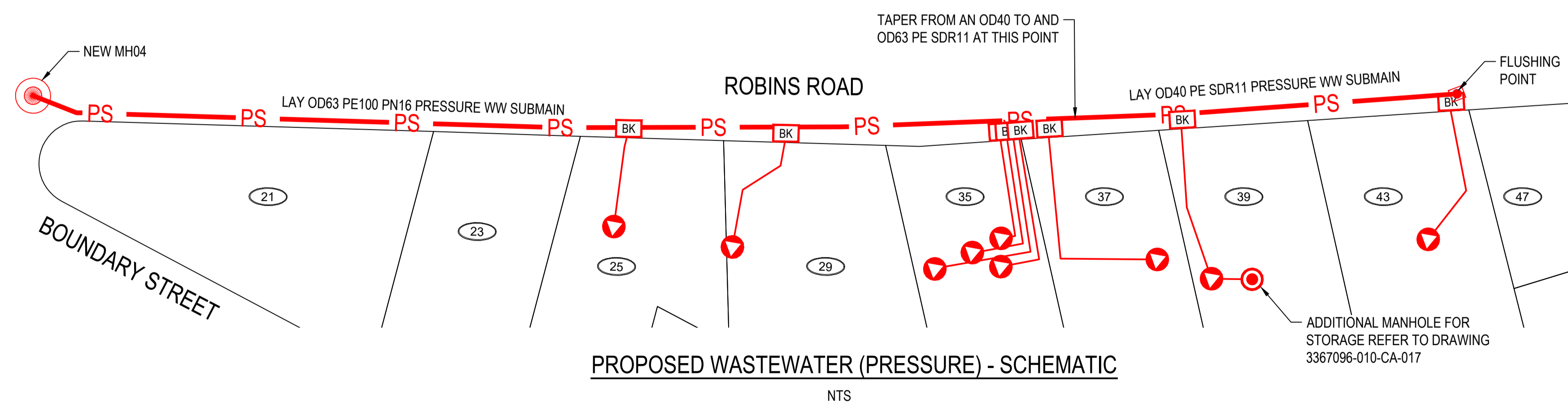


**PROPOSED WASTEWATER (PRESSURE) - PLAN**  
SCALE: 1:250

**LEGEND**

- PROPERTY BOUNDARY
- EXISTING SERVICES
- GRAVITY SEWER MAIN
- SEWER LATERAL
- WATER MAIN
- STORMWATER MAIN
- POWER (UNDERGROUND)
- POWER (OVERHEAD)
- 11kV / 33kV POWER (OVERHEAD & UNDERGROUND)
- GAS PIPE
- CHORUS
- FIBRE OPTIC
- SEWER / STORMWATER MANHOLE
- STORMWATER SOAKPIT
- STORMWATER OUTLET
- POWER / LIGHT POLE
- PROPOSED SERVICES
- GRAVITY SEWER MAIN
- SEWER LATERAL
- SEWER MANHOLE
- PRESSURE SEWER SUBMAIN
- SIMPLEX PRESSURE SEWER UNIT
- PRESSURE SEWER SUBMAIN FLUSHING POINT
- PRESSURE SEWER BOUNDARY KIT
- NEW WATER SUPPLY MAIN
- NEW WATER SUPPLY SUBMAIN
- WATER METER CONNECTION
- FIRE HYDRANT ON MAIN
- SLUICE VALVE ON MAIN

- NOTES:**
- FOR GENERAL NOTES REFER TO DRAWING 3367096-010-CA-001.
  - EACH PROPERTY SHALL HAVE A BOUNDARY KIT CONTAINING A ISOLATION VALVE (FULL BORE OR GATE), CHECK VALVE WITH TOP ACCESS, AND FLUSHING POINT. ALL BOUNDARY KIT FITTINGS SHALL BE BRONZE (MAX ZINC COMPONENT 7%) OR GRADE 316 STAINLESS STEEL WITH A PRESSURE RATING OF MINIMUM PN16.
  - ALL PRESSURE SEWER PIPES TO BE A MINIMUM OF OD40 PE100 SDR11.
  - LATERAL CONNECTIONS TO EACH PROPERTY TO BE DN100 PVC-u.



**PROPOSED WASTEWATER (PRESSURE) - SCHEMATIC**  
NTS

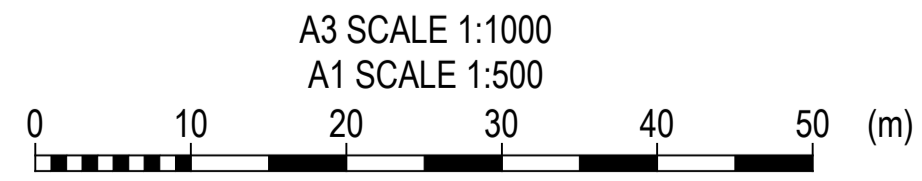
PRESSURE SEWER UNITS			
ADDRESS	PRESSURE SEWER SYSTEM	PRESSURE SEWER LATERAL	STORAGE ABOVE HIGH ALARM LEVEL (24HR STORAGE), L
25 Robins Rd	SIMPLEX	DN40 PE100 PN16	750
29 Robins Rd	SIMPLEX		750
35 Robins Rd	4 x SIMPLEX		750
37 Robins Rd	SIMPLEX		750
39 Robins Rd	DUPLEX		2460 (4.5HRS STORAGE - PS + MH)
43 Robins Rd	SIMPLEX		750

**WARNING**  
BEWARE OF UNDERGROUND SERVICES. THE LOCATIONS OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THEIR EXACT POSITION SHOULD BE PROVEN ON SITE. NO GUARANTEE IS GIVEN THAT ALL EXISTING SERVICES ARE SHOWN.

**ORIGINAL DRAWING IN COLOUR**

**DRAFT ONLY NOT FOR CONSTRUCTION**

**DETAILED DESIGN NOT FOR CONSTRUCTION**



No.	Revision	By	Chk	Appd	Date
A	ISSUED FOR DRAFT DETAILED DESIGN	MC	NU	PM	17.12.24

Original Scale (A1)	Design	Drawn	Scale (A3)	Dwg Check	Date	Approved For Construction*
AS SHOWN	N. UNGERER	M. CROWLEY	1/2 SHOWN	R. SIMPSON	17.12.24	



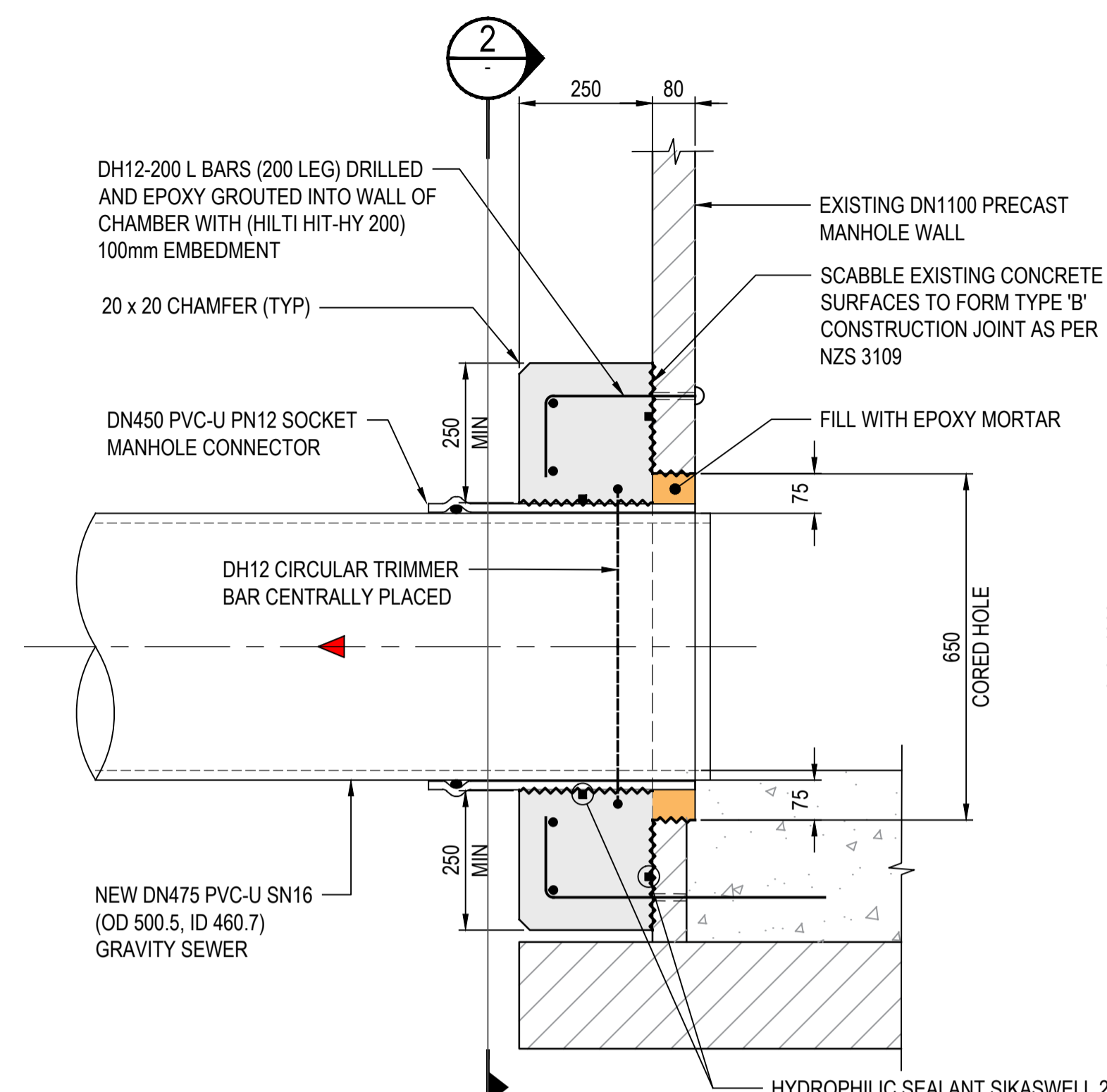
Client: **QUEENSTOWN LAKES DISTRICT COUNCIL**  
Project: **ROBINS ROAD WASTEWATER UPGRADES**

Title: **WASTEWATER PRESSURE LAYOUT PLAN**

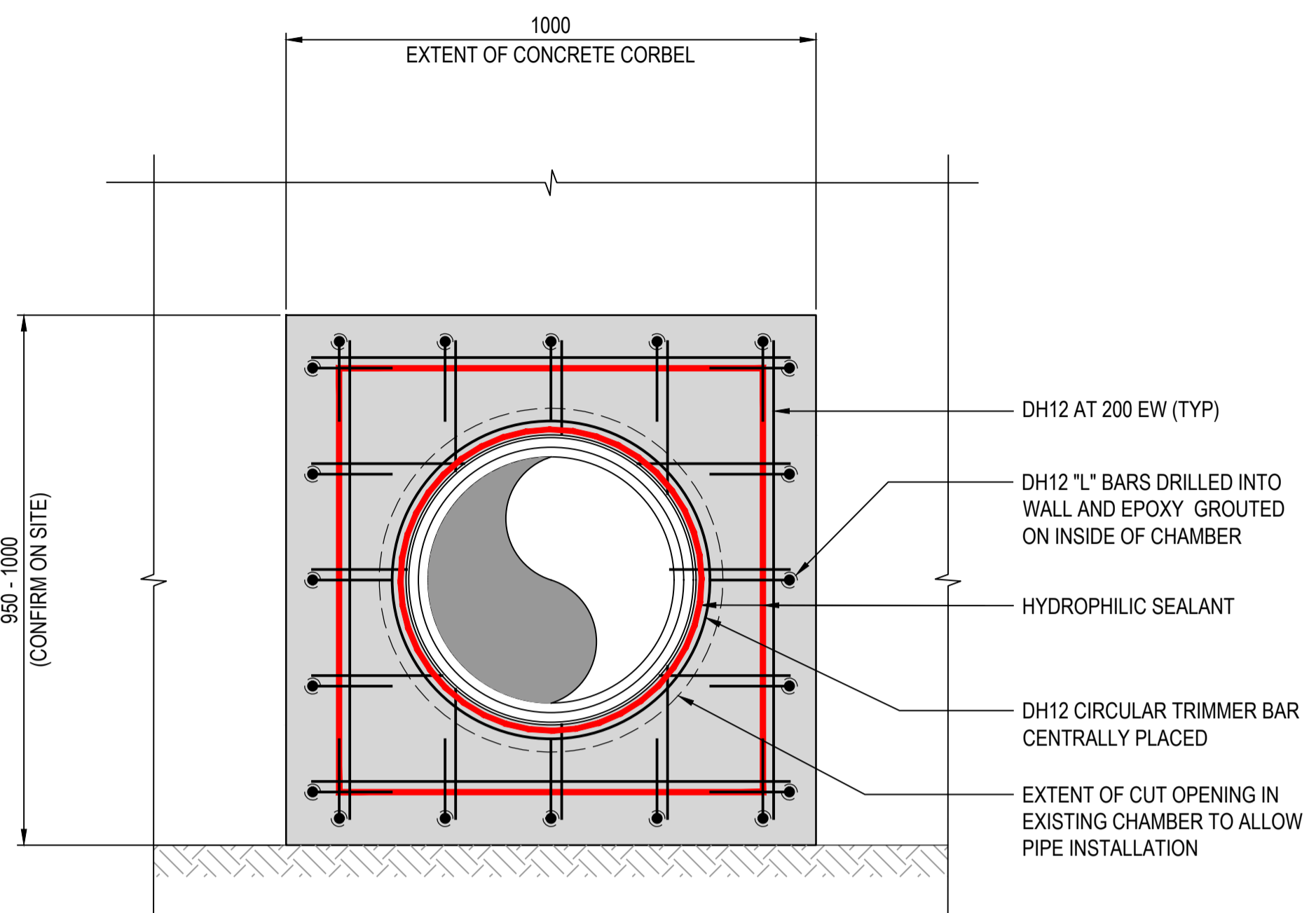
Discipline: **CIVIL ENGINEERING**  
Drawing No.: **3367096-010-CA-005**  
Rev: **A**

**NOTES**

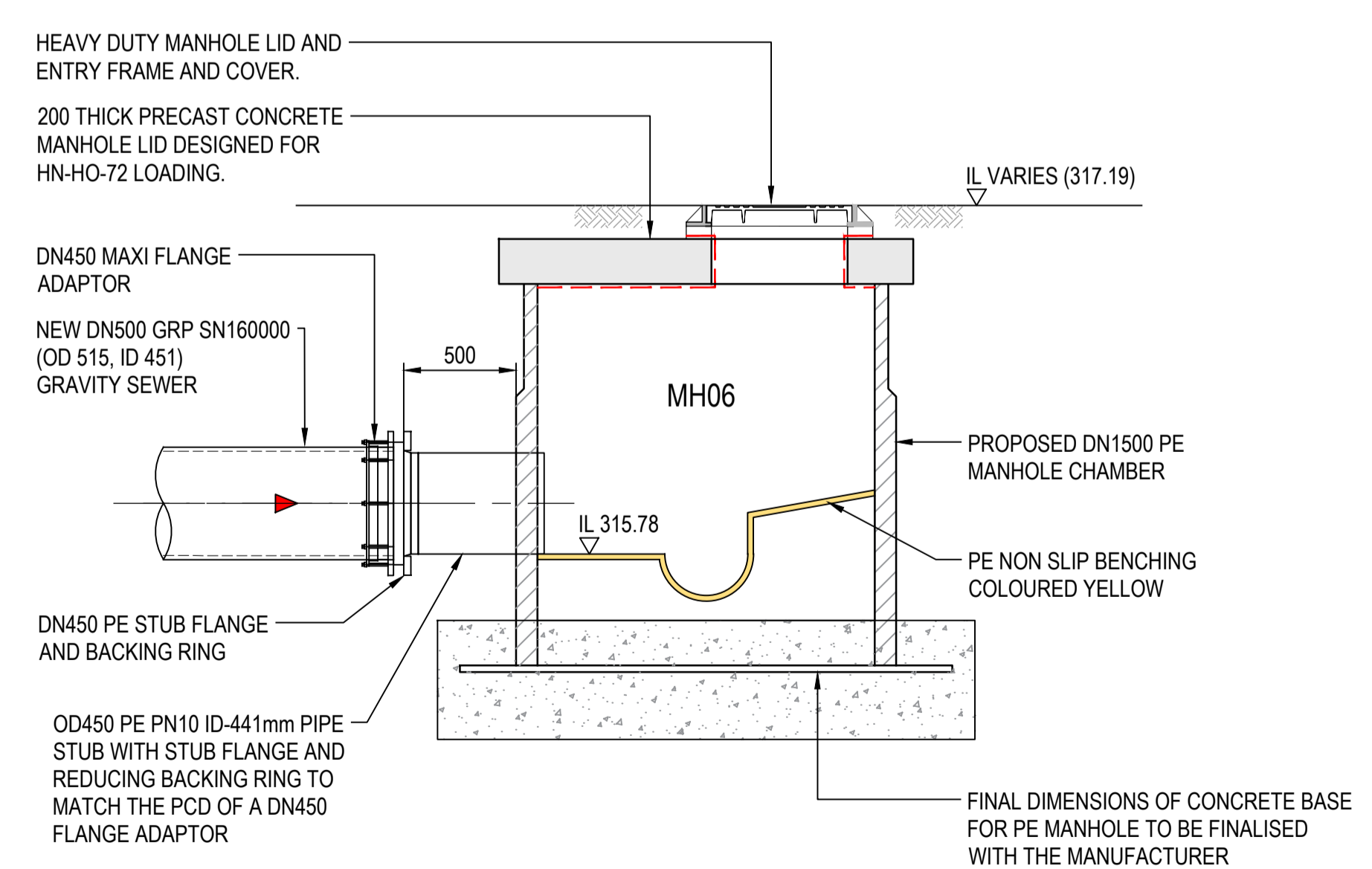
1. MANHOLE TO BE A PE AND DESIGNED AND FABRICATED BY THE PE MANHOLE MANUFACTURER.
2. LOADINGS FOR MANHOLES TO BE HNH072.
3. ANTI FLOATATION TO BE DESIGNED BY THE PE MANHOLE MANUFACTURER.
4. ALL FLANGES TO BE PN16 AS PER AS/NZS 4087 FIGURE B5.
5. ALUMINIUM LADDERS TO BE INSTALLED IN ALL MANHOLES
6. ALL BURIED METALLIC FITTINGS TO BE COATED IN THE DENSO SYSTEM OF MASTIC TAPE



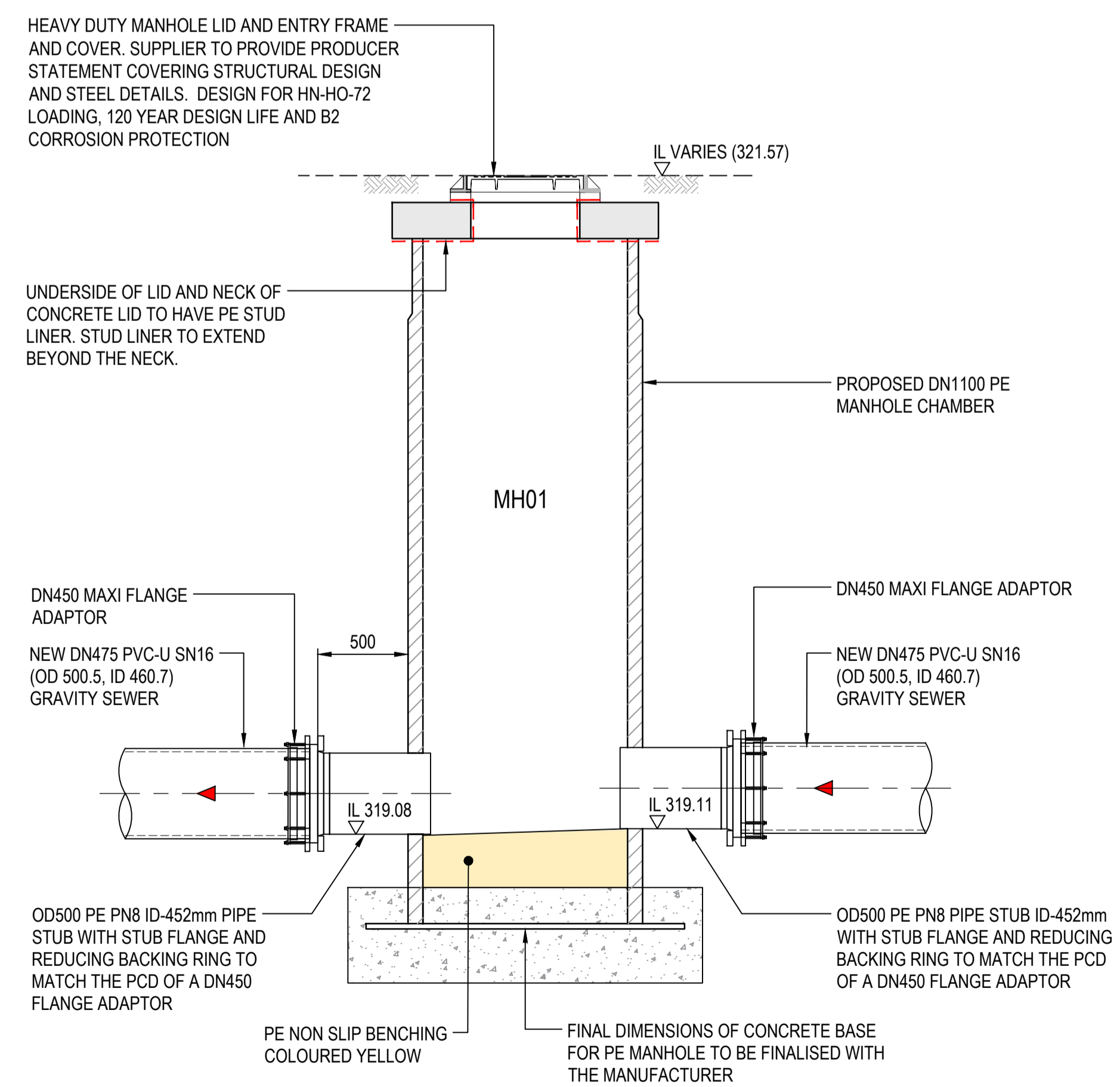
**B** DETAIL - PIPE CORBEL  
1:10



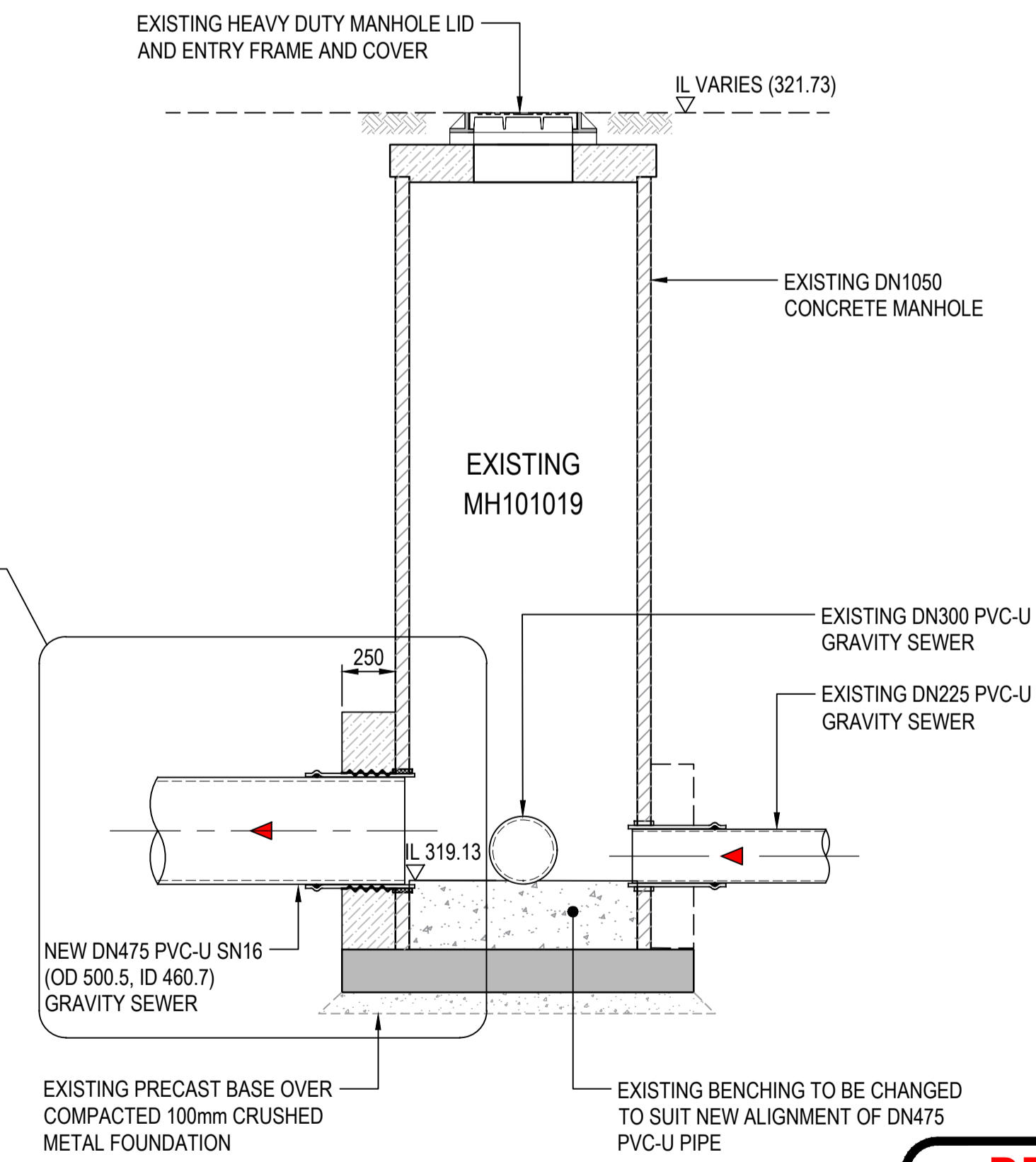
**2** SECTION - PIPE CORBEL  
1:10



**3** MH06 CONNECTION DETAIL  
SCALE 1:25



**2** MH01 CONNECTION DETAIL  
SCALE 1:25



**1** EXISTING MH101019 CONNECTION  
SCALE 1:25

**DRAFT ONLY**  
**NOT FOR CONSTRUCTION**

**DETAILED DESIGN**  
**NOT FOR CONSTRUCTION**

No.	Revision	By	Chk	Appd	Date
B	ISSUED FOR DRAFT DETAILED DESIGN - TRENCHLESS	JK	NU	PM	11.02.25
A	ISSUED FOR DRAFT DETAILED DESIGN	JK	NU	PM	17.12.24

Original Scale (A1)	Design	Drawn	Checked	Approved For Construction*
AS SHOWN	N. UNGERER	J. KNOX	P. MARSHALL	02.12.24
Reduced Scale (A3)	1/2 SHOWN	R. SIMPSON		17.12.24



Client: **QUEENSTOWN LAKES DISTRICT COUNCIL**

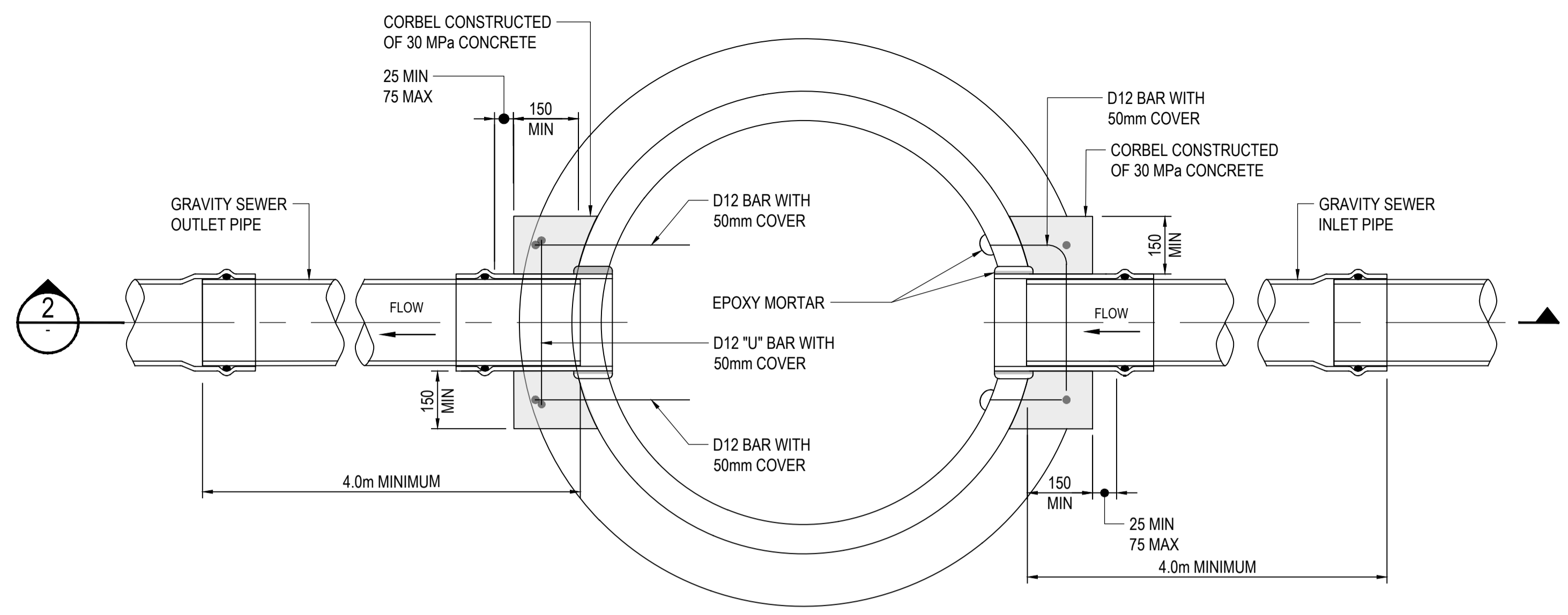
Project: **ROBINS ROAD WASTEWATER UPGRADES**

Title: **WASTEWATER MANHOLE DETAILS SHEET 2**

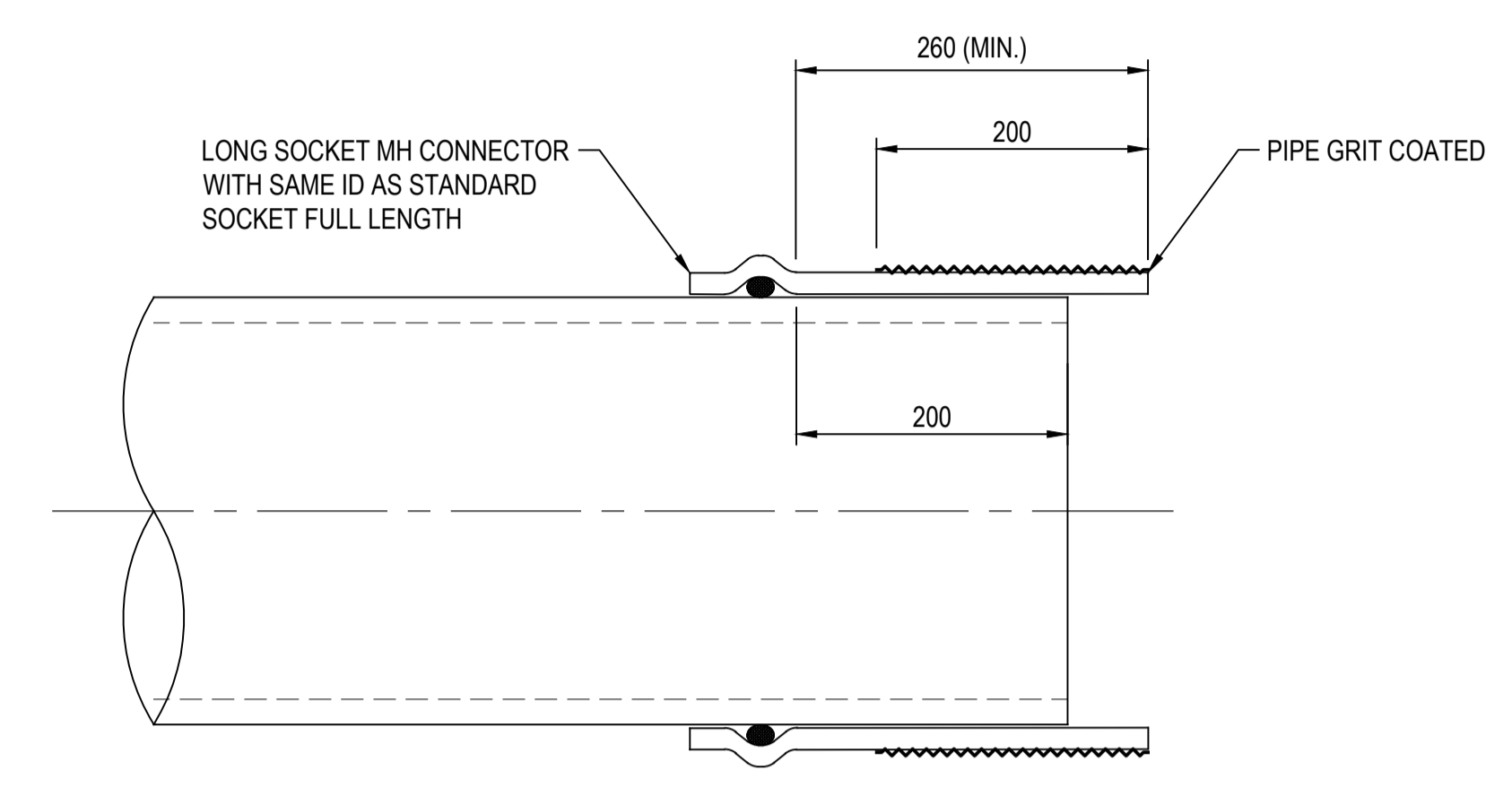
Discipline: **CIVIL ENGINEERING**

Drawing No.: **3367096-010-CA-007**

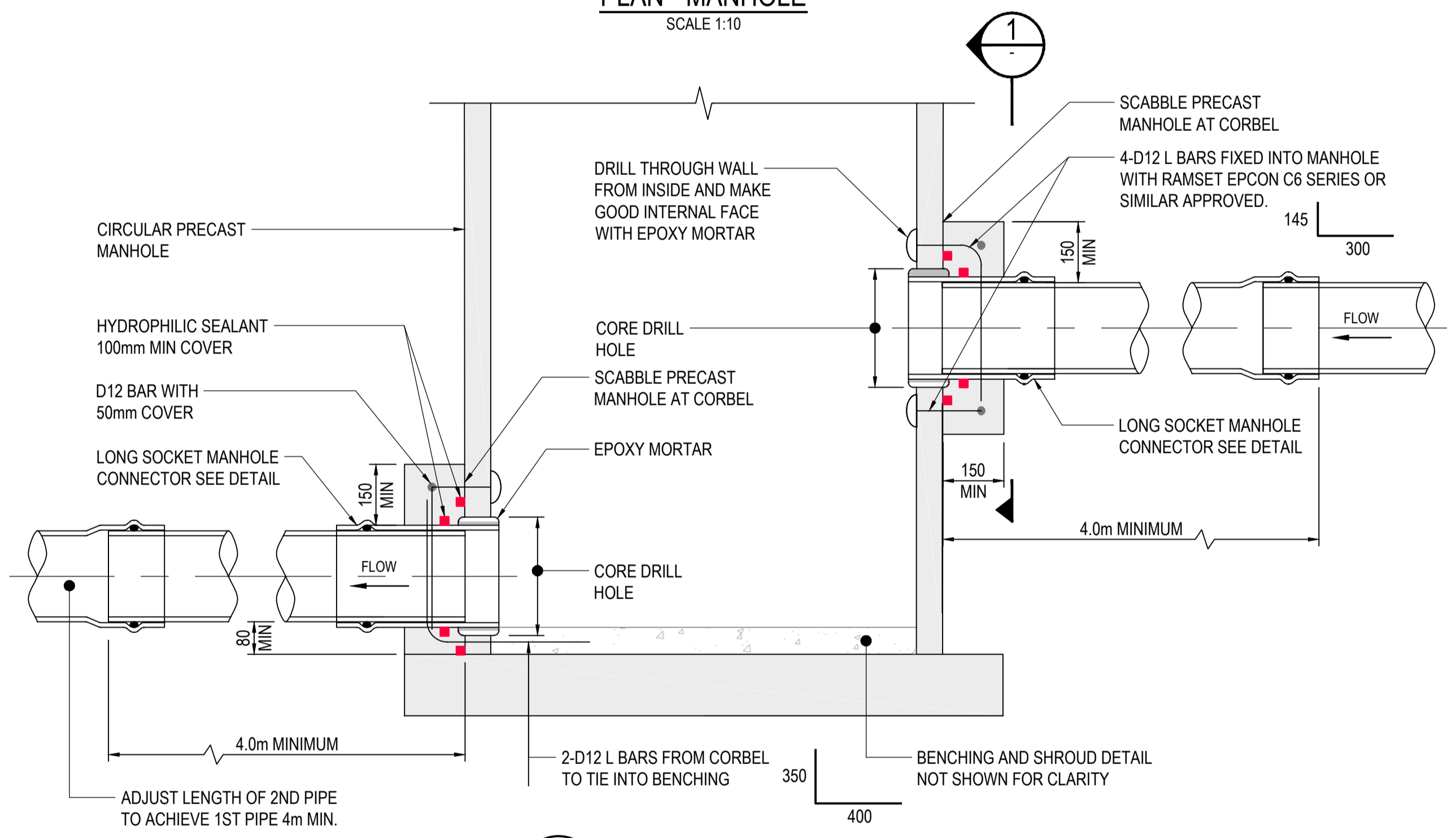
Rev: **B**



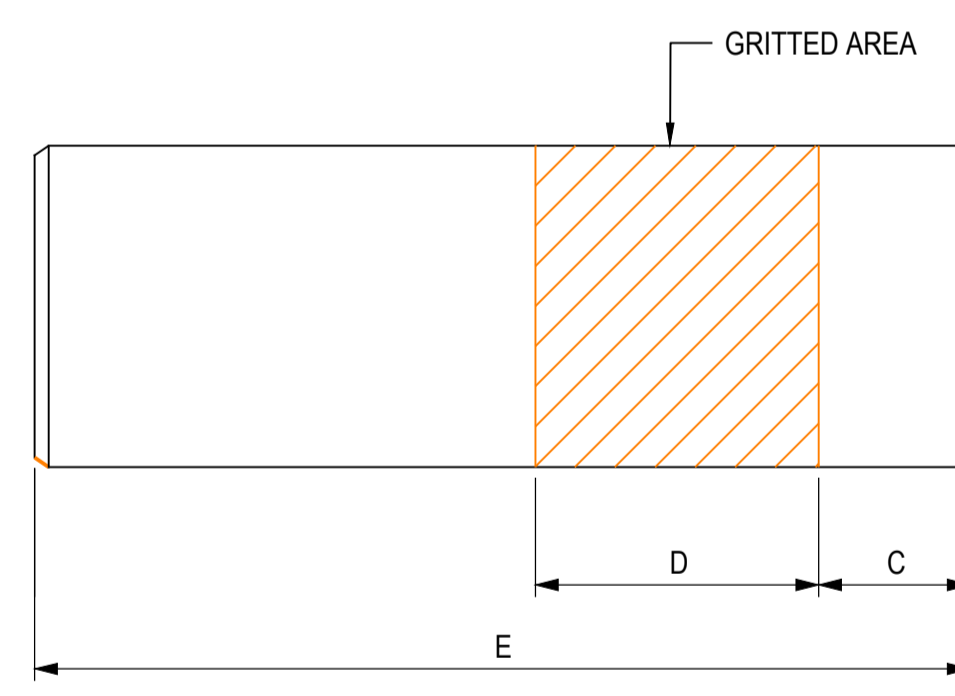
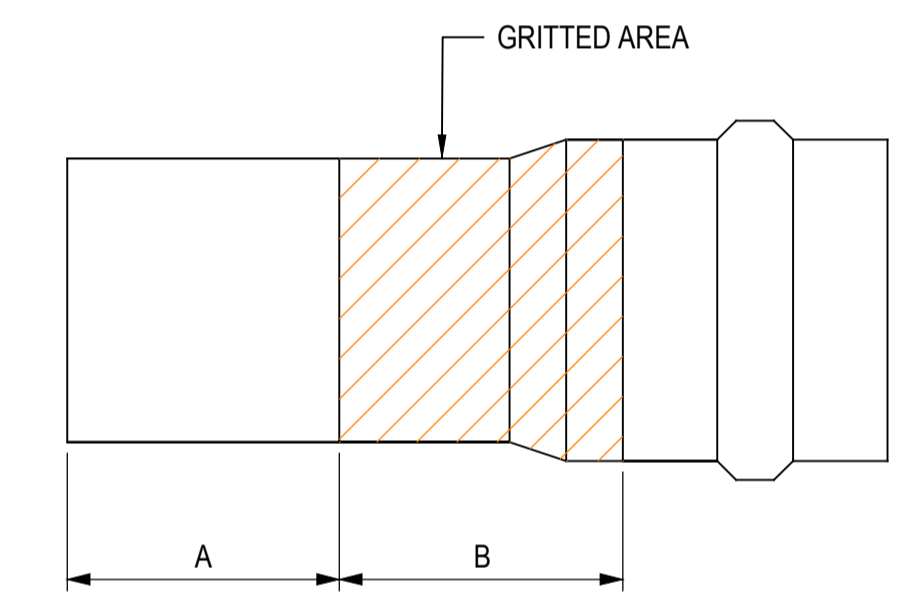
**PLAN - MANHOLE**  
SCALE 1:10



**PVC LONG SOCKET MANHOLE CONNECTOR**  
SCALE 1:5

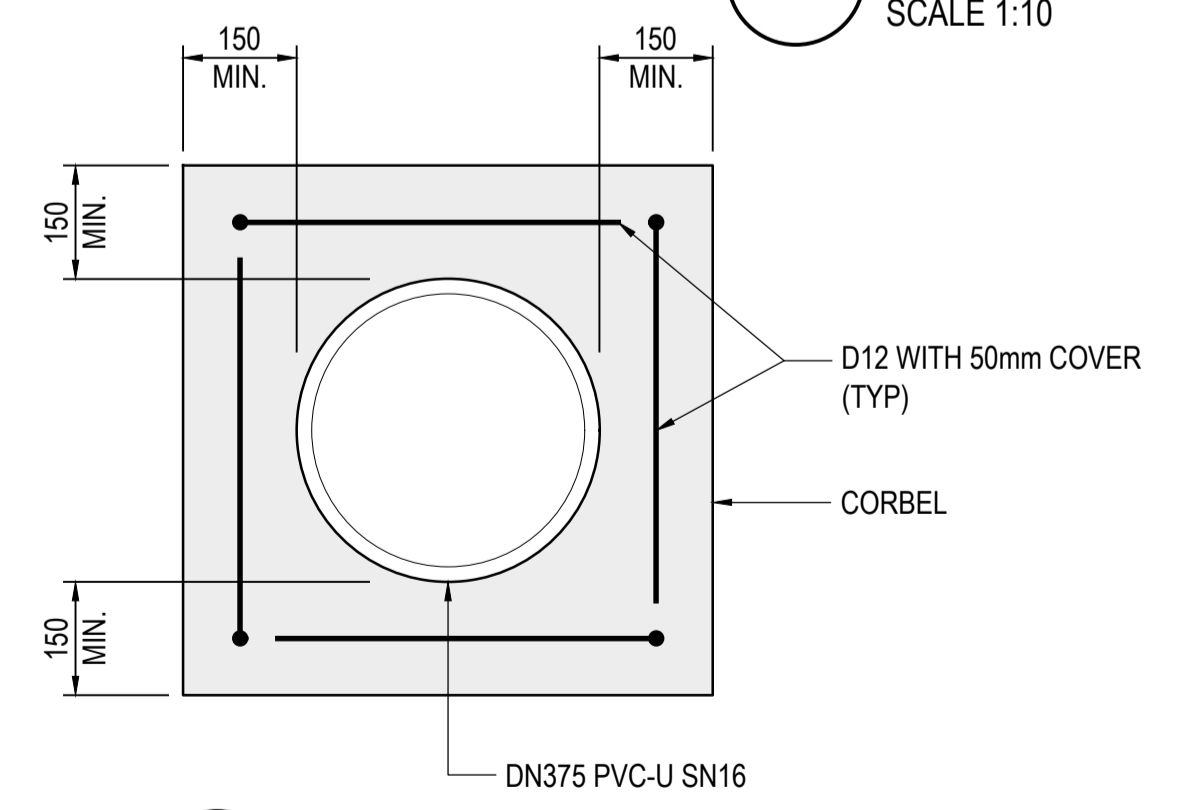


**SECTION - MANHOLE**  
SCALE 1:10



PIPE DN	A	B	C	D	E
100	144	150	80	150	500
150	129	150	80	150	500
175	113	150	80	150	500
225	95	150	80	150	500
300	82	150	80	150	500
475	**	150	80	150	600

\*\* BASED ON SUPPLIER, CONFIRM WITH ENGINEER



**SECTION - CORBEL**  
SCALE 1:10

**NOTE:**

- PIPE OPENING AND CORBELS SHALL BE AT LEAST 300mm CLEAR OF ANY JOINT IN PRECAST MANHOLE.
- CORBEL TO HAVE AT LEAST 70mm CONCRETE BELOW STARTER/FINISHER.

No.	Revision	By	Chk	Appd	Date
B	ISSUED FOR DRAFT DETAILED DESIGN -TRENCHLESS	JK	NU	PM	11.02.25
A	ISSUED FOR DRAFT DETAILED DESIGN	JK	NU	PM	17.12.24

Original Scale (A1)	Design	Date	Approved For Construction*
AS SHOWN	N. UNGERER	02.12.24	
Reduced Scale (A3)	Drawn J. KNOX	10.12.24	
	Design Verifier P. MARSHALL	17.12.24	
	Design Check R. SIMPSON	17.12.24	



Project: **ROBINS ROAD WASTEWATER UPGRADES**

Title: **WASTEWATER MANHOLE CONNECTION DETAILS**

Discipline: **CIVIL ENGINEERING**  
Drawing No.: **3367096-010-CA-008**  
Rev.: **B**

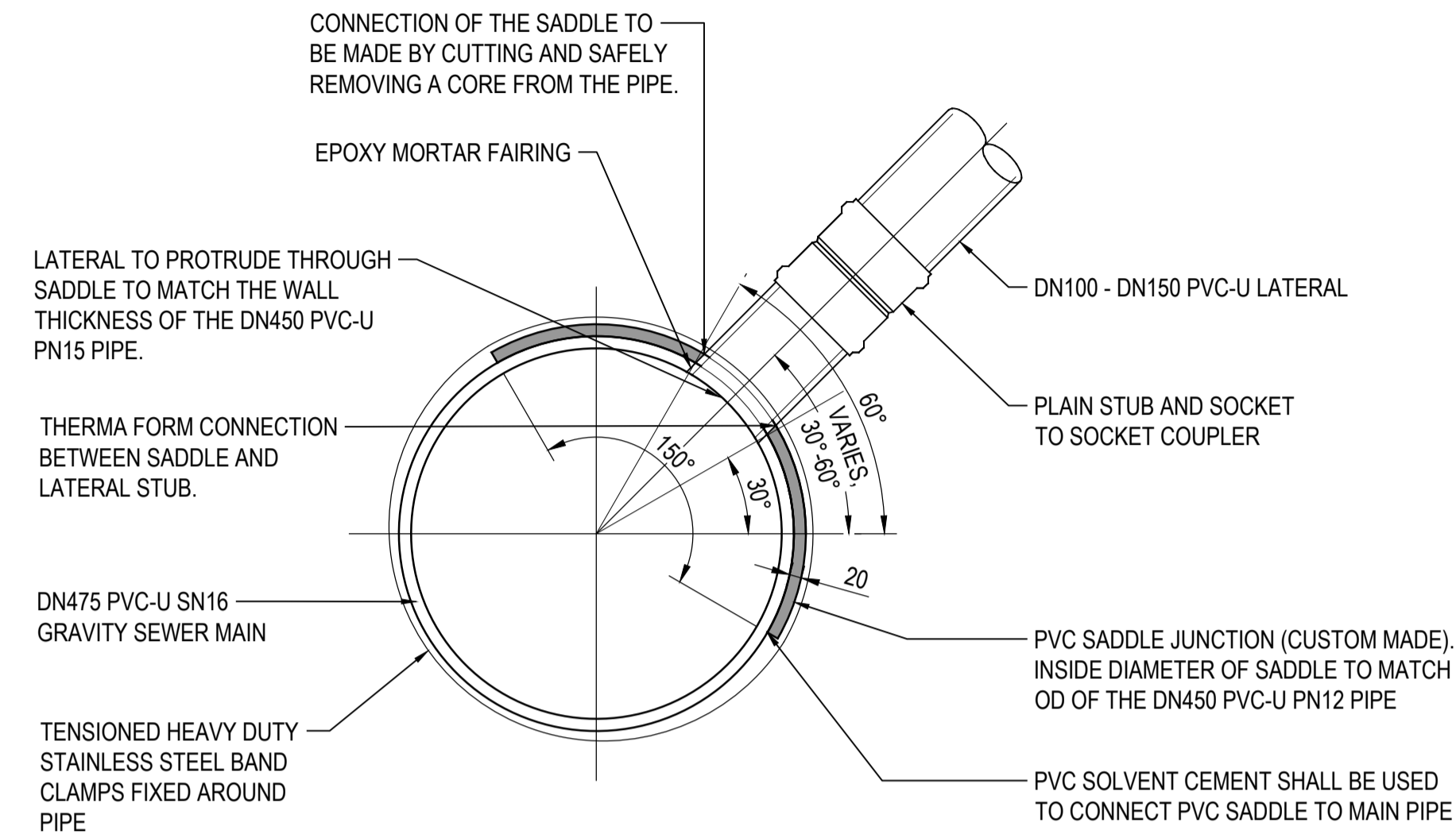
**ORIGINAL DRAWING**  
**IN COLOUR**

**DRAFT ONLY**

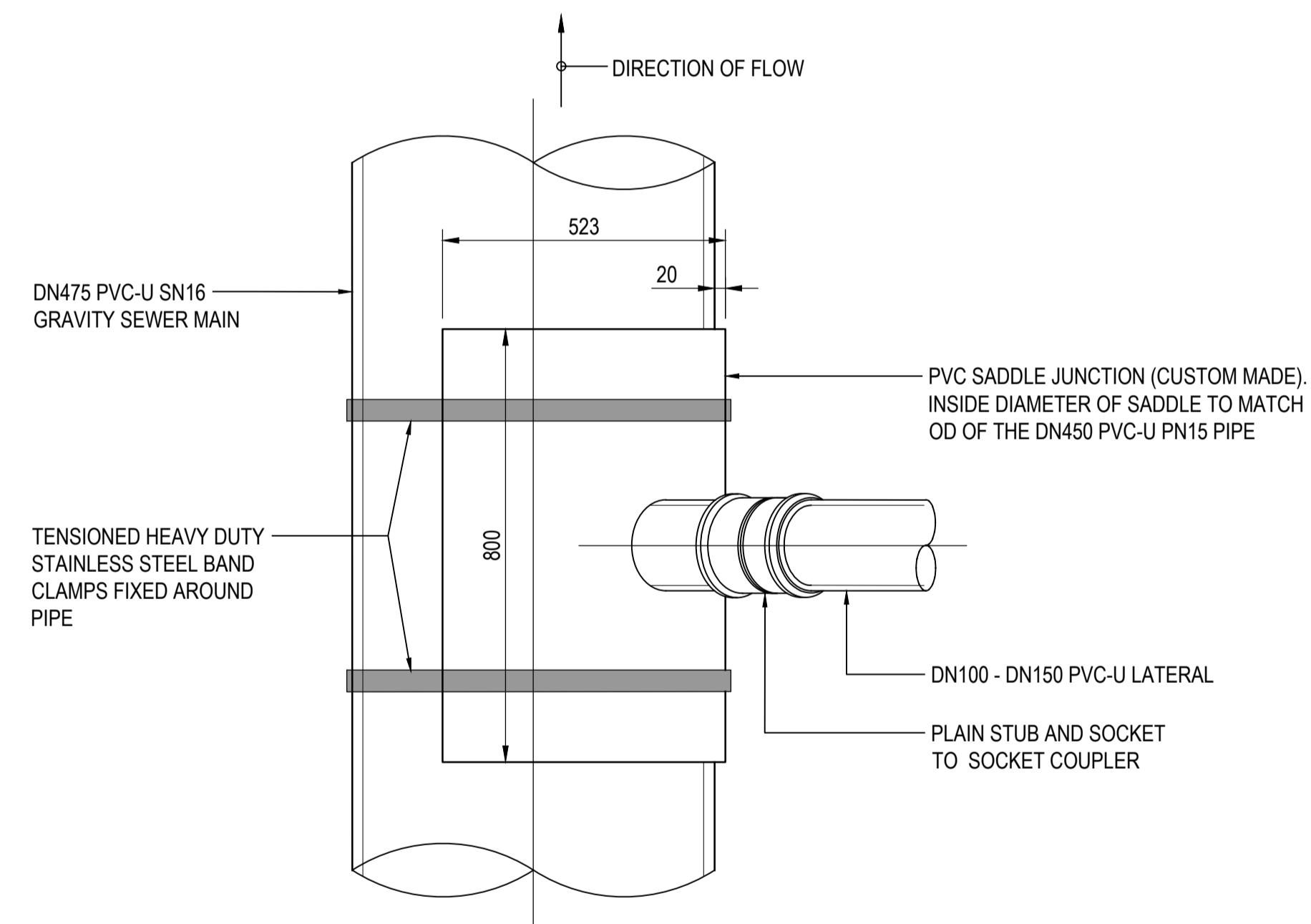
**DETAILED DESIGN**  
**NOT FOR CONSTRUCTION**

**NOTES**

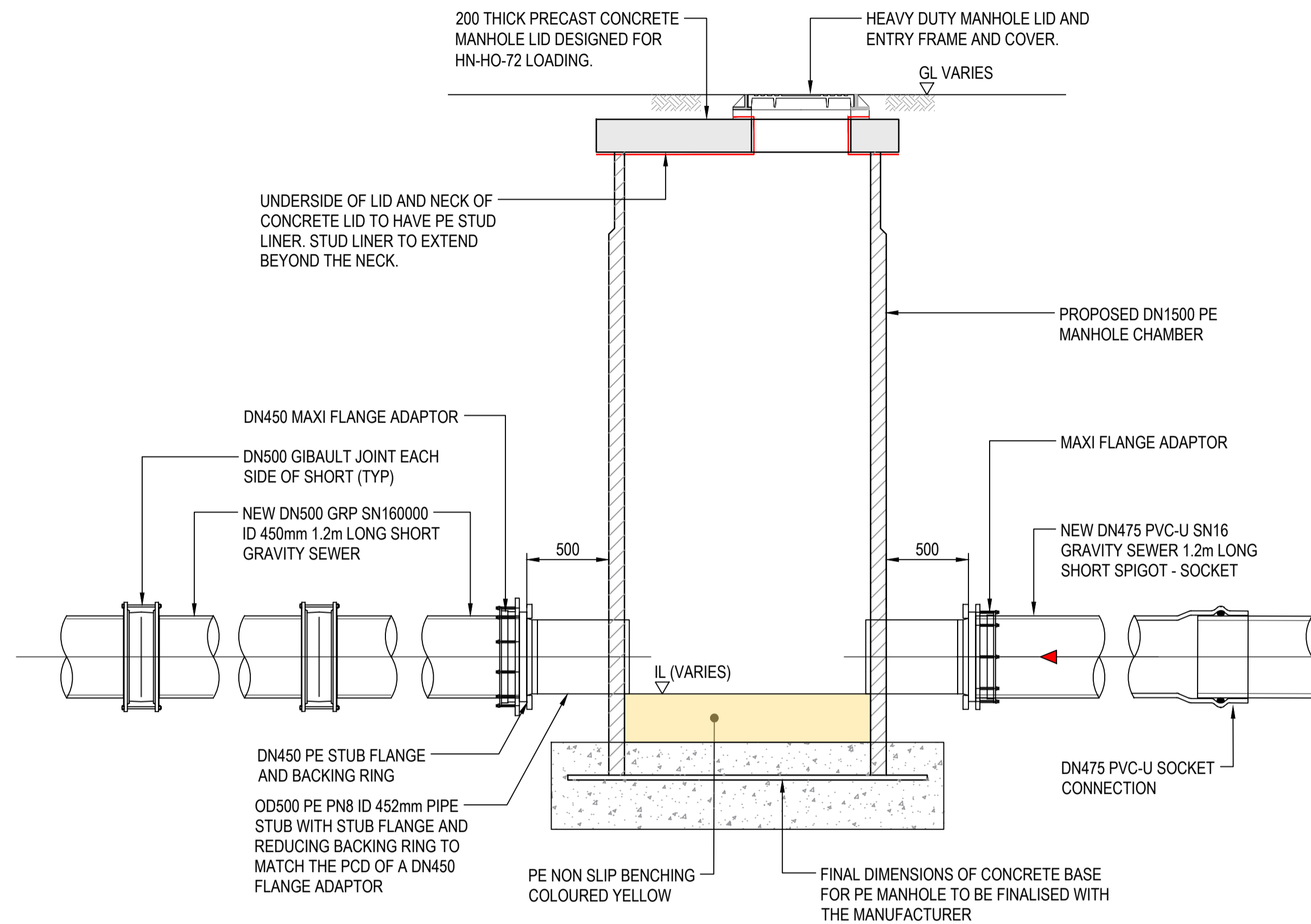
1. THE CONNECTIONS USING SADDLES ON THE DN450 SHALL ONLY BE USED WHERE SPECIFIED AND WITH WRITTEN APPROVAL FROM THE ENGINEER.
2. CONNECTING PIPE LATERAL SHALL NOT PROTRUDE INTO THE MAIN PIPELINE.
3. CUT HOLE IN MAIN PIPE FOR LATER SHALL MATCH INCOMING Y-BRANCH (EGG SHAPED) TO WITHIN +2mm, -0mm TOLERANCE. SMOOTH JUNCTION INTERFACE WITH EPOXY MORTAR.
4. PVC COMPATIBLE EPOXY MORTAR SHALL BE USED FOR SMOOTHING TRANSITION INTO MAIN PIPE AS SHOWN.
5. ALL SURFACES SHALL BE CLEANED PRIOR TO BEING BONDED. ABRASE SURFACES IN TWO DIRECTIONS WITH 40 GRIT SANDPAPER. SOLVENT WIPE TO REMOVE DUST.
6. MAXIMUM LATERAL CONNECTION TO BE DN150.
7. ALL BURIED METALLIC FITTINGS TO BE COATED IN THE DENSO SYSTEM OF MASTIC AND TAPE.



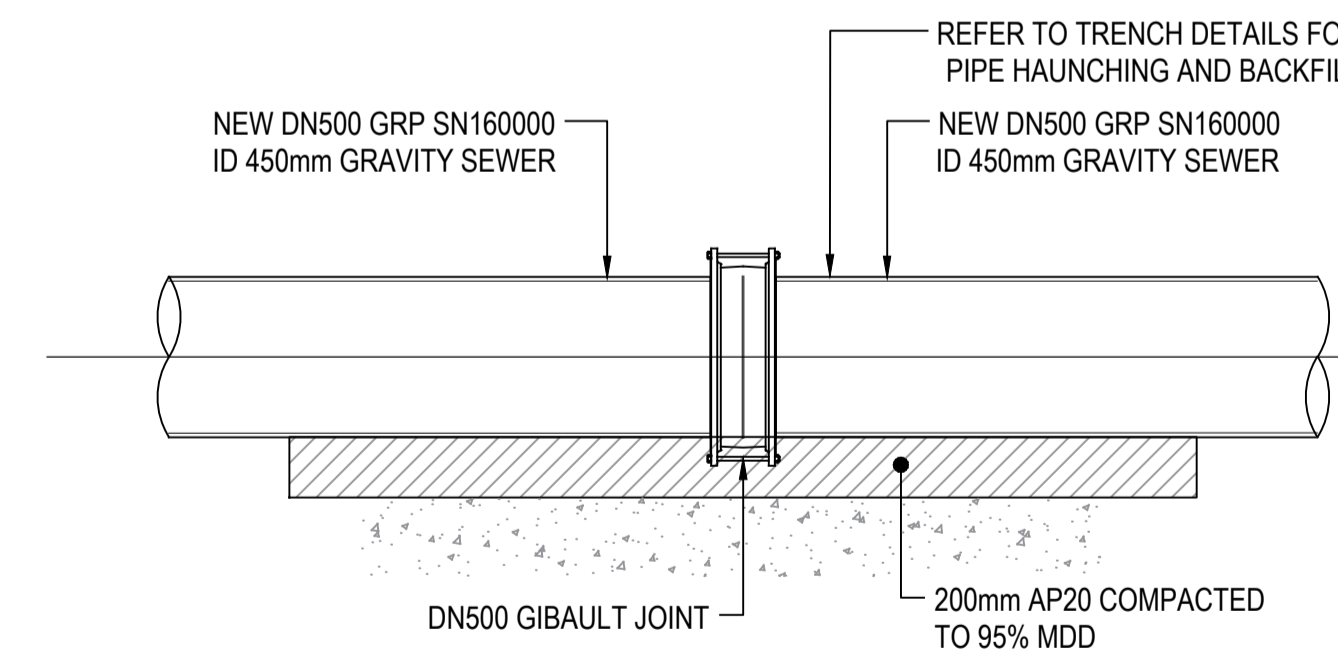
**DETAIL - PIPE SADDLE**  
SCALE 1:10



**PLAN - PIPE SADDLE**  
SCALE 1:10



**MANHOLE WWMH02 DETAIL  
TRANSITION FROM GRP TO PVC**  
SCALE 1:25



**CONNECTION GRP TO GRP  
IN TRANSITION PITS**  
SCALE 1:25

FOR TRENCH DETAIL REFER TO DRAWING 3367096-010-CA-001

No.	Revision	By	Chk	Appd	Date
B	ISSUED FOR DRAFT DETAILED DESIGN -TRENCHLESS	JK	NU	PM	11.02.25
A	ISSUED FOR DRAFT DETAILED DESIGN	JK	NU	PM	17.12.24

Original Scale (A1)	Design	N. UNGERER	02.12.24	Approved For Construction*
AS SHOWN	Drawn	J. KNOX	10.12.24	
Reduced Scale (A3)	Dwg Verifier	P. MARSHALL	17.12.24	
1/2 SHOWN	Dwg Check	R. SIMPSON	17.12.24	



Client: **QUEENSTOWN LAKES DISTRICT COUNCIL**  
Project: **ROBINS ROAD WASTEWATER UPGRADES**

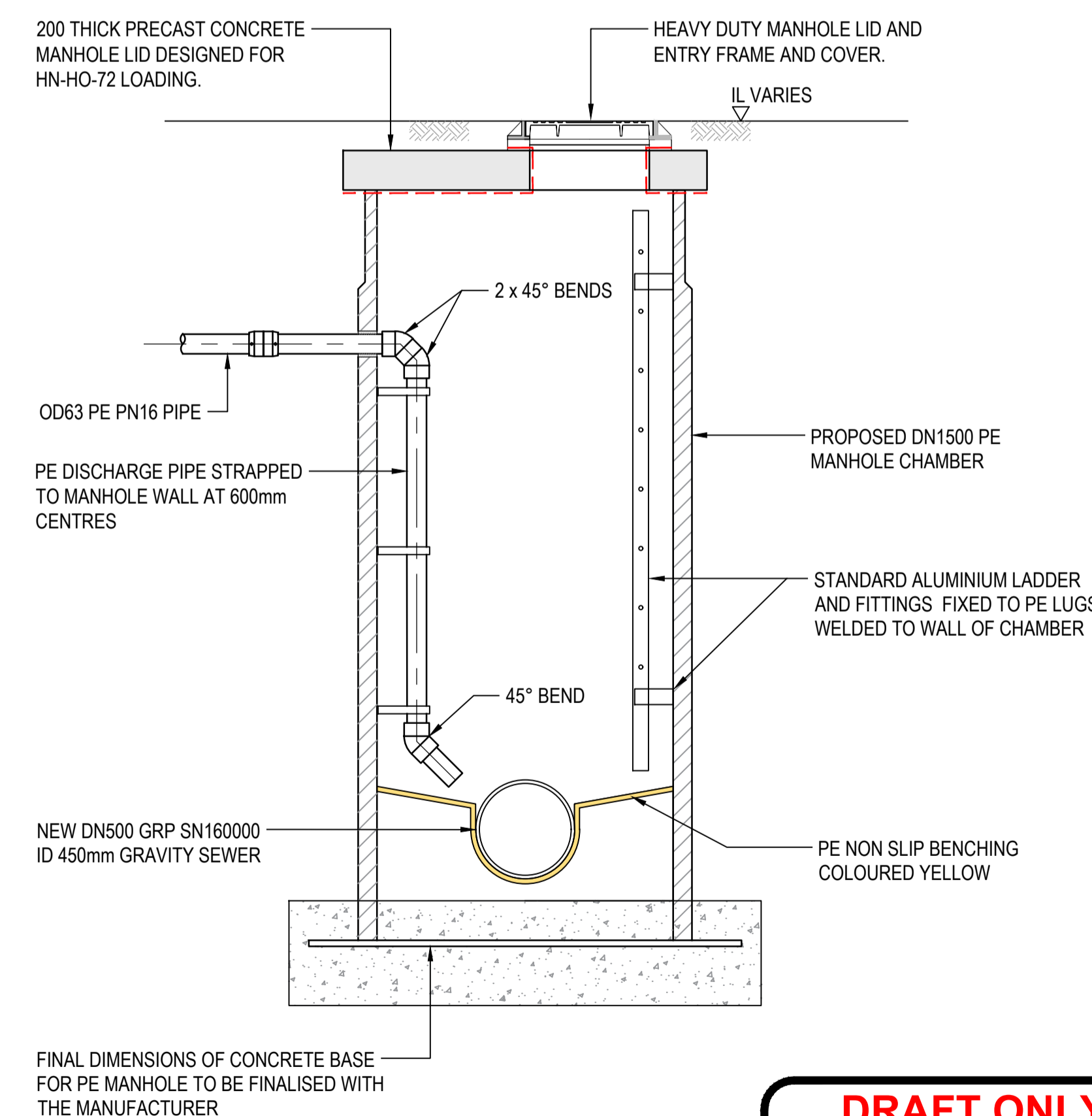
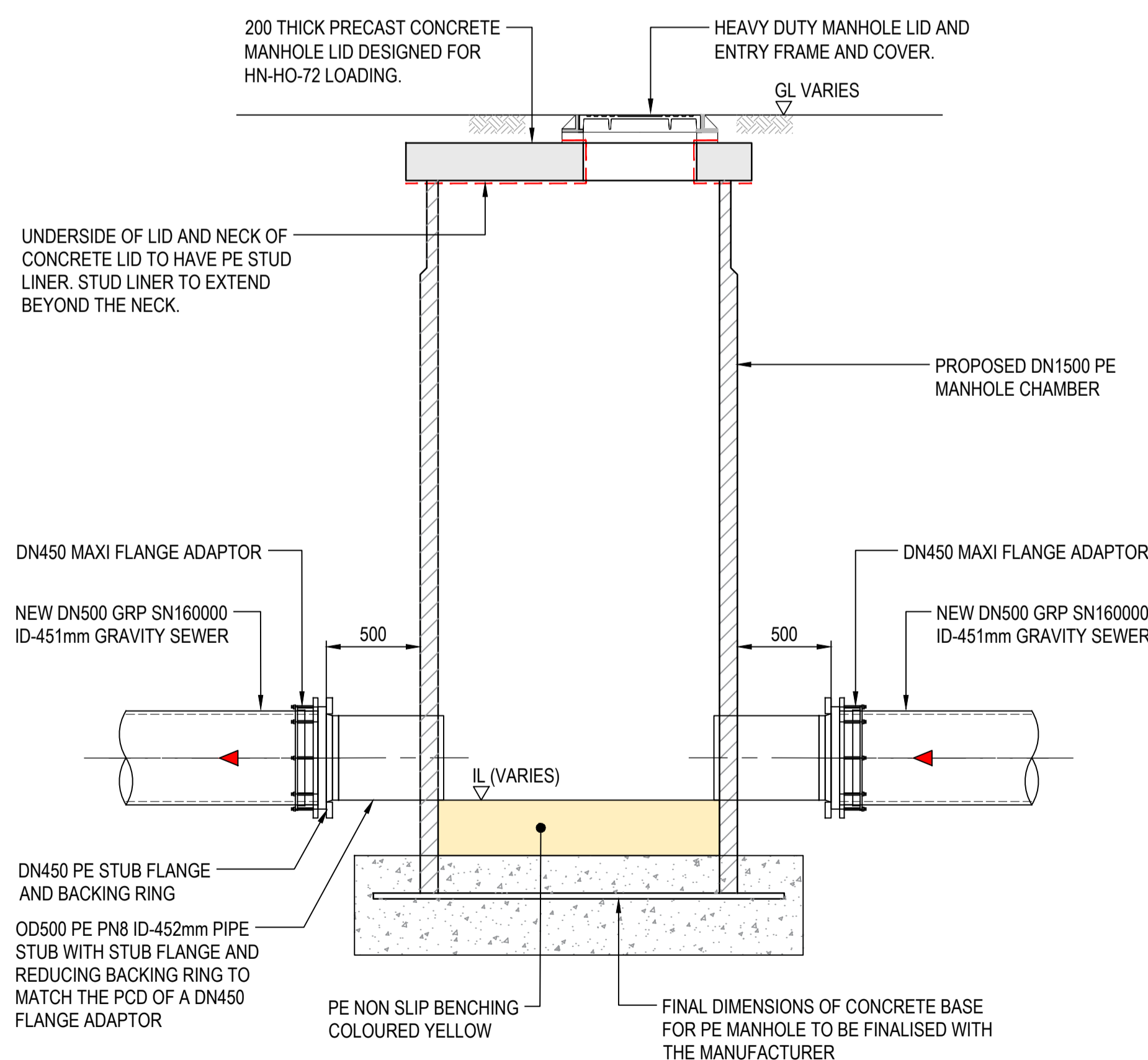
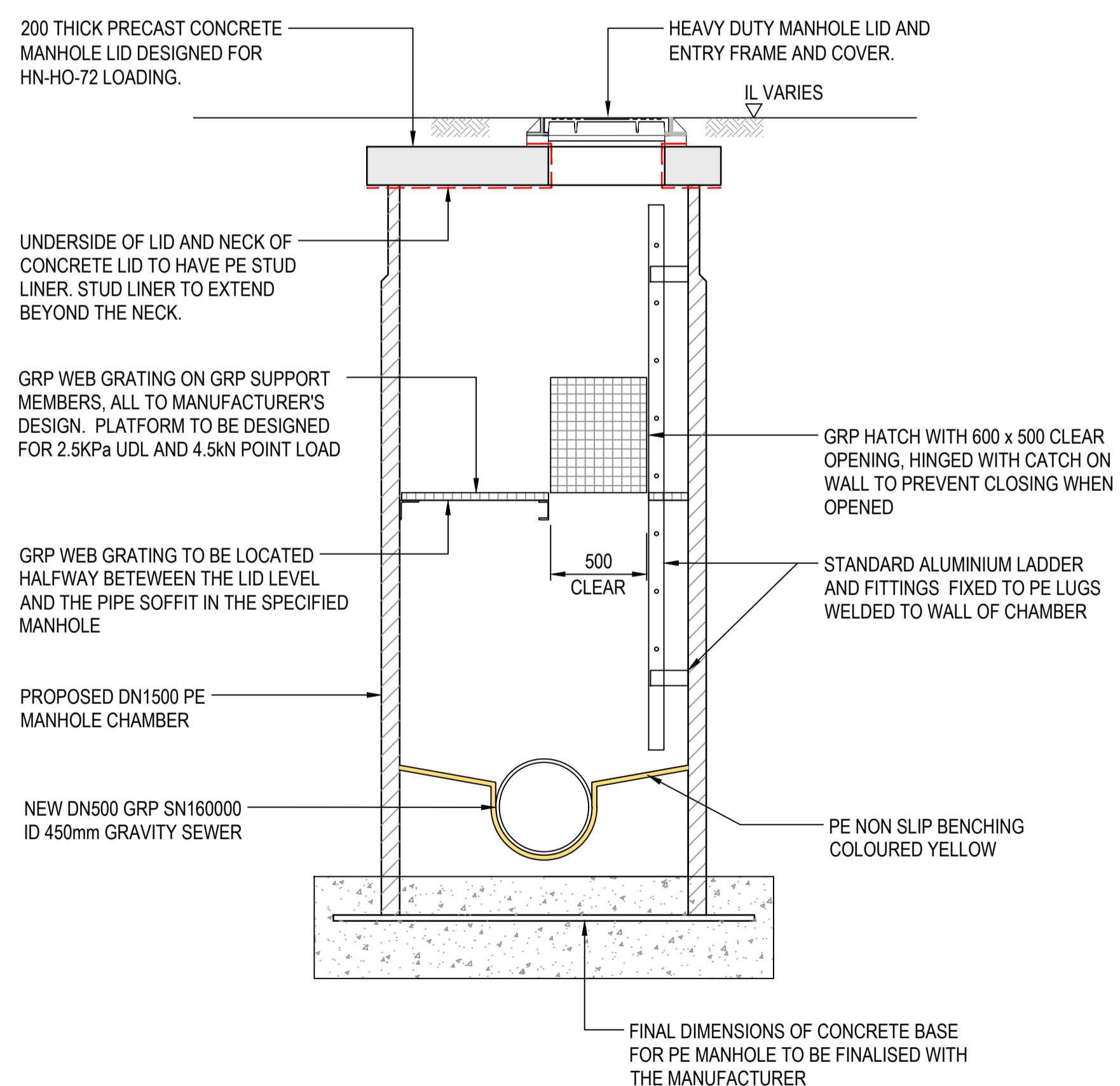
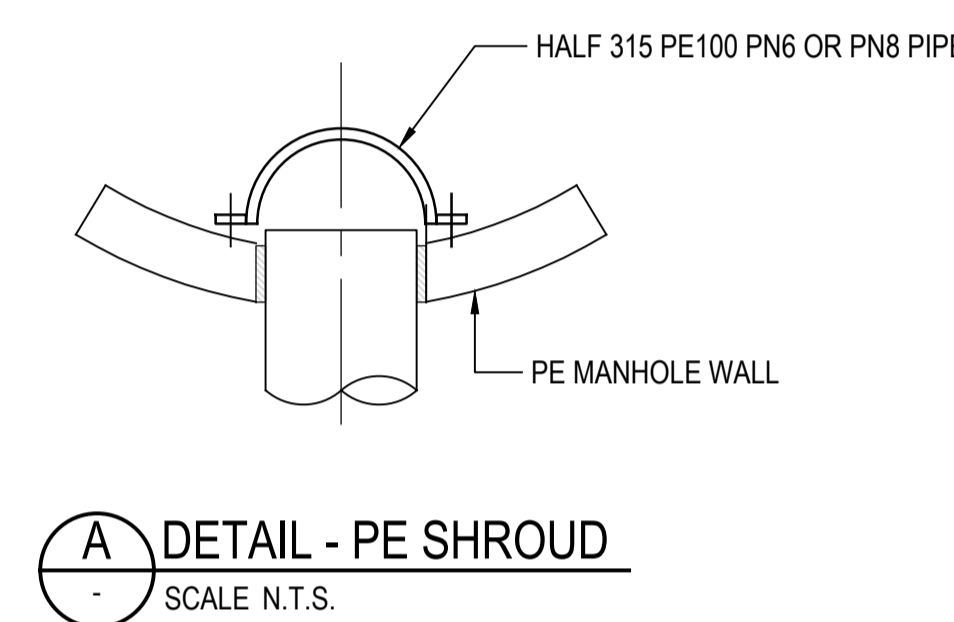
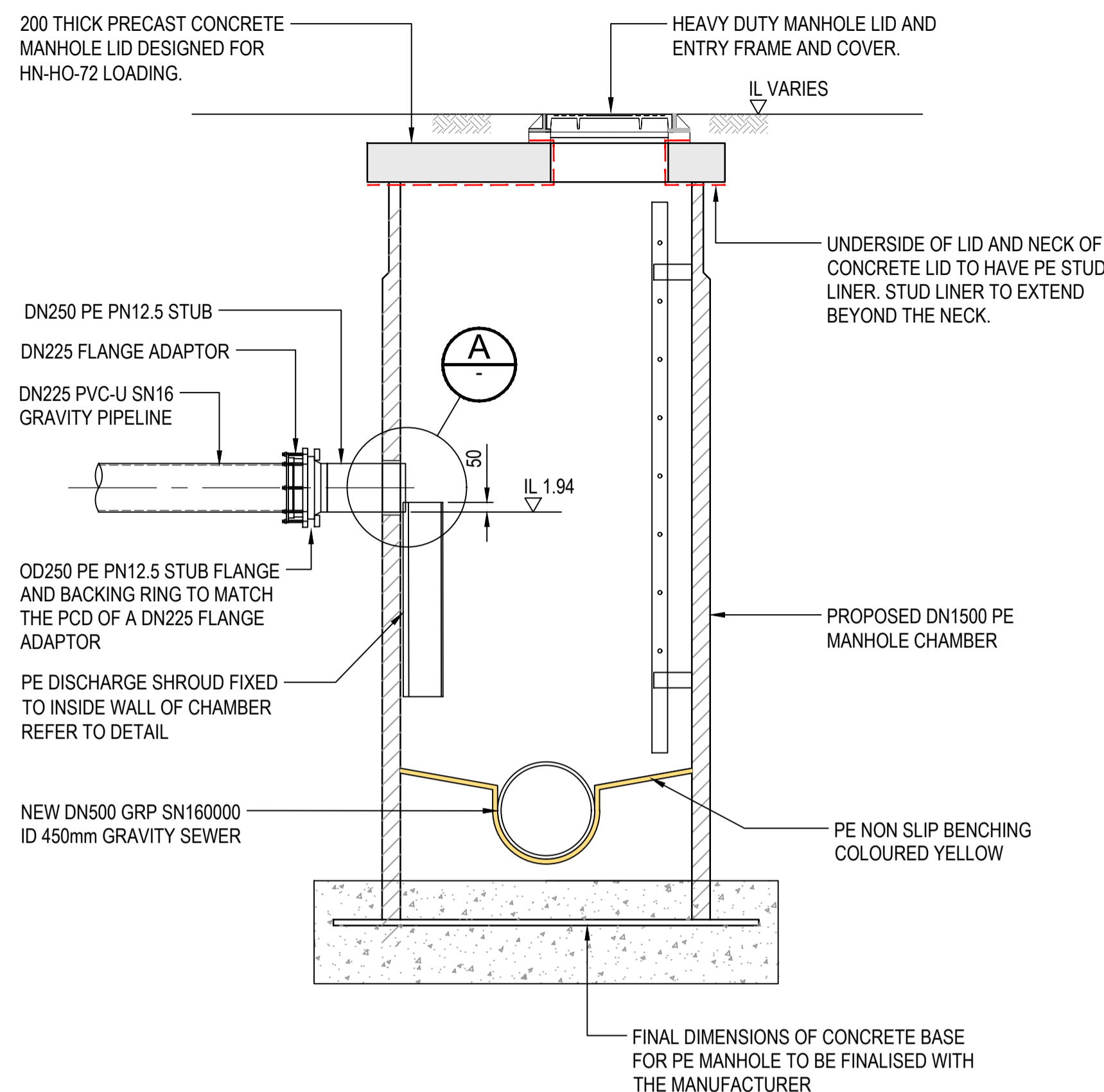
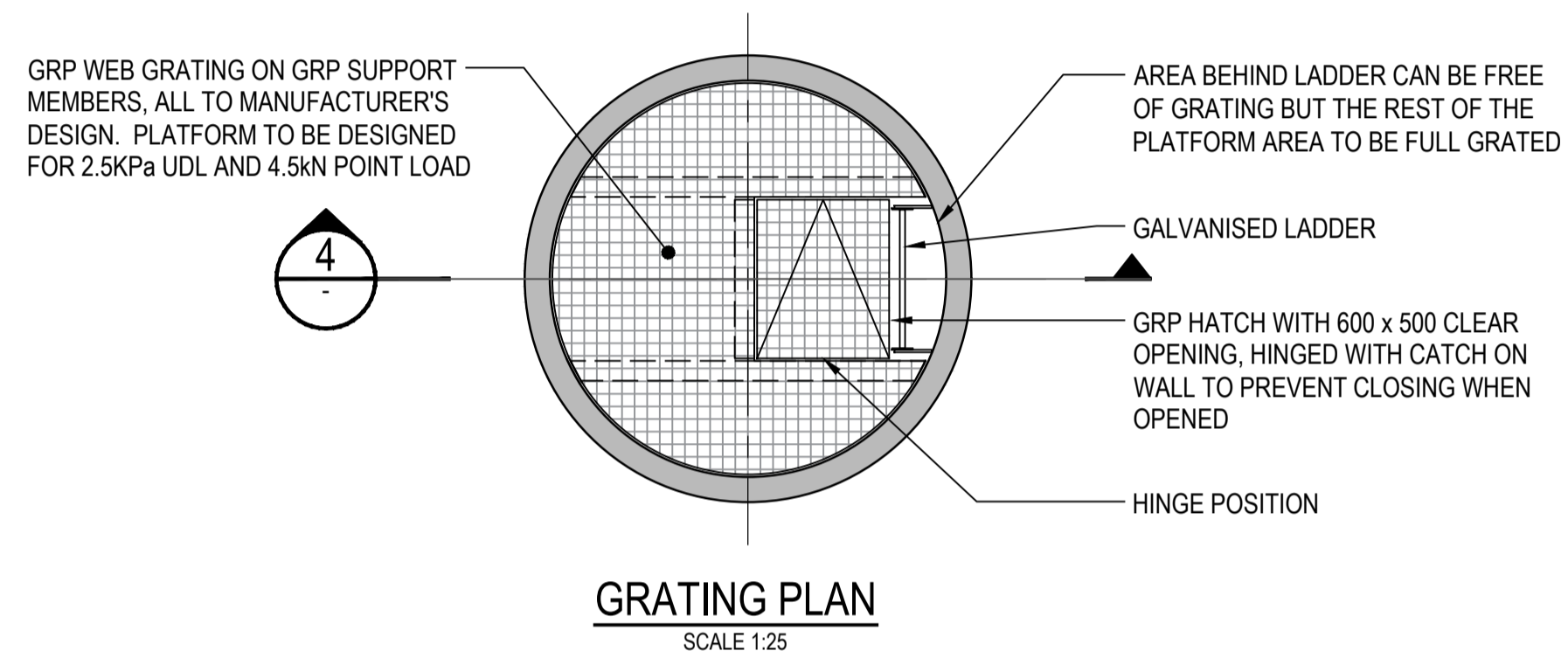
Title: **WASTEWATER LATERAL CONNECTION DETAILS**

Discipline	CIVIL ENGINEERING
Drawing No.	3367096-010-CA-009
Rev.	B

MANHOLE SCHEDULE				
MANHOLE ID	DIAMETER Ø	DEPTH TO PIPE INVERT (m)	LADDER REQUIRED	GRP PLATFORM REQUIRED
WWMH01	DN1100	2.50		NO
WWMH02		3.08		NO
WWMH03	DN1500	4.93	YES	YES
WWMH04		6.14		YES
WWMH05		7.20		YES
WWMH06		1.41	YES	NO

**NOTES**

1. MANHOLE TO BE A PE AND DESIGNED AND FABRICATED BY THE PE MANHOLE MANUFACTURER.
2. LOADINGS FOR MANHOLES TO BE HHN072.
3. ANTI FLOATATION TO BE DESIGNED BY THE PE MANHOLE MANUFACTURER.
4. ALL FLANGES TO BE PN16 AS PER AS/NZS 4087 FIGURE B5.
5. ALUMINIUM LADDERS TO BE INSTALLED IN ALL MANHOLES



**DRAFT ONLY**  
NOT FOR CONSTRUCTION

**DETAILED DESIGN**  
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
B	ISSUED FOR DRAFT DETAILED DESIGN - TRENCHLESS	JK	NU	PM	11.02.25
A	ISSUED FOR DRAFT DETAILED DESIGN	JK	NU	PM	17.12.24

Original Scale (A1)	Design	N. UNGERER	02.12.24	Approved For Construction*
AS SHOWN	Drawn	J. KNOX	10.12.24	
Reduced Scale (A3)	Dwg Verifier	P. MARSHALL	17.12.24	Date
1/2 SHOWN	Dwg Check	R. SIMPSON	17.12.24	

\* Refer to Revision 1 for Original Signature



Client: **QUEENSTOWN LAKES DISTRICT COUNCIL**

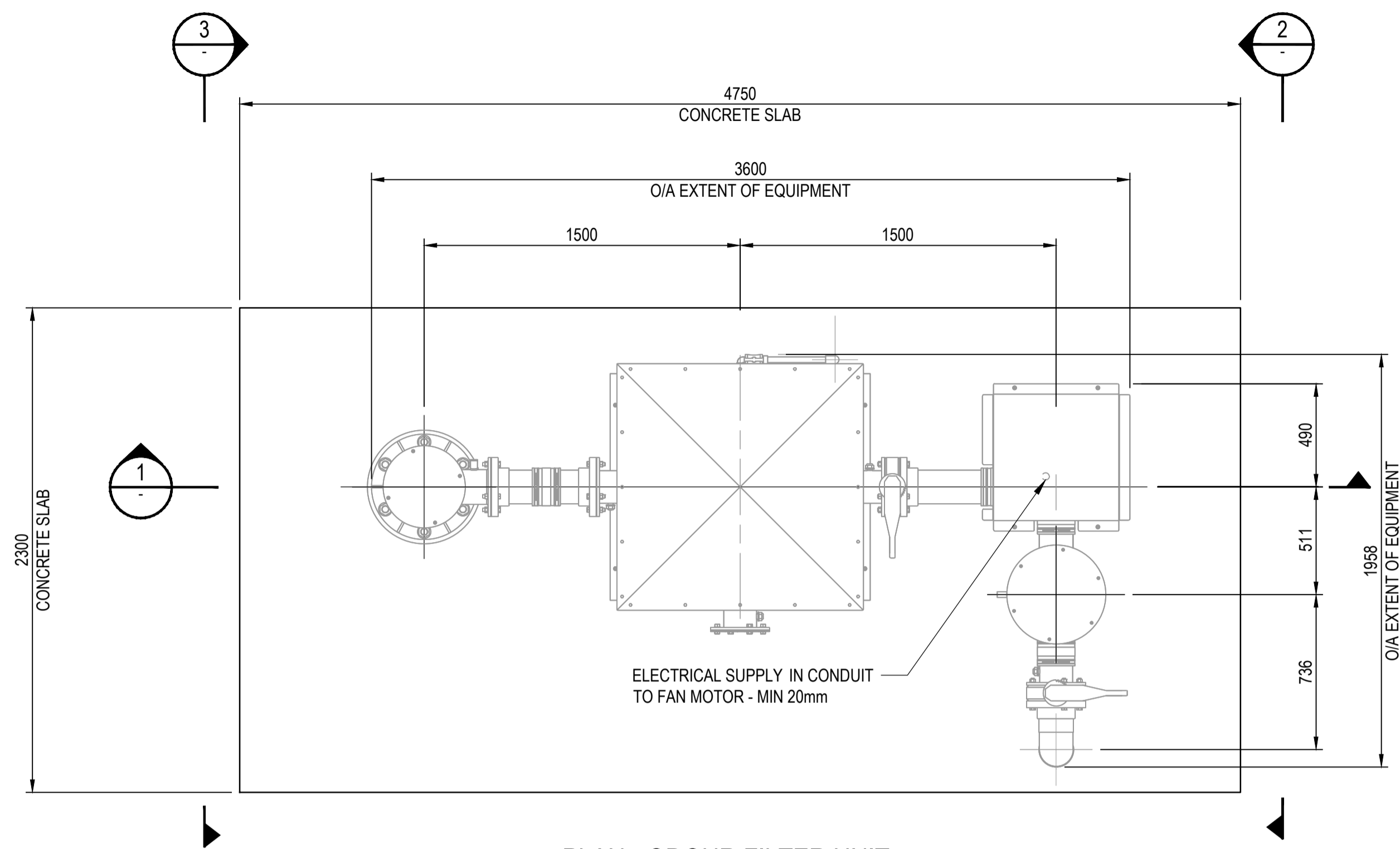
Project: **ROBINS ROAD WASTEWATER UPGRADES**

Title: **WASTEWATER PE MANHOLE DETAILS**

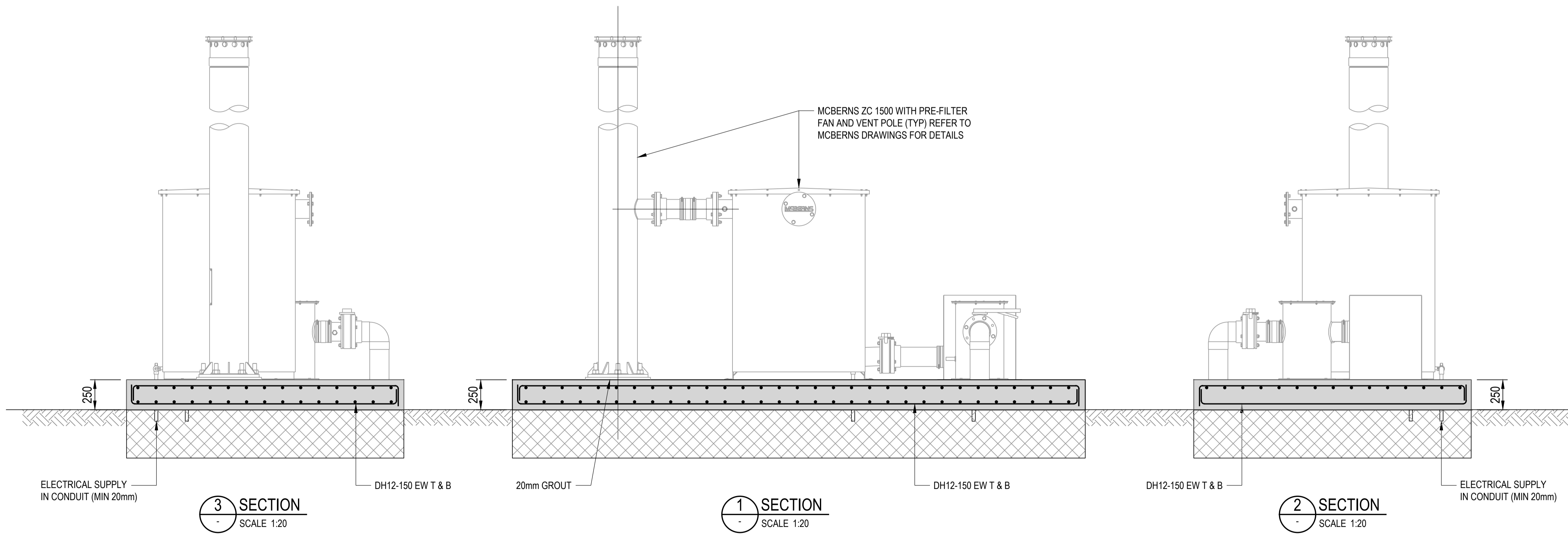
Discipline: **CIVIL ENGINEERING**

Drawing No.: **3367096-010-CA-010**

Rev.: **B**



**PLAN - ODOUR FILTER UNIT**  
SCALE 1:20



**3 SECTION**  
SCALE 1:20

**1 SECTION**  
SCALE 1:20

**2 SECTION**  
SCALE 1:20

**DRAFT ONLY**  
**DETAILED DESIGN**  
**NOT FOR CONSTRUCTION**

No.	Revision	By	Chk	Appd	Date
B	ISSUED FOR DRAFT DETAILED DESIGN - TRENCHLESS	JK	NU	PM	11.02.25
A	ISSUED FOR DRAFT DETAILED DESIGN	JK	NU	PM	17.12.24

Original Scale (A1)	Design	Drawn	Checked	Date	Approved For Construction*
AS SHOWN	N. UNGERER	J. KNOX	P. MARSHALL	02.12.24	10.12.24
Reduced Scale (A3)	R. SIMPSON	R. SIMPSON		17.12.24	17.12.24



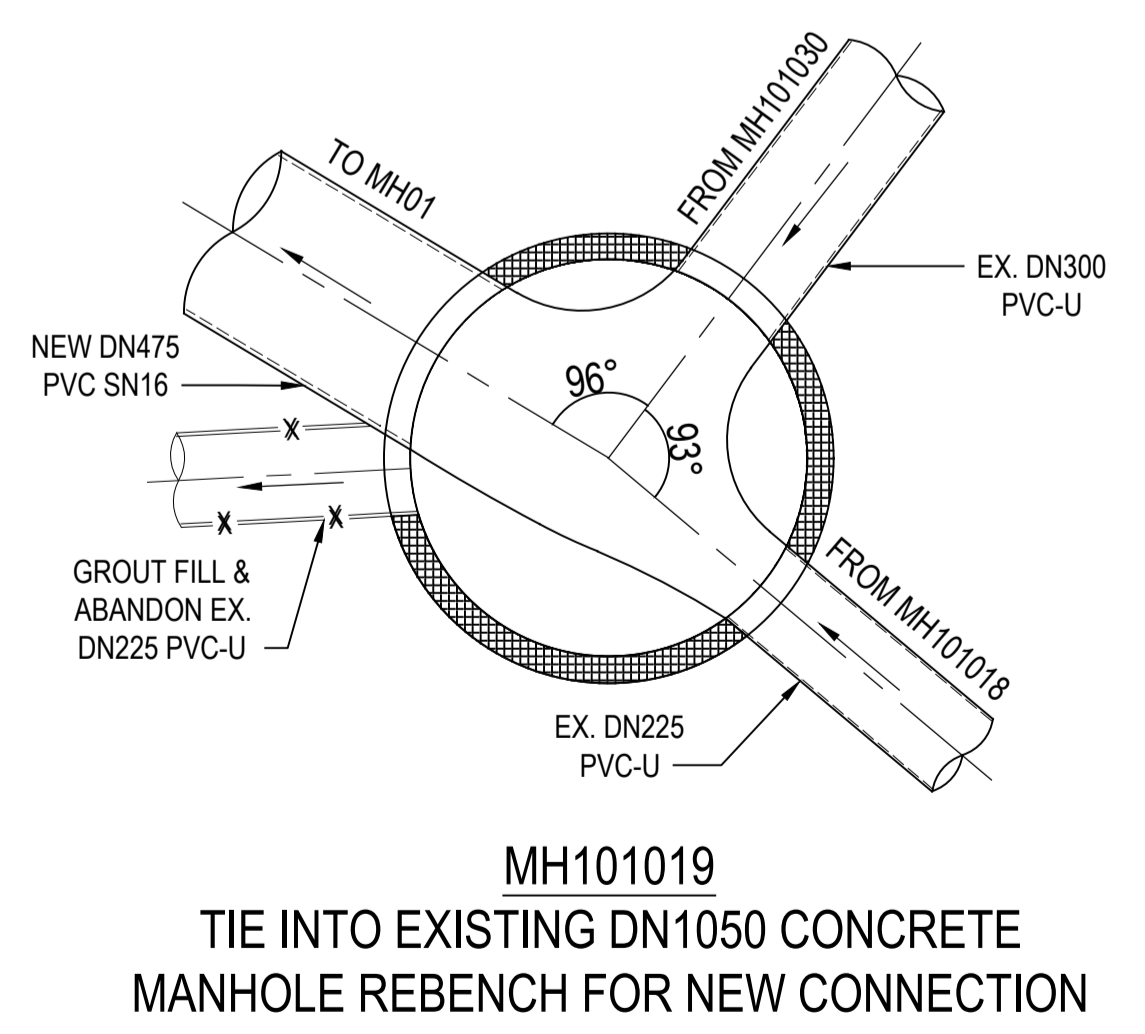
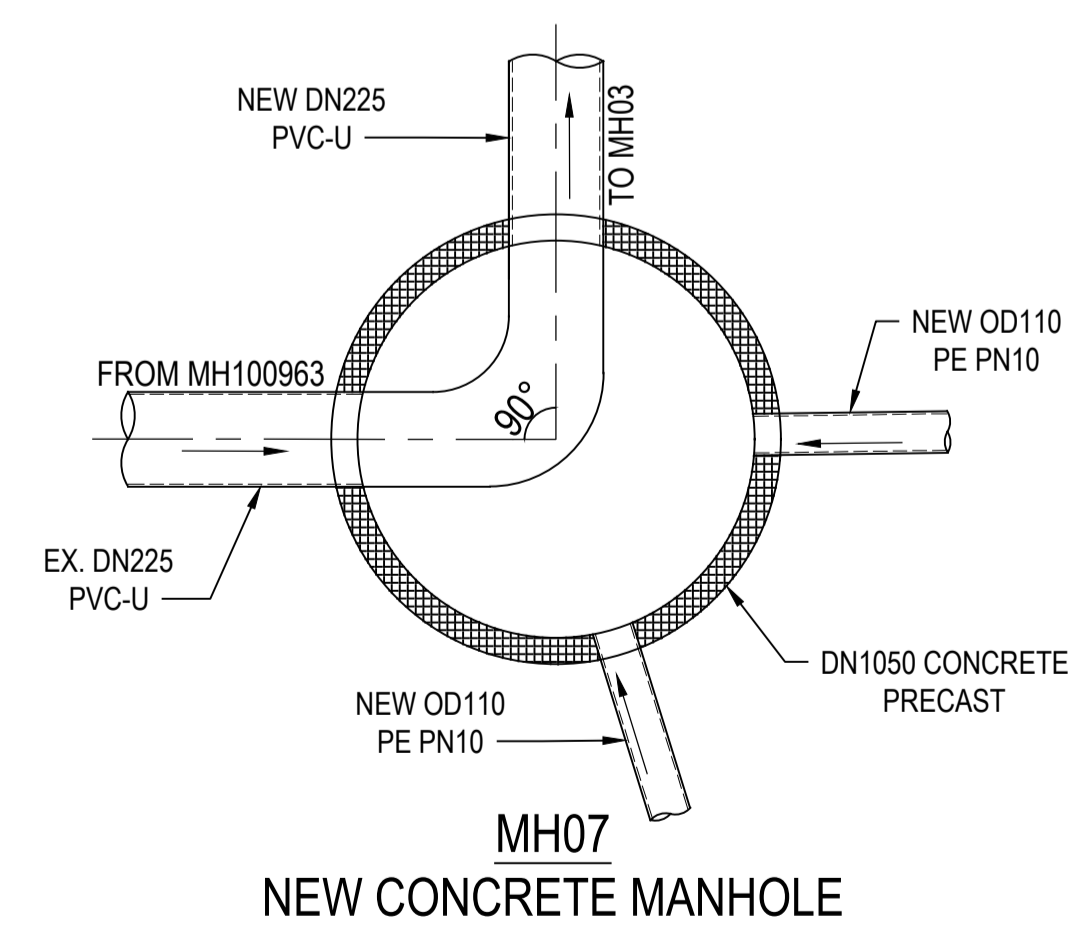
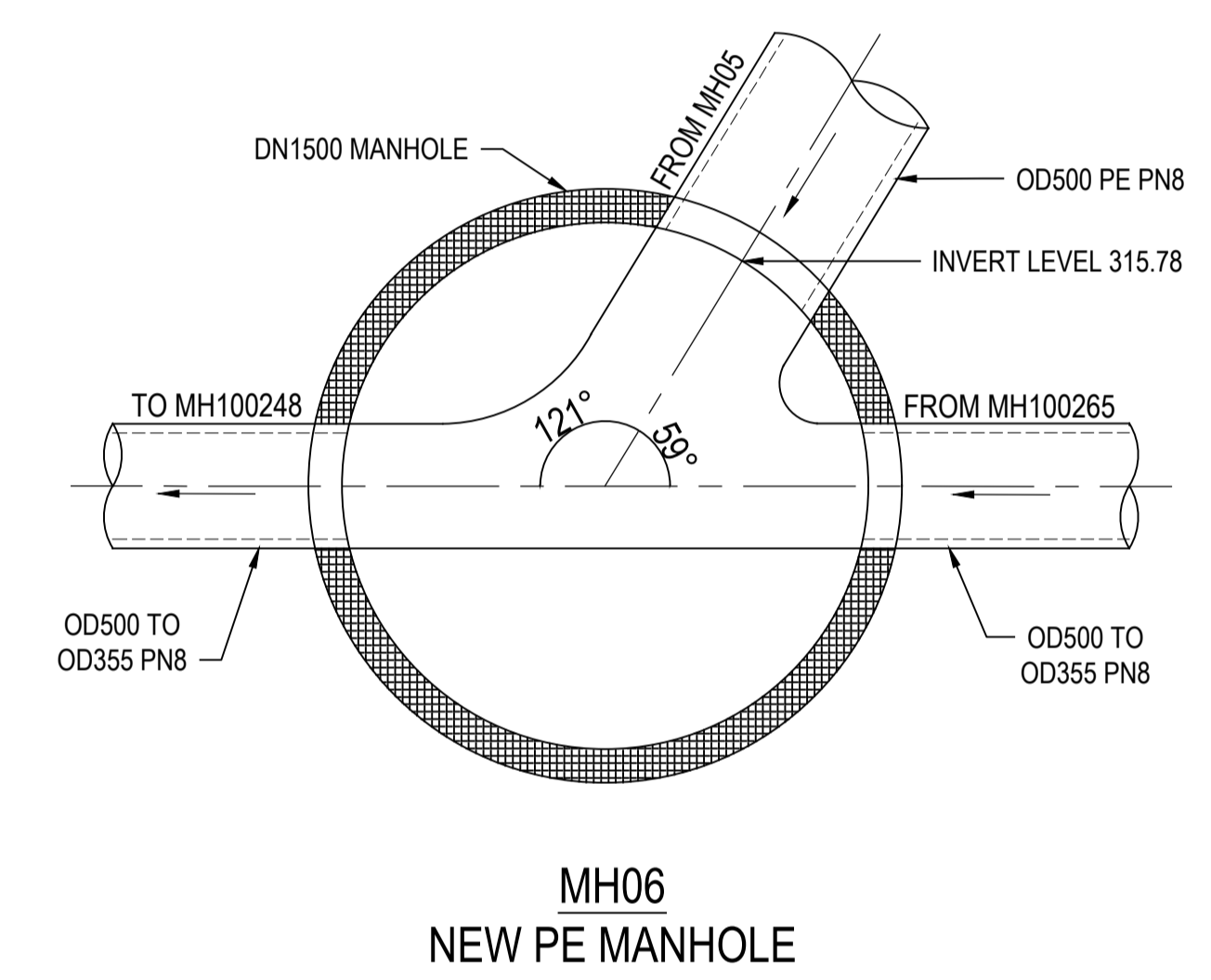
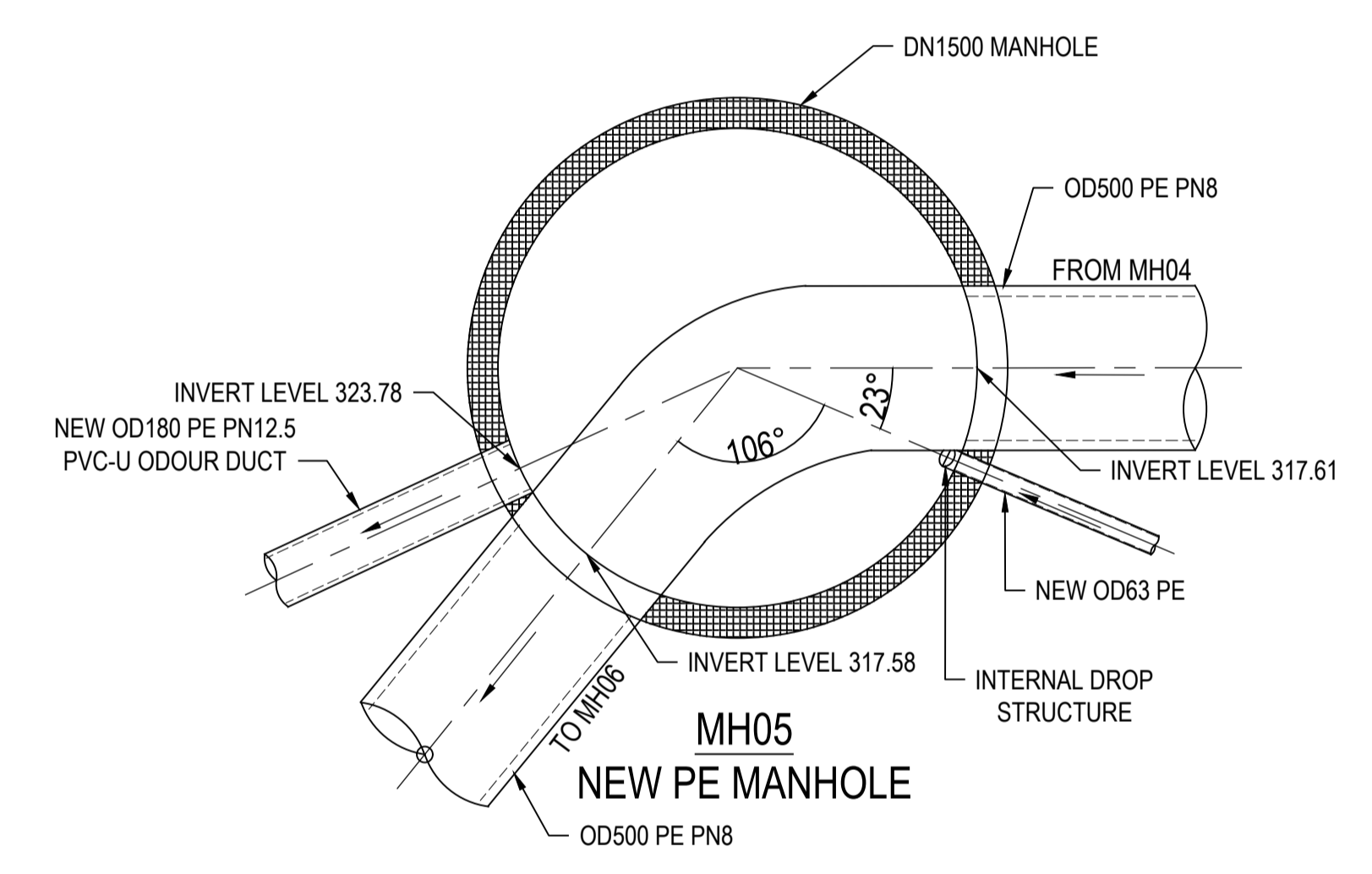
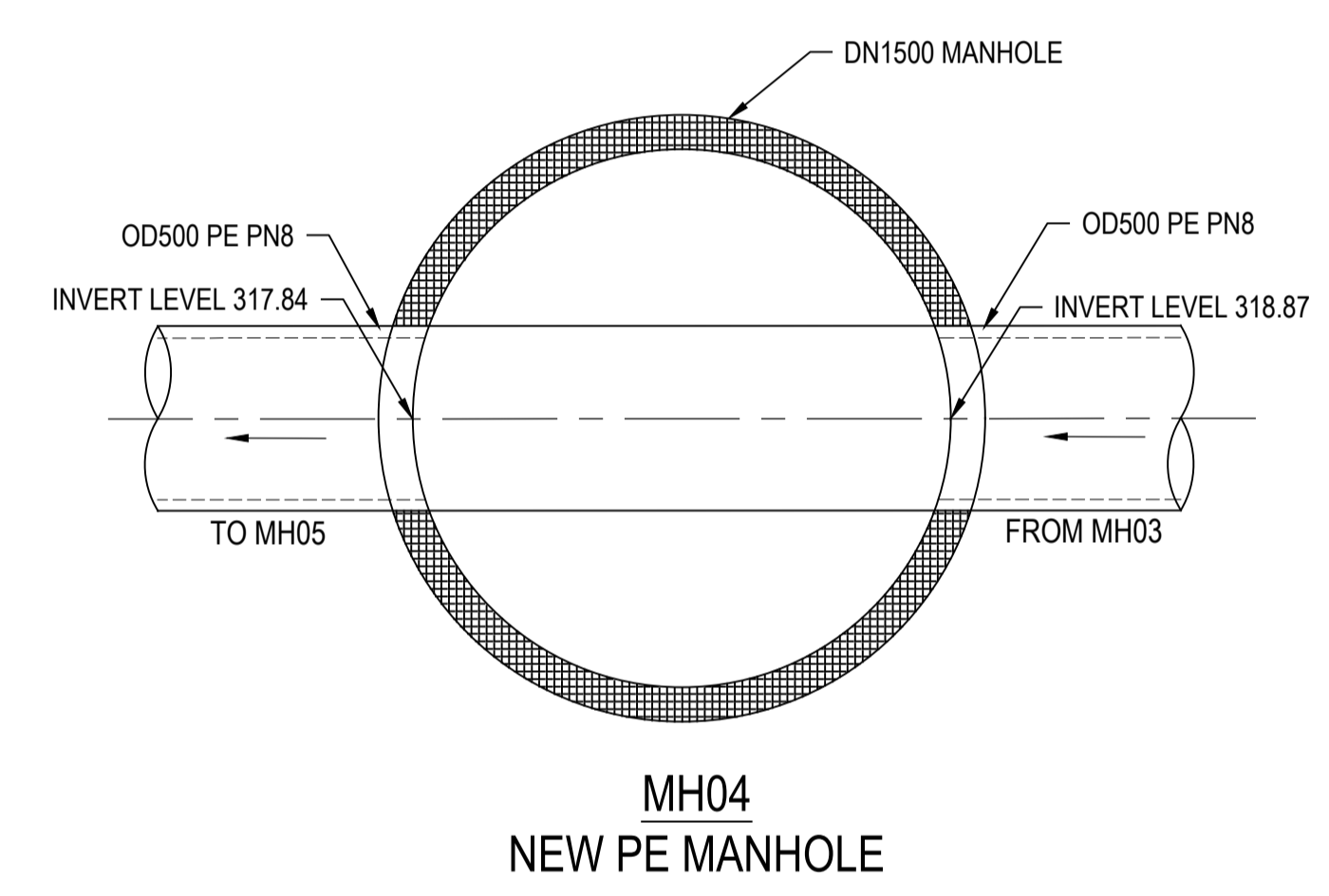
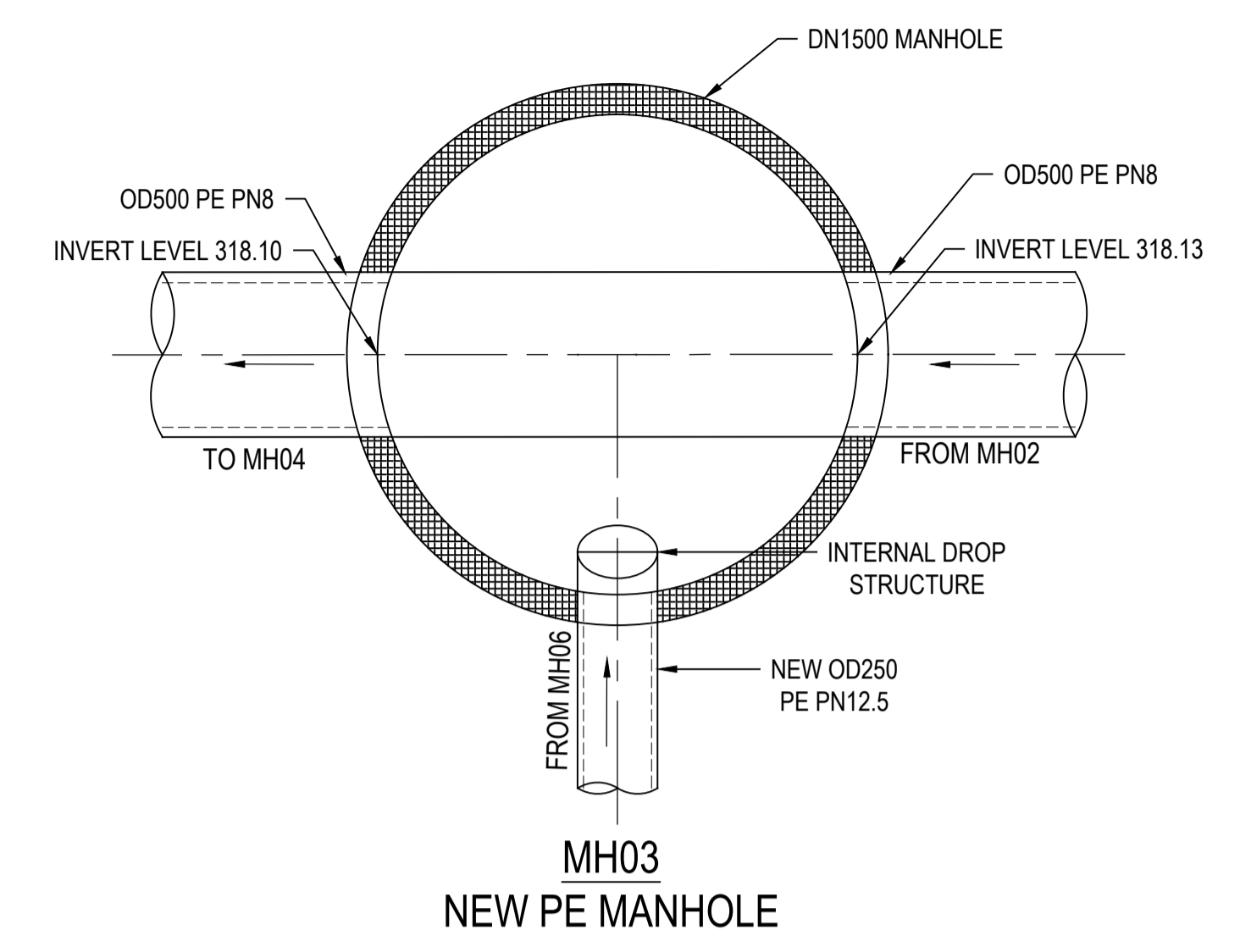
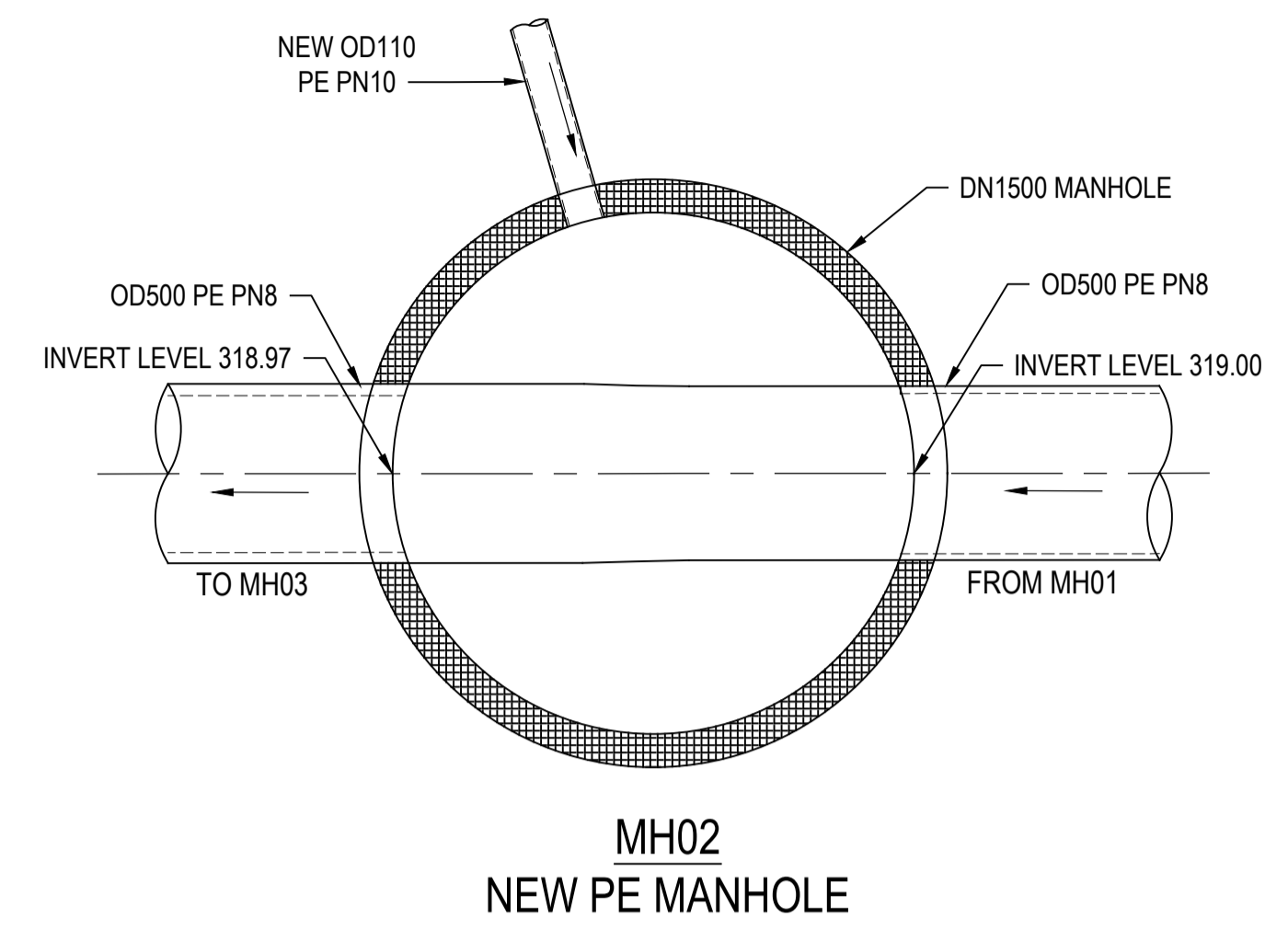
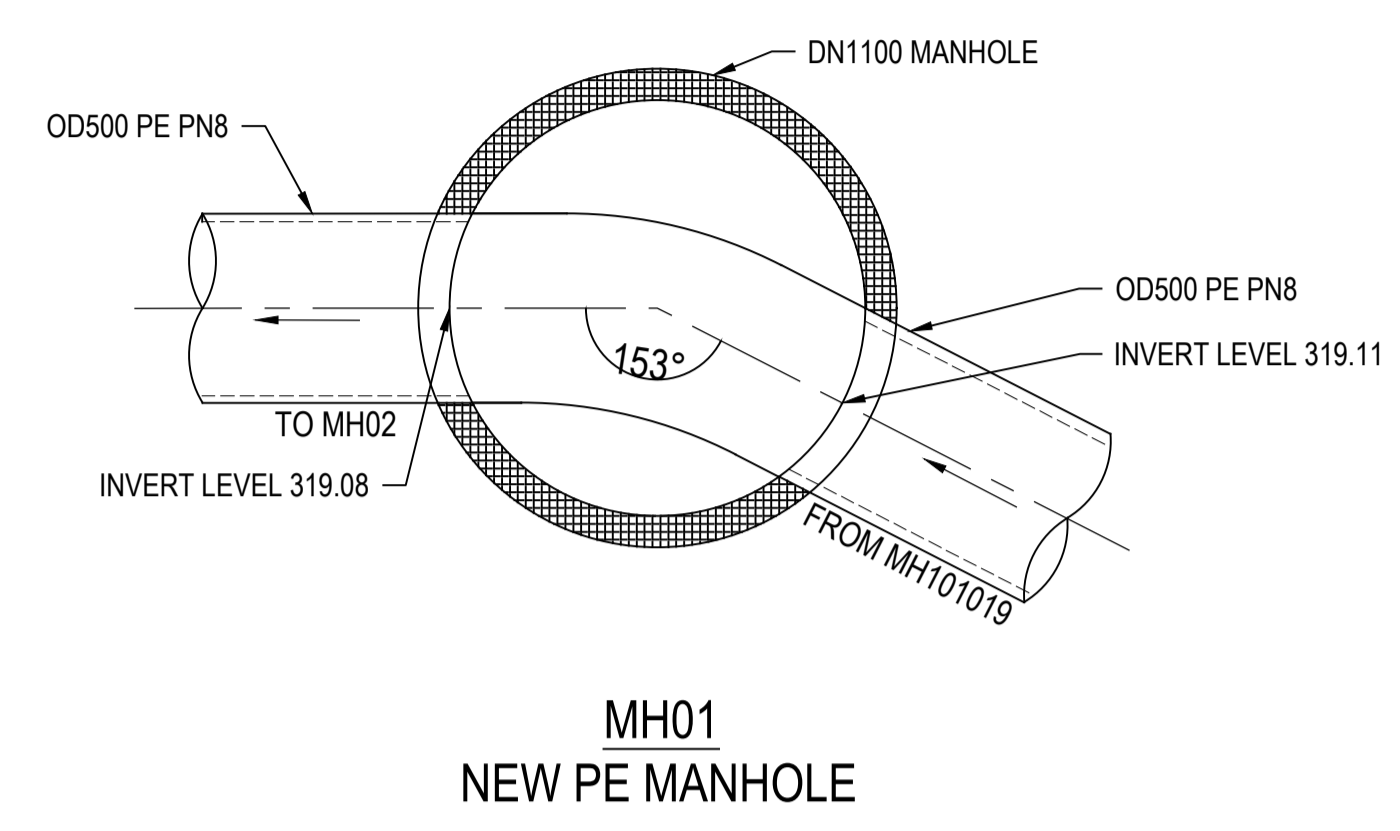
Client: **QUEENSTOWN LAKES DISTRICT COUNCIL**  
Project: **ROBINS ROAD WASTEWATER UPGRADES**

Title: **WASTEWATER ODOUR FILTER LAYOUT DETAILS**

Discipline	Rev.
<b>CIVIL ENGINEERING</b>	<b>B</b>
Drawing No. <b>3367096-010-CA-011</b>	

**NOTES:**

- FOR GENERAL NOTES AND LEGEND REFER TO DRAWING 3367096-010-CA-001.
- CONNECTIONS TO MANHOLE TO BE A PE STUB FLANGE AND BACKING RING CONNECTED WITH A FLANGE ADAPTOR TO THE DN450 PVC.
- BUOYANCY FOR THE MANHOLES TO BE ACCOUNTED FOR IN THE STRUCTURAL DESIGN BY THE PE MANHOLE MANUFACTURER.
- LOADINGS FOR MANHOLES TO BE NHH072.
- FOR LOADINGS ON THE MANHOLES REFER TO THE SPECIFICATION.



ASSETS				
MH NUMBER	DIAMETER (MM)	DEPTH (M)	GRP PLATFORM	LONG SECTION SHEET
1	1100 PE	2.50	No	3367096-CA-003
2	1500 PE	3.08	No	3367096-CA-003
3	1500 PE	4.93	Yes	3367096-CA-003
4	1500 PE	6.14	Yes	3367096-CA-002
5	1500 PE	7.20	Yes	3367096-CA-002
6	1500 PE	1.41	No	3367096-CA-002
7	1050 CONCRETE	TBC	No	3367096-CA-003

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NOT FOR CONSTRUCTION

**DETAILED DESIGN**  
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
B	ISSUED FOR DRAFT DETAILED DESIGN -TRENCHLESS	MC	NU	PM	11.02.25
A	ISSUED FOR DRAFT DETAILED DESIGN	MC	NU	PM	17.12.24

Original Scale (A1) AS SHOWN  
Reduced Scale (A3) 1/2 SHOWN

Design	N. UNGERER	17.12.24	Approved For Construction*
Drawn	F. CUI	17.12.24	
Dwg Verifier	P. MARSHALL	17.12.24	
Dwg Check	J. KNOX	17.12.24	

Client: **QUEENSTOWN LAKES DISTRICT COUNCIL**

Project: **ROBINS ROAD WASTEWATER UPGRADES**

Title: **WASTEWATER PRESSURE MANHOLE ARRANGEMENTS**

Discipline: **CIVIL ENGINEERING**

Drawing No. **3367096-010-CA-012**

Rev. **B**

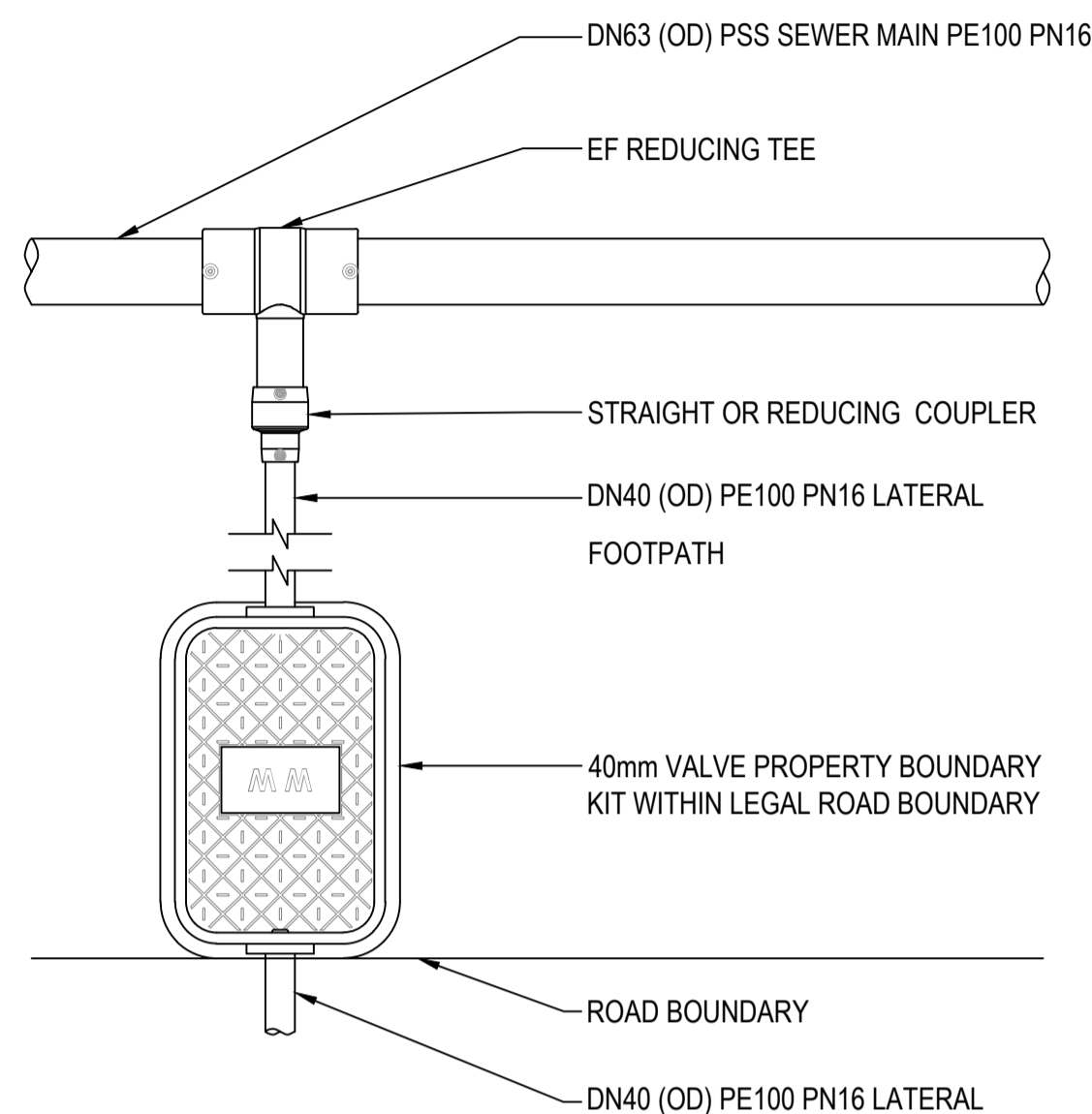
NOTES

- WHERE THE PUMP CHAMBER LID REQUIRES AN EXTERNAL VENT (TRAFFICABLE OR SUSCEPTIBLE TO INUNDATION FROM FLOODING), IT SHALL BE 50MM DIAMETER, MOUNTED ON THE DWELLING, EXTENDING ABOVE THE ROOFLINE AND AWAY FROM WINDOWS.
- ALL ELECTRICAL WORK SHALL COMPLY WITH THE LATEST STANDARDS AND REQUIREMENTS
- SELF-TAPPING JOINTS ON BRANCH PIPE SHALL BE AT A DEPTH OF NOT LESS THAN 600mm
- FRO PIPE LESS THAN DN90 (OD), ONLY ELECTROFUSION TEE JOINTS SHALL BE USED.
- SADDLE JOINTS SHALL NOT BE USED ON PIPES THAT ARE SUPPLIED IN COILS.
- NO BRASS FITTINGS ARE TO BE USED IN ANY PART OF A PRESSURE SEWER SYSTEM.
- MECHANICAL COUPLERS SHALL ONLY BE USED ON POLYETHYLENE PRESSURE PIPE DN90 (OD) OR LESS FRO APPROVED EMERGENCY REPAIRS.

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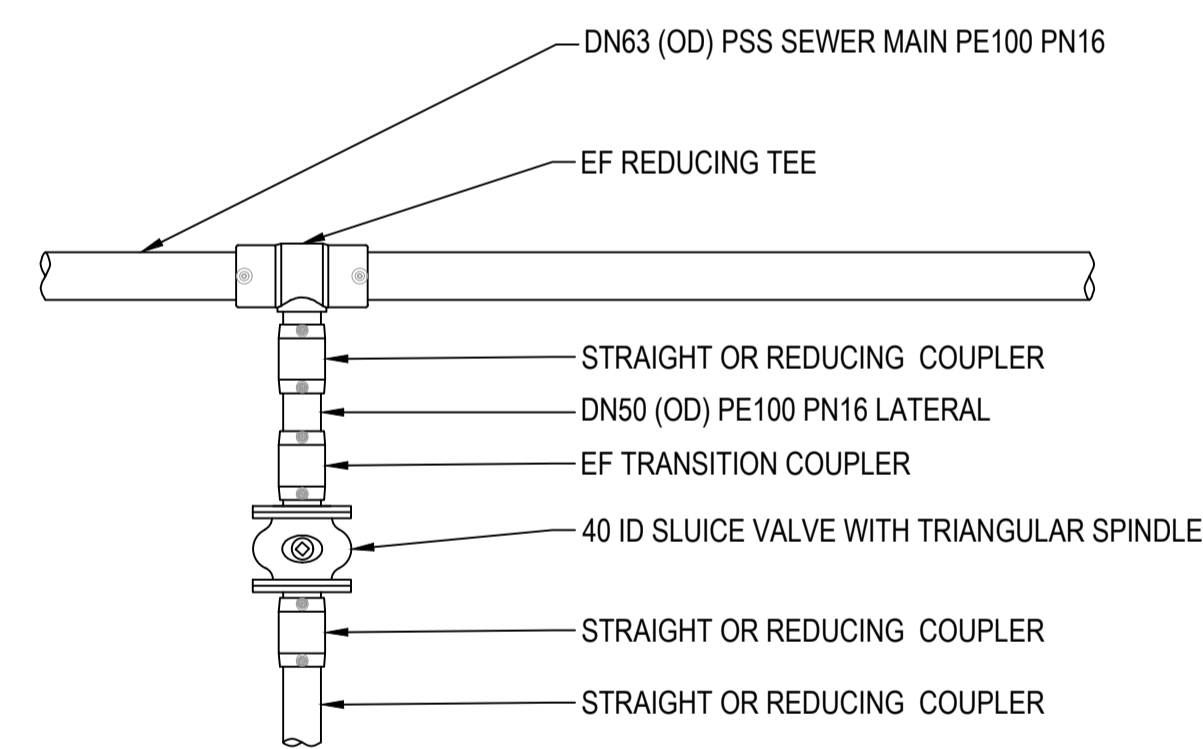
www.beca.com

Document No. 3367096-010-CA-014.DWG



MAIN / DN40 (OD) PSS DWELLING CONNECTION DETAILS

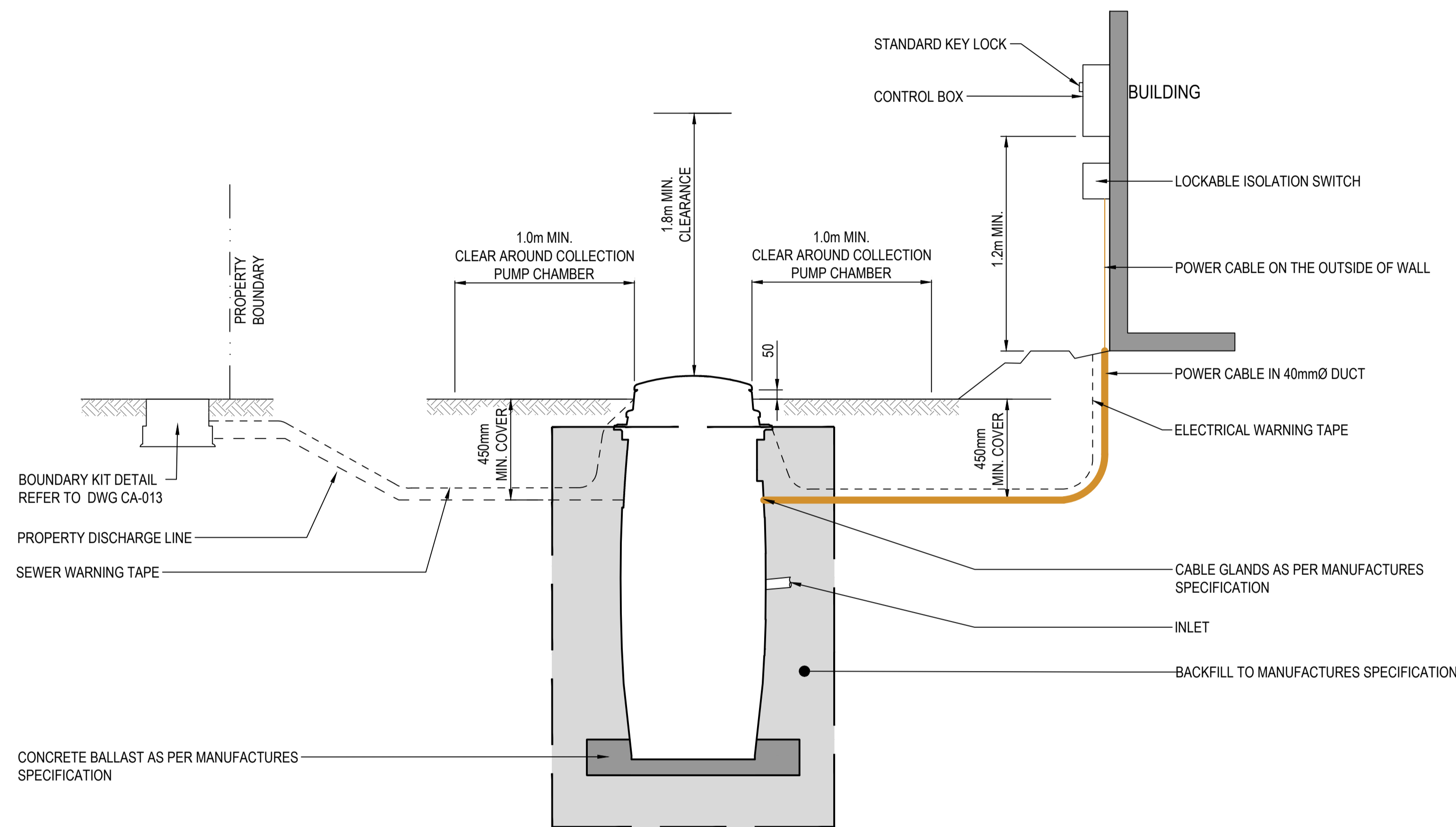
SCALE 1:10



MAIN / DN50 (OD) PSS SUBMAIN CONNECTION DETAIL

SCALE 1:10

PE TEE AND REDUCER SUMMARY				
DN40 PSS DWELLING CONNECTIONS				
MAIN	TEE	REDUCER	REDUCER	
DN63	63 / 50	+ 50 / 40		
DN50 PSS SUBMAIN CONNECTIONS				
MAIN	TEE	REDUCER	REDUCER	
DN63	63 / 50	-----	+ 40 ID SLUICEVALVE	



PRESSURE SEWER SYSTEM TYPICAL CONNECTION DETAIL

SCALE 1:20

No.	Revision	By	Chk	Appd	Date
A	ISSUED FOR DRAFT DETAILED DESIGN	FC	NU	PM	17.12.24

Original Scale (A1)	Design	Drawn	Date	Approved For Construction*
AS SHOWN	N. UNGERER	F. CUI	17.12.24	
Reduced Scale (A3)	Design	Drawn	Date	Approved For Construction*
1/2 SHOWN	P. MARSHALL	R. SIMPSON	17.12.24	



Client: QUEENSTOWN LAKES DISTRICT COUNCIL  
Project: ROBINS ROAD WASTEWATER UPGRADES

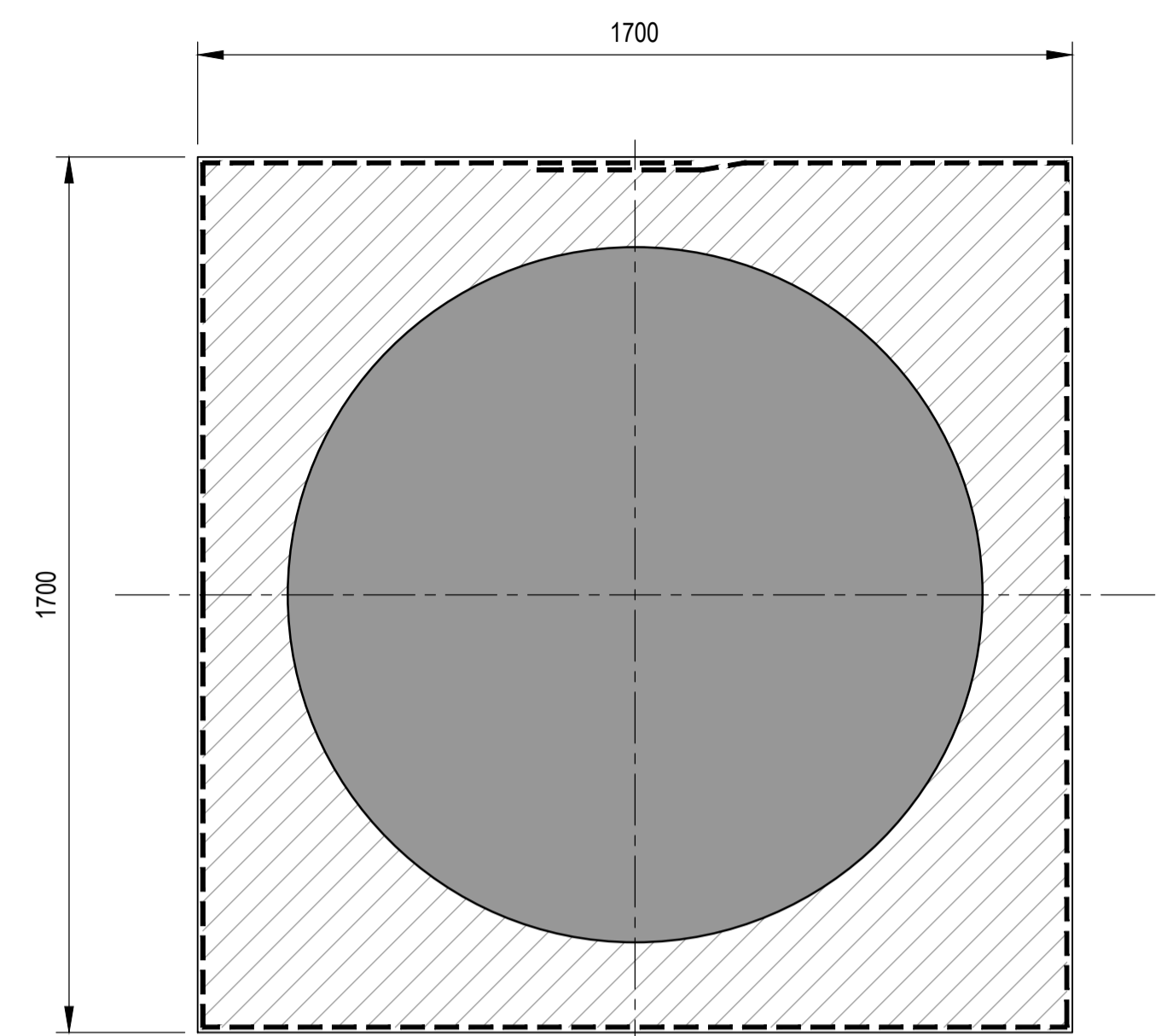
Title: WASTEWATER PRESSURE HOUSE CONNECTION DETAIL

Discipline: CIVIL ENGINEERING  
Drawing No. 3367096-010-CA-014  
Rev. A

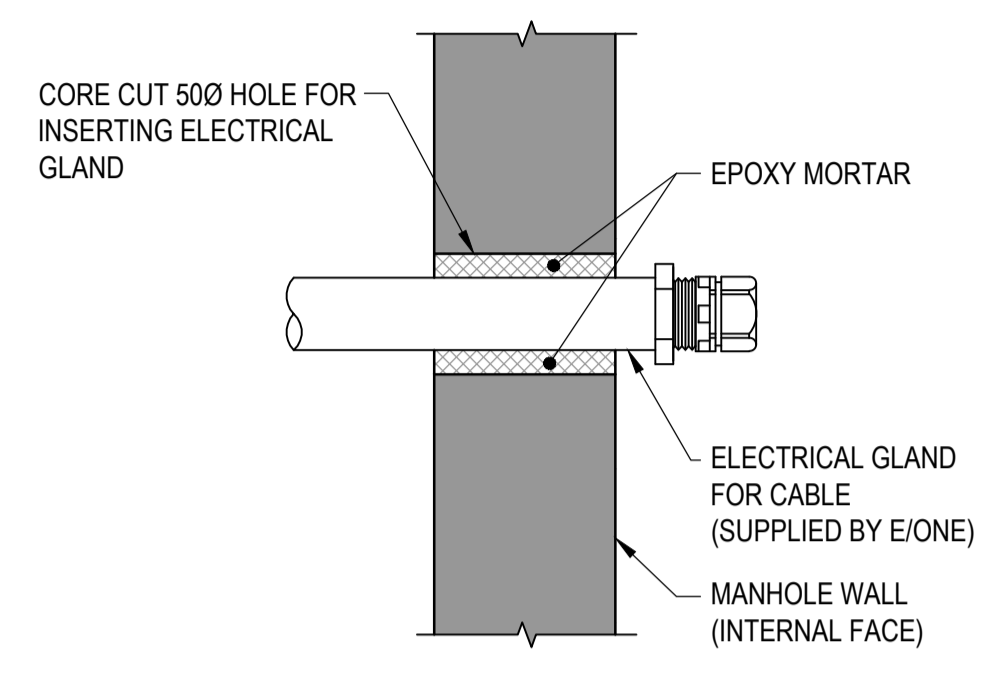
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NOT FOR CONSTRUCTION

**DETAILED DESIGN**  
NOT FOR CONSTRUCTION

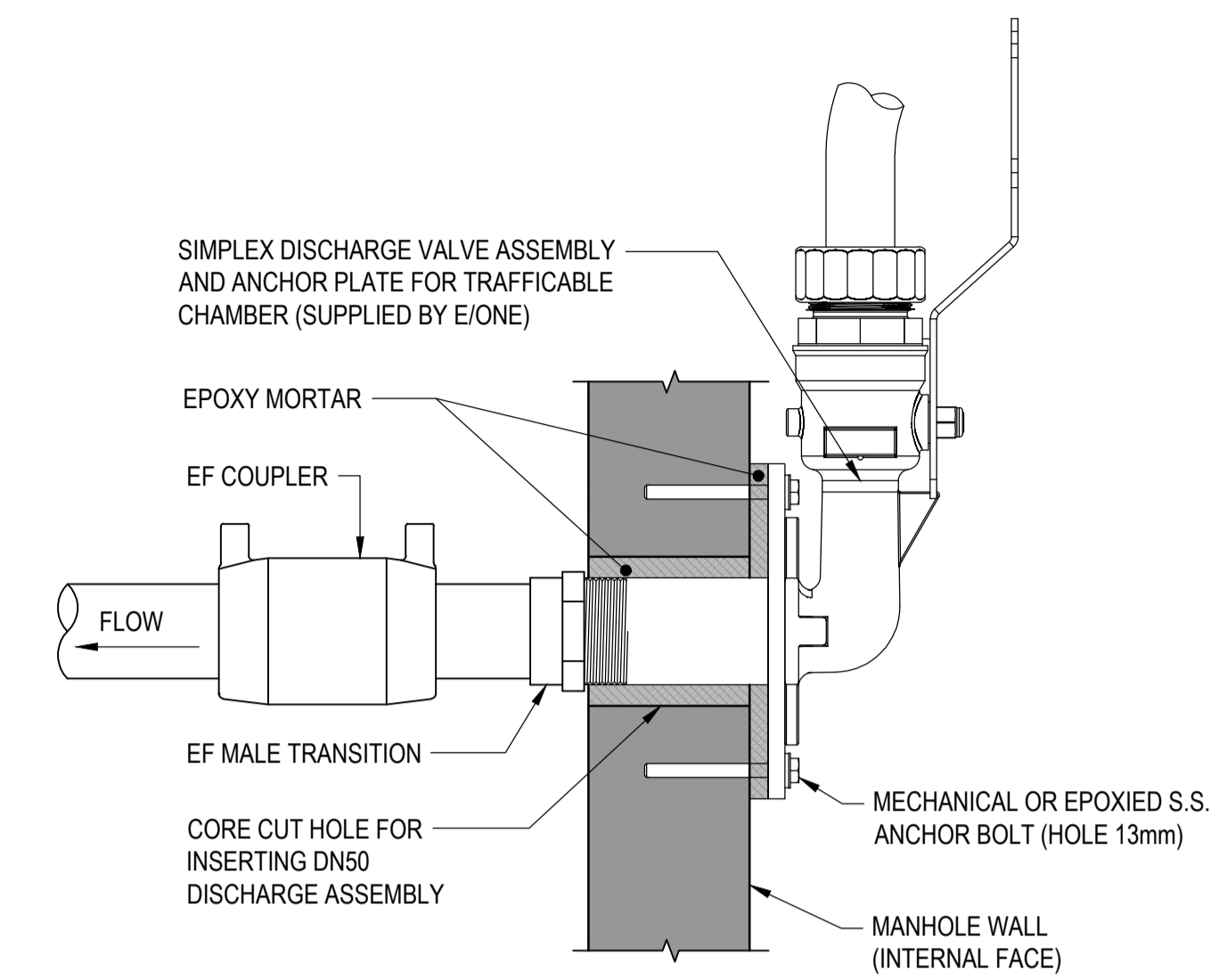




**PLAN AT FLANGED BASE LEVEL**  
SCALE NTS



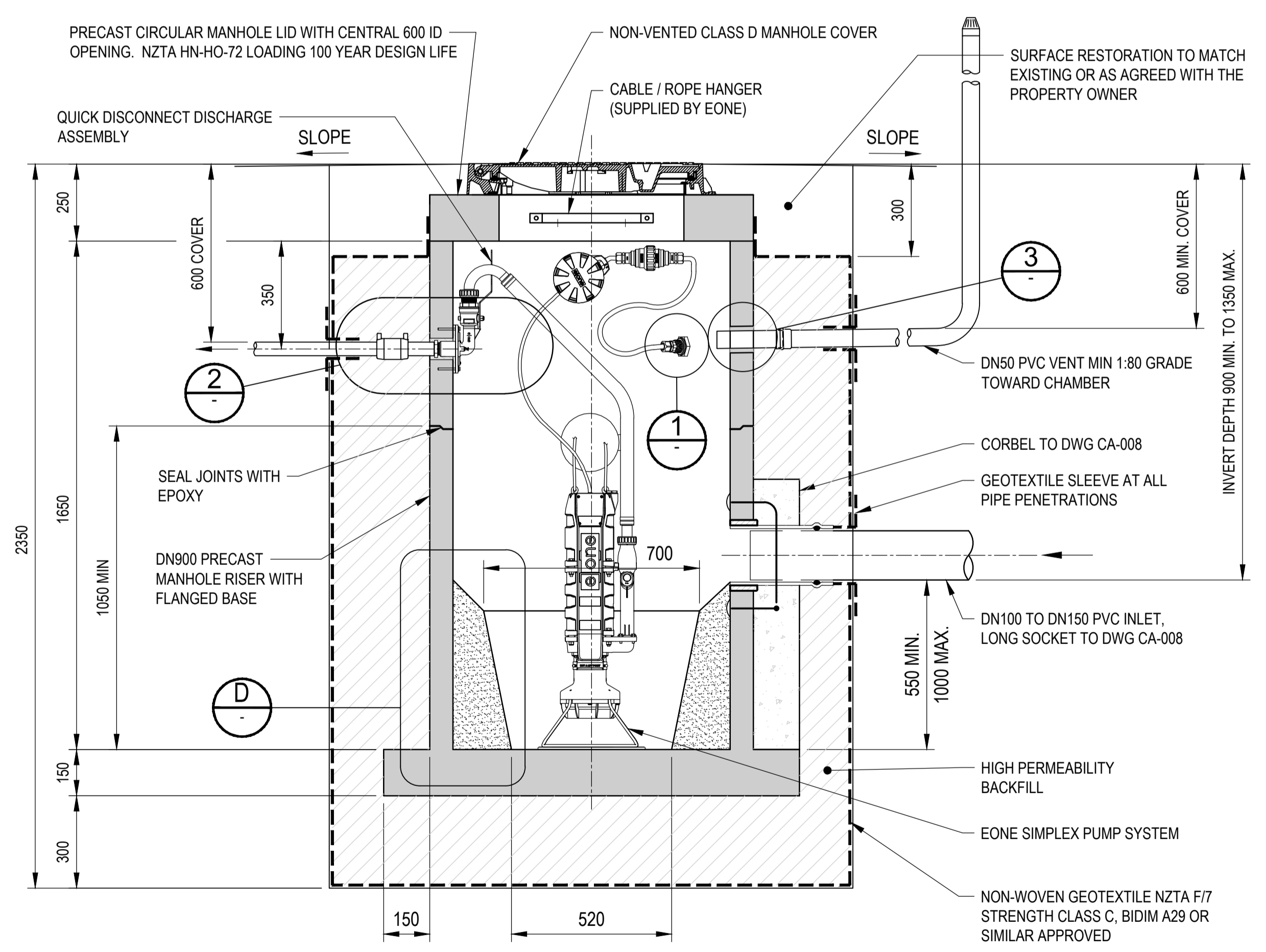
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SCALE 1:5



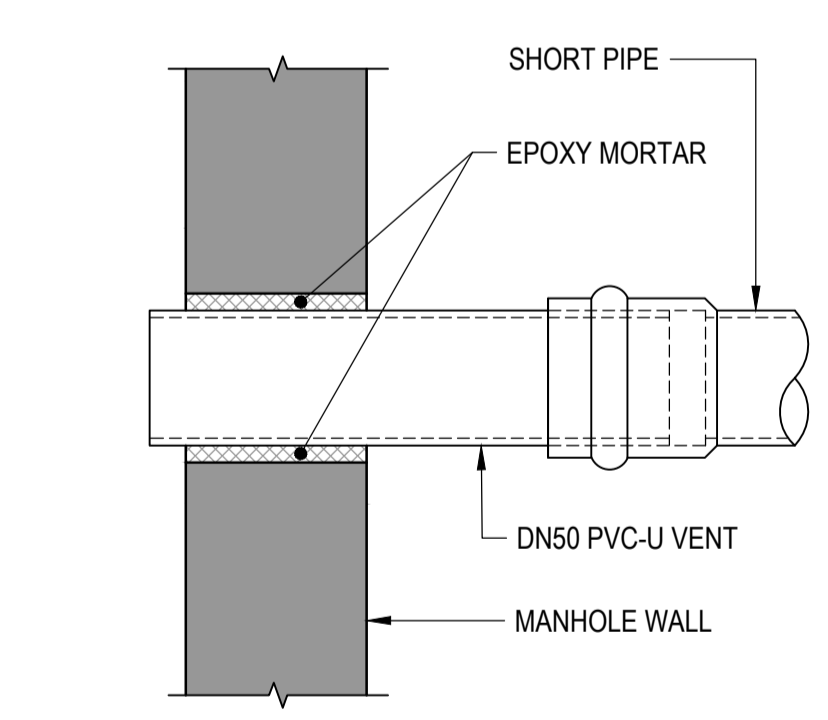
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SCALE 1:5

**NOTES**

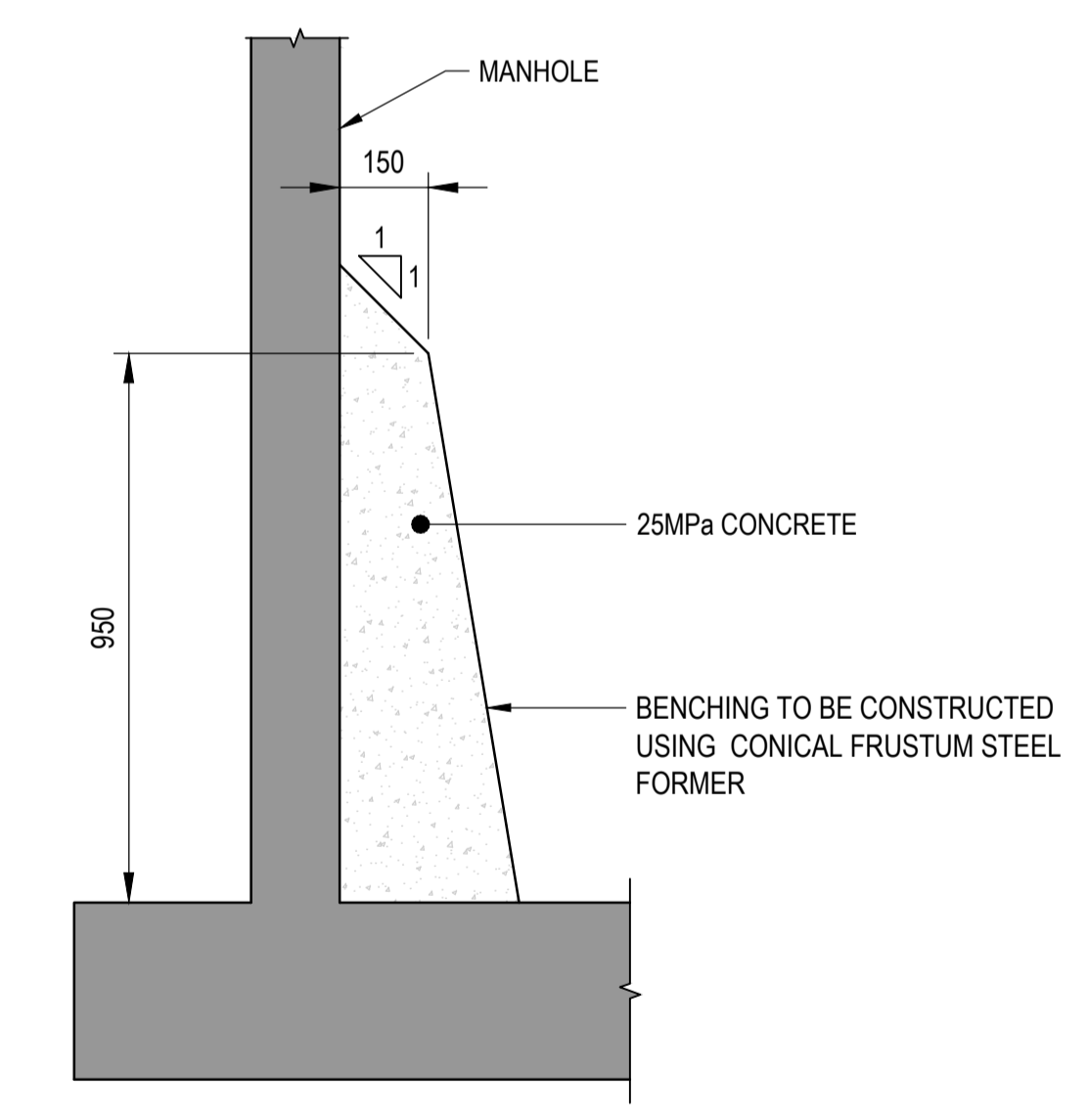
1. THE DEPTH OF THE OUTLET IS CRITICAL TO ALLOW MAINTENANCE ACCESS TO THE QUICK DISCONNECT ASSEMBLY. THE DIMENSION FROM THE TOP OF THE RISER TO THE CENTRELINE OF THE OUTLET WALL PENETRATION IS 350mm.
2. FOR DESIGN GROUNDWATER DEPTHS  $\geq 1000$  mm, THE GEOTEXTILE AROUND THE HIGH PERMEABILITY BACKFILL IS NOT REQUIRED. REFER TO THE PROJECT SPECIFICATION FOR THE DESIGN GROUNDWATER DEPTH.
3. HIGH PERMEABILITY BACKFILL TO BE ONE OF THE FOLLOWING OPTIONS (OR SIMILAR APPROVED) WITH A MINIMUM COMPACTED DENSITY OF  $1600\text{kg/m}^3$ .



**1 SECTION - SIMPLEX TRAFFICABLE DETAIL**  
SCALE NTS



**C DETAIL - EXTERNAL VENT**  
SCALE 1:5



**D CONCRETE STORAGE CHAMBER BENCHING DETAIL**  
SCALE 1:25

No.	Revision	By	Chk	Appd	Date
A	ISSUED FOR DRAFT DETAILED DESIGN	FC	NU	PM	17.12.24

Original Scale (A1)	Design	N. UNGERER	17.12.24	Approved For Construction*
AS SHOWN	Drawn	F. CUI	17.12.24	
Reduced Scale (A3)	Dwg Verifier	P. MARSHALL	17.12.24	
1/2 SHOWN	Dwg Check	R. SIMPSON	17.12.24	



Client: **QUEENSTOWN LAKES DISTRICT COUNCIL**  
Project: **ROBINS ROAD WASTEWATER UPGRADES**

Title: **WASTEWATER PRESSURE SIMPLEX TRAFFICABLE DETAIL**

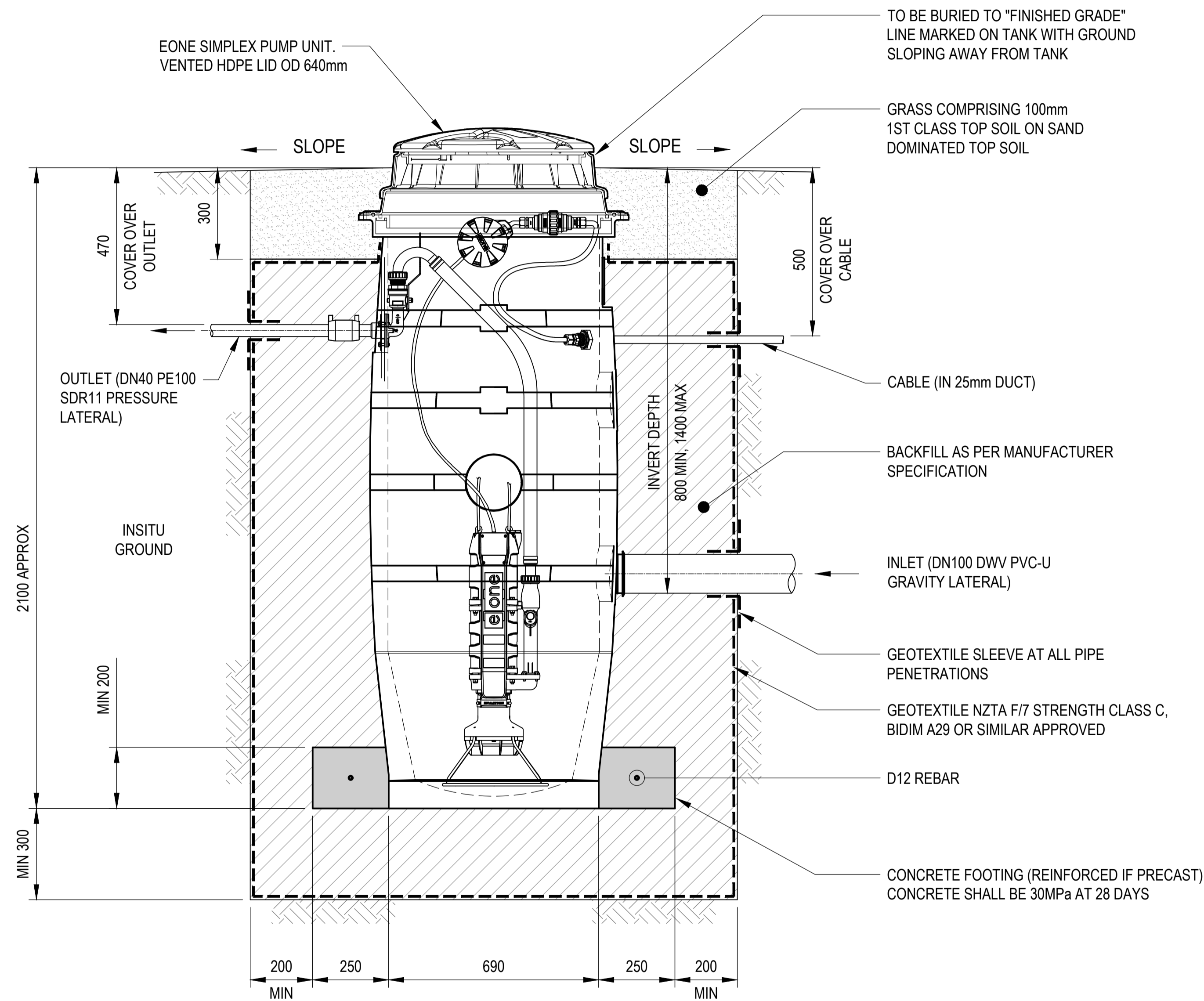
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Drawing No.	3367096-010-CA-015
Rev.	A

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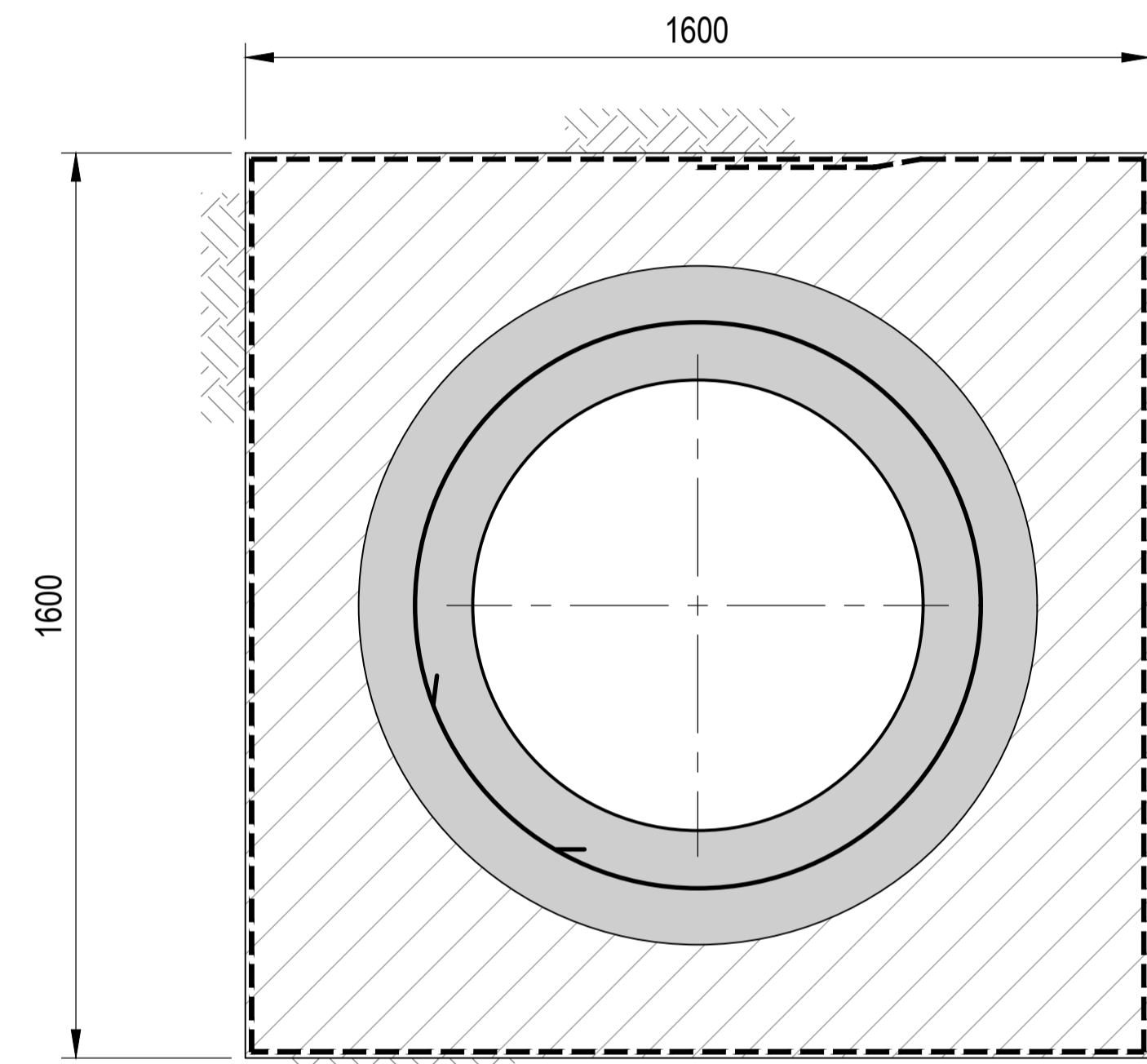
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**NOTES**

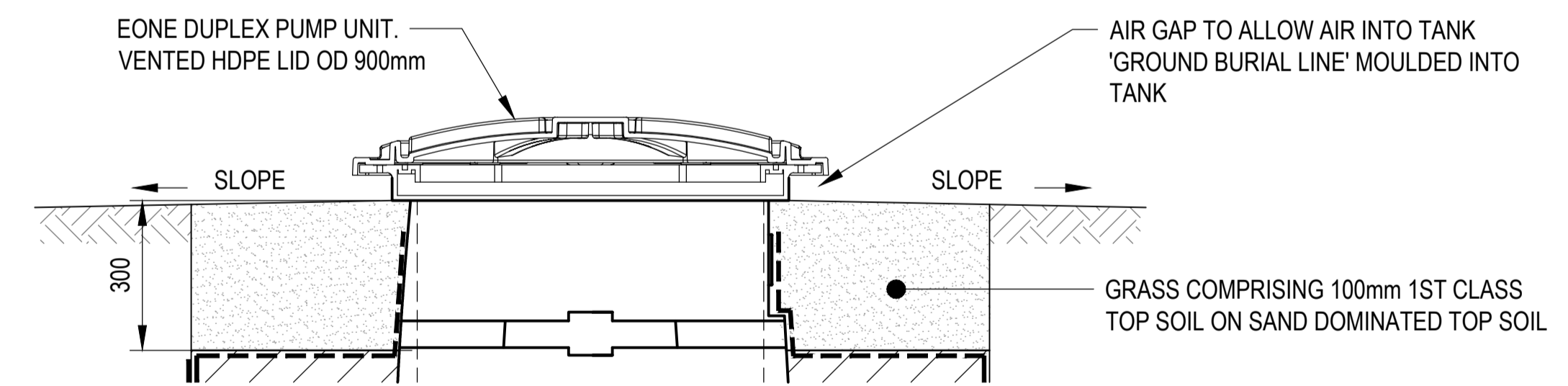
1. MAKE ALL CONNECTIONS THROUGH THE TANK WALL IN ACCORDANCE WITH EONE INSTALLATION INSTRUCTIONS AND USING EONE SUPPLIED CONNECTION FITTINGS.
2. THE ALTERNATIVE LID CHANGES EXCAVATION AND COVER DEPTHS. CONTACT EONE FOR DETAILS.
3. GROUNDWATER DEPTH TO BE DETERMINED BY THE DESIGNER. REFER TO THE PROJECT SPECIFICATION.
4. FOR GROUNDWATER DEPTHS >2000mm A CONCRETE FOOTING (REFER SHEET 1) WITH AP20 BACKFILL MAY BE USED INSTEAD OF TYPE 1 OR TYPE 2 BACKFILL.
5. FOR DESIGN GROUNDWATER DEPTHS ≥ 1000 mm, THE GEOTEXTILE AROUND THE HIGH PERMEABILITY BACKFILL IS NOT REQUIRED. REFER TO THE PROJECT SPECIFICATION FOR THE DESIGN GROUNDWATER DEPTH.
6. HIGH PERMEABILITY BACKFILL TO BE ONE OF THE FOLLOWING OPTIONS WITH A MINIMUM COMPACTED DENSITY OF 1600kg/m<sup>3</sup>.



**1 SECTION - SIMPLEX DETAIL**  
SCALE NTS



**PLAN AT FOOTING LEVEL**  
SCALE NTS



**ALTERNATIVE LID**  
SCALE NTS

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No.	Revision	By	Chk	Appd	Date
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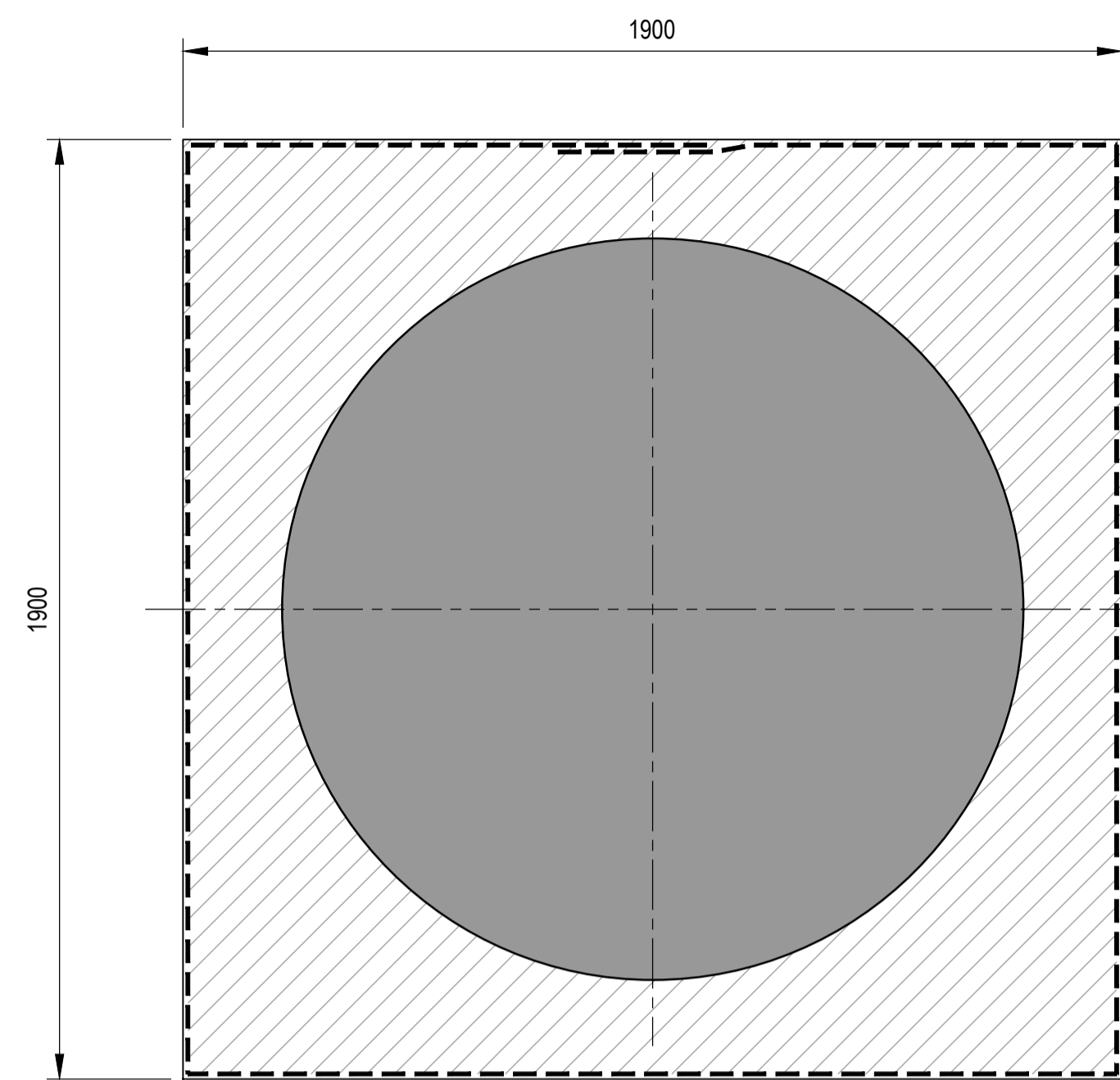
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Project: **ROBINS ROAD WASTEWATER UPGRADES**

Title: **WASTEWATER PRESSURE SIMPLEX NON-TRAFFICABLE DETAIL**

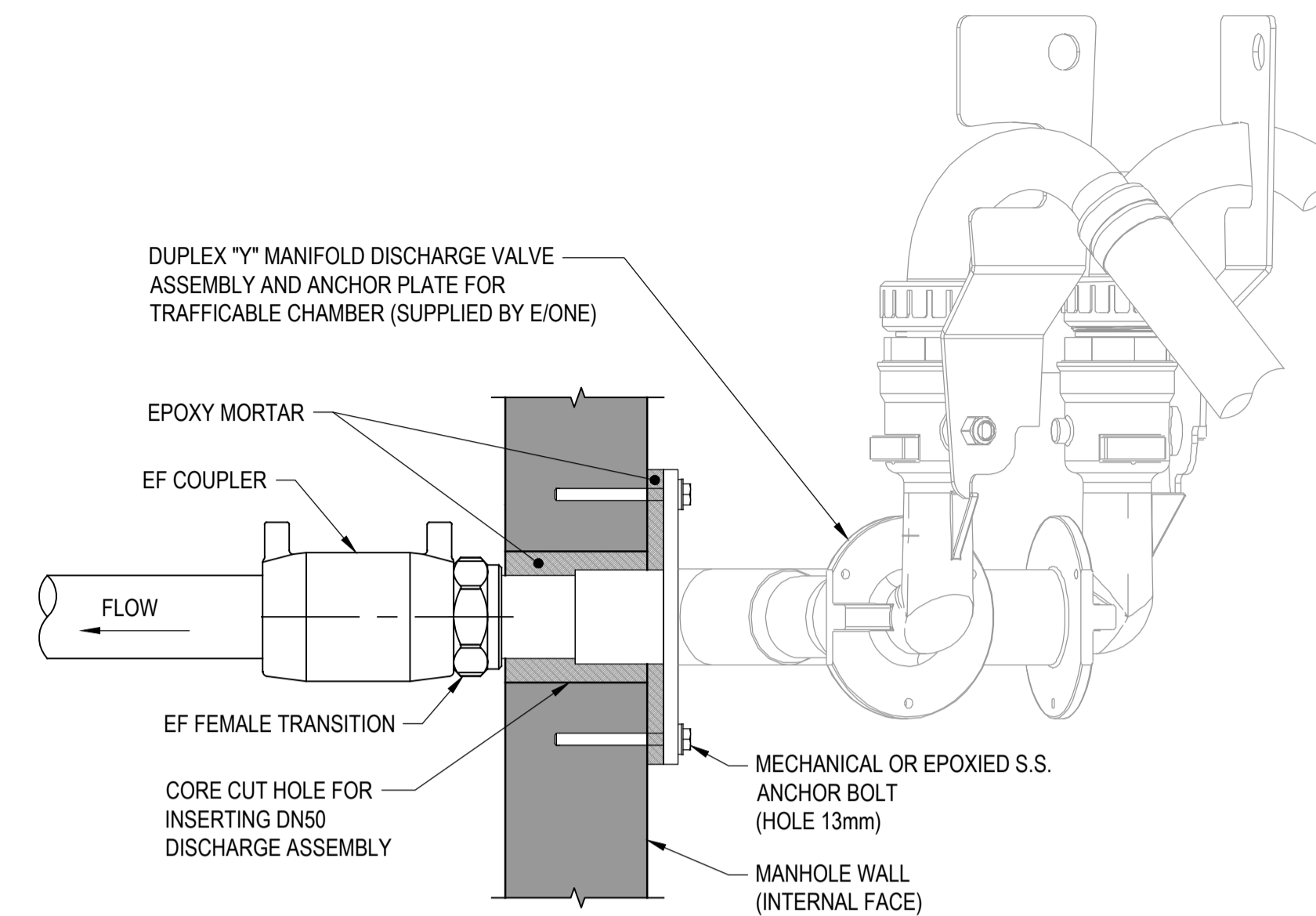
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Drawing No.	3367096-010-CA-016
Rev.	A

**NOTES**

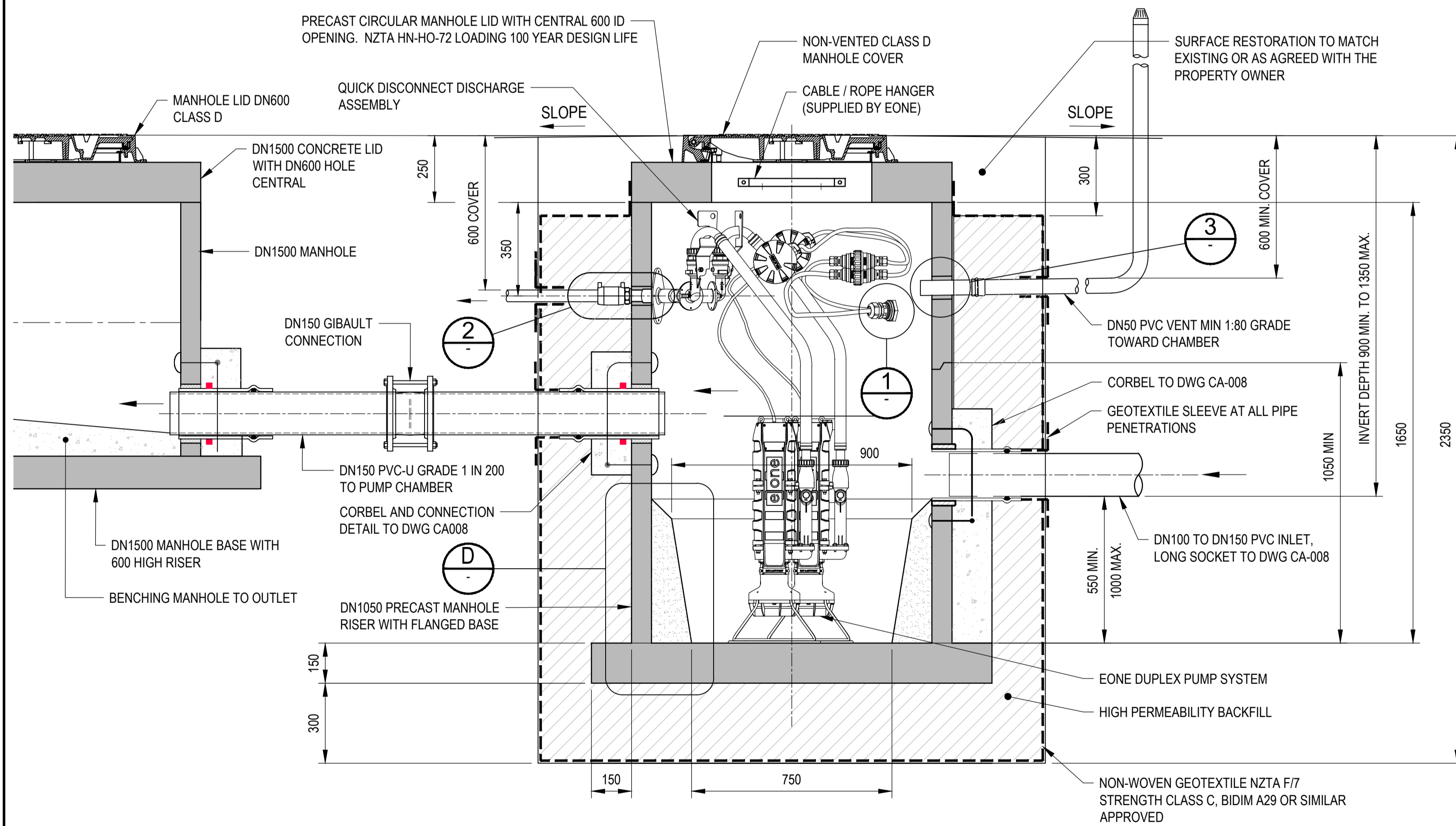
1. THE DEPTH OF THE OUTLET IS CRITICAL TO ALLOW MAINTENANCE ACCESS TO THE QUICK DISCONNECT ASSEMBLY. THE DIMENSION FROM THE TOP OF THE RISER TO THE CENTRELINE OF THE OUTLET WALL PENETRATION IS 350mm.
2. FOR DESIGN GROUNDWATER DEPTHS  $\geq 1000$  mm, THE GEOTEXTILE AROUND THE HIGH PERMEABILITY BACKFILL IS NOT REQUIRED. REFER TO THE PROJECT SPECIFICATION FOR THE DESIGN GROUNDWATER DEPTH.
3. HIGH PERMEABILITY BACKFILL TO BE ONE OF THE FOLLOWING OPTIONS WITH A MINIMUM COMPACTED DENSITY OF 1600kg/m<sup>3</sup>.



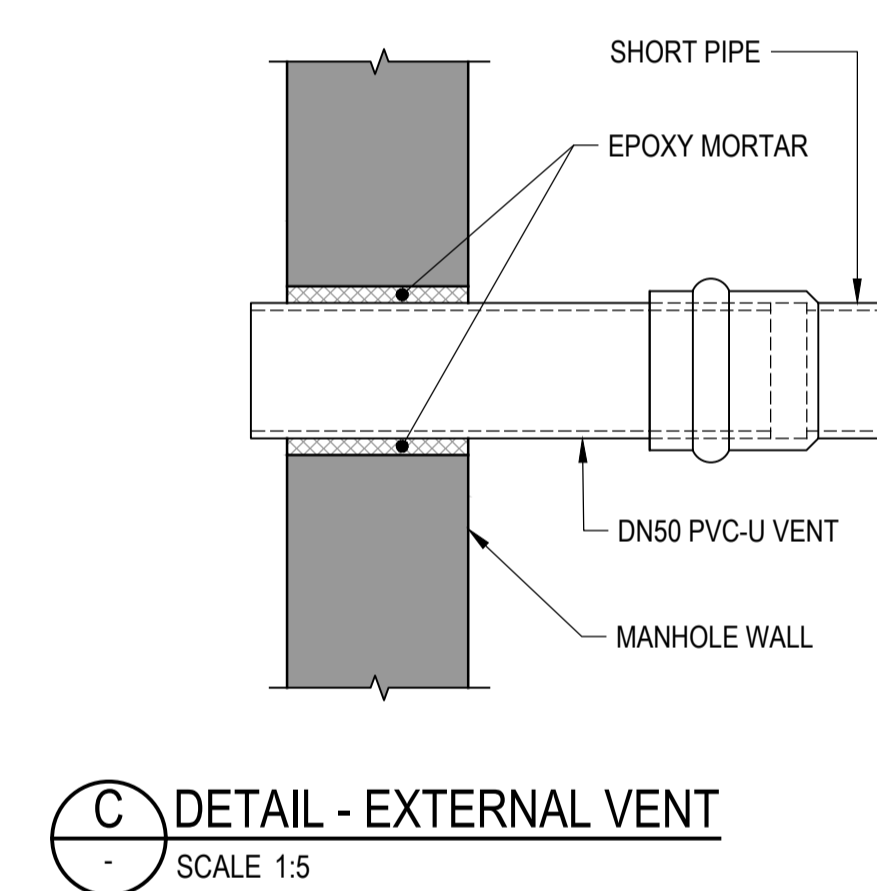
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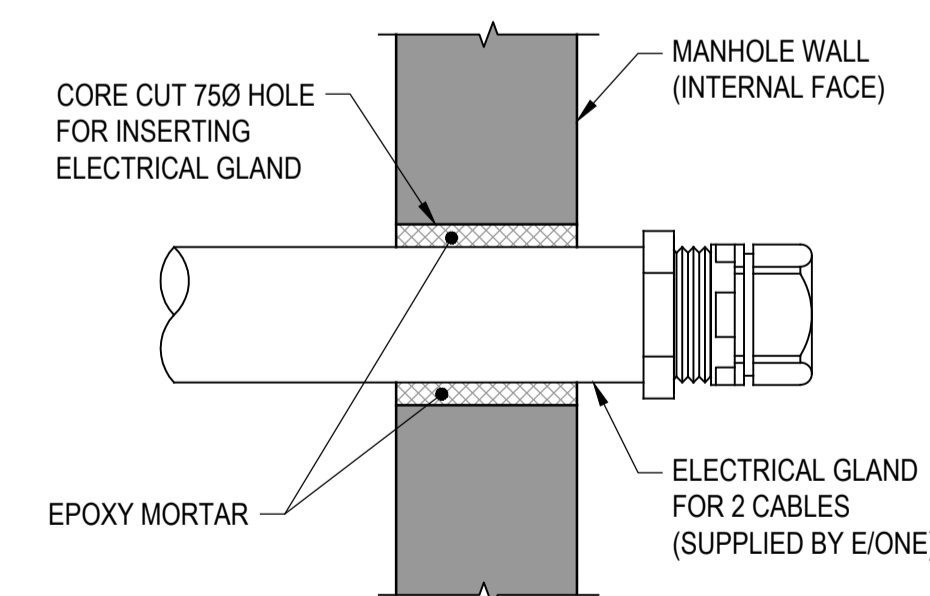
**B DISCHARGE PIPE TO CONCRETE STORAGE CHAMBER**  
SCALE 1:5



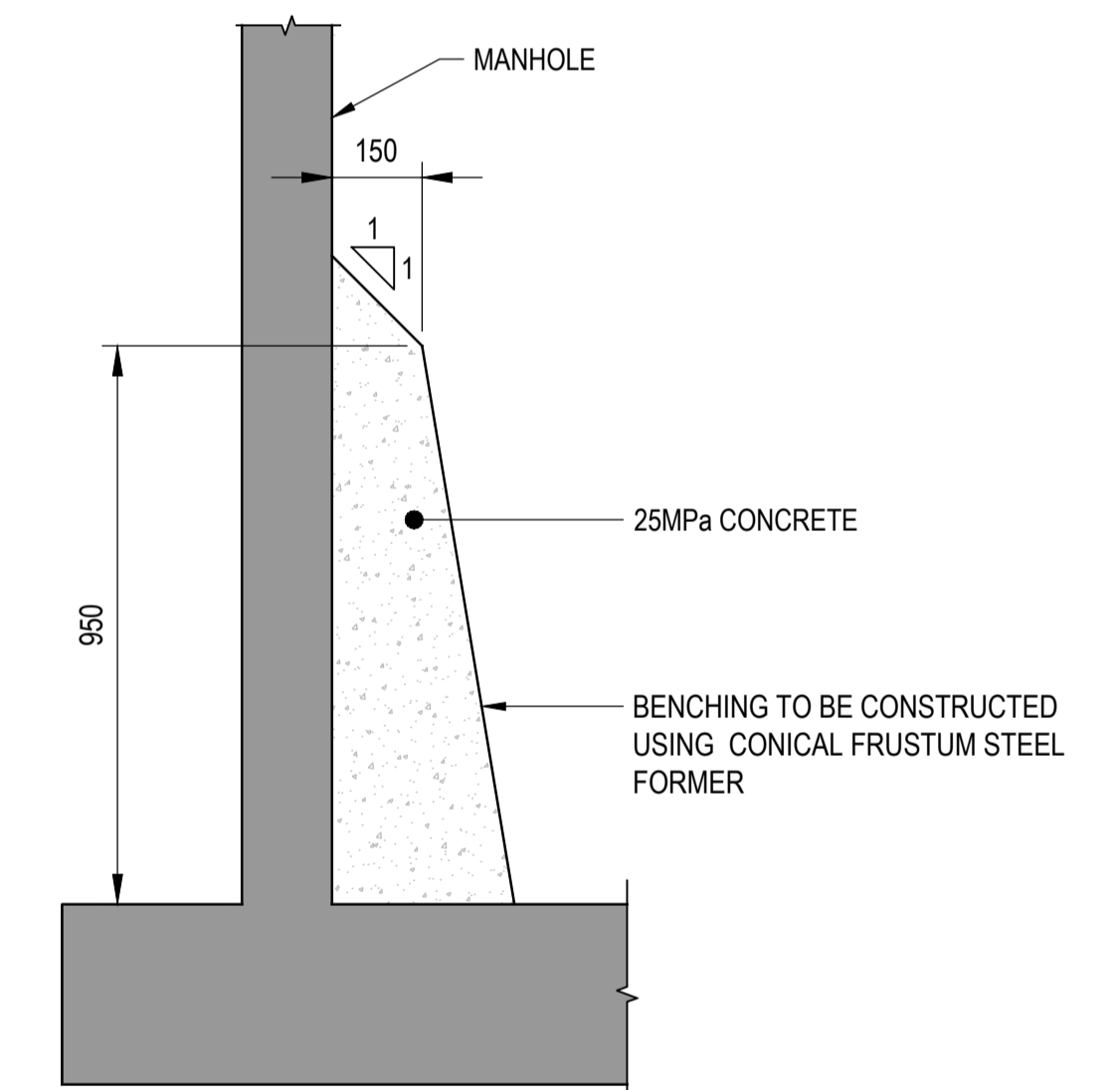
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SCALE NTS



**C DETAIL - EXTERNAL VENT**  
SCALE 1:5



**A ELECTRICAL GLAND TO CONCRETE STORAGE CHAMBER**  
SCALE 1:5



**D CONCRETE STORAGE CHAMBER BENCHING DETAIL**  
SCALE 1:25

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No.	Revision	By	Chk	Appd	Date
A	ISSUED FOR DRAFT DETAILED DESIGN	FC	NU	PM	17.12.24

Original Scale (A1)	Design	N. UNGERER	17.12.24	Approved For Construction*
AS SHOWN	Drawn	F. CUI	17.12.24	
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1/2 SHOWN	Design Check	R. SIMPSON	17.12.24	



Client: **QUEENSTOWN LAKES DISTRICT COUNCIL**  
Project: **ROBINS ROAD WASTEWATER UPGRADES**

Title: **WASTEWATER PRESSURE DUPLEX TRAFFICABLE DETAIL**

Discipline	CIVIL ENGINEERING
Drawing No.	3367096-010-CA-017
Rev.	A

# APPENDIX C – Stakeholder Interaction Record

Project Name:		Robins Road Wastewater Pipeline Upgrade		SCEP - Stakeholder Interactions (Ongoing comms and engagement)	
Stakeholder interactions once the comms and engagement methods have commenced, capture and record all ongoing conversations					
Date	Communication type	Reason	Business Name or Resident	Description and if any follow up actions required	
15/03/2024	Meeting	Consultation	Queenstown Park Boutique Hotel	Meeting to discuss QPBH concerns and considerations regarding timing of works, seasonality, hotel bookings and provision of concept plans for project as well as discussion on possible methodologies	
1/05/2024	Letter drop	Information provided	43 Robins Road	Letter delivered with discussion with both Dot and Beau. Action to return to discuss alignment of pressure sewer	
1/05/2024	Letter drop	Information provided	23 Robins Road	Delivered by hand to tenant. Noted Pure Property manage the rental	
1/05/2024	Letter drop	Information provided	25 Robins Road	Delivered to letterbox	
1/05/2024	Letter drop	Information provided	29 Robins Road	Delivered to letterbox	
1/05/2024	Letter drop	Information provided	35a Robins Road	Delivered to letterbox	
1/05/2024	Letter drop	Information provided	35b Robins Road	Delivered by hand to tenant.	
1/05/2024	Letter drop	Information provided	35c Robins Road	Delivered to letterbox	
1/05/2024	Letter drop	Information provided	35d Robins Road	Delivered to letterbox	
1/05/2024	Letter drop	Information provided	37 Robins Road	Delivered to letterbox	
1/05/2024	Letter drop	Information provided	Flaming kiwi Backpackers	Dropped to reception and noted new cabins going in which lie over the current pipe	
30/07/2024	Meeting	Consultation	Queenstown Park Boutique Hotel	Derek and Tim met with hotel manager to discuss investigation works and upcoming construction works	
16/08/2024	Meeting	Consultation	Queenstown Primary School	Tim and James met Deputy Principal, discussed planned works and investigation works happening Sept 2024	
25/10/2024	Letter drop	Advance warning of works (≥5 days)	23 Robins Road	Delivered by hand to tenant. Formal notice to be sent to Pure Property. Note new tenant.	
25/10/2024	Letter drop	Advance warning of works (≥5 days)	25 Robins Road	Delivered to letterbox	
25/10/2024	Letter drop	Advance warning of works (≥5 days)	29 Robins Road	Delivered to letterbox	
25/10/2024	Letter drop	Advance warning of works (≥5 days)	35a Robins Road	Delivered to letterbox	
25/10/2024	Letter drop	Advance warning of works (≥5 days)	35b Robins Road	Delivered to letterbox	
25/10/2024	Letter drop	Advance warning of works (≥5 days)	35c Robins Road	Delivered to letterbox	
25/10/2024	Letter drop	Advance warning of works (≥5 days)	35d Robins Road	Delivered to letterbox	
25/10/2024	Letter drop	Advance warning of works (≥5 days)	37 Robins Road	Delivered to letterbox	
25/10/2024	Letter drop	Advance warning of works (≥5 days)	Flaming kiwi Backpackers	Dropped to reception and noted new cabins going in in next few weeks	
25/10/2024	Letter drop	Advance warning of works (≥5 days)	43 Robins Road	Letter delivered with discussion with both Dot and Beau. Action to return to discuss alignment of pressure sewer	
13/11/2024	Letter drop	Advance warning of works (≥5 days)	23 Robins Road	Letter delivered to letterbox with proposed alignment of pressure sewer and update on construction works timings	
13/11/2024	Letter drop	Advance warning of works (≥5 days)	25 Robins Road	Letter delivered to letterbox with proposed alignment of pressure sewer and update on construction works timings	
13/11/2024	Letter drop	Advance warning of works (≥5 days)	29 Robins Road	Letter delivered to letterbox with proposed alignment of pressure sewer and update on construction works timings	
13/11/2024	Letter drop	Advance warning of works (≥5 days)	35a Robins Road	Letter delivered to letterbox with proposed alignment of pressure sewer and update on construction works timings	
13/11/2024	Letter drop	Advance warning of works (≥5 days)	35b Robins Road	Letter delivered to tenants with proposed alignment of pressure sewer and update on construction works timings	
13/11/2024	Letter drop	Advance warning of works (≥5 days)	35c Robins Road	Letter delivered to letterbox with proposed alignment of pressure sewer and update on construction works timings	
13/11/2024	Letter drop	Advance warning of works (≥5 days)	35d Robins Road	Letter delivered to letterbox with proposed alignment of pressure sewer and update on construction works timings	
13/11/2024	Letter drop	Advance warning of works (≥5 days)	37 Robins Road	Letter delivered to letterbox with proposed alignment of pressure sewer and update on construction works timings	
13/11/2024	Letter drop	Advance warning of works (≥5 days)	Flaming kiwi Backpackers	Delivered pressure sewer mark-up with location of private property works and general works to backpackers management.	
13/11/2024	Letter drop	Advance warning of works (≥5 days)	43 Robins Road	Delivered pressure sewer mark-up with location of private property works and general works. Agreed to return and mark out proposed location on property	
13/11/2024	Letter drop	Consultation	Queenstown Park Boutique Hotel	Meeting with hotel manage with update to project timings being receptive to busy seasons and discussing likely methodologies for construction and access maintenance for hotel guests	
13/11/2024	Letter drop	Consultation	Creeksyde Holiday Park	Flyer delivered to letterbox/property with outline of planned works and brief meeting with Holiday Park owner and manager around impact and timing of works. Item raised around surrounding road network safety (Weaver Street mirror installation)	
13/11/2024	Letter drop	Advance warning of works (≥5 days)	Bella Vista Hotel	Flyer delivered to reception with outline of planned works	
13/11/2024	Letter drop	Advance warning of works (≥5 days)	44 Robins Road - Hadleys Consultants	Flyer delivered to letterbox/property with outline of planned works	
13/11/2024	Letter drop	Advance warning of works (≥5 days)	46 Robins Road - Downer Office	Flyer delivered to letterbox/property with outline of planned works	
13/11/2024	Letter drop	Advance warning of works (≥5 days)	40 Robins Road	Flyer delivered to letterbox/property with outline of planned works	
13/11/2024	Letter drop	Advance warning of works (≥5 days)	62 Robins Road	Flyer delivered to letterbox/property with outline of planned works	
13/11/2024	Letter drop	Advance warning of works (≥5 days)	66 Robins Road	Flyer delivered to letterbox/property with outline of planned works	
13/11/2024	Letter drop	Advance warning of works (≥5 days)	66b Robins Road	Flyer delivered to letterbox/property with outline of planned works	
13/11/2024	Letter drop	Advance warning of works (≥5 days)	70 Robins Road	Flyer delivered to letterboxes/properties with outline of planned works	
13/11/2024	Letter drop	Advance warning of works (≥5 days)	53 Robins Road	Flyer delivered to letterbox/property with outline of planned works	
13/11/2024	Letter drop	Advance warning of works (≥5 days)	58 Robins Road	Flyer delivered to letterbox/property with outline of planned works	
13/11/2024	Letter drop	Advance warning of works (≥5 days)	10 Hamilton Road	Flyer delivered to letterbox/property with outline of planned works	
13/11/2024	Letter drop	Advance warning of works (≥5 days)	12 Hamilton Road	Flyer delivered to letterbox/property with outline of planned works	
13/11/2024	Letter drop	Advance warning of works (≥5 days)	14 Hamilton Road	Flyer delivered to letterbox/property with outline of planned works	
13/11/2024	Letter drop	Advance warning of works (≥5 days)	18 Hamilton Road	Flyer delivered to letterbox/property with outline of planned works	
13/11/2024	Letter drop	Advance warning of works (≥5 days)	20 Hamilton Road	Flyer delivered to letterbox/property with outline of planned works	
4/12/2024	Phone call	Consultation	Kent Mcelra	Phone call to follow up on enquiry made to customer services - message left to return call for further discussion	

Queenstown Lakes District Council

# ROBINS ROAD WASTEWATER PIPELINE UPGRADE FRAMEWORK CONSTRUCTION NOISE AND VIBRATION MANAGEMENT PLAN

20 MARCH 2025

PUBLIC






## ROBINS ROAD WASTEWATER PIPELINE UPGRADE FRAMEWORK CONSTRUCTION NOISE AND VIBRATION ASSESSMENT

Queenstown Lakes District Council

WSP  
Christchurch  
12 Moorhouse Avenue  
Christchurch 8011  
New Zealand  
+64 3 363 5400  
wsp.com/nz

REV	DATE	DETAILS
00	02/12/2024	Issue
01	20/03/2025	Clarification of mitigation measures post peer review

	NAME	DATE	SIGNATURE
Prepared by:	Raj Prasad	20/03/2025	
Reviewed by:	George van Hout	20/03/2025	
Approved by:	George van Hout	20/03/2025	

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# GLOSSARY

Decibel, dB	The decibel (dB) is a logarithmic scale that allows a wide range of sound pressures to be represented in a more comprehensible range, typically 0 dB to 120 dB. The decibel is ten times the logarithm of the ratio of sound energy. (i.e. power squared, or pressure squared relative to a reference level squared). The reference level for sound pressure is typically 20 $\mu$ Pa which is the approximate threshold of human hearing.
A-weighting, dBA	A frequency weighting designed to reflect the relative loudness perceived by the human ear. It de-emphasizes frequencies in which the ear is less sensitive and is commonly used to measure environmental and industrial noise, ensuring readings are more representative of human auditory perception.
Equivalent Continuous Sound Pressure Level, $L_{eq,T}$	Many sounds, such as road traffic noise or construction noise, vary repeatedly in level over a given time period. $L_{eq,T}$ is the equivalent continuous sound level over a given time period (T). It is often referred to as the 'average' level.
Maximum Sound Pressure Level, $L_{max}$	$L_{max}$ is the absolute maximum sound level recorded over the measurement period.
Sound Power Level, $L_w$ or SWL	The sound power level is the inherent noise of the source and is the total power radiated by the source, in dB. Sound power level does not vary with distance from the noise source or within a different acoustic environment.
Sound Pressure Level, $L_p$ or SPL	The sound pressure level of a source, in dB, varies with distance from the noise source and the environment in which it is located.
Façade Noise Level	A noise level measured/assessed at one metre in front of a sound reflecting object such as a building façade and including the contribution of the sound reflection.
Free-Field Noise Level	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5 metres away from any reflecting wall, screen, or object.
Peak Particle Velocity, PPV	The peak speed in a particular direction a particle travels at the measurement location resulting from vibration.

# 1 INTRODUCTION

WSP has been engaged by Queenstown Lakes District Council (QLDC) to prepare a construction noise and vibration management plan (CNVMP) for the installation of a new wastewater pipe and associated enabling works on Robins Road, Queenstown (the Project).

The Project includes the installation of a new wastewater pipe between Robins Road/Gorge Road intersection and Queenstown Reserve which replaces an ageing wastewater pipe.

The objectives of this CNVMP are:

- 1 Set out the procedures to identify and adopt the best practicable option (BPO) for minimising adverse construction noise and vibration effects on neighbours.
- 2 Define the procedures to be followed to ensure that the noise and vibration standards are being met as far as practicable.

This CNVMP follows the guidance set out in Annex E of NZS 6803:1999 *Acoustics – Construction noise* (NZS 6803)

Early contractor involvement (ECI) on the project has provided construction information including the proposed equipment, timing and locations. This, along with discussions with the consenting team and the following information has been used as the basis of this CNVMP:

- Brief Construction Methodology for Consenting by HEB, received 09 October 2024.
- Robins Road Plant Requirements by HEB, received 10 October 2024.
- Robins Road Wastewater Upgrades Developed Design Drawings by Beca, dated 17 May 2024, and received 09 October 2024.
- Robins Road Wastewater Upgrades Geotechnical Factual Report by Beca, dated 21 March 2024, and received 29 November 2024.
- Robins Road Wastewater Upgrades Geotechnical Interpretive Report by Beca, dated 26 March 2024, and received 29 November 2024.

General details of the Project are presented in Table 1.1

Table 1.1: Project details

PROJECT	ROBINS ROAD WASTEWATER PIPE UPGRADE
Location	The Project follows Robins Road from south of the Gorge Road intersection to the Queenstown Recreational Reserve.
Contractor	<i>HEB Construction</i>
Construction Period	Monday to Saturday, duration > 20 weeks.
Construction Hours	0730 to 1730 hours <i>Night-time work is to be carried out for connections/tie ins to existing water network when water flowrates are low.</i>
Contractor Contact	<i>TBC</i>
Noise and Vibration Contact	<i>TBC</i>

Items in *red italics* are important specific areas of the plan that need to be reviewed and updated as works progress. This is a live document and will be continually updated if the construction methodology changes, when measurements have been undertaken on the specific machinery, and for specific management of impacted properties.

## 1.1 CONTACT DETAILS

The contractor nominated Noise Liaison Officer or equivalent will be responsible for ensuring that this CNVMP is correctly implemented. They will review all documentation relating to construction noise before it is issued.

As part of site induction, all personnel will be made aware of the noise sensitivity of the surrounding environment, along with the acoustic mitigation strategies outlined in this plan.

The respective authority for these works is Queenstown Lakes District Council.

Table 1.2 should be completed by the relevant person before commencement of any construction works, this table outlines key contacts associated with the project.

Table 1.2: Key Contacts

ROLE	NAME	ORGANISATION	PHONE	EMAIL
24 – Hour Public Contact (Site Foreman)	<i>TBC</i>			
Environmental Manager	<i>TBC</i>			
Project Manager	<i>TBC</i>			
Construction Manager	<i>TBC</i>			
Ext. Communications Consultant	<i>TBC</i>			
Noise Liaison Officer	<i>TBC</i>			
Noise and Vibration Monitoring Manager (Site Foreman)	<i>TBC</i>			

## 2 PROJECT BACKGROUND

The following provides a description of the Project.

### 2.1 SITE LOCATION

The Project follows Robins Road from south of the Gorge Road intersection to the Queenstown Recreational Reserve, as shown in blue in Figure 2.1. For further information refer to Appendix A for the Developed Design Drawings.

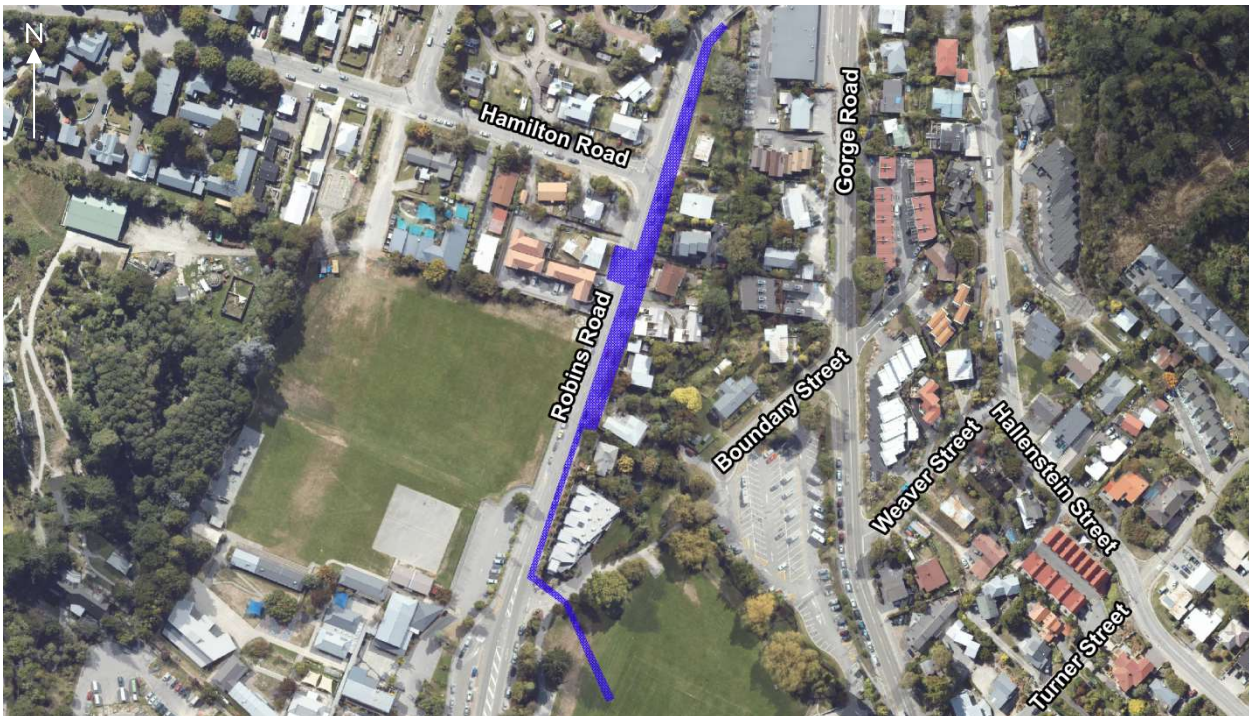


Figure 2.1: Site Location

### 2.2 DESCRIPTION OF PROPOSED WORKS

A brief construction methodology for the Project has been provided by the contractor. This methodology has been used to develop the phases of construction and equipment used. The general sequence of work will involve the following:

- Sheet piling for approximately 70 days.
- Excavation, installation, and backfilling for approximately 140 days.
- Dewatering for approximately 40 days.
- Reinstatement of the road for approximately 20 days.
- Shallow excavation works (less than 1.5 m in depth) for approximately 30 days.
- Night-time connection/tie in works for approximately 7 nights.

Note that some of the above activities are likely to run in parallel to each other, the above are total durations over the entire project. As such, the activities may not occur consistently or constantly along to project timeline or all day.

For further detail on the works, the Brief Construction Methodology for Consenting is included within Appendix C.

### *2.2.1 NIGHT-TIME WORKS*

Dewatering will likely be required between Hamilton Road and Gorge Road of the alignment which will operate 24 hours a day for 7 days a week.

Tie-in works (such as connecting the new wastewater pipe to the existing pipe) may occur at night when usage is lowest.

Specific mitigation measures are proposed to minimise adverse effects of activities at dwellings during the night-time.

## 2.3 NOISE AND VIBRATION SENSITIVE RECEPTORS

Figure 2.2 presents the noise sensitive receptors (NSRs) and their use of site per QLDC for the Project. The addresses, use of site, and distance from the Project to the land parcel boundary are provided in Appendix C.

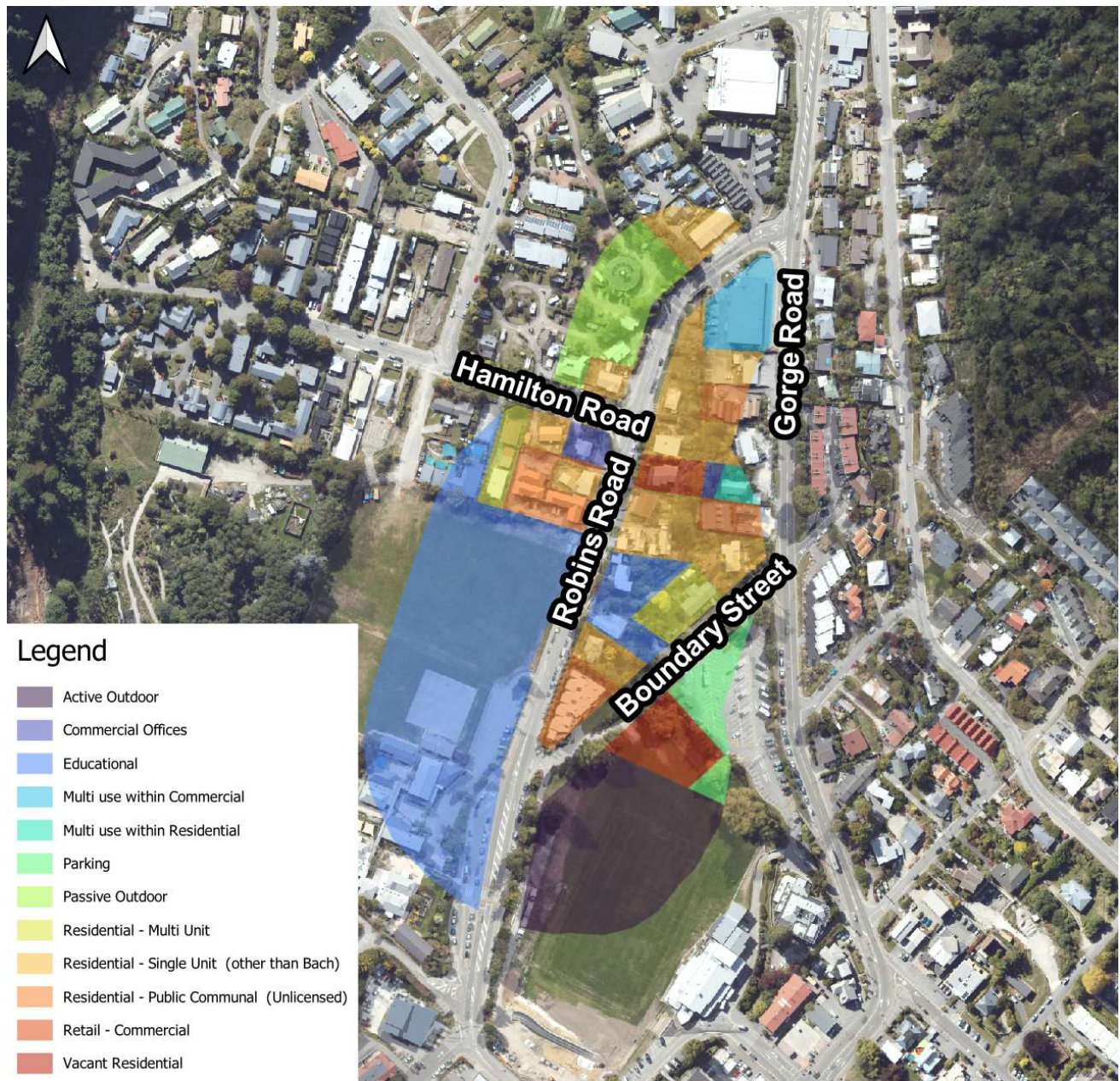


Figure 2.2: NSR locations in relation to the Project

## 3 ACOUSTIC CRITERIA

The noise and vibration criteria have been developed based on the QLDC Proposed District Plan (PDP).

### 3.1 NOISE CRITERIA

The QLDC PDP refers to NZS 6803:1999 *Acoustics – Construction Noise* (NZS 6803) for construction noise criteria. The relevant criteria of NZS 6803 are reproduced within Table 3.1.

Table 3.1: Project construction noise criteria

TIME OF WEEK	TIME PERIOD	NOISE LIMITS (dB)		ASSESSMENT LOCATION
		$L_{Aeq,(15min)}$	$L_{AFmax}$	
Weekdays	06:30 – 07:30	55	75	At any point within any other site.
	07:30 – 18:00	70	85	
	18:00 – 20:00	65	80	
	20:00 – 06:30	45	75	
Saturdays	06:30 – 07:30	45	75	
	07:30 – 18:00	70	85	
	18:00 – 20:00	45	75	
	20:00 – 06:30	45	75	

### 3.2 VIBRATION CRITERIA

For construction vibration criteria, the QLDC PDP refers to DIN 4150-3:1999 *Structural Vibration - Effects of vibration on structures* (DIN 4150). The relevant criteria of DIN 4150 are reproduced within Table 3.2.

Table 3.2: Project construction vibration criteria

STRUCTURE TYPE	VIBRATION LIMIT	ASSESSMENT LOCATION
Commercial buildings	10 mm/s PPV	On any structures or buildings on any other site
Residential buildings	5 mm/s PPV	

Humans perceive vibration at much lower magnitudes than the levels of vibration that are likely to cause building damage. Occupants of buildings are therefore likely to complain about experiencing vibration magnitudes significantly below the levels likely to result in cosmetic damage to buildings. The guidance values in British Standard BS 5228-2:2014 *Code of Practice for noise and vibration control on construction and open sites – Part 2: Vibration* (BS 5228-2) acknowledge this fact and are provided in Table 3-3.

The BS 5228-2 levels can be used as thresholds to trigger certain management measures.



Table 3-3: BS 5228-2 human perception of vibration

VIBRATION LEVEL (PPV)	EFFECT
0.14 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3 mm/s	Vibration might be just perceptible in residential environments.
1.0 mm/s	It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning and explanation has been given to residents.
10 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments.

However, we note that human perception and response to vibration varies depending upon the sensitivity of the individual, the tasks being performed, the magnitude, frequency, and duration of the vibration, whether the vibration is expected, and whether there is concern that structural damage may occur.

## 4 PREDICTED LEVELS

This section presents the predicted vibration and noise setback distances.

### 4.1 PREDICTION METHODOLOGY

Construction noise calculations have been undertaken in accordance with the method provided in NZS 6803 to predict setback distances.

Vibration propagation between the source and receiving locations has been predicted based on the methodology outlined in the NZTA methodology guidance<sup>1</sup>. The calculation is based upon competent soil conditions (sandy or silty clays, gravel, most sands, silts, weathered rock), and slab-on-grade foundations type of all adjacent properties.

Light construction works (such as light handheld tools, manual digging, etc.) are also expected to occur on site. These activities are not expected to produce noise or vibration levels that will modify the resultant average ( $L_{Aeq,T}$ ) or maximum ( $L_{Amax}$ ) noise levels than those presented, and have therefore not been included.

### 4.2 EQUIPMENT VIBRATION SETBACK DISTANCES

*This section should be updated if vibration measurements of the equipment items are taken.*

Table 4.1 sets out the expected vibratory equipment to be used and its associated vibration level, and the predicted vibration setback distance from each piece of construction equipment without any mitigation. Any dwelling without mitigation, and within the setback distance is predicted to exceed the vibration criteria.

Table 4.1: Vibration setback distances

EQUIPMENT ITEM	VIBRATION LEVEL OF EQUIPMENT (mm/s PPV @10m)	SETBACK DISTANCE TO ACHIEVE VIBRATION CRITERIA (m) NUMBER OF RECEPTORS LOCATED IN THE SETBACK DISTANCE			
		10 mm/s	5 mm/s	1 mm/s*	0.3 mm/s*
4 t Vibratory Roller	2.9	1	4	44	114
Plate Compactor	2.5	0.8	3	37	105
Vibratory Sheet Piling Rig	4.0	2	7	60	140

\*BS 5228-2 guideline human perception of vibration criteria

The structures at the following addresses are within the DIN 4150 5 mm/s setback distance for any equipment item of Table 4.1:

<sup>1</sup> Waka Kotahi NZ Transport Agency's State Highway Construction and Maintenance Noise Vibration Guide (version 1.1, dated August 2019)

- 21 Robins Road
- 25 Robins Road
- 29 Robins Road
- 35 Robins Road
- 36 Robins Road
- 37 Robins Road
- 40 Robins Road
- 43 Robins Road

## 4.3 PREDICTED NOISE SETBACK DISTANCES

*This section should be updated if noise measurements of the equipment items are taken.*

Table 4.2 presents the construction equipment items for the Project, the associated equipment sound power level, the setback distance for each piece of equipment to achieve the criteria, and the number of NSR predicted to be within the associated equipment setback distance.

Based on correspondence with the contractor:

- Physical mitigation has been applied to certain equipment items of Table 4.2. These are indicated by an asterisk.
- Equipment on-times have been assumed to be 100% except where noted.

**Table 4.2 Sound power levels and equipment setback distances to achieve construction noise criteria**

EQUIPMENT ITEM	SWL dB L <sub>WA</sub>	SETBACK DISTANCE IN METRES TO ACHIEVE 70 dB L <sub>Aeq(15MIN)</sub> CONSTRUCTION NOISE CRITERIA	NSR WITHIN SETBACK DISTANCE
7 kVa Diesel Generator	93	6	1
15 kW Electric Water Pump	96	8	4
14 t Excavator	97	9	7
20 t Excavator	99	11	14
8 t Excavator	99	11	14
30 t Excavator	103	18	20
Construction Roller	103	18	20
Jumping Jack Compactor	104	20	28
Road Sweeper	104	20	28
Bobcat	104	20	28
5 t Vibratory Drum Roller	105	22	28
Plate Compactor*	110	22	28
Truck/Hiab	107	28	33
9 t Loader	107	28	33
Water Cart	107	28	33
Concrete Saw (30% on-time adjustment applied)*	120	39	36
Grader	113	56	42
Vibratory Sheet Piling Rig (Crane, 44 t vibro-hammer and power pack)	118	100	48

\* -5 dB screening correction applied for localised screening around equipment item.

The sound power level of any single maximum noise event ( $L_{AFmax}$ ) from any piece of equipment is predicted to be no greater than 15 dB higher than the average sound power level ( $L_{WA}$ ) of the Grader (which is the highest piece of equipment used across the alignment). This means no further properties would be impacted than those indicated within Appendix C.

The analysis has been undertaken on the basis that the source noise levels presented in Table 4.2 are not exceeded by the equipment. It is the contractor's responsibility to ensure that all equipment on site is at or lower than the levels presented in Table 4.2.

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## 4.4 ASSUMPTIONS

The following list of assumptions and limitations apply to the noise and vibration prediction methodology, particularly regarding source implementation in the model.

- It is assumed that the reasonable worst-case scenario involves noise from a single item of equipment only.
- Noise levels have been predicted “at or within” the boundary of adjacent sites in line with the QLDC Proposed District Plan, rather than one metre from the façade as per NZS 6803.
- All setback distances are reliant upon QLDC and LINZ data for parcel boundaries and structure locations.

There is always a level of uncertainty in predicting noise from construction activities. Numerous variables including variations in the specific models of equipment, the exact location of each item on site, and how the operator uses the equipment, will affect the accuracy of the noise predicted.

## 5 MITIGATION AND MANAGEMENT

The construction noise and vibration assessment indicates that specific mitigation measures are required.

This section provides details of the specific mitigation measures that shall be applied to the works. Additionally, as noted in the Resource Management Act, mitigation measures should be adopted where practicable to protect against unreasonable levels of noise and vibration.

This section describes the BPO managerial and physical mitigation measures to reduce noise as far as reasonably practicable.

---

### 5.1 PRINCIPLES OF MITIGATION

Proactive noise mitigation is the most effective method to control construction noise. Physical and managerial mitigation is not only necessary to minimise the actual level of noise received but to minimise unnecessary impacts (such as from people not knowing the works will occur). Noise events the community deem to be unnecessary are more likely to generate complaints. The guiding principles of determining mitigation are:

- The BPO of mitigation shall be identified and implemented to manage and mitigate potential adverse effects of noise and vibration. The BPO of mitigation will need to be constantly reviewed during construction.
- Construction noise effects need to be managed, even when levels are within the limits, and management needs to be intensified when the limits are approached.
- Ongoing assessment of all construction activities and continual consideration of potential noise effects and appropriate mitigation shall be undertaken.
- Ongoing effective stakeholder engagement shall be provided, making available information of what, when and why construction works are taking place.

A general hierarchy of the development of the BPO of mitigation measures to reduce the impact of noise and vibration is:

- 1 Selection of equipment and construction methodologies which reduce noise at the source, such as selecting quieter items of plant.
- 2 Including physical mitigation measures to reduce the noise levels at receivers, such as temporary screens or enclosures for specific items of plant.
- 3 Liaising with parties potentially impacted so they know what to expect and can work around specific construction activities.
- 4 Adopt a site policy that the conduct and behaviours of workers shall be considerate to the local community and refer to noise impacts in regular training sessions, toolbox talks and site inductions.
- 5 Temporary movement/relocation of parties potentially affected.

## 5.2 PHYSICAL MITIGATION MEASURES

Physical mitigation is required to reduce noise to a *reasonable level* under Section 16 of the RMA. Specific (required) and practicable (recommended) mitigation measures are presented below.

Physical mitigation can be used to reduce noise emissions from the construction works. In some instances, the use of physical mitigation may not be practicable (due to space requirements, or machinery utilised).

*Where new or improved physical mitigation measures are available, these will be considered by the team and added as a best practicable option to this section, if they can be utilised for this Project.*

### 5.2.1 SPECIFIC BPO MITIGATION MEASURES

For this site, the specific BPO mitigation that is key to reducing the actual level of noise are:

- Equipment selection, siting and operation.
- Adoption of site hoardings or other physical barriers.

Based on discussions with the contractor, the following physical mitigation measures will be adopted as part of the management of noise from these works:

#### 5.2.1.1 EQUIPMENT SELECTION

Equipment for the Project will, where practicable:

- Be the appropriate power, size, or type for the proposed task/activity.
- Prioritise quieter and newer technologies/models over noisier and older equipment/plant.
- Use electric equipment over petrol/diesel alternatives including saws and hand power tools.
- Be fitted with the appropriate exhaust attenuators.
- All vehicles that are fitted with audible reversing warning sirens will be fitted with broadband reversing beepers (squawkers not beepers).
- Generators and/or water pumps are to be selected that have acoustic enclosures to reduce the noise radiated by these units. The reduction that the acoustic enclosures can provide in comparison to standard units depends on the manufacturer.

#### 5.2.1.2 EQUIPMENT SITING

Equipment siting for the Project will, where practicable:

- Limit and/or not use any compression/engine braking on site as far as practicable.
- Where practicable, power shall be provided from mains power rather than generators.
- Where generators are required, these shall be located as far as practicable away from NSR.

#### 5.2.1.3 EQUIPMENT OPERATION

Equipment operation for the Project will, where practicable:

- Be periodically inspected to ensure that they have been maintained correctly and are not generating excessive noise and/or vibration.

- Equipment that is used intermittently to be shut off when not in use.
- Where the vibration/oscillatory function is adjustable, minimise amplitude and maximise the driving frequency to minimise vibration effects where practicable.
- Minimise the number of periods of vibration activity (e.g., complete compaction in one extended period rather than two shorter periods with the same overall duration).
- Start/stop the vibratory/oscillating function at the furthest possible point away from NSR structures and pass by while the vibration level is stable.

#### 5.2.1.4 BARRIER DESIGN

Barriers can lower the level and general perceptibility of construction noise at NSRs when the line of sight is eliminated. For maximum benefit, screening barriers should be positioned as close to the source of noise as possible, and they should block the direct line of sight to NSRs. Where barriers do not block line of sight (for example, where NSRs are elevated and overlook the site), there may not be any appreciable noise reduction.

Where practicable, acoustic site hoardings and localised barriers shall be used:

- Along the working area(s) of the eastern side of the Project / Robins Road.
- Localised barriers around the concrete saw, plate compactor, generators, and water pumps when in use.

For night-time works including dewatering, localised barriers shall be utilised to screen noise from construction equipment items.

All barriers are to be constructed in accordance with the following guidance:

- Barriers should be a minimum height of 1.8 m and ideally installed so that no part of the noise source will be visible from the NSR.
- Barriers should have no gaps or openings at joints in the barrier material or to the ground.
- The length of the barrier should typically be at least five times greater than its height, or it should surround stationary noise producing equipment and be positioned as close as possible to the noise source.
- A barrier material with minimum surface mass of 10 kg/m<sup>2</sup> shall be used.

For short-term construction works, proprietary temporary barriers such as Duraflex Hushtec or SFI Echo Barrier can be utilised provided the above guidance is met.

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## 5.3 MANAGERIAL MITIGATION MEASURES

Where BPO physical mitigation is implemented and the noise limit thresholds are still exceeded, as indicated by this CNVMP, managerial mitigation shall be implemented to reduce adverse noise effects at adjacent properties.

For this site, the key managerial mitigation measures for noise are:

- Training of staff.
- Behaviour and conduct of staff.
- Engagement with the local community.

Specific and practicable managerial mitigation are provided below.

*This section shall be kept up to date by the contractor throughout the construction process.*

### 5.3.1 SPECIFIC BPO MANAGERIAL MITIGATION

The following specific BPO managerial mitigation measures apply:

#### 5.3.1.1 TRAINING

Site-specific training shall be given to site personnel including management and workers involved in construction activities that have potential to generate noise and vibration effects.

Site inductions for these personnel will include a briefing on relevant aspects of the CNVMP, including:

- The roles and responsibilities of all site personnel in the management of noise and vibration effects.
- Identification of the noise and vibration sensitive receptors and identification of the activities that have potential to cause adverse noise and vibration effects.
- Procedures and operational considerations associated with those sensitive receptors and construction activities, to manage the noise. This may include the understanding of physical mitigation requirements, allowable hours of operation and appropriate use of equipment.
- Contacts and procedures for site personnel to gain information related to noise and vibration limits, noise and vibration sources on-site, and the noise and vibration mitigation and management procedures expected of site personnel.
- How plant equipment and methodologies may impact noise and vibration effects, and the relevant procedures to follow for selection of appropriate plant and methodologies.
- How site behaviours and conduct may affect noise and vibration effects, and procedures to follow for appropriate site behaviours and conduct.
- Maintaining goodwill amongst the community.

Toolbox/tailgate meetings throughout the Project construction will also include consideration of noise and vibration effects, refreshing the training information given in the site induction and/or updating training information.

Site Specific training must be provided to site personnel involved in monitoring noise and vibration and development of procedures for management and mitigation of noise and vibration effects, where required.

This includes where noise and/or vibration monitoring is required to investigate any complaint. Site induction for these personnel will include briefing on relevant aspects of these mitigation measures, plus procedures for recording monitoring results and where noise and vibration effects are identified to comply or not comply with the noise limits.

#### 5.3.1.2 BEHAVIOUR AND CONDUCT

Site personnel shall understand that their behaviours and conduct can affect noise and vibration effects. Conduct that is perceived as unnecessarily noisy can influence the community's perception of the overall noise generated by the project.



During the site induction for contractor staff, the following management mitigation measures will be acknowledged and addressed where practicable and safe to do so:

- When arriving at work, drive slowly on site and keep revs to a minimum, keep stereos at a low volume (or off) and do not slam doors.
- No shouting or unnecessary raised voices on site. Either walk over and talk to somebody or use a radio/phone.
- Be careful with tools and equipment. Place them down and do not drop them.
- Do not drag materials on the ground. Place them down when arriving at the work area.
- Equipment and vehicles shall be switched off when not in use.
- Noise enclosures should have doors/hatches closed when the equipment is in use.
- Stationary equipment such as pumps and generators shall be located away from neighbours as far as possible.
- All equipment is to be well maintained.
- If staff, see anything/anyone making unnecessary noise then stop it/them. If the source cannot be stopped, then report it to the Noise Liaison Officer or equivalent.

It is essential that good relationships are maintained with the local community. Any queries from members of the public shall be responded to politely and referred to the Noise Liaison Officer/ Stakeholder & Engagement Manager. Staff shall assist the public to contact this person. Staff shall not enter debate or argue with members of the public.

### 5.3.1.3 SCHEDULING OF WORKS

*The final scheduling of particularly loud activities shall be decided once consultation with the community has been undertaken.*

Occupied buildings are sensitive to the timing of construction works.

While construction activities should be prioritised when buildings are not occupied (and less sensitive to noise), with residential and commercial buildings, it is unlikely all buildings will be unoccupied for extended periods.

Cumulative noise emissions should always be considered by the contractor when scheduling the works, noise emissions from multiple items of the plant will summate and cause a greater overall noise level.

Where nightworks for activities other than dewatering are required:

- If equipment generating notable noise relative to the noise criteria is required for connection or tie-in works (such as concrete cutting, metallic grinding/cutting, or use of an air/hydro-vac or excavator), this shall occur prior to 2200 hours as far as reasonably practicable to minimise sleep disturbance for the adjacent accommodation/residential buildings.
- NSR shall be granted respite from night-time works following guidance from consultation or after receiving noise from three consecutive night-time work shifts.
- Where the extent of the above mitigation measures is not possible or practicable, and/or complaints of sleep disturbance are received on the first night of works, the final plausible

mitigation solution is to temporarily relocate those sensitive residents for the second night of works. This mitigation situation must be considered and anticipated by the contractor.

- Where nightworks occur next to visitor accommodation spaces, the contractor will work with the accommodation provider to minimise/remove guests from rooms exposed to elevated noise levels for greater than three consecutive nights.

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## 5.4 TEMPORARY MOVEMENT/RELOCATION

*This section should be updated if noise measurements of the equipment items are taken.*

Temporary movement/relocation is only required where noise and / or vibration levels from construction works are deemed to not be reasonable, even with the BPO physical and managerial mitigation measures incorporated.

This may take the form of managing effects from vibratory sheet piling by offering to temporarily move residents when piling adjacent to their properties (for example if piling only occurs between 1200 – 1300 hours, offer lunch at a nearby restaurant for people).

The following procedure will need to be undertaken to action temporary movement/relocation:

- Determine NSR within 20 m of the Vibratory Sheet Piling Rig.
- Undertake community consultation with the respective NSR to determine the level of impact that construction noise may have i.e:
  - Whether the dwelling will be occupied when the high-noise activity will occur, or if any activities particularly sensitive to noise will occur during the construction hours (e.g. residents working from home).
  - Whether sensitive rooms are facing away from construction areas and therefore will receive lower noise levels when assessed within sensitive spaces.
- As part of the consultation, a suitably qualified acoustic engineer may analyse the predicted noise and / or vibration level within sensitive rooms to determine whether noise from works will be reasonable.
- If the above analysis shows that noise and / or vibration levels within sensitive spaces may not be reasonable, then further consultation will be required with the impacted property to determine if temporary relocation is a suitable and preferred measure for the occupiers.

## 6 COMMUNITY ENGAGEMENT

A key component in minimising the impact of noise and vibration effects is early community engagement. Prior to the start of construction, a Community Relations Manager role will be established. This representative for the project will advise (in person or by writing) all properties that are predicted to infringe the construction noise and vibration criteria 10 working days in advance of those works commencing on site..

This advice will include:

- Description of the construction works.
- The activity that the occupants/landowners may be impacted by.
- Why the works are required to occur.
- Duration of these specific activities.
- Timing of when they will occur; and,
- Contact details (including telephone number and email) for the Noise Liaison Officer which the public can contact to find out information or lodge a complaint.
- How any noise and vibration complaints will be handled by the contractor.

Regular direct communication (in person or by writing) will be undertaken with the properties that potentially could receive noise levels greater than the noise limits outlined in this report at any point during the construction.

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### 6.1 CONSULTATION

The objective of consultation with neighbouring properties is to foster positive communication and relationships between the Requiring Authority, contractors, client, and potentially affected parties. It also provides a platform for residents to learn about the project.

Consultation will be undertaken with all properties that are predicted to infringe the construction noise and/or vibration limits to determine:

- Hours that higher noise and/or vibration activities would have the lowest impact (such as times when all occupants are at work).
- Days/times when occupants are the most sensitive such as:
  - During tests, exams or key learning times at Queenstown Primary School
  - During key events
  - At night if small children are going to bed, etc.
- If there are any special needs relating to noise and/or vibration within the construction window, that may require key management of construction noise and/or vibration.

Where practicable, high noise and/or vibration construction activities will occur at times when the adjacent occupants are least noise sensitive.

# 7 COMPLAINTS HANDLING PROTOCOL

The Contractor will adopt the following protocol for handling complaints. This protocol is intended to ensure that the issues are addressed, and that appropriate corrective actions are identified and implemented as necessary.

The Noise Liaison Officer will record all verbal and telephone complaints in writing within a Noise Complaint Register. Details to be recorded should include:

- Full details of the complaint (complainant's name and address)
- Time and date of the event.
- Location of the event.
- What was felt/heard (can they identify the plant or process).
- If it was felt/heard outside or inside.
- If inside, were windows/doors open.
- Impact of the event (e.g. woken from sleep, couldn't hear the TV, disturbed whilst reading).
- Weather conditions at the time (if known) including cloud cover, temperature, wind strength and direction.
- Any specific requests.
- What activities were occurring at the time of the complaint, including the items of equipment operating and where they were operating.
- Any additional acoustic data, including any noise or vibration measurements that are relevant to the complaint.

An initial response will be made and recorded. Depending on the nature of the complaint, the initial response could be to immediately cease the activity pending investigation, to replace an item of equipment, or screen the activity. However, it might not be practicable to provide immediate relief in some cases. The complainant and Council will be informed of actions taken. Contact details for the Council are recorded above.

Where the initial response does not address the complaint, further investigation, corrective action, and follow-up monitoring shall be undertaken as appropriate within 5 working days. The complainant [and Council] will be informed of actions taken.

Complainants will be informed of the implementation of the corrective action that has been taken to mitigate the adverse effects.

All actions will be recorded on a Noise Complaint Register, and the complaint will then be closed. The Contractor's complaint response line will be always attended during out of hours works. It will be kept up to date and made available to the Environmental Health Officer at the territorial authority if requested.

## 8 MONITORING

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### 8.1 NOISE

It is recommended that noise monitoring is undertaken to confirm that the actual noise emissions are no greater than those predicted and to identify NSR that would benefit from temporary relocation during specific activities, or to investigate any noise or vibration complaints.

Attended noise monitoring is recommended to be conducted:

- To confirm the sound levels and setback distances of notable noise generating equipment used on site.
- At the first occurrence of vibratory sheet piling.
- To address any reasonable complaints.

Measurements will be used to validate or refine the equipment setback distances and determine which NSR would benefit from temporary relocation.

Noise monitoring will be undertaken by a suitably qualified person using a Class 1 or 2 Sound Level Meter (SLM) and associated kit, in accordance with NZS 6801 and NZS 6803. The calibrator will be verified by an accredited laboratory annually, and the sound level meter and microphone biannually (every two years) during the construction programme.

The contractors may undertake noise monitoring with an SLM that does not have any class classification; however, it must be noted that this approach would not be in accordance with noise measurement guidance and standards. If this approach is adopted and measured noise levels exceed the predicted noise levels, noise monitoring by a suitably qualified person using a Class 1 or 2 SLM shall be undertaken.

Following each attended noise survey, the results will be evaluated and reported on noise survey report template. All noise survey reports will be kept on file and available to the territorial authority on request.

### 8.2 VIBRATION

Attended and continuous vibration monitoring is recommended to be undertaken to confirm that the actual vibration levels are no greater than those predicted, and where required, to investigate any vibration complaints.

Monitoring of building vibration will be performed in accordance with DIN 4150. All vibration survey reports will be kept on file and available to the territorial authority upon request.

#### 8.2.1 ATTENDED VIBRATION MONITORING

Attended vibration monitoring should be undertaken when key vibratory equipment as presented in Table 4.1 first operates on site, in a position that is unlikely to generate exceedances for the adjacent dwellings (based on 5mm/s vibration criteria setback distances). This is intended to confirm the site-specific vibration propagation, which is recommended to be used to update the predicted vibration levels on a site-specific basis.

### 8.2.2 CONTINUOUS VIBRATION MONITORING

Continuous vibration monitoring is recommended to be undertaken when high vibration generating equipment operating on site as presented in Table 4.1 is expected to approach the site specific setback distance (refer to Section 8.2.1) for any NSR structure. This is to take place at a single worst-case location per site, that is representative of the nearest NSR to the high vibration generating equipment activity.

The selected continuous vibration monitoring system is to have an automatic warning system. A 5 mm/s vibration threshold will be set, and immediate warnings to key personnel will be sent if this level is exceeded. If a warning is received, works are to pause while the source of the vibration is determined.

On the first instance of a construction activity giving rise to an exceedance, the activity will be reviewed such that where practicable, mitigation measures (either physical or managerial) are implemented. As part of this process, recurring building condition surveys should be undertaken to log any degradation in cosmetic building condition whilst equipment causing the exceedances is operating on site.

Exceedances will be continued to be monitored and should an increase in measured levels occur, the activity will undergo an additional review to audit the effectiveness of mitigation measures currently applied and determine if further mitigation is considered practicable.

### 8.2.3 NSR SPECIFIC ATTENDED VIBRATION MONITORING

To address any reasonable complaints and where access is granted by the owners and/or occupiers, consideration should be given to the measurement of vibration levels inside dwellings.

On the first instance of a construction activity giving rise to an exceedance, the activity will be reviewed such that where practicable, mitigation measures (either physical or managerial) are implemented. As part of this process, recurring building condition surveys should be undertaken to log any degradation in cosmetic building condition whilst equipment causing the exceedances is operating on site.

## 9 BUILDING CONDITION SURVEY

A building condition survey is recommended to be undertaken by a suitably qualified building surveyor and will be conducted prior to the works adjacent to dwellings within the 5 mm/s PPV cosmetic setback distances, where the occupant and/or landowner grants access.

Where the setback distances are updated based on measurements further building condition surveys may be required. The NSR at which building condition surveys are required are presented in Section 4.2

A report will be prepared for each building surveyed, including:

- A description of the building condition, including construction materials and the present condition;
- Any existing cosmetic or structural damage, or other building-related defects;
- Sketched and photographs showing the location and extent of any existing damage, such as cracks; and
- Verification of the report by the surveyor and building owner.

Following the works, all building condition surveys will be repeated. The post-completion report will be prepared, including:

- Sketches and new photographs of any new damage, and
- Verification of the report by the surveyor and building owner.

Pre- and post-construction building condition surveys will be held on record and provided to the building owner, and/or relevant territorial authority if requested.

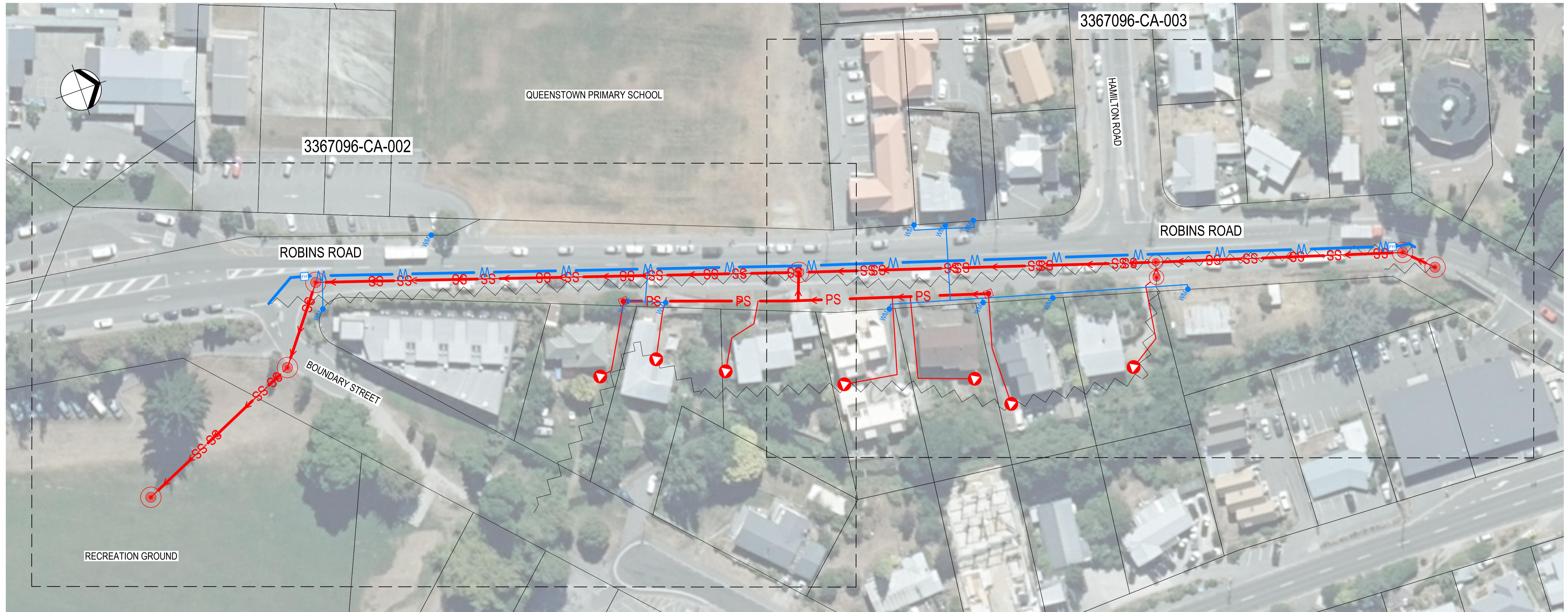
## 10 LIMITATIONS

This report ('Report') has been prepared by WSP New Zealand Limited ('WSP') exclusively for Queenstown Lakes District Council ('Client') in relation to the construction noise and vibration impact assessment of the installation of a new wastewater pipe and associated enabling works on Robins Road ('Purpose') and in accordance with the C-19-052 Strategic Planning Services contract with the Client, signed 17/10/2019 ('Agreement'). The findings in this Report are based on and are subject to the assumptions specified in the Report and the Offer of Service date 19 September 2024. WSP accepts no liability whatsoever for any use or reliance on this Report, in whole or in part, for any purpose other than the Purpose or for any use or reliance on this Report by any third party.



# APPENDIX A: DEVELOPED DESIGN DRAWINGS

# ROBINS ROAD WASTEWATER UPGRADES



ISSUED

DRAWING INDEX		DAY MONTH YEAR	28	17
DRAWING No	DRAWING TITLE		03	05
3367096-CA-000	COVER SHEET AND DRAWING LIST		A	B
3367096-CA-001	GENERAL NOTES AND TRENCH DETAILS		A	B
3367096-CA-002	ROBINS ROAD LAYOUT PLAN SHEET 1	2024	A	B
3367096-CA-003	ROBINS ROAD LAYOUT PLAN SHEET 2		A	B
3367096-CA-004	MANHOLE DROP STRUCTURE DETAILS SHEET		A	B

**WARNING**  
BEWARE OF UNDERGROUND SERVICES. THE LOCATIONS OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THEIR EXACT POSITION SHOULD BE PROVEN ON SITE. NO GUARANTEE IS GIVEN THAT ALL EXISTING SERVICES ARE SHOWN.

**ORIGINAL DRAWING  
IN COLOUR**

**DEVELOPED DESIGN  
NOT FOR CONSTRUCTION**

No.	Revision	By	Chk	Appd	Date
B	DEVELOPED DESIGN	EM	PM	RS	17.05.24
A	DRAFT DEVELOPED DESIGN	EM	PAR	RS	28.03.24

Original Scale (A1)	Design	E. MOLLOY	25.03.24	Approved For Construction*
AS SHOWN	Drawn	E. MOLLOY	25.03.24	
Reduced Scale (A3)	Dwg Verifier	P. REED	26.03.24	
1/2 SHOWN	Dwg Check	R. SIMPSON	26.03.24	Date



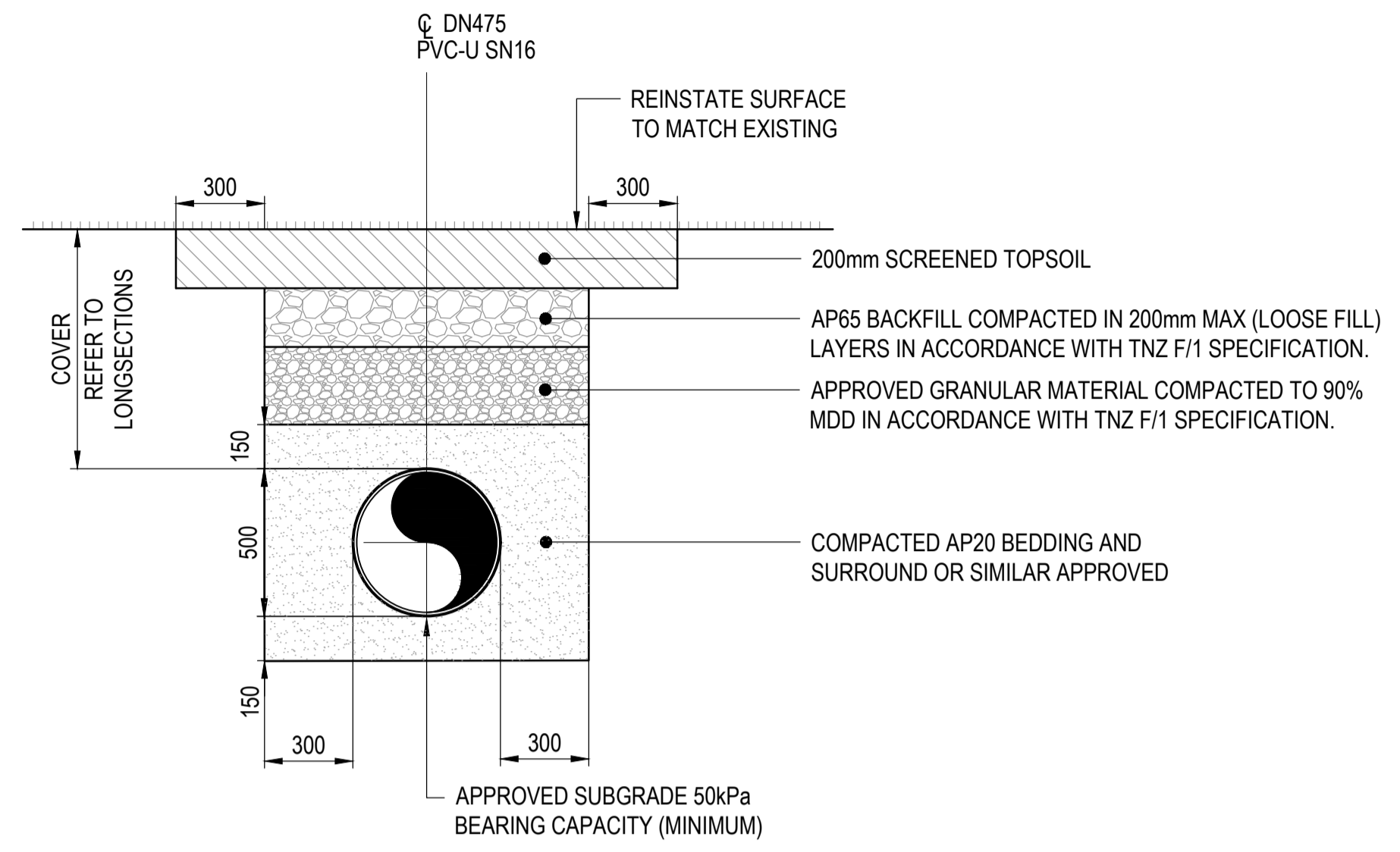
Client: QUEENSTOWN LAKES DISTRICT COUNCIL  
Project: ROBINS ROAD WASTEWATER UPGRADES

Title: COVER SHEET AND DRAWING LIST

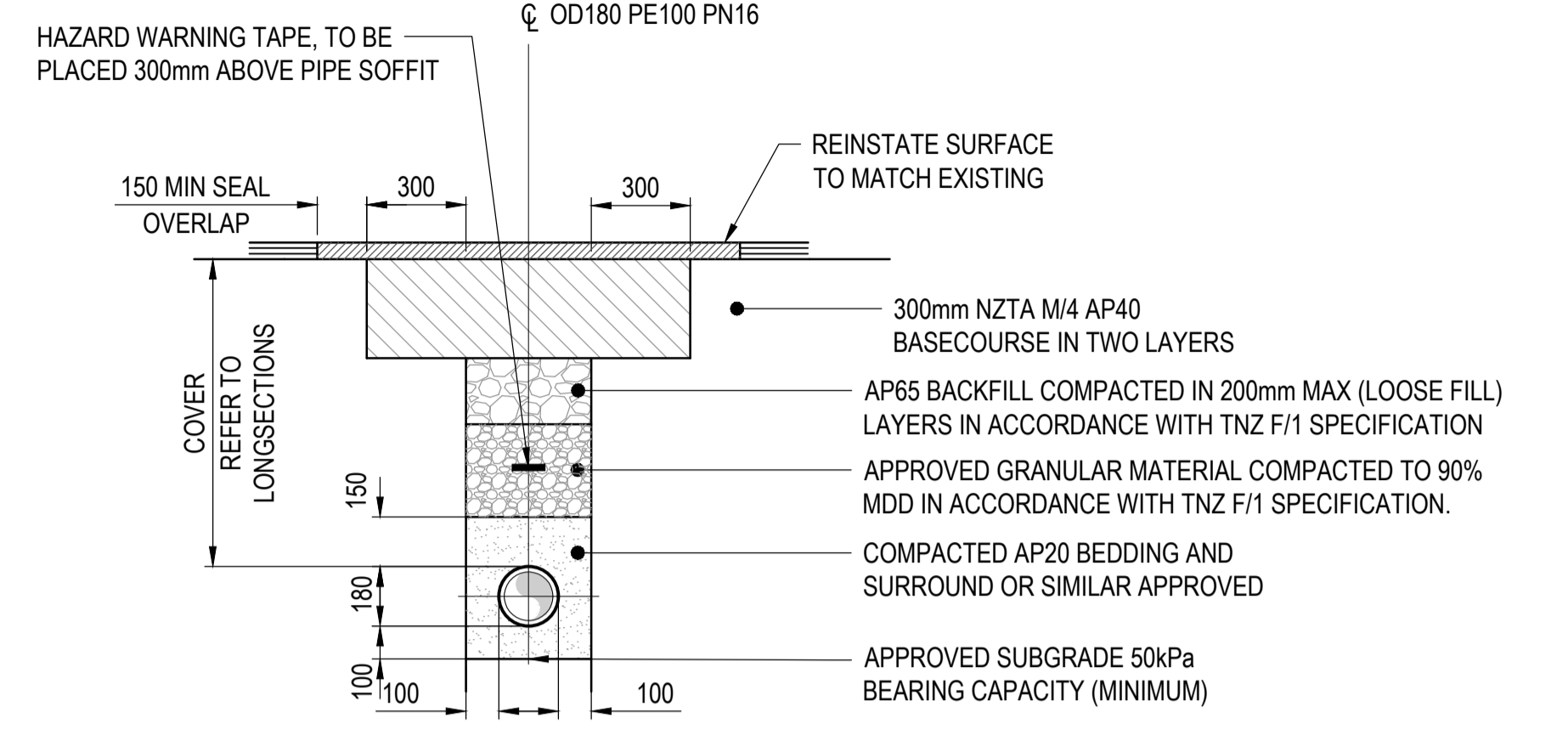
Discipline: CIVIL ENGINEERING  
Drawing No: 3367096-CA-000  
Rev: B

**GENERAL NOTES:**

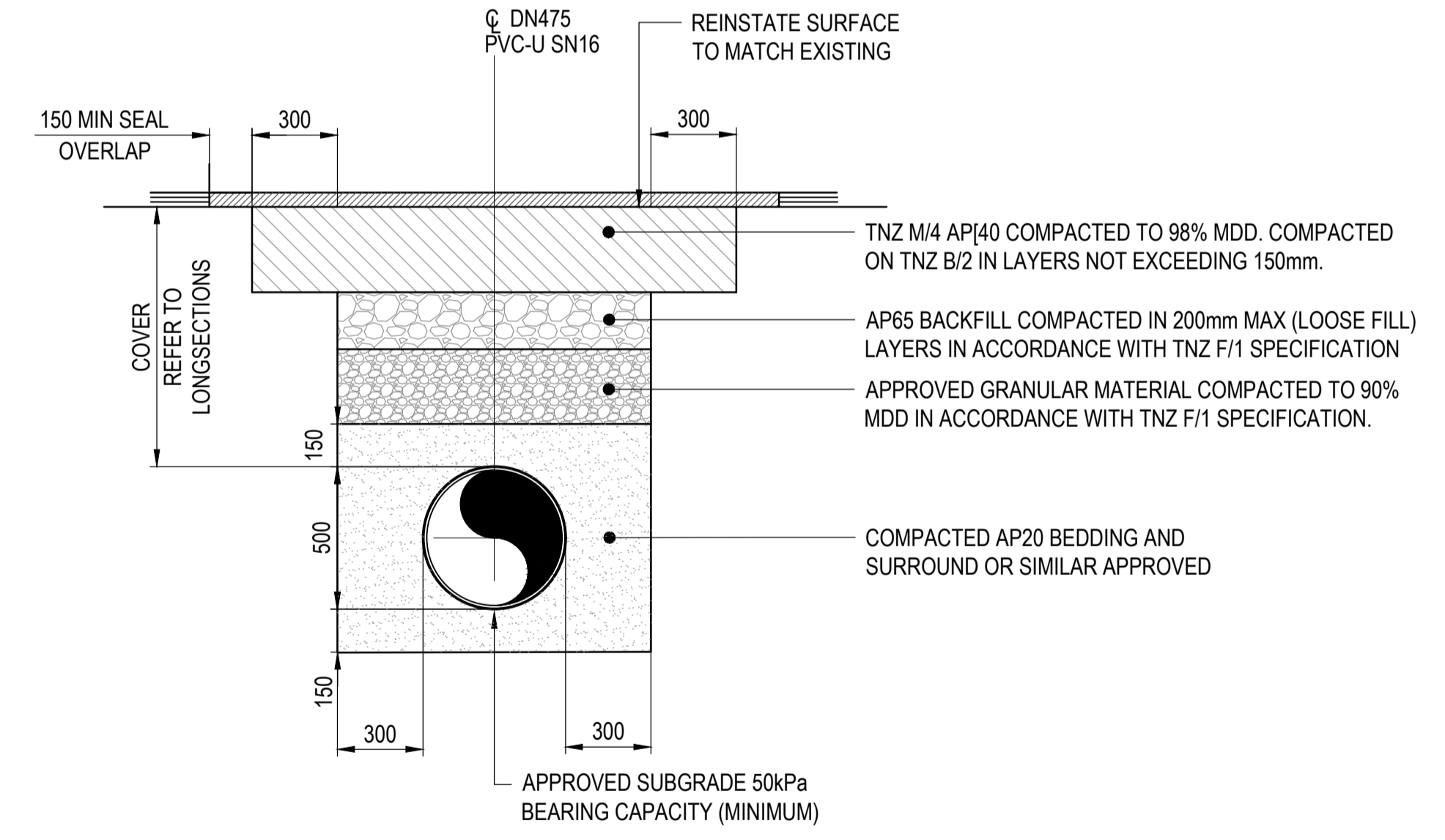
1. LEVELS ARE IN NZVD2016.
2. HORIZONTAL COORDINATES ARE IN TERMS OF NZGD2000, NEW ZEALAND TRANSVERSE MERCATOR (NZTM)
3. DEPTH OF INVERT GIVEN FROM PROPOSED SURFACE.
4. EXISTING SURFACE BASED ON LIDAR SURVEY (SOURCED FROM LINZ, JULY 2022)
5. SERVICES SHOWN ARE INDICATIVE ONLY. SOURCED FROM BEFOREUDIG AND QLDC GIS.
6. LEVELS OF EXISTING MANHOLES SOURCED FROM QLDC GIS.
7. ALL WORKS ARE TO COMPLY WITH QUEENSTOWN DISTRICT COUNCIL LANDSCAPE AND DEVELOPMENT CODE OF PRACTICE (QLDC COP). IT SHOULD BE NOTED THAT PRINTED VERSIONS ARE UNCONTROLLED. ANY DEVIATION FROM QLDC COP IS TO BE CARRIED OUT ONLY AFTER A WRITTEN INSTRUCTION IS RECEIVED FROM THE ENGINEER.
8. PIPE BEDDING, HAUNCHING AND BACKFILL TO BE IN ACCORDANCE WITH DRAWING QLDC COP APPENDIX B CM-002.
9. ALL VALVE COVERS TO BE INSTALLED IN ACCORDANCE WITH DRAWING QLDC COP APPENDIX B2-3.
10. SLUICE VALVES TO BE INSTALLED IN ACCORDANCE WITH DRAWING QLDC COP APPENDIX B2-5.
11. ALL WATER INSTALLATION SHALL BE CARRIED OUT IN ACCORDANCE WITH THE QLDC COP. ANY DEVIATION FROM THE QLDC COP IS TO BE AGREED BY THE ENGINEER PRIOR TO ANY WORKS COMMENCING.
12. THE LEVELS AND LOCATIONS OF EXISTING SERVICES ARE APPROXIMATE ONLY. THE CONTRACTOR IS TO LOCATE ALL UTILITIES AND SERVICES ON SITE (DEPTH AND LOCATION) AND LIAISE WITH THE RELEVANT AUTHORITY IF PROTECTION AND/OR RELOCATION IS REQUIRED.
12. IF THE CONTRACTOR LOCATES ANY UTILITY NOT SHOWN ON THE DRAWINGS, THEY ARE TO INFORM THE ENGINEER IMMEDIATELY. THE ENGINEER SHALL THEN ADVISE THE CONTRACTOR ON HOW TO PROCEED.
14. WHERE POSSIBLE, THE SIZE AND TYPE OF EXISTING PIPE MATERIAL OF SERVICES HAVE BEEN SHOWN TO ASSIST THE CONTRACTOR. THE CONTRACTOR SHALL SATISFY THEMSELVES THAT THIS INFORMATION IS CORRECT.
15. THE CONTRACTOR SHALL CONFIRM THE ALIGNMENT OF THE PIPE IN CONSULTATION WITH THE ENGINEER AFTER ALL THE EXISTING SERVICES HAVE BEEN LOCATED UNLESS SHOWN OTHERWISE ON THE DRAWINGS.
16. ALL MANHOLES TO HAVE 100kPa SAFE BEARING CAPACITY FOUNDATIONS BELOW 600mm OF THE MANHOLE BASE. ALL PIPES TO HAVE 50kPa SAFE BEARING CAPACITY FOUNDATIONS BELOW 600mm OF THE EMBEDMENT BASE. WHERE FOUNDATIONS DO NOT MEET THE BEARING CAPACITY, SITE SPECIFIC DESIGN IS REQUIRED.
17. ALL LATERALS ON DRAWINGS ARE SHOWN AT INDICATIVE LOCATIONS. EXACT LATERAL CONNECTIONS ARE TO BE CONFIRMED ON SITE.



**TYPICAL PIPE TRENCH - GRASSED AREAS  
(GRAVITY WASTEWATER)**  
SCALE 1:20



**TYPICAL PIPE TRENCH (WATERMAIN)**  
SCALE 1:20



**TYPICAL PIPE TRENCH - SEALED AREAS  
(GRAVITY WASTEWATER)**  
SCALE 1:20

**WARNING**  
BEWARE OF UNDERGROUND SERVICES. THE LOCATIONS OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THEIR EXACT POSITION SHOULD BE PROVEN ON SITE. NO GUARANTEE IS GIVEN THAT ALL EXISTING SERVICES ARE SHOWN.

**ORIGINAL DRAWING  
IN COLOUR**

**DEVELOPED DESIGN  
NOT FOR CONSTRUCTION**

No.	Revision	By	Chk	Appd	Date
B	DEVELOPED DESIGN	EM	PM	RS	17.05.24
A	DRAFT DEVELOPED DESIGN	EM	PAR	RS	28.03.24

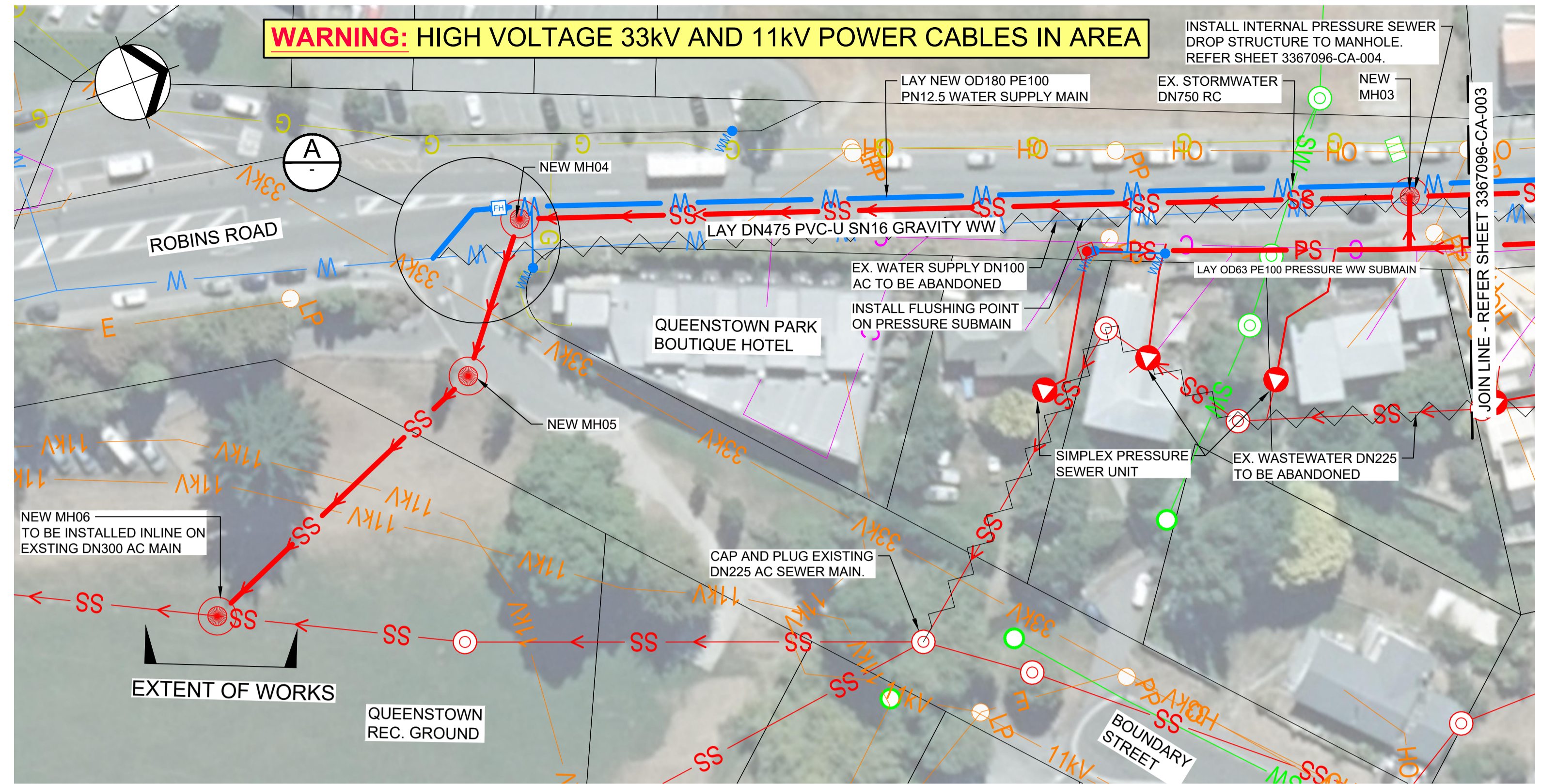
Original Scale (A1)	Design	E. MOLLOY	25.03.24	Approved For Construction*
AS SHOWN	Drawn	E. MOLLOY	25.03.24	
Reduced Scale (A3)	Dwg Verifier	P. REED	26.03.24	
1/2 SHOWN	Drg Check	R. SIMPSON	26.03.24	Date



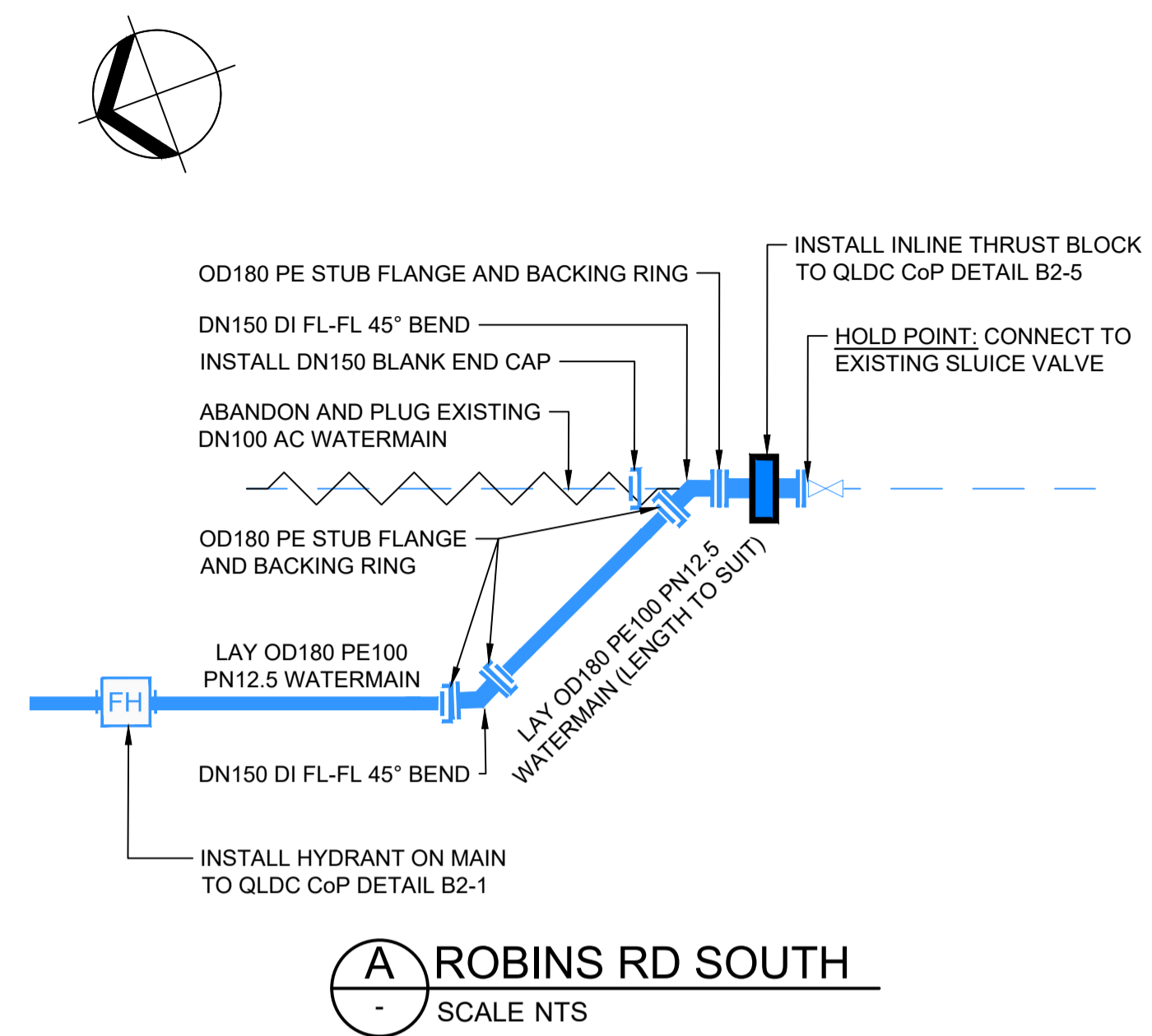
Client: QUEENSTOWN LAKES DISTRICT COUNCIL  
Project: ROBINS ROAD WASTEWATER UPGRADES

Title: GENERAL NOTES & TRENCH DETAILS

Discipline	CIVIL ENGINEERING
Drawing No.	3367096-CA-001
Rev.	B



**PROPOSED WASTEWATER - PLAN**  
SCALE: 1:500



**LEGEND**

**PROPERTY BOUNDARY**

**EXISTING SERVICES**

- SS → GRAVITY SEWER MAIN
- SEWER LATERAL
- W WATER MAIN
- SW STORMWATER MAIN
- E POWER (UNDERGROUND)
- OH POWER (OVERHEAD)
- 11kV / 33kV POWER (OVERHEAD & UNDERGROUND)
- G GAS PIPE
- C CHORUS
- FO FIBRE OPTIC
- SEWER PUMP STATION
- SEWER / STORMWATER MANHOLE
- STORMWATER SOAKPIT
- STORMWATER OUTLET
- PP LP POWER / LIGHT POLE

**PROPOSED SERVICES**

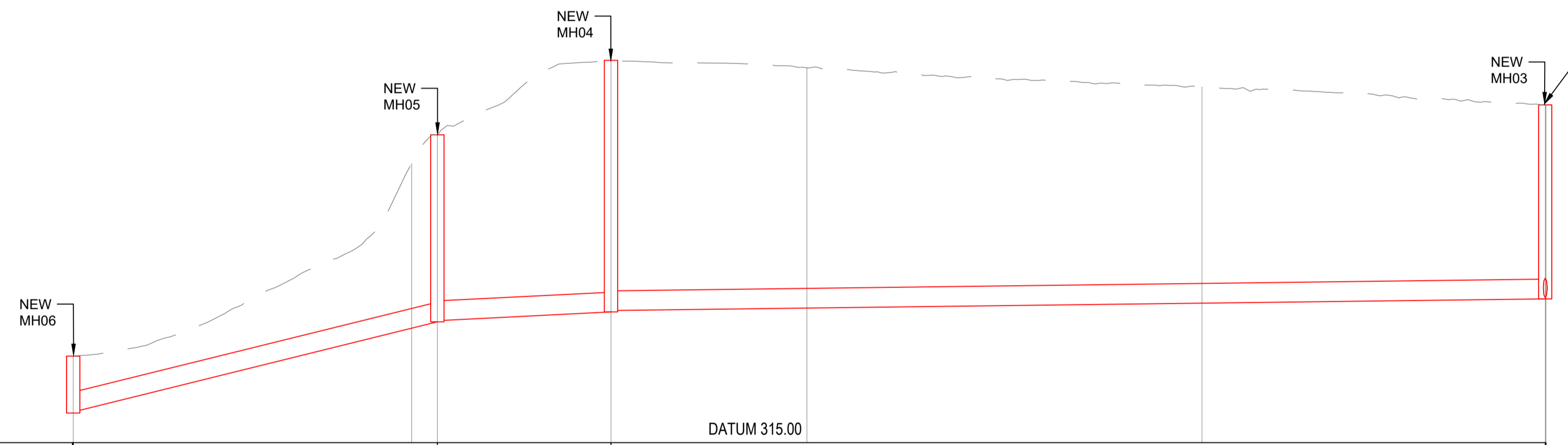
- SS → GRAVITY SEWER MAIN
- SEWER LATERAL
- SEWER MANHOLE
- PS → PRESSURE SEWER SUBMAIN
- ▲ PRESSURE SEWER UNIT
- PRESSURE SEWER SUBMAIN FLUSHING POINT
- W → NEW WATER SUPPLY MAIN
- NEW WATER SUPPLY SUBMAIN
- WM ● WATER METER CONNECTION
- FH FIRE HYDRANT ON MAIN
- ⊗ SLUICE VALVE ON MAIN

- NOTES:**
- FOR GENERAL NOTES REFER TO DRAWING 3367096-CA-001.
  - LOCATIONS OF PRESSURE SEWER UNITS ARE SHOWN AS INDICATIVE ONLY. FINAL LOCATIONS TO BE CONFIRMED FOLLOWING STAKEHOLDER CONSULTATION.
  - ALL PRESSURE SEWER LATERALS TO BE OD32 PE100 PN16 UNLESS STATED OTHERWISE.
  - DETAILS OF ODOUR MITIGATION FOR MANHOLES TO BE FINALISED AT NEXT STAGE OF DESIGN.

**WARNING**  
BEWARE OF UNDERGROUND SERVICES. THE LOCATIONS OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THEIR EXACT POSITION SHOULD BE PROVEN ON SITE. NO GUARANTEE IS GIVEN THAT ALL EXISTING SERVICES ARE SHOWN.

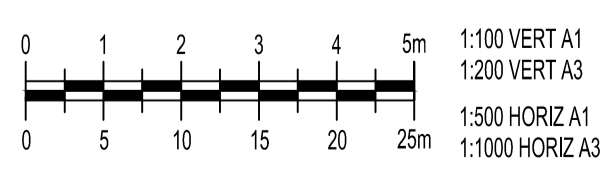
**ORIGINAL DRAWING IN COLOUR**

**DEVELOPED DESIGN NOT FOR CONSTRUCTION**



EXISTING SURFACE LEVEL	317.19	322.79	324.88	323.95
PIPE COVER	0.90	4.19 4.22	5.82 5.86	4.40
DEPTH TO PIPE INVERT	1.41	4.70 4.73	6.34 6.37	4.91
PIPE INVERT LEVEL	315.78	318.09 318.06	318.34 318.31	318.64
PIPE SIZE AND CLASS		DN 475 PVC-U SN8	DN 475 PVC-U SN8	DN 475 PVC-U SN8
PIPE GRADE		1:20 (4.95%)	1:100 (1.00%)	1:400 (0.25%)
DISTANCE AND CHAINAGE	342.82	46.07 296.75	21.97 274.78	118.20 156.58

**PROPOSED WASTEWATER - LONGITUDINAL SECTION**  
SCALE: 1:500 HOR 1:100 VER



No.	Revision	By	Chk	Appd	Date
B	ISSUED FOR DEVELOPED DESIGN	EM	PM	RS	17.05.24
A	DRAFT DEVELOPED DESIGN	EM	PAR	RS	28.03.24

Original Scale (A1)	AS SHOWN	Design	E.MOLLOY	27.02.24	Approved For Construction*
Reduced Scale (A3)	1/2 SHOWN	Drawn	E.MOLLOY	27.02.24	
		Dwg Verifier	P. REED	25.03.24	
		Drg Check	R. SIMPSON	25.03.24	Date



Client: **QUEENSTOWN LAKES DISTRICT COUNCIL**

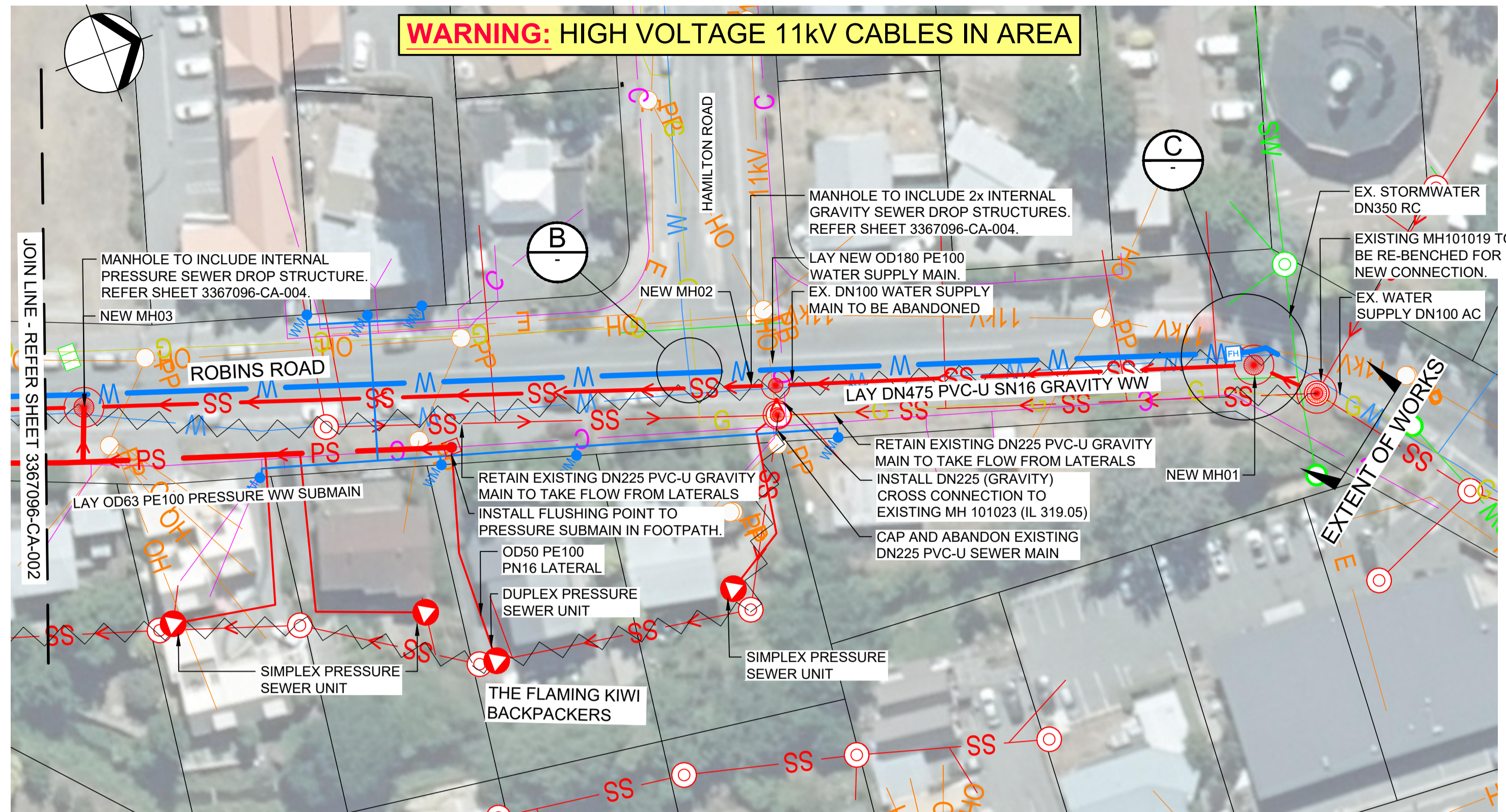
Project: **ROBINS ROAD WASTEWATER UPGRADES**

Title: **ROBINS ROAD WASTEWATER LAYOUT PLAN SHEET 1**

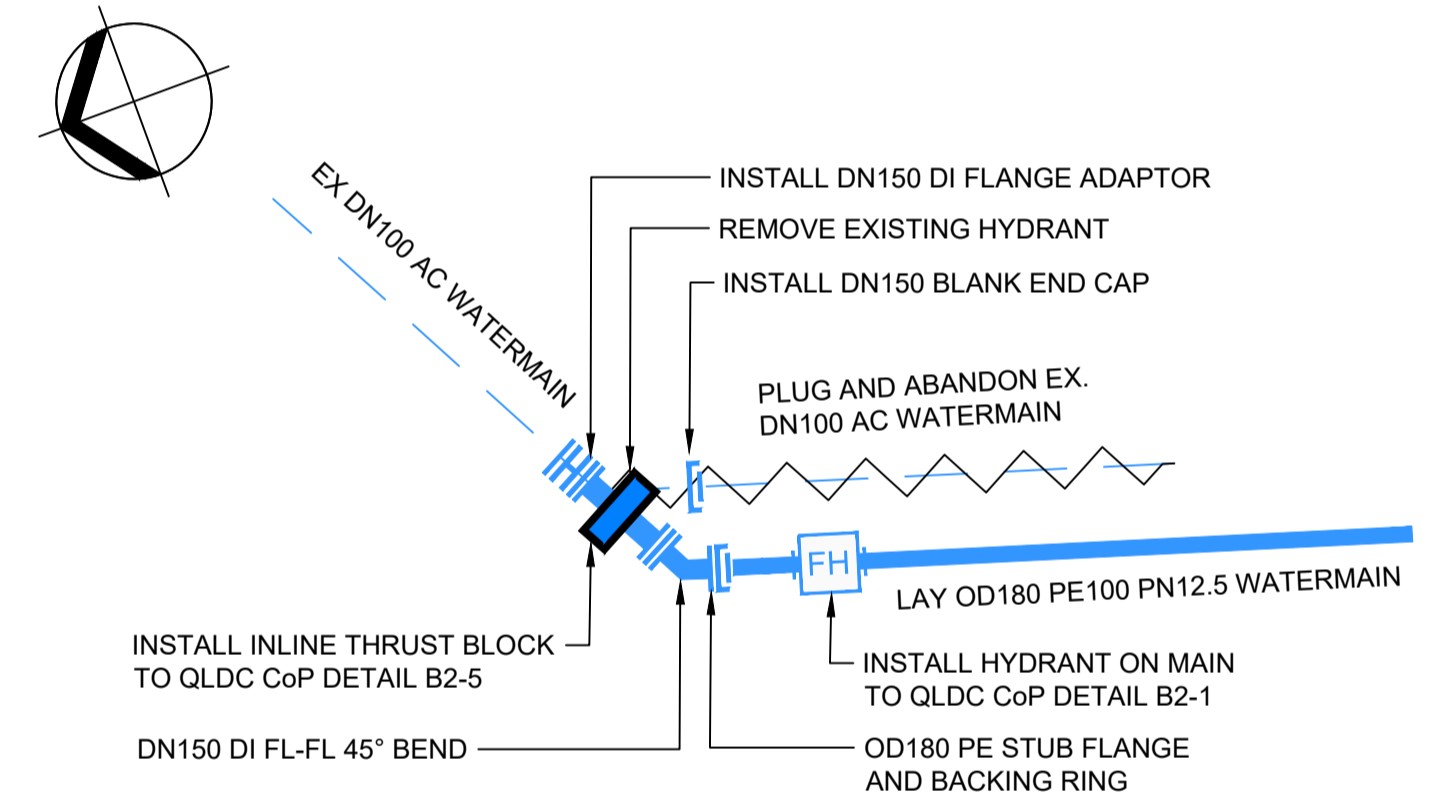
