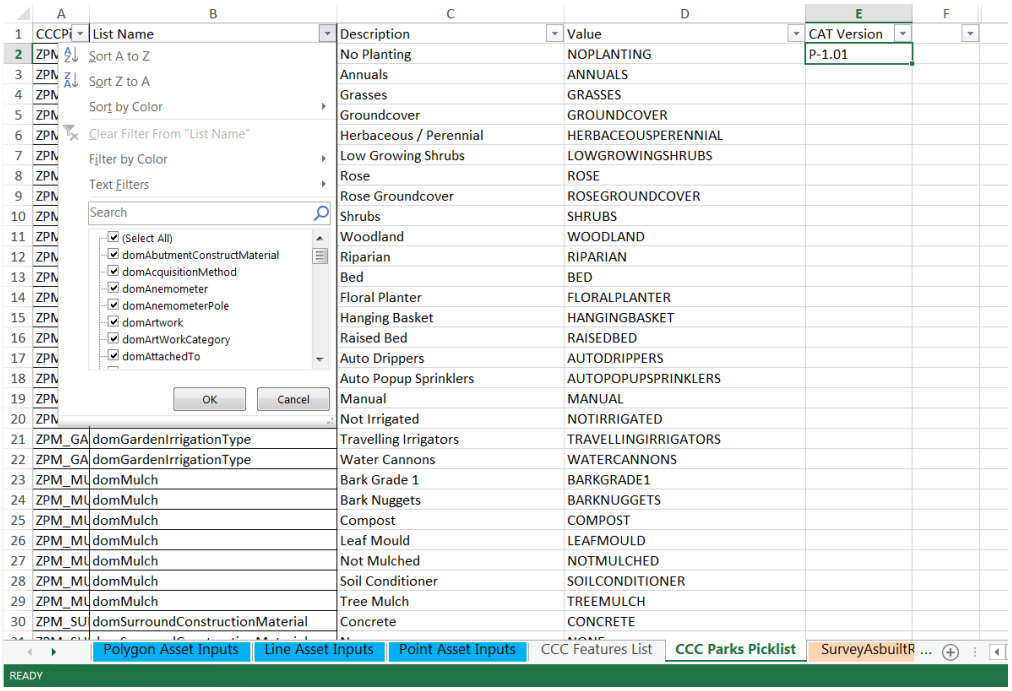


Figure 4: PickLists Tab in the CCC As-built Template

4.1.3 Point Asset Input Sheet

The 'Point Asset Inputs' Sheet holds all point assets, a unique number needs to be specified for every asset. Refer to Appendices D, E, F, G & H for details of geospatial and attribute requirements. Figure 5 shows the CAT headers for point assets.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	SAG Feature Number	Asset Type	Old or New Asset	Design Change	Unique Name From Design Data	mE	mN	RL	I	SUMP Base Level Z	Pit Size	Date of Commission	Location Certainty	Service Status	Main Contractor	Date of Survey	Guideline Revision Used

Figure 5: Point Asset Input Sheet Headings

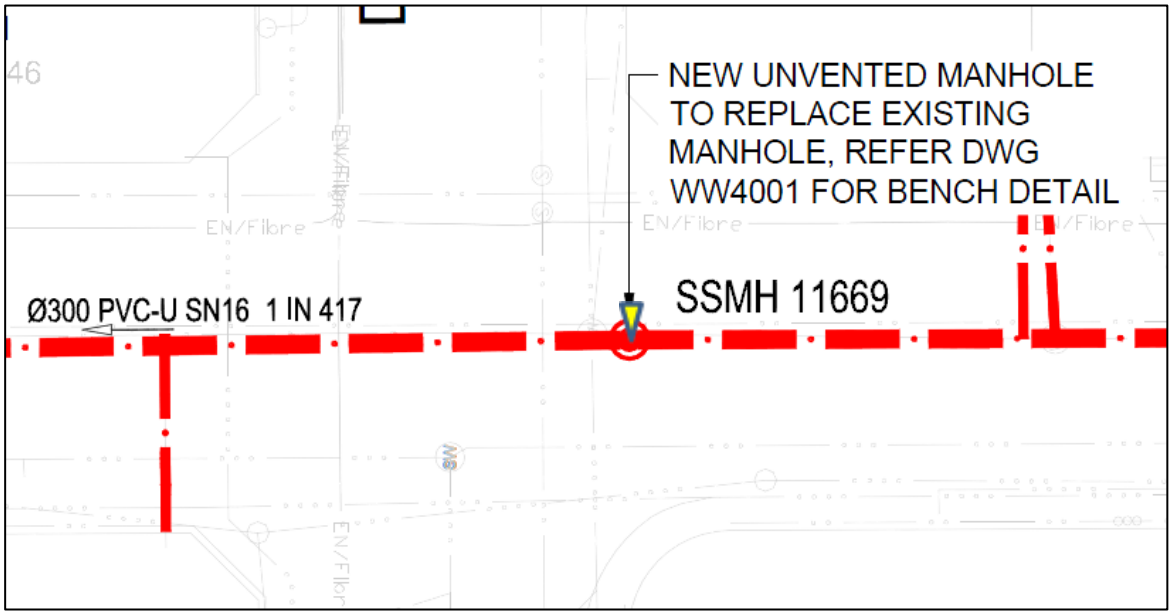
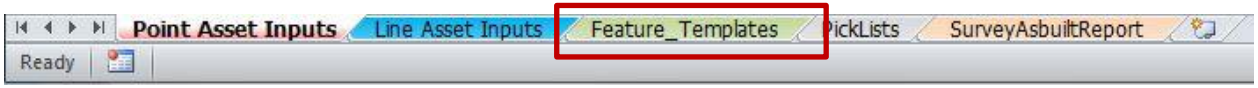


Figure 6: Point Asset Input Example – Manhole with unique name SSMH 11669 (New)

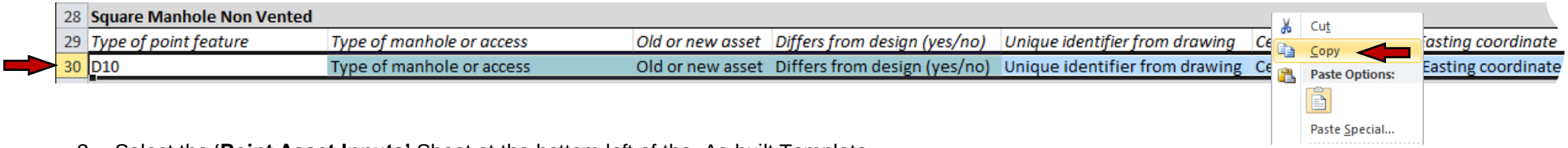
Point Asset – Input Sheet – directions for using feature templates

The following explains the use of the Point Asset Input sheet for the example manhole in figure 6 (see Appendices C-G for further notes and examples).

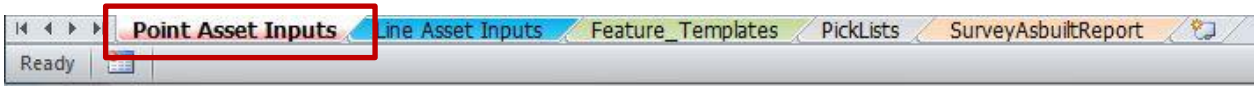
1. Select the **'Feature_Templates'** Sheet at the bottom left of the CCC As-built Template.



2. Select the correct SAG Feature (D10 for Square Manhole Non Vented) and **copy the whole row** starting with that number (D10).



3. Select the **'Point Asset Inputs'** Sheet at the bottom left of the As-built Template.



4. **Paste** the feature template into the next empty row (Figure 7).
5. **Complete all columns** according to the SAG Feature table (regardless of design change).

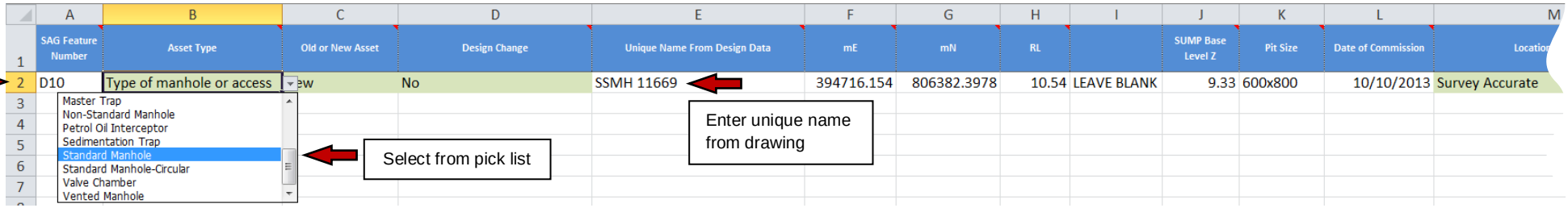


Figure 7: Point Asset Input Example of Square Manhole Non Vented (D10) with the unique name 'SSMH 11669'

- In most cases the asset being surveyed will be a new asset, but there is an option for old assets to be entered if required. (i.e. previously in the CCC database).
- For **old assets** which were not installed by the contractor (col C = Old)but do exist on the ground, enter all attributes which are known. Unknown attributes can be left blank/unchanged.
- 'Design Change' will be either 'Yes' or "No' depending on whether the delivery team surveyor considers the asset has a design change (see section 3.2)
- Select values from pick lists where highlighted in green
- Enter the unique name as shown on the construction drawing.
- Columns containing 'LEAVE BLANK' are to be left blank or must hold the value 'LEAVE BLANK'

4.1.4 Line Asset Input Sheet

A line or outline asset is any asset that is defined by more than one point e.g. a pipe or structure. Similar to the point inputs, a unique number needs to be specified for every asset. For example, if the asset is a lateral, the user will need to specify the same unique number for each point (vertex) surveyed on that lateral. Figure 8 shows the CAT headers for line assets.

Figure 8: Line Asset Input Sheet Headings

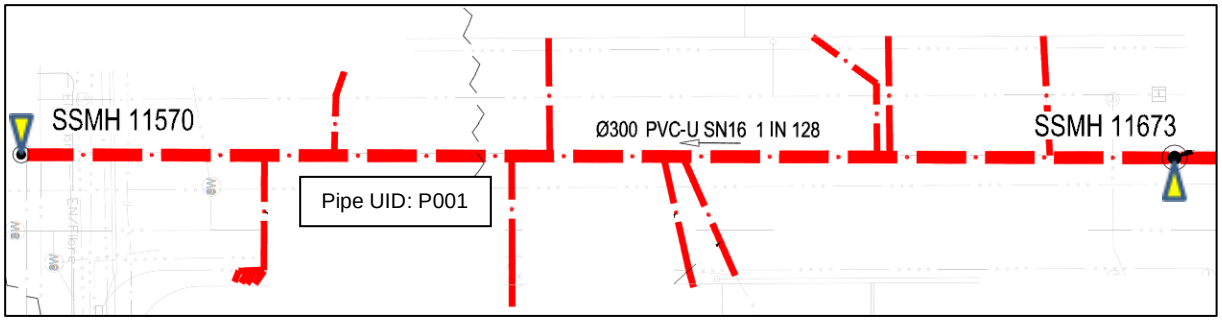
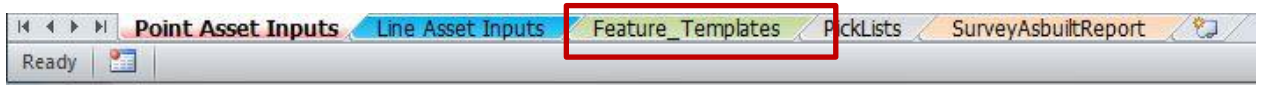


Figure 9: Example of gravity pipe between SSMH 11570 and SSMH 11673 with the unique name 'P001'

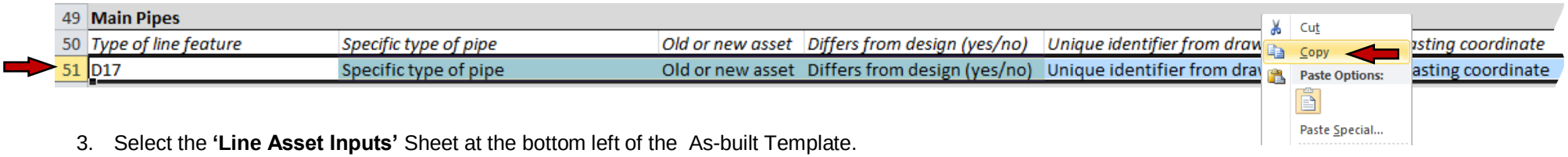
Line Asset – Input Sheet – directions for using feature templates

The following explains the use of the Line Asset Input sheet on the example gravity pipe in figure 9 (see Appendices C-G for further notes and examples).

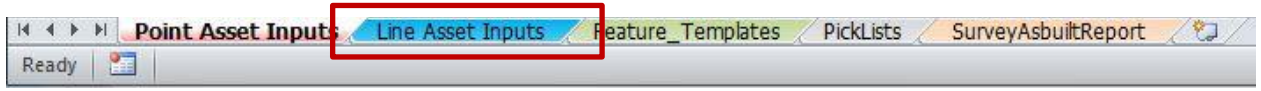
1. Select the **'Feature_Templates'** Sheet at the bottom left of the CCC As-built Template.



2. Select the correct SAG Feature (D17 for Main Pipes in Gravity) and **copy the whole row** starting with that number (D17).



3. Select the **'Line Asset Inputs'** Sheet at the bottom left of the As-built Template.



4. **Paste** the feature template into the next empty row (create one row for each line or outline vertex) (Figure 10).
5. **Complete all columns** according to the SAG Feature table (regardless of design change) starting with the downstream vertex followed by all line/outline vertices in the correct order to the upstream vertex (please also enter the vertex number into column I) .

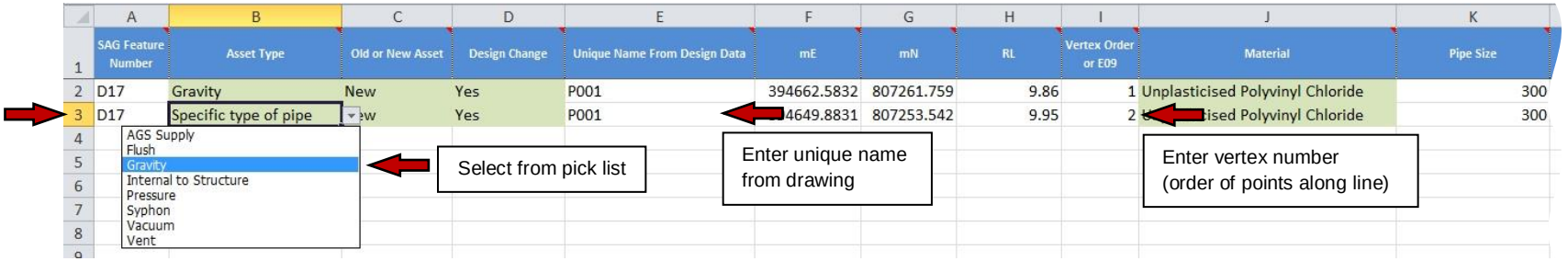


Figure 10: Line Asset Input Example of gravity pipe between SSMH 11570 and SSMH 11673 with the unique name 'P001' (column A-K)

- In most cases the asset being surveyed will be a new asset, but there is an option for old assets to be entered if required. (i.e. previously in the CCC database).
- For **old assets** which were not installed by the contractor (col C = Old) but do exist on the ground, enter all attributes which are known. Unknown attributes can be left blank/unchanged.
- 'Design Change' will be either 'Yes' or "No' depending on whether the delivery team surveyor considers the asset has a design change (see section 3.2)
- Select values from pick lists where highlighted in green
- Enter the unique name as shown on construction drawing.
- **Column I** is used to indicate the order of the point (vertex) along the pipe. I.e. enter 1 for the first point, 2 for the second point and so on.
- Column I may also be used to indicate the start and end points of an arc (curved line). Enter SA for start of arc and EA for end of arc. For more details see feature E09.
- Columns containing 'LEAVE BLANK' are to be left blank or must hold the value 'LEAVE BLANK'

- The **'At Pit' and 'To Pit'** fields are required by the system to assign coordinate levels for each invert. If surveying an invert, the pit which you are surveying is the 'At Pit' and the pit at the other end of the pipe is the 'To Pit'. Always start at the downstream pit (for examples see Appendix C). See figure 11 below for example data in the CAT.

	H	I	J	K	L	M	N	O
1	RL	Vertex Order or E09	Material	Pipe Size	At Pit	To Pit	Manufacturer	Main Contractor
2	9.86	1	Unplasticised Polyvinyl Chloride	300	SSMH 11570	SSMH 11673	Humes Pipeline Systems	City Care
3	9.95	2	Unplasticised Polyvinyl Chloride	300	SSMH 11673	SSMH 11570	Humes Pipeline Systems	City Care
4								

Downstream

Upstream

Invert at 'At Pit'

'At Pit' Manhole UID: Pit at which coordinates and invert level were surveyed

Figure 11: Line Asset Input Example of gravity pipe between SSMH 11570 and SSMH 11673 with the unique name 'P001' (column H-P)

4.1.5 Pick List Clarifications

The following clarifies some values used in the CAT pick lists

4.1.5.1 Old and New Manholes

Old Manhole	Less than 50% repair (maintenance i.e. cracking, minor repairs) Use old asset ID (from CCC GIS), e.g. WWMH-19912
New Manhole	More than 50 % (Refurbishment i.e. new lid and riser section) New asset ID, e.g. WWMH_10569_01

4.1.5.2 Commission/Decommission Date

Commission Date	When the asset was commissioned, when it became operational
Decommission Date	When the asset was either abandoned or removed (Service Status abandoned or removed)

4.1.5.3 Location Certainty

See section 3.1 for further details regarding Location Certainty.

Survey Accurate	Asset surveyed to surveying standards - see 3.1.1
Survey Accurate XY, Approximate Z	Horizontally surveyed to surveying standards, vertically surveyed to approximate height
Survey Accurate Z, Approximate XY	Vertically surveyed to surveying standards, horizontally surveyed to approximate location
Approximate XYZ	Asset surveyed to approximate location – see 3.1.2

4.2 Red-line Marked Up Drawings

Each survey as-built is to be accompanied by a complete set of scanned redline drawings. The purpose of these is to record and detail any changes (from the design) during construction other than slight positional changes.

The Red-line drawings need to contain the full drawing set as latest revisions, including any agreed design changes, with the specific changes (including survey as-built levels) marked up in red pen and annotated with exact details of the change. Such changes might include:

- Additional assets installed, e.g. Manholes, Sumps.
- Changes to material types.
- Changes to pipe sizes, e.g. 150mm changed to 225mm.
- Additional bends in pipe.
- Change in the depth of pipe, e.g. 0.8 m changed to 1.5 m.
- Change in pit sizes, e.g. 1050mm changed to 1200mm.
- Reduction of assets installed, i.e. manhole not installed.
- Any unexpected findings, e.g. redundant 1m brick barrel sewer.
- Change in structure type. e.g. manhole to sump.

Each page shall be signed and dated, even in case of 'no changes'.

4.3 Survey As-built Report

A survey as-built report is required to provide detail for certain key areas detailed below. The purpose of this is to provide the CCC corporate data team with the relevant information into how the survey was done. It also provides a measure of quality control ensuring that the key issues have been addressed.

The report is to be delivered as an additional tab within the CAT spreadsheet file and is to consist of the following headings:

1. To be titled 'CCC Project number and name' survey as-built report.
2. List of CCC construction drawings (list drawing numbers).
3. Survey benchmarks used for control.
4. Equipment used (and calibration expiry date).
5. Summary of redline drawing changes, (summarise changes from design).
6. General comments (include unexpected findings and any other comments worth noting).

4.4 Asset Naming (Unique Identifiers)

1. All assets must be named as per design drawings
2. If assets are installed/constructed outside of design drawings, use a consistent naming convention to uniquely identify each asset. For example:

"VAC-MAIN 2-14" (Prefix, ID)
"VMH 2A" (Prefix, ID)
"WWMH_10569_01" (Prefix_ ProjectNumber_ID)

Please ensure that a unique identifier is used for each asset

4.5 Decommissioning of existing assets

If during the course of the project an existing asset needs to be removed or otherwise decommissioned the process for doing so is outlined below.

4.5.1 Geospatial Assets

The decommissioning process for geospatial assets requires the contractor to identify the following information and provide it to CCC in a tabular format as part of the CAT (A separate tab in the CAT has been made for this purpose)

Table 12. Decommission data required for geospatial assets

Name	Description
GIS Domain	GIS Domain e.g. WwManhole
GIS ID	GIS ID e.g. 3453
Date of Decommission	e.g. 01/01/2016
Reason for Decommission	Chose from picklist - domDecomReason
Action Taken	Chose from picklist - domActionTaken
Project Decommissioned under	Project Number, CP number, or Resource Consent Number (For subdivisions only)

4.5.2 Non Geospatial Assets

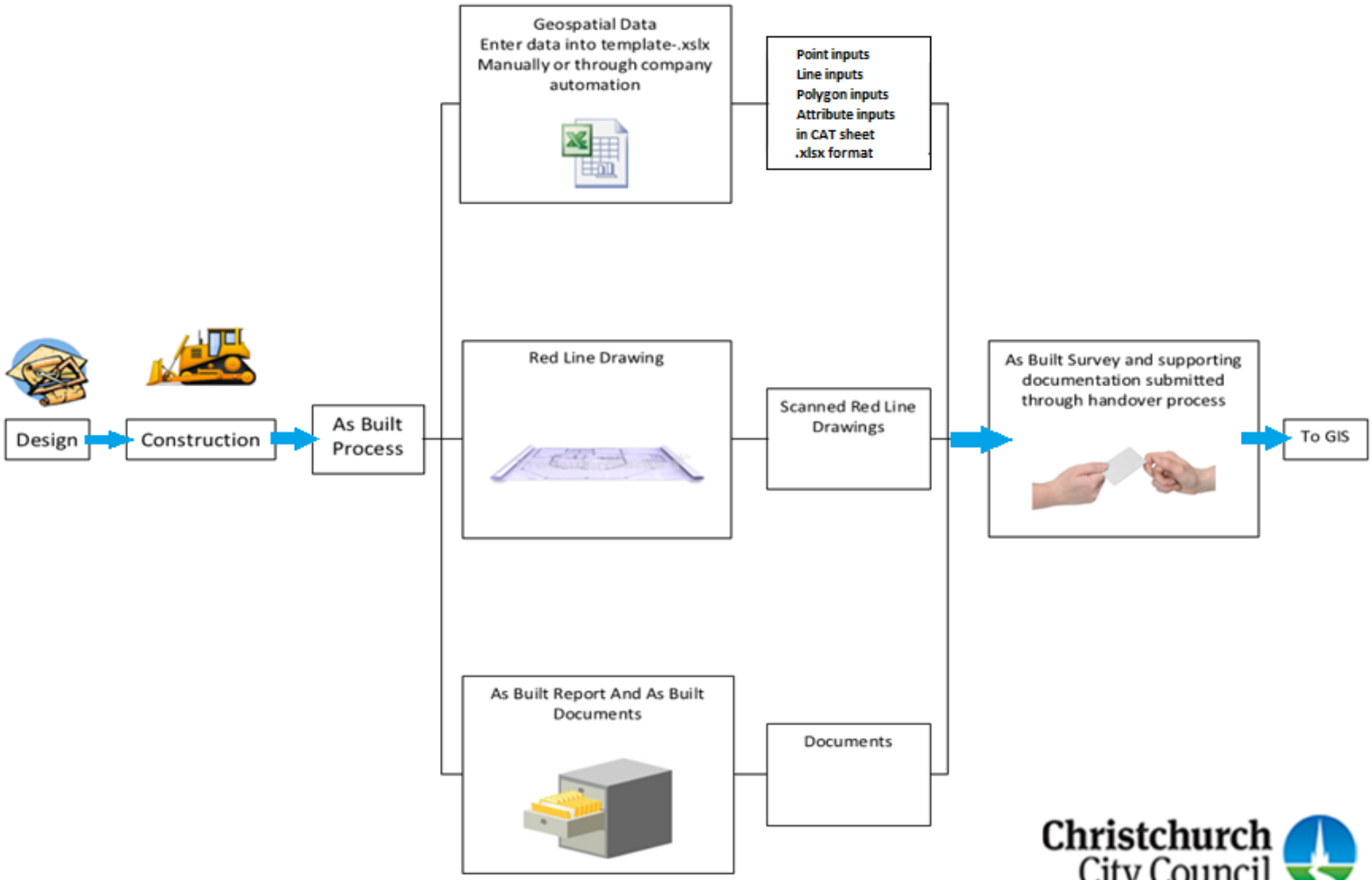
The decommissioning process for non-geospatial assets requires the contractor to identify the following information and provide it to CCC in a tabular format as part of the CAT (A separate tab in the CAT has been made for this purpose)

Table 13. Decommission data required for geospatial assets

Name	Description
SAP ID	SAP Equipment ID or SAP Functional Location
Date of Decommission	e.g. 01/01/2016
Reason for Decommission	Chose from picklist - domDecomReason
Action Taken	Chose from picklist - domActionTaken
Project Decommissioned under	Project Number, CP number, or Resource Consent Number (For subdivisions only)

The project scope document should outline the existing assets that have been planned to be decommissioned. If this list of assets to be decommissioned has not been received, it is the contractor's responsibility to ensure that all GIS information and asset registers are obtained from council in order to accurately identify assets for decommissioning

Appendix A Work Flow Chart for Survey As-Built



Appendix B Design Drawing Examples

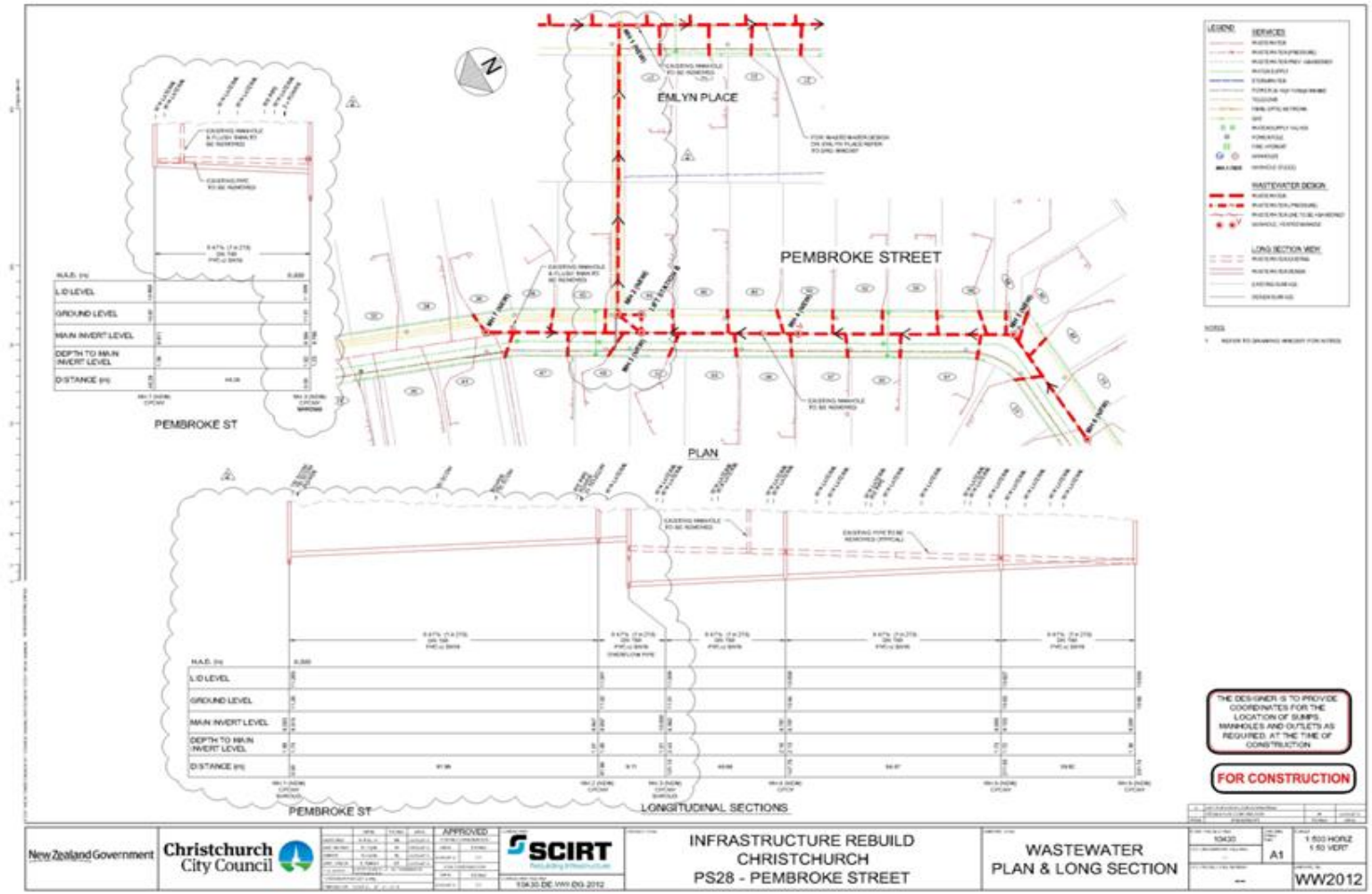


Figure 12: Design Drawing Example (WW gravity)

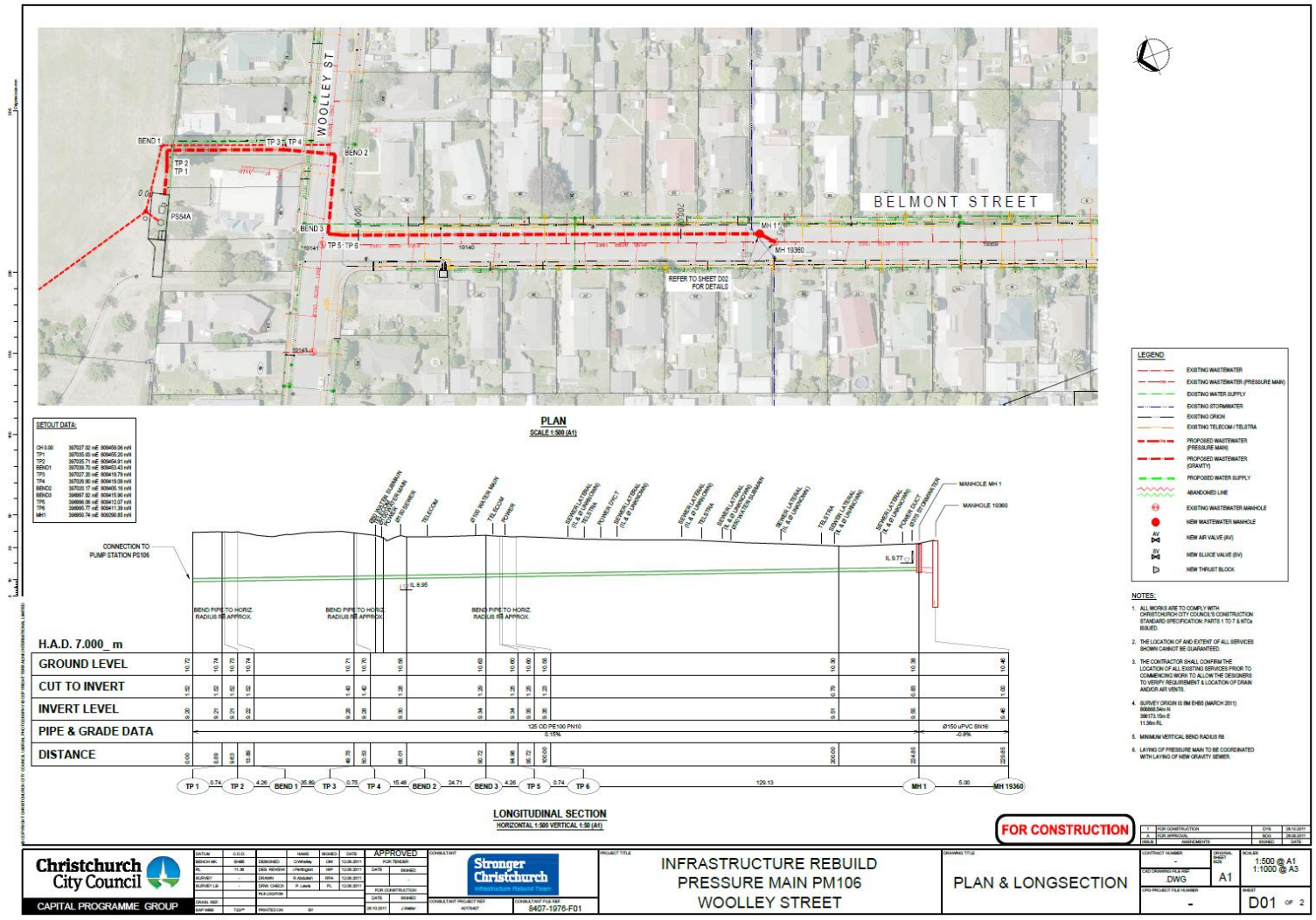


Figure 13: Design Drawing Example (WW pressure main)

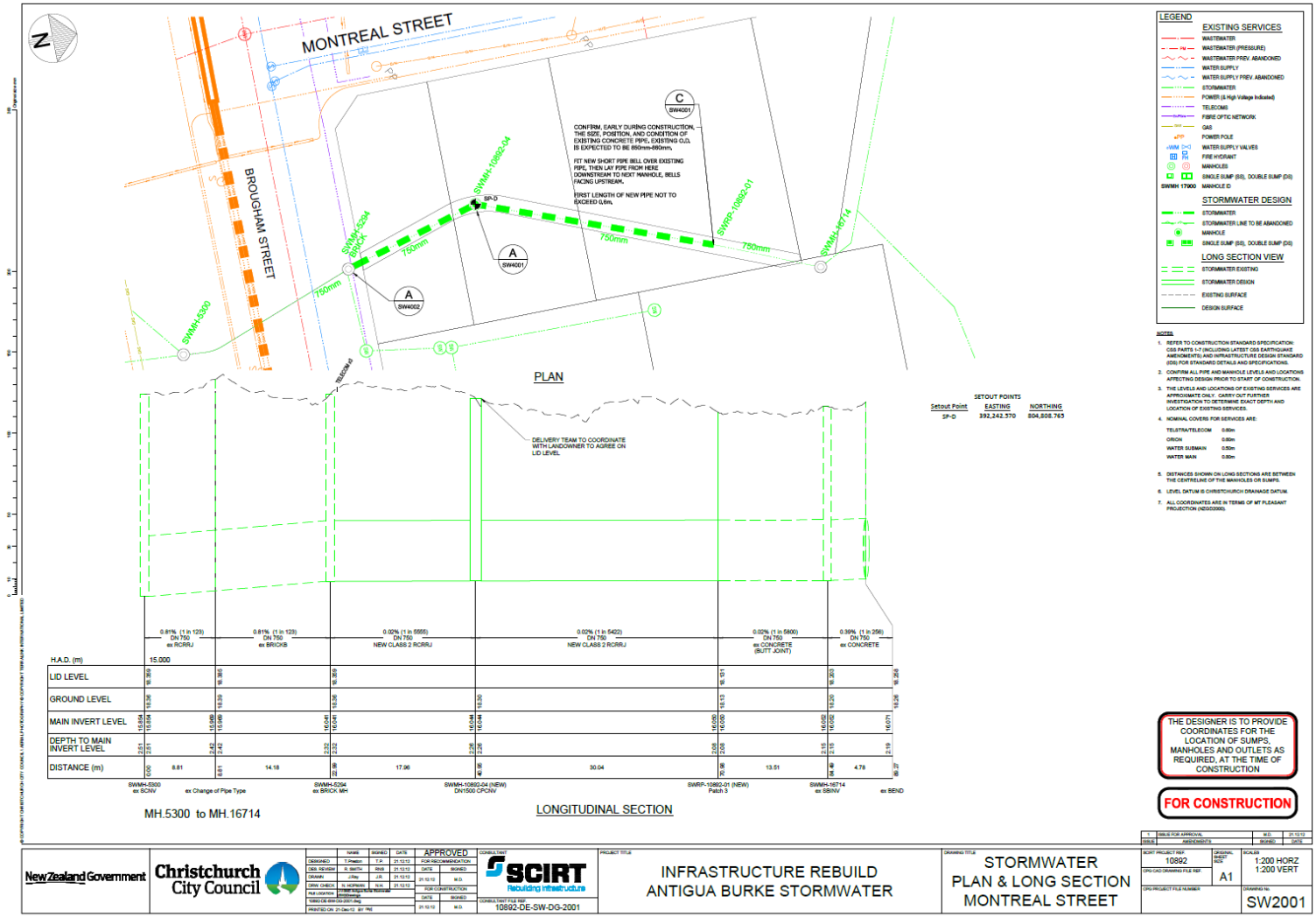


Figure 14: Design Drawing Example (SW gravity)

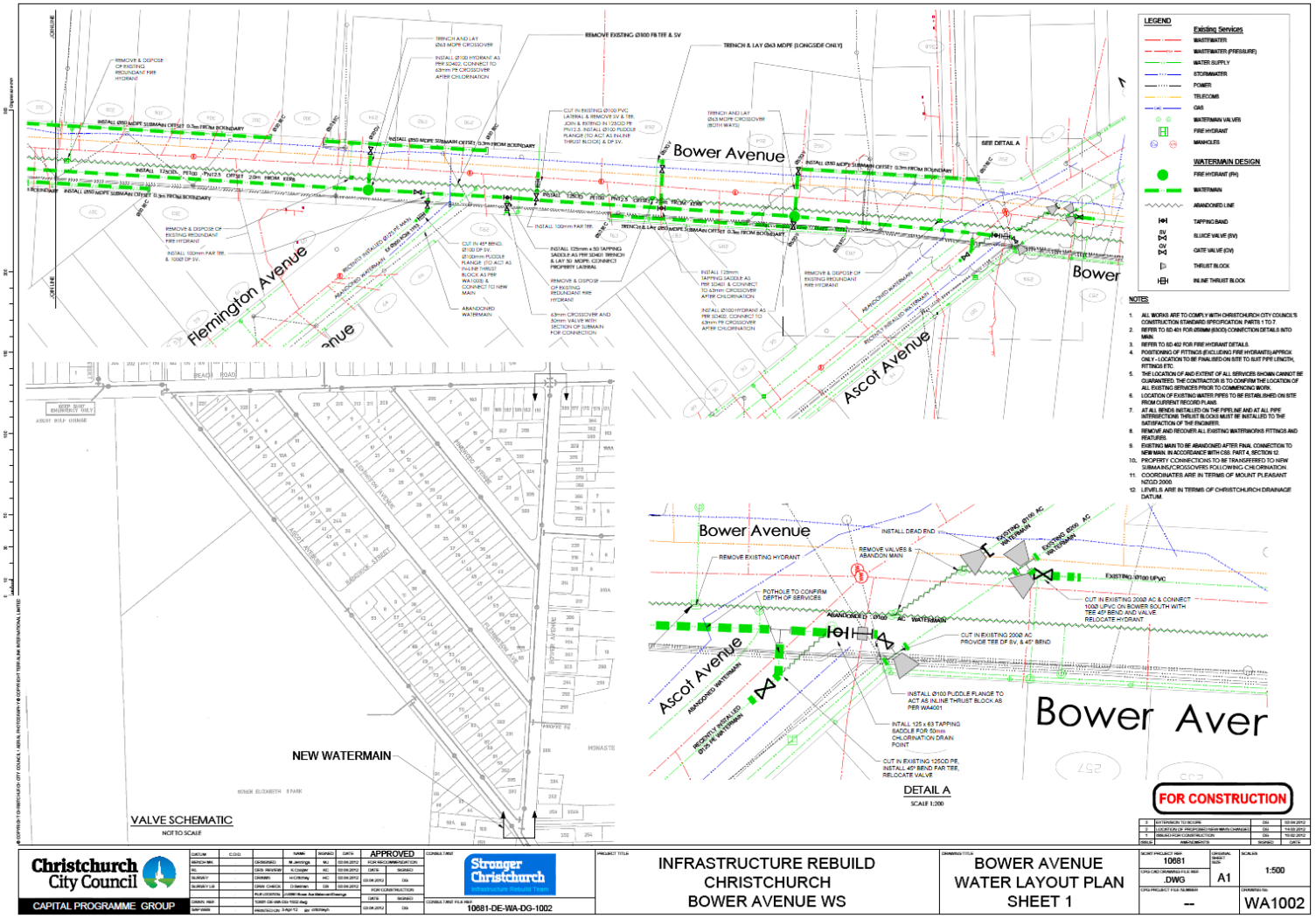


Figure 15: Design Drawing Example (WS)

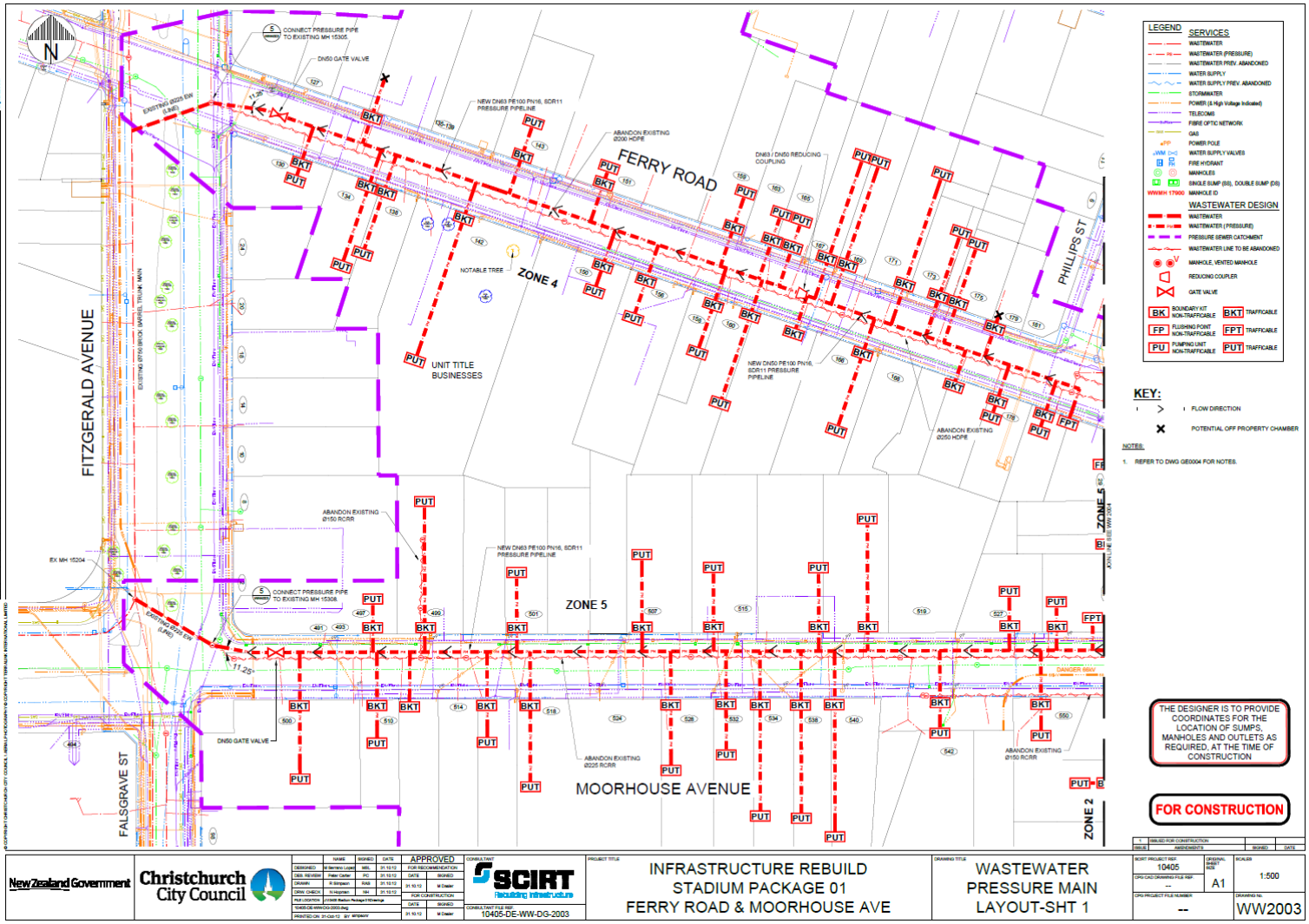


Figure 16: Design Drawing Example (WW Pressure Sewer Systems)

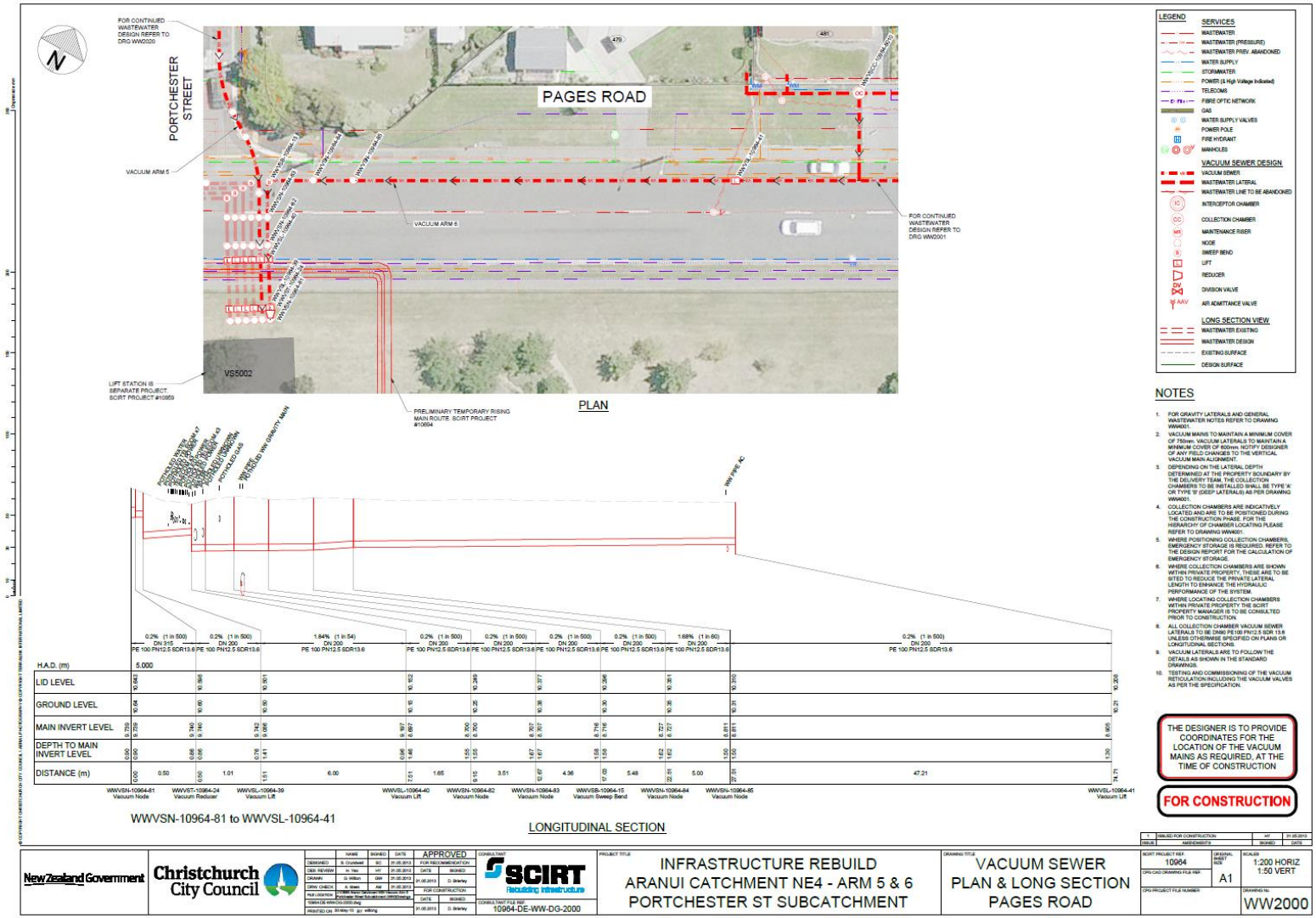


Figure 17: Design Drawing Example (WW Vacuum Systems)

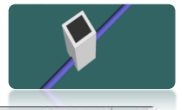
Appendix C Points, Lines and Outlines Examples

C.1 Points Examples

C.1.1 D10 Square Manhole Non Vented

Figure 18 is an example of typical CAT data for SAG feature **D10 Square Manhole Non Vented**. Please note the following:

- Col K: pit size entered as width x length as for square manhole
- Col X is left unchanged as there was no treatment on the new manhole



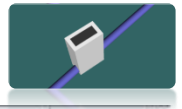
	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	SAG Feature Number	Asset Type	Old or New Asset	Design Change	Unique Name From Design Data	mE	mN	RL	I	SUMP Base Level Z	Pit Size	Date of Commission	Location Certainty	Service Status
2	D10	Standard Manhole	New	No	WWMH-15687	394716.154	806382.398	10.5	LEAVE BLANK	9.33	600x800	14/10/2013	Survey Accurate	In Service

	O	P	Q	R	S	T	U	V	W	X
1	Main Contractor	Date of Survey	Guideline Revision Used	Attribute 1	Attribute 2	Attribute 3	Attribute 4	Attribute 5	Attribute 6	Attribute 7
2	Fulton Hogan	24/11/2013	2	Solid	Square	Humes Pipeline Systems	Concrete	Unsecured	25	Treatment material for refurbished manholes

Figure 18: Example – Manhole Square D10 (Point)

C.1.2 D02 Double Sump

Figure 19 is an example of typical CAT data for SAG feature D02 Double Sump.



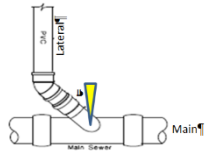
	A	B	C	D	E	F	G	H	I	J	K	L
1	SAG Feature Number	Asset Type	Old or New Asset	Design Change	Unique Name From Design Data	mE	mN	RL	I	SUMP Base Level Z	Pit Size	Date of Commission
2	D02	Double Sump	New	No	SWSP-4208	394716.1544	806382.3978	10.54	LEAVE BLANK	9.33	600x800	16/10/2013

	M	N	O	P	Q	R	S	T	U	V	W
1	Location Certainty	Service Status	Main Contractor	Date of Survey	Guideline Revision Used	Attribute 1	Attribute 2	Attribute 3	Attribute 4	Attribute 5	Attribute 6
2	Survey Accurate	In Service	Downer	24/11/2013	2	Wavy grated	LEAVE BLANK	Iplex Pipelines NZ Ltd	Concrete	Unsecured	35

Figure 19: Example – Double Sump D02 (Point)

C.1.3 D23 Lateral Junction

Figure 20 is an example of typical CAT data for SAG feature **D23 Lateral Junction** (i.e. a join between lateral and main pipe).



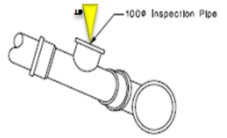
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	SAG Feature Number	Asset Type	Old or New Asset	Design Change	Unique Name From Design Data	mE	mN	RL	I	SUMP Base Level Z	Pit Size	Date of Commission	Location Certainty	Service Status	Main Contractor	Date of Survey	Guideline Revision Used
2	D23	Side Right	New	Yes	WWEY-80678	394714.6064	807647.3024	LEAVE BLANK	LEAVE BL	LEAVE BL	LEAVE BLA	26/07/2013	Survey Accurate	In Service	Downer	13/08/2013	2

Figure 20: Example – Lateral Junction D23 (Point)

C.1.4 D24 Inspection Point

Figure 21 is an example of typical CAT data for SAG feature **D24 Inspection Point**. Please note:

- Col H: RL can be left blank/unchanged.
- Col J: can be left blank/unchanged as not needed for inspection points.
- Col W: can be left blank/unchanged as not applicable to inspection points (and circular pits).
- Col X: can be left blank/unchanged as not applicable to inspection points.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	SAG Feature Number	Asset Type	Old or New Asset	Design Change	Unique Name From Design Data	mE	mN	RL	I	SUMP Base Level Z	Pit Size	Date of Commission	Location Certainty	Service Status	Main Contractor
2	D24	Inspection Point	New	Yes	WWPF-501256	394708.1522	807657.3715	8.56	LEAVE BLANK	RL at manhole base (lowest point)	150	13/09/2013	Survey Accurate	In Service	Fletcher

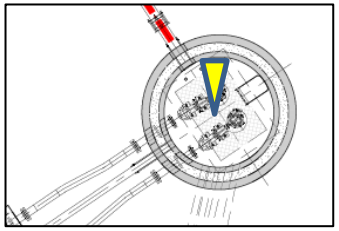
	O	P	Q	R	S	T	U	V	W	X
1	Main Contractor	Date of Survey	Guideline Revision Used	Attribute 1	Attribute 2	Attribute 3	Attribute 4	Attribute 5	Attribute 6	Attribute 7
2	cher	22/09/2013	2	Solid	Circular	Hynds Pipe Systems Ltd	Plastic	Unsecured	Pit angle - orientation of inner structure to nearest 5 degrees	Treatment material for refurbished manholes

Figure 21: Example – Inspection Point D24 (Point)

C.1.5 D12 Circular Manhole Non Vented (valve chamber manhole as part of a pump station)

Figure 22 is an example of typical CAT data for SAG feature **D12 valve chamber manhole as part of a pump station**. This is to be entered as the applicable manhole (here **Circular Manhole Non Vented D12**). Please note the following:

- Asset Type is set to Valve Chamber (rather than manhole).
- All other attributes are completed as for any other manhole.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	SAG Feature Number	Asset Type	Old or New Asset	Design Change	Unique Name From Design Data	mE	mN	RL	I	SUMP Base Level Z	Pit Size	Date of Commission	Location Certainty	Service Status	Main Contractor	Date of Survey
2	D12	Valve Chamber	New	No	WWMH-16726	394639.1379	807647.7889	10.89	LEAVE BLANK	8.77	2500	14/06/2013	Survey Accurate	In Service	City Care	28/06/2013

P	Q	R	S	T	U	V	W	X
ate of Survey	Guideline Revision Used	Attribute 1	Attribute 2	Attribute 3	Attribute 4	Attribute 5	Attribute 6	Attribute 7
3/06/2013	2	Solid	Circular	Humes Pipeline Systems	Concrete	Secure Padlock	Pit angle - orientation of inner structure to nearest 5 degrees	Treatment material for refurbished manholes

Figure 22: Example – Valve Chamber entered as Circular Manhole Non Vented D12 (Point)

Lines Examples

C.2.1 D17 Gravity Main

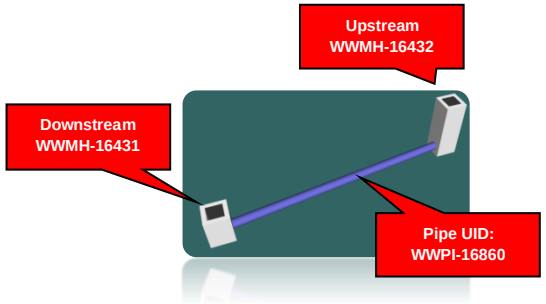
Figure 23 is an example of typical CAT data for SAG feature **D17 Gravity Main** with two vertices (points with XYZ coordinates). Please note:

- Asset Type is Gravity.
- First entry must be the downstream vertex (downstream 'At Pit', here WWMH-16431).
- Second entry is at the upstream vertex (upstream 'At Pit', here WWMH-16432), therefore 'At Pit' and 'To Pit' are swapped.
- Col Y: set to 0 (or left unchanged) as this applies to vacuum pipes only.

At Pit – Pit UID at survey location

To Pit – UID of pit at other end of pipe

Pick Lists are highlighted in green



	A	B	C	D	E	F	G	H	I	J	K	L	M
1	SAG Feature Number	Asset Type	Old or New Asset	Design Change	Unique Name From Design Data	mE	mN	RL	Vertex Order or E09	Material	Pipe Size	At Pit	To Pit
2	D17	Gravity	New	No	WWPI-16860	394573.6151	808107.2582	9.22	1	Unplasticised Polyvinyl Chloride	225	WWMH-16431	WWMH-16432
3	D17	Gravity	New	No	WWPI-16860	394477.2639	808107.3905	9.31	2	Unplasticised Polyvinyl Chloride	225	WWMH-16432	WWMH-16431

	M	N	O	P	Q	R	S	T	U	V	W	X	Y
1	To Pit	Manufacturer	Main Contractor	Pressure or Stiffness Class of Pipe	Date of Commission	Location Certainty	Service Status	Date of Survey	Guideline Revision Used	Attribute 1	Attribute 2	Attribute 3	Attribute 4
2	1H-16432	Hynds Pipe Systems Ltd	MacDow	SN16 (stiffness 16 kN/m2)	22/08/2013	Survey Accurate	In Service	15/09/2013	2	Circle	2.5	Yes	0
3	MH-16431	Hynds Pipe Systems Ltd	MacDow	SN16 (stiffness 16 kN/m2)	22/08/2013	Survey Accurate	In Service	15/09/2013	2	Circle	2.5	Yes	0

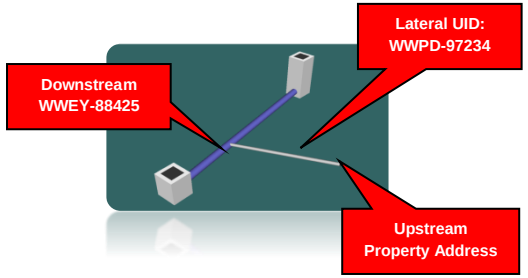
Figure 23: Example – Main Pipe Gravity (Line)

C.2.2 D19 Gravity Lateral

Figure 24 is an example of typical CAT data for SAG feature **D19 Gravity Lateral.** Please note:

- Asset Type is Gravity.
- As in the above example, vertices are entered in order from downstream to upstream (starting at the Lateral Junction).
- Col I holds the order of the vertices.
- Col Z: set to 0 (or left unchanged) as this applies to vacuum laterals only.

Pick Lists are highlighted in green



	A	B	C	D	E	F	G	H	I	J	K	L	M
1	SAG Feature Number	Asset Type	Old or New Asset	Design Change	Unique Name From Design Data	mE	mN	RL	Vertex Order or E09	Material	Pipe Size	At Pit	To Pit
2	D19	Gravity	New	No	WWPD-97234	394476.9993	808130.6739	LEAVE	1	Polyvinyl Chloride	100	LEAVE BLANK	LEAVE BLANK
3	D19	Gravity	New	No	WWPD-97234	394486.9993	808135.6739	LEAVE	2	Polyvinyl Chloride	100	LEAVE BLANK	LEAVE BLANK

	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
	Manufacturer	Main Contractor	Pressure or Stiffness Class of Pipe	Date of Commission	Location Certainty	Service Status	Date of Survey	Guideline Revision Used	Attribute 1	Attribute 2	Attribute 3	Attribute 4	Attribute 5
	RX Plastics Ltd	City Care	SN12 (stiffness 12 kN/m2)	22/08/2013	Survey Accurate	In Service	15/09/2013	2	Circle	1	Yes	No	0
	RX Plastics Ltd	City Care	SN12 (stiffness 12 kN/m2)	22/08/2013	Survey Accurate	In Service	15/09/2013	2	Circle	1	Yes	No	0

Figure 24: Example –Gravity Lateral (Line)

C.2.3 E02 Pressure Main

Figure 26 is an example of typical CAT data for SAG feature **E02 Pressure Main** with five vertices (Figure 25). Please note:

- The data has to be entered into the CAT starting from the downstream manhole 'MH1', followed by three bends and the upstream flange 'Tee001'.
- Each vertex (point) is represented by a row in the CAT Line Asset Inputs Sheet.
- To avoid misunderstandings, please enter the vertex order in column I (numbers in yellow circles in figure 26).

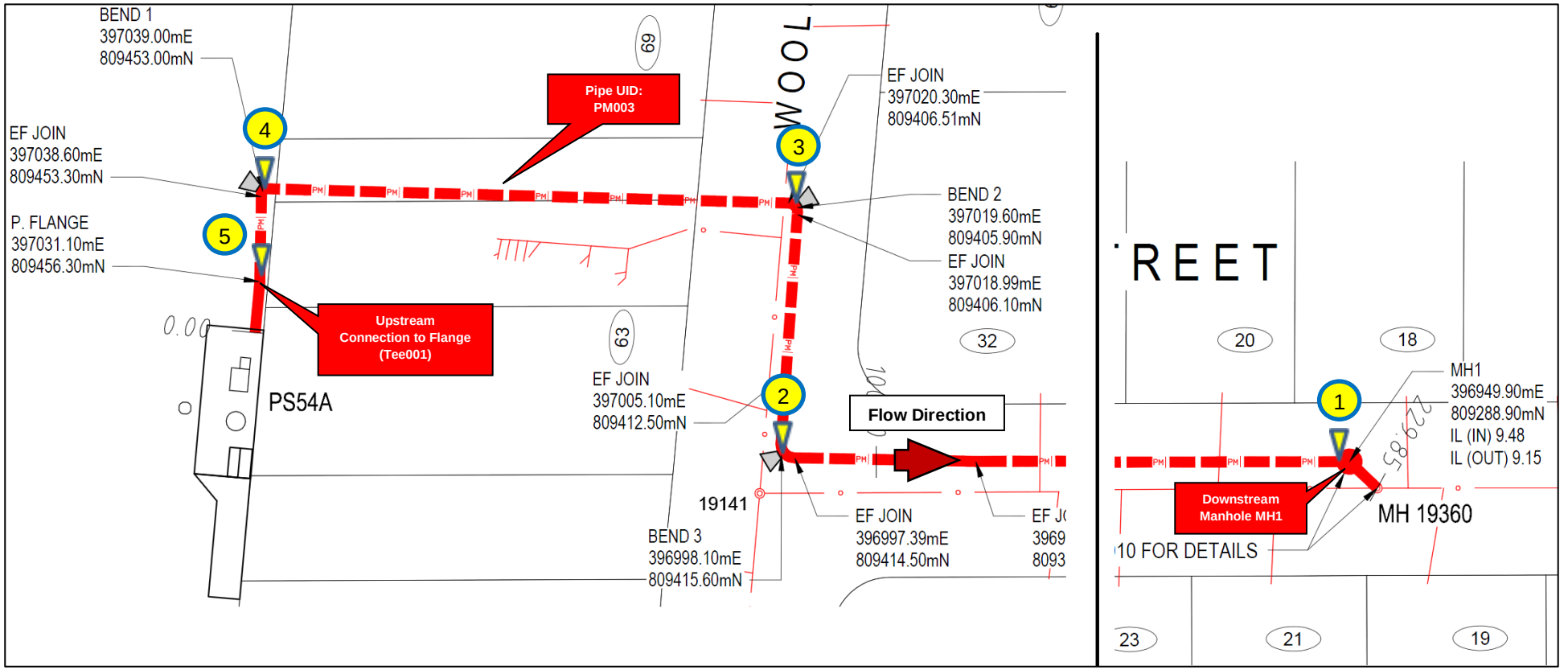


Figure 25: Example of Pressure Main between PS54 Flange 'Tee001' and Manhole 'MH1' with the unique name 'PM003' with 5 vertices

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	SAG Feature Number	Asset Type	Old or New Asset	Design Change	Unique Name From Design Data	mE	mN	RL	Vertex Order or E09	Material	Pipe Size	At Pit	To Pit	Manufacturer
2	E02	Pressure	New	No	PM003	396949.23	809288.32	9.48	1	Polyethelene 100	125	MH1	Tee001	Hynds Pipe Syst
3	E02	Pressure	New	No	PM003	396998.55	809415.62	9.51	2	Polyethelene 100	125	MH1	Tee001	Hynds Pipe Syst
4	E02	Pressure	New	No	PM003	397019.54	809405.62	9.22	3	Polyethelene 100	125	MH1	Tee001	Hynds Pipe Syst
5	E02	Pressure	New	No	PM003	397039.85	809453.22	9.73	4	Polyethelene 100	125	MH1	Tee001	Hynds Pipe Syst
6	E02	Pressure	New	No	PM003	397031.15	809456.85	8.22	5	Polyethelene 100	125	Tee001	MH1	Hynds Pipe Syst

	N	O	P	Q	R	S	T	U	V	W	X	Y
	Manufacturer	Main Contractor	Pressure or Stiffness Class of Pipe	Date of Commission	Location Certainty	Service Status	Date of Survey	Guideline Revision Used	Attribute 1	Attribute 2	Attribute 3	Attribute 4
	nds Pipe Syst	Fletcher	PN12.5 (pressure 1250 kPa)	24/07/2013	Survey Accurate	In Service	15/09/2013	2	Circle	1.5	Yes	0
	ynds Pipe Syst	Fletcher	PN12.5 (pressure 1250 kPa)	24/07/2013	Survey Accurate	In Service	15/09/2013	2	Circle	1.5	Yes	0
	nds Pipe Syst	Fletcher	PN12.5 (pressure 1250 kPa)	24/07/2013	Survey Accurate	In Service	15/09/2013	2	Circle	1.5	Yes	0
	ds Pipe Syst	Fletcher	PN12.5 (pressure 1250 kPa)	24/07/2013	Survey Accurate	In Service	15/09/2013	2	Circle	1.5	Yes	0
	nds Pipe Syst	Fletcher	PN12.5 (pressure 1250 kPa)	24/07/2013	Survey Accurate	In Service	15/09/2013	2	Circle	1.5	Yes	0

Figure 26: Line Asset Input Example of Pressure Main between PS54 Flange 'Tee001' and Manhole 'MH1' with the unique name 'PM003' with 5 vertices (Line)

At Pit – Pit UID at survey location

To Pit – UID of pit at other end of pipe

Pick Lists are highlighted in green

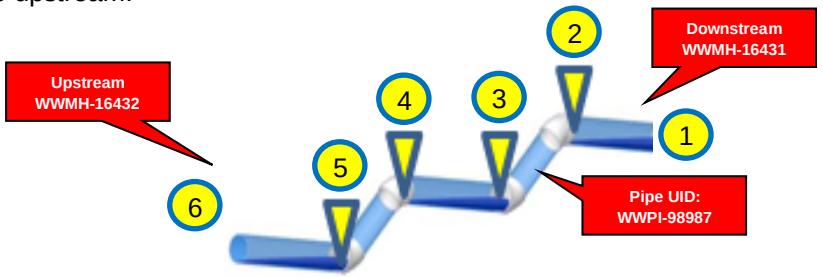
Note the following in the above CAT example (Figure 27):

- Col A: Pressure Main is SAG Feature E02
- Col B: Asset Type is Pressure
- Col E: all vertices are tagged with the same asset ID as all belong to one pipe
- Col F-H: coordinates and inverts are ordered from downstream vertex followed by all vertices in the correct order to the upstream vertex
- Col I: holds the vertex number (yellow numbers in figure 26), for **arc codes see feature E09**
- Col L-M: 'At Pit' is the downstream manhole except for the last vertex where 'At Pit' is the upstream Tee
- Col Y: can be left unchanged (or 0) as it doesn't apply to pressure pipes

C.2.4 G04 Vacuum Main

Figure 27 is an example of typical CAT data for SAG feature **G04 Vacuum Main** with two vacuum lifts. Please note:

- Asset Type is Vacuum.
- There is one CAT row per vertex (per pipe grade change), ordered from downstream to upstream.
- Col I: holds the vertex number (yellow numbers).
- Col Y: contains number of vacuum lifts (2).



	A	B	C	D	E	F	G	H	I	J	K	L	M
1	SAG Feature Number	Asset Type	Old or New Asset	Design Change	Unique Name From Design Data	mE	mN	RL	Vertex Order or E09	Material	Pipe Size	At Pit	To Pit
2	G04	Vacuum	New	No	WWPI-98987	394576.6151	808107.2582	9.22	1	Polyethelene 100	150	WWMH-16431	WWMH-16432
3	G04	Vacuum	New	No	WWPI-98987	394520.2639	808107.3905	9.18	2	Polyethelene 100	150	WWMH-16431	WWMH-16432
4	G04	Vacuum	New	No	WWPI-98987	394522.6549	808107.6587	8.56	3	Polyethelene 100	150	WWMH-16431	WWMH-16432
5	G04	Vacuum	New	No	WWPI-98987	394497.2657	808107.7242	8.44	4	Polyethelene 100	150	WWMH-16431	WWMH-16432
6	G04	Vacuum	New	No	WWPI-98987	394499.2457	808107.9574	8.11	5	Polyethelene 100	150	WWMH-16431	WWMH-16432
7	G04	Vacuum	New	No	WWPI-98987	394477.2639	808107.9475	8.03	6	Polyethelene 100	150	WWMH-16432	WWMH-16431

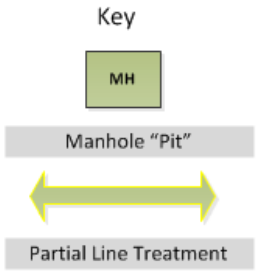
	M	N	O	P	Q	R	S	T	U	V	W	X	Y
1	To Pit	Manufacturer	Main Contractor	Pressure or Stiffness Class of Pipe	Date of Commission	Location Certainty	Service Status	Date of Survey	Guideline Revision Used	Attribute 1	Attribute 2	Attribute 3	Attribute 4
2	H-16432	AirVac	Fulton Hogan	PN12 (pressure 1200 kPa)	18/11/2013	Survey Accurate	In Service	15/12/2013	2	Circle	1.5	Yes	2
3	MH-16432	AirVac	Fulton Hogan	PN12 (pressure 1200 kPa)	18/11/2013	Survey Accurate	In Service	15/12/2013	2	Circle	1.5	Yes	2
4	VMH-16432	AirVac	Fulton Hogan	PN12 (pressure 1200 kPa)	18/11/2013	Survey Accurate	In Service	15/12/2013	2	Circle	1.5	Yes	2
5	MH-16432	AirVac	Fulton Hogan	PN12 (pressure 1200 kPa)	18/11/2013	Survey Accurate	In Service	15/12/2013	2	Circle	1.5	Yes	2
6	H-16432	AirVac	Fulton Hogan	PN12 (pressure 1200 kPa)	18/11/2013	Survey Accurate	In Service	15/12/2013	2	Circle	1.5	Yes	2
7	MH-16431	AirVac	Fulton Hogan	PN12 (pressure 1200 kPa)	18/11/2013	Survey Accurate	In Service	15/12/2013	2	Circle	1.5	Yes	2

Figure 27: Line Asset Input Example of Vacuum Main MH1' with the unique name 'WWPI-98987' with 2 vacuum lifts (Line)

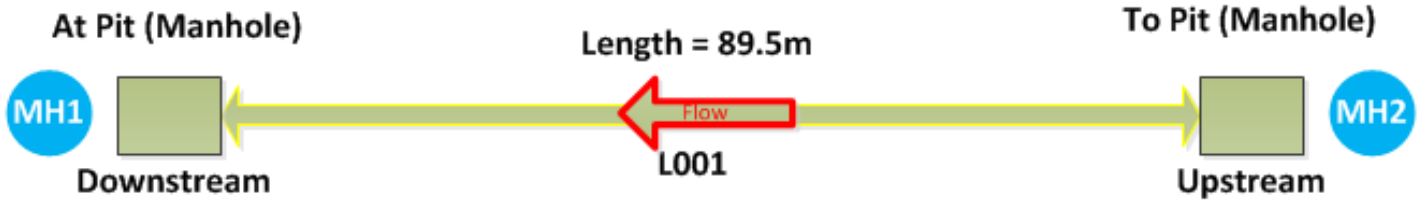
C.2.5 D21 Pipe Lining

Figure 28 is an example of typical CAT data for SAG feature **D21 Pipe Lining (**in this case a **fully lined pipe).** Please note:

- Pipe lining to be entered into SAG feature D21.
- Location given by one of the following:
  - Start and end distance from upstream manhole to be entered into col V & W (use full pipe length) **or**
  - Start and end coordinates may be entered into col F & G (if used, two CAT rows are required)
- Col B: select 'Full Lining'.
- Col J: select material or type of lining.
- Col K: diameter of 'host pipe'.
- **When recording lining of laterals, enter the property address into col L (At Pit) and provide start/end coordinates where possible.**



Start and End X and Y
or start distance
and end distance from
Upstream Manhole



	A	B	C	D	E	F	G	H	I	J	K	L	M
1	SAG Feature Number	Asset Type	Old or New Asset	Design Change	Unique Name From Design Data	mE	mN	RL	Vertex Order or E09	Material	Pipe Size	At Pit	To Pit
2	D21	Full Lining	New	No	L001	Line vertex Easting	Line vertex Northing	LEAVE BLANK	1	Cured in Place Pipe	250	MH1	MH2

	M	N	O	P	Q	R	S	T	U	V	W
1	To Pit	Manufacturer	Main Contractor	Pressure or Stiffness Class of Pipe	Date of Commission	Location Certainty	Service Status	Date of Survey	Guideline Revision Used	Attribute 1	Attribute 2
2	MH2	Agru Kunststofftechnik Gmbh	Downer	LEAVE BLANK	22/10/2013	Approximate XYZ	In Service	15/11/2013	2	0	89.5

Figure 28: Full length pipe lining

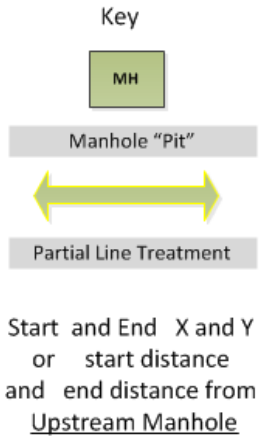
Lining from 0 to 89.5 m (full length)

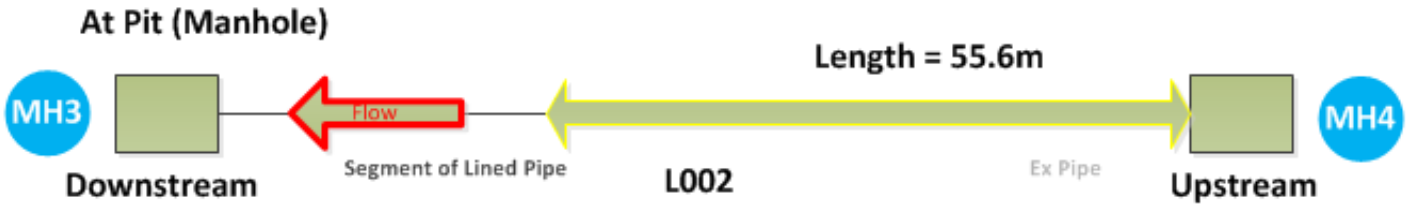
C.2.6 D21 Pipe Lining

Figure 29 is an example of typical CAT data for SAG feature **D21 Pipe Lining (**in this case a **partially lined pipe).** Please note:

- Pipe lining to be entered into SAG feature D21.
- Location given by one of the following:
  - Start and end distance from upstream manhole to be entered into col V & W **or**
  - Start and end coordinates may be entered into col F & G (if used, two CAT rows are required)
- Col B: select 'Lining Patch'.
- Col J: select material or type of lining.
- Col K: diameter of 'host pipe'.

- **When recording lining of laterals, enter the property address into col L (At Pit) and provide start/end coordinates where possible.**





	A	B	C	D	E	F	G	H	I	J	K	L	M
1	SAG Feature Number	Asset Type	Old or New Asset	Design Change	Unique Name From Design Data	mE	mN	RL	Vertex Order or E09	Material	Pipe Size	At Pit	To Pit
2	D21	Lining Patch	New	No	L002	Line vertex Easting	Line vertex Northing	LEAVE BLANK	1	Cured in Place Pipe	250	MH3	MH4

	L	M	N	O	P	Q	R	S	T	U	V	W
1	t Pit	To Pit	Manufacturer	Main Contractor	Pressure or Stiffness Class of Pipe	Date of Commission	Location Certainty	Service Status	Date of Survey	Guideline Revision Used	Attribute 1	Attribute 2
2	H3	MH4	Agru Kunststofftechnik Gmbh	MacDow	LEAVE BLANK	22/10/2013	Approximate XYZ	In Service	15/11/2013	2	0	55.6

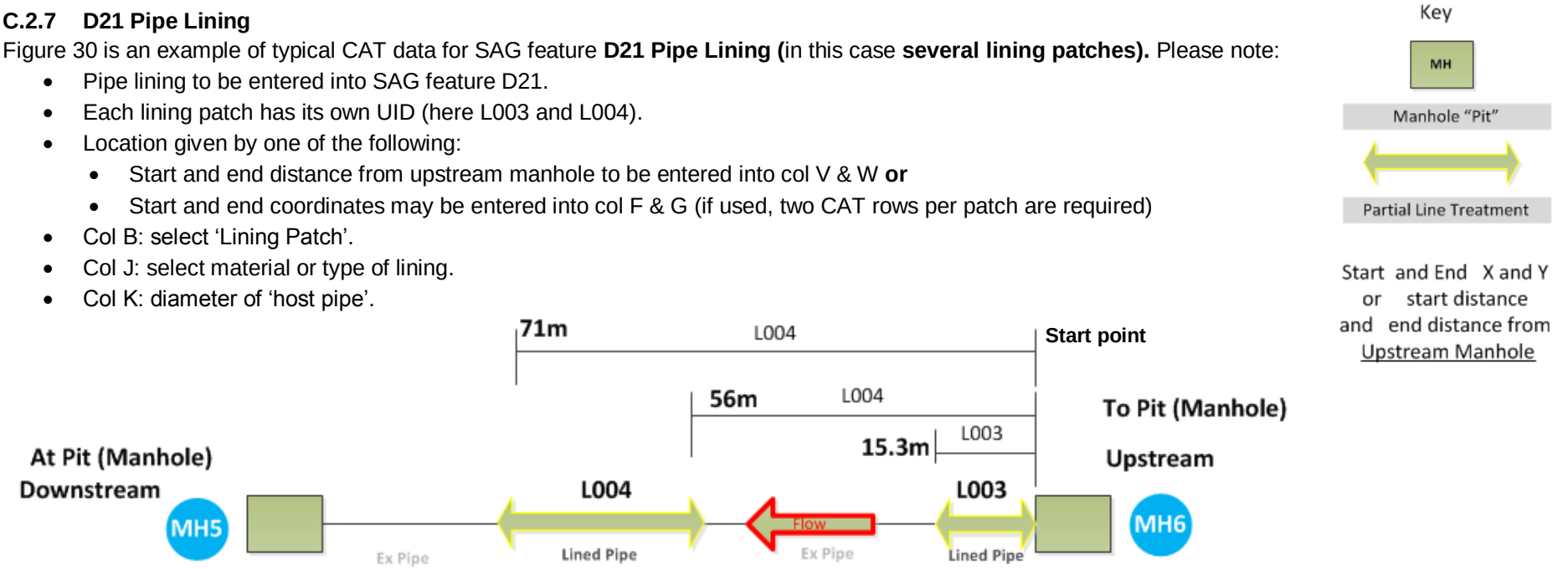
Figure 29: Partial length pipe lining

Lining from 0 to 55.6 m (partial)

C.2.7 D21 Pipe Lining

Figure 30 is an example of typical CAT data for SAG feature **D21 Pipe Lining (**in this case **several lining patches).** Please note:

- Pipe lining to be entered into SAG feature D21.
- Each lining patch has its own UID (here L003 and L004).
- Location given by one of the following:
  - Start and end distance from upstream manhole to be entered into col V & W **or**
  - Start and end coordinates may be entered into col F & G (if used, two CAT rows per patch are required)
- Col B: select 'Lining Patch'.
- Col J: select material or type of lining.
- Col K: diameter of 'host pipe'.



	A	B	C	D	E	F	G	H	I	J	K	L	M
1	SAG Feature Number	Asset Type	Old or New Asset	Design Change	Unique Name From Design Data	mE	mN	RL	Vertex Order or E09	Material	Pipe Size	At Pit	To Pit
2	D21	Lining Patch	New	No	L003	Line vertex Easting	Line vertex Northing	LEAVE BLANK	1	Cured in Place Pipe	250	MH5	MH6
3	D21	Lining Patch	New	No	L004	Line vertex Easting	Line vertex Northing	LEAVE BLANK	1	Cured in Place Pipe	250	MH5	MH6

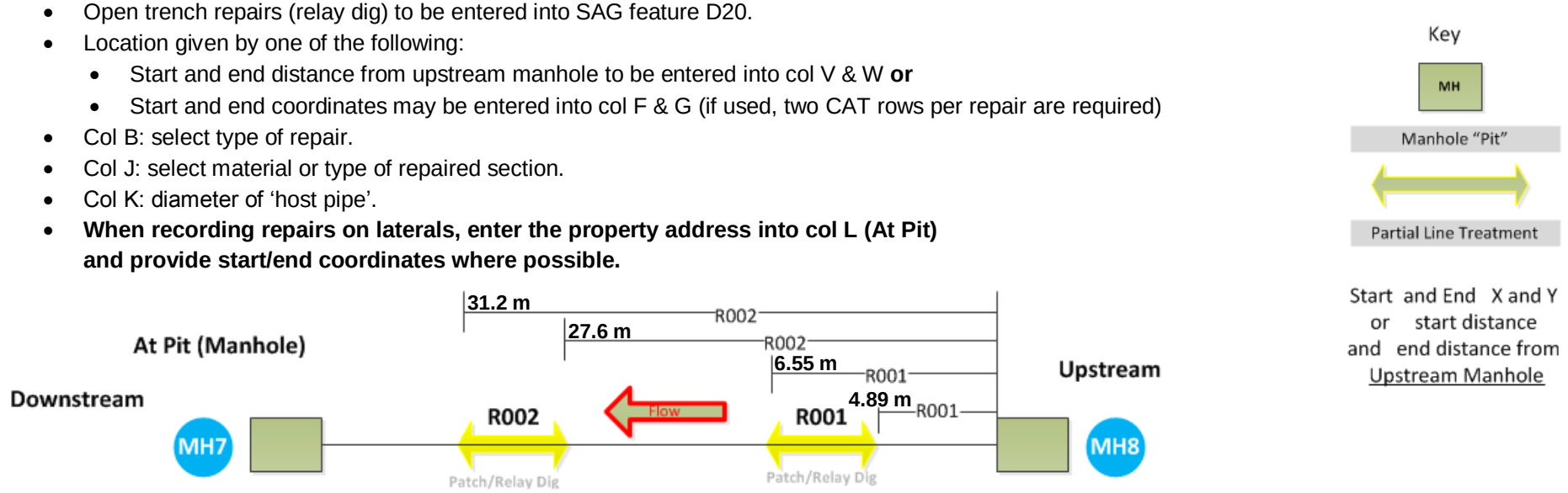
L	M	N	O	P	Q	R	S	T	U	V	W
At Pit	To Pit	Manufacturer	Main Contractor	Pressure or Stiffness Class of Pipe	Date of Commission	Location Certainty	Service Status	Date of Survey	Guideline Revision Used	Attribute 1	Attribute 2
H5	MH6	Agru Kunststofftechnik Gmbh	MacDow	LEAVE BLANK	22/10/2013	Approximate XYZ	In Service	15/11/2013	2	0	15.3
H5	MH6	Agru Kunststofftechnik Gmbh	MacDow	LEAVE BLANK	22/10/2013	Approximate XYZ	In Service	15/11/2013	2	56	71

Figure 30: Partial pipe lining – several patches

C.2.8 D20 Repair/Relay Dig

Figure 31 is an example of typical CAT data for SAG feature **D20 Repair/Relay Dig.** Please note:

- Open trench repairs (relay dig) to be entered into SAG feature D20.
- Location given by one of the following:
  - Start and end distance from upstream manhole to be entered into col V & W **or**
  - Start and end coordinates may be entered into col F & G (if used, two CAT rows per repair are required)
- Col B: select type of repair.
- Col J: select material or type of repaired section.
- Col K: diameter of 'host pipe'.
- **When recording repairs on laterals, enter the property address into col L (At Pit) and provide start/end coordinates where possible.**



	A	B	C	D	E	F	G	H	I	J	K	L	M
1	SAG Feature Number	Asset Type	Old or New Asset	Design Change	Unique Name From Design Data	mE	mN	RL	Vertex Order or E09	Material	Pipe Size	At Pit	To Pit
2	D20	Clamp	New	Yes	R001	Line vertex Easting	Line vertex Northing	LEAVE BLANK	1	Clamp	300	MH7	MH8
3	D20	New Pipe	New	Yes	R002	Line vertex Easting	Line vertex Northing	LEAVE BLANK	1	Polyvinyl Chloride	300	MH7	MH8

L	M	N	O	P	Q	R	S	T	U	V	W
t Pit	To Pit	Manufacturer	Main Contractor	Pressure or Stiffness Class of Pipe	Date of Commission	Location Certainty	Service Status	Date of Survey	Guideline Revision Used	Attribute 1	Attribute 2
H7	MH8	Iplex Pipelines NZ Ltd	Fletcher	LEAVE BLANK	22/10/2013	Approximate XYZ	In Service	15/11/2013	2	4.89	6.55
H7	MH8	Hynds Pipe Systems Ltd	Fletcher	LEAVE BLANK	22/10/2013	Approximate XYZ	In Service	15/11/2013	2	27.6	31.2

Repairs from 4.89 to 6.55 m, and from 27.6 to 31.2 m

Figure 31: Open trench pipe repairs

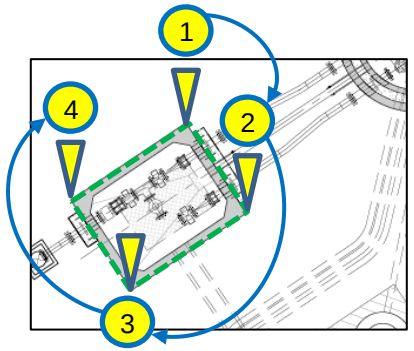
C.3 Outlines Example

C.3.1 D27 Pump Chamber

Figure 32 is an example of typical CAT data for SAG feature **D27 Pump Chamber.** Please note:

- Asset Type is Pump Chamber.
- There is one CAT row for each vertex along the outline of the structure, ordered along the outline.
- Col I: holds the vertex number (yellow number).

Pick Lists are highlighted in green



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1	SAG Feature Number	Asset Type	Old or New Asset	Design Change	Unique Name From Design Data	mE	mN	RL	Vertex Order or E09	Material	Pipe Size	At Pit	To Pit	Manufacturer	Main Contractor	Pressure or Stiffness Class of Pipe	Date of Commission	Location Certainty	Service Status	Date of Survey	Guideline Revision Used
2	D27	Pump Chamber	New	No	WWST-8765	394684.3802	807668.0841	LEAV	1	Concrete	LEAVE I	LEAVE	LEAVE	LEAVE BLA	Fletcher	LEAVE BLANK	20/04/2013	Survey Accurate	In Service	28/04/2013	2
3	D27	Pump Chamber	New	No	WWST-8765	394692.7146	807668.1172	LEAV	2	Concrete	LEAVE I	LEAVE	LEAVE	LEAVE BLA	Fletcher	LEAVE BLANK	20/04/2013	Survey Accurate	In Service	28/04/2013	2
4	D27	Pump Chamber	New	No	WWST-8765	394692.7146	807663.3878	LEAV	3	Concrete	LEAVE I	LEAVE	LEAVE	LEAVE BLA	Fletcher	LEAVE BLANK	20/04/2013	Survey Accurate	In Service	28/04/2013	2
5	D27	Pump Chamber	New	No	WWST-8765	394684.5787	807663.4208	LEAV	4	Concrete	LEAVE I	LEAVE	LEAVE	LEAVE BLA	Fletcher	LEAVE BLANK	20/04/2013	Survey Accurate	In Service	28/04/2013	2

Figure 32: Line Asset Input Example of Pump Station Structure Outline 'Pump Chamber' (Outline)

Appendix D - P

Refer to separate documents