

Schedule to BoQ: Automated Quantities

Trench depth bands, pipes, bed and surround and manholes measured to ARM5 from a drainage schedule; every figure traceable to the links behind it.

PROJECT

Large Residential Development

SYSTEMS

Storm & foul: two bills

INPUT

CAD drainage schedule

MEASUREMENT

ARM5 Section 22:2

The levels are all there. The arithmetic is the risk.

A drainage long section carries every level needed to measure below-ground drainage under ARM5. Turning it into a bill means computing an average depth for every link, banding it in 500mm stages, splitting pipes by diameter and counting manholes by depth; then keying each figure against the right description.

Hand-transferred quantities fail silently

- A figure keyed one row down still totals correctly; it just prices the wrong item.
- Existing pipes and non-manhole nodes drift into the counts.
- A depth exactly on a band boundary goes in the band below; easy to get wrong by hand.
- Impossible levels on the drawing pass unnoticed into the price.

Two networks, one pass

37 links read off the schedule

652.87 m of new pipe, 150mm and 225mm

35 new manholes, banded by depth

21 bill items across storm and foul

A link-per-row schedule from the CAD long section

Link	US MH	US CL	US IL	DS MH	DS CL	DS IL	Section	Slope 1:	Length
S1.000	S1-0	16.913	15.900	S1-1	16.913	15.547	225mm	96.5	34.048
S1.001	S1-1	16.913	15.547	S1-2	16.380	15.350	225mm	72.2	14.219
S1.002	S1-2	16.380	15.350	S1-3	15.800	14.800	225mm	46.3	25.461
S1.003	S1-3	15.800	13.910	S1-4	15.400	13.860	225mm	186.4	9.322
S1.004	S1-4	15.400	13.860	S1-5	15.400	13.800	225mm	212.5	12.750
S1.005	S1-5	15.400	13.800	S1-6	15.780	13.760	225mm	150.4	5.950
S1.006	S1-6	15.780	13.723	S1-7	14.200	13.050	225mm	39.4	26.546
S1.008	S1-7	14.200	13.050	S1-8	13.500	12.000	225mm	30.3	31.768
S2.000	S2-0	16.720	15.600	S1-1	16.913	15.547	225mm	262.2	13.895
S4.000	S4-0	16.450	15.400	S1-3	15.800	14.800	225mm	43.3	25.973
S5.000	S5-0	15.500	14.075	S5-1	15.400	13.910	225mm	140.6	23.197

Storm schedule extract: 11 of 19 links. Levels in mOD, lengths in metres. Drawing 221295-PUNCH-XX-XX-DR-C-0100 C08.

What the schedule gives

- One row per link: US/DS manhole, cover and invert levels, section, slope, length.
- Produced by the Drainage Sections Extraction workflow.
- Storm: 19 links, all 225mm.
- Foul: 18 links, 150mm and 225mm, one existing.
- Labels carried through: Backdrop, Existing, Inspection Junction Box.

One rule decides every trench quantity



Average $(1.013 + 1.366) / 2 = 1.189 \text{ m}$ → trench 1.00–1.50 m

ARM5 22:2 measures trench by average depth between adjacent manholes, from the stated starting level, in 500mm stages.

Agreed convention: start at manhole cover level, depth to invert. Nothing added for bedding; a run is never split between bands; a depth exactly on a boundary sits in the band below.

Pipes and bed & surround: by diameter, no depth. Manholes: cover to lowest invert, 500mm stages.

01

Check the fit

Bill's trench and pipe blocks matched to the schedule's diameters before any arithmetic.

02

Derive

Depths, bands and totals per system; existing work excluded; every node checked.

03

Map by description

Each quantity matched to its bill item by reading the description; never by row number.

04

Write and prove

Quantity column only. Source in a cell comment, build-up tab, totals cross-checked.

Storm: quantities written straight into the Excel bill

Build-up: every link, depth and band. Build-up extract: 9 of 19 storm links.

Link	Dia	US depth	DS depth	Average	Trench band	Length (m)
S1.000	225	1.013	1.366	1.189	1.00–1.50m	34.048
S1.001	225	1.366	1.030	1.198	1.00–1.50m	14.219
S1.002	225	1.030	1.000	1.015	1.00–1.50m	25.461
S1.003	225	1.890	1.540	1.715	1.50–2.00m	9.322
S1.004	225	1.540	1.600	1.570	1.50–2.00m	12.750
S1.005	225	1.600	2.020	1.810	1.50–2.00m	5.950
S1.006	225	2.057	1.150	1.603	1.50–2.00m	26.546
S1.008	225	1.150	1.500	1.325	1.00–1.50m	31.768
S2.000	225	1.120	1.366	1.243	1.00–1.50m	13.895

The bill in Excel: trench block, quantities in the Quantity column. The bill in Excel: trench totals for all 19 links.

BILL OF QUANTITIES					
Section 22:2 - Drainage: Below Ground - Storm Water (measured in accordance with ARM5, 5th Edition, November 2024)					
Project:					
Date:					
Ref No.	Item Description	Quantity	Unit	Rate	Total
Excavating trenches for					
Pipe not exceeding 250mm nominal diameter (225mm nominal diameter storm pipes)					
1	Average depth of trench not exceeding 0.50m; backfilled with special materials, Clause 804 granular fill material		m		
2	Average depth of trench exceeding 0.50m and not exceeding 1.00m; backfilled with special materials, Clause 804 granular fill material	20.27	m		
3	Average depth of trench exceeding 1.00m and not exceeding 1.50m; backfilled with special materials, Clause 804 granular fill material	222.79	m		
4	Average depth of trench exceeding 1.50m and not exceeding 2.00m; backfilled with special materials, Clause 804 granular fill material	117.79	m		
5	Average depth of trench exceeding 2.00m and not exceeding 2.50m; backfilled with special materials, Clause 804 granular fill material		m		
6	Average depth of trench exceeding 2.50m and not exceeding 3.00m; backfilled with special materials, Clause 804 granular fill material		m		
7	Average depth of trench exceeding 3.00m and not exceeding 3.50m; backfilled with special materials, Clause 804 granular fill material		m		
8	Average depth of trench [state 500mm stage]; curved; backfilled with special materials, Clause 804 granular fill material		m		
9	Average depth of trench [state 500mm stage]; below groundwater level; backfilled with special materials, Clause 804 granular fill material		m		
10	Average depth of trench [state 500mm stage]; in unstable ground; backfilled with special materials, Clause 804 granular fill material		m		

360.85 m

network length

225mm uPVC: trench = pipe = B&S

19

links

shortest 4.80 m; no short lengths

18

manholes

existing S1-8 and IJB S8-3 excluded

3

trench bands

0.50–2.00 m average depth

OUTPUT 2: FOUL

Foul: two diameters, existing pipe set aside

Build-up: every link, depth and band, extract showing the first 9 of the 18 foul links.

Link	Dia	US depth	DS depth	Average	Trench band	Length (m)
F4.000a	150	1.106	1.406	1.256	1.00–1.50m	14.020
F4.000	150	1.406	1.704	1.555	1.50–2.00m	24.686
F4.001a	225	1.704	1.727	1.715	1.50–2.00m	9.621
F4.001	225	1.727	1.459	1.593	1.50–2.00m	12.811
F4.002	225	1.720	1.500	1.610	1.50–2.00m	22.233
F4.003	225	1.500	1.310	1.405	1.00–1.50m	20.039
F4.005	225	2.025	2.505	2.265	2.00–2.50m	10.163
F1.008	225	2.505	1.497	2.001	2.00–2.50m	28.308
F8.002	225	1.497	1.681	1.589	1.50–2.00m	7.404

Populated bill lines the full foul totals for all 17 new links.

Ref	Bill item	Unit	Qty
3	Trench ≤250mm, avg depth 1.00–1.50m	m	144.093
4	Trench ≤250mm, avg depth 1.50–2.00m	m	109.458
5	Trench ≤250mm, avg depth 2.00–2.50m	m	38.471
35	Bed & surround 450mm sq — 150mm	m	130.082
36	Bed & surround 525mm sq — 225mm	m	161.940
39	uPVC pipe 150mm	m	130.082
41	uPVC pipe 225mm	m	161.940
59	Precast MH 1200mm, depth 0.50–1.00m	nr	1
60	Precast MH 1200mm, depth 1.00–1.50m	nr	10
61	Precast MH 1200mm, depth 1.50–2.00m	nr	4
62	Precast MH 1200mm, depth 2.00–2.50m	nr	1
63	Precast MH 1200mm, depth 2.50–3.00m	nr	1

One trench block covers both sizes: ARM bands trench by diameter class, and 150mm and 225mm both sit in ≤250mm. Pipes and bed & surround are billed per diameter.

292.02 m

new network

27.08 m existing excluded

2

diameters

150mm 130.08 m · 225mm 161.94 m

17

manholes

existing EX_2 and EX_3 excluded

3

trench bands

1.00–2.50 m average depth

Flagged, not guessed: what the run surfaced

CONDITION

Drop over 50mm at a node, not labelled

S1-5 and F4-5 each take a 0.50 m drop from a branch with no backdrop shown

FLAG Raised with the designer; backdrop quantities left to the QS

CONDITION

Incoming invert below outgoing

S8-2: incoming 0.793 m lower than outgoing, yet labelled a backdrop

FLAG RFI. Affected trench and manhole bands named so they can be revisited

CONDITION

Bill does not fit the schedule

Template built for 300mm pipe; every pipe here is 150 or 225mm

FLAG Bill rebuilt for ≤250mm, storm and foul; never forced

CONDITION

Existing work in the schedule

EX_2–EX_3 (27.08 m) and three existing manholes

FLAG Excluded from new-works quantities automatically

CONDITION

Same node, two names

'(ATTN) S1-4' and 'S1-4' are one chamber

FLAG Merged; one manhole counted, not two

CONDITION

Node that is not a manhole

S8-3 is an inspection junction box

FLAG Kept in the pipe runs, out of the manhole count

A bill you can check, not just price

✓ Every quantity traceable

A cell comment lists the links or manholes behind each figure; the build-up tab shows every depth.

✓ Totals that prove themselves

Trench, pipe and bed & surround each equal the network length: 652.87 m across both bills.

✓ Flags before pricing

Impossible levels, unlabelled drops and existing work surface before a rate is applied.

✓ Re-run, don't re-measure

When the S8-2 RFI comes back, revised levels re-derive the bill in one pass.

PART OF THE QSTIMATING SUITE

1 Drainage Sections Extraction

CAD long section → validated link schedule

2 ARM5 BoQ Template

Blank ARM5 bill, every item written out, coverage-audited

3 Schedule to BoQ

THIS

Schedule → quantities in the bill, with build-up and flags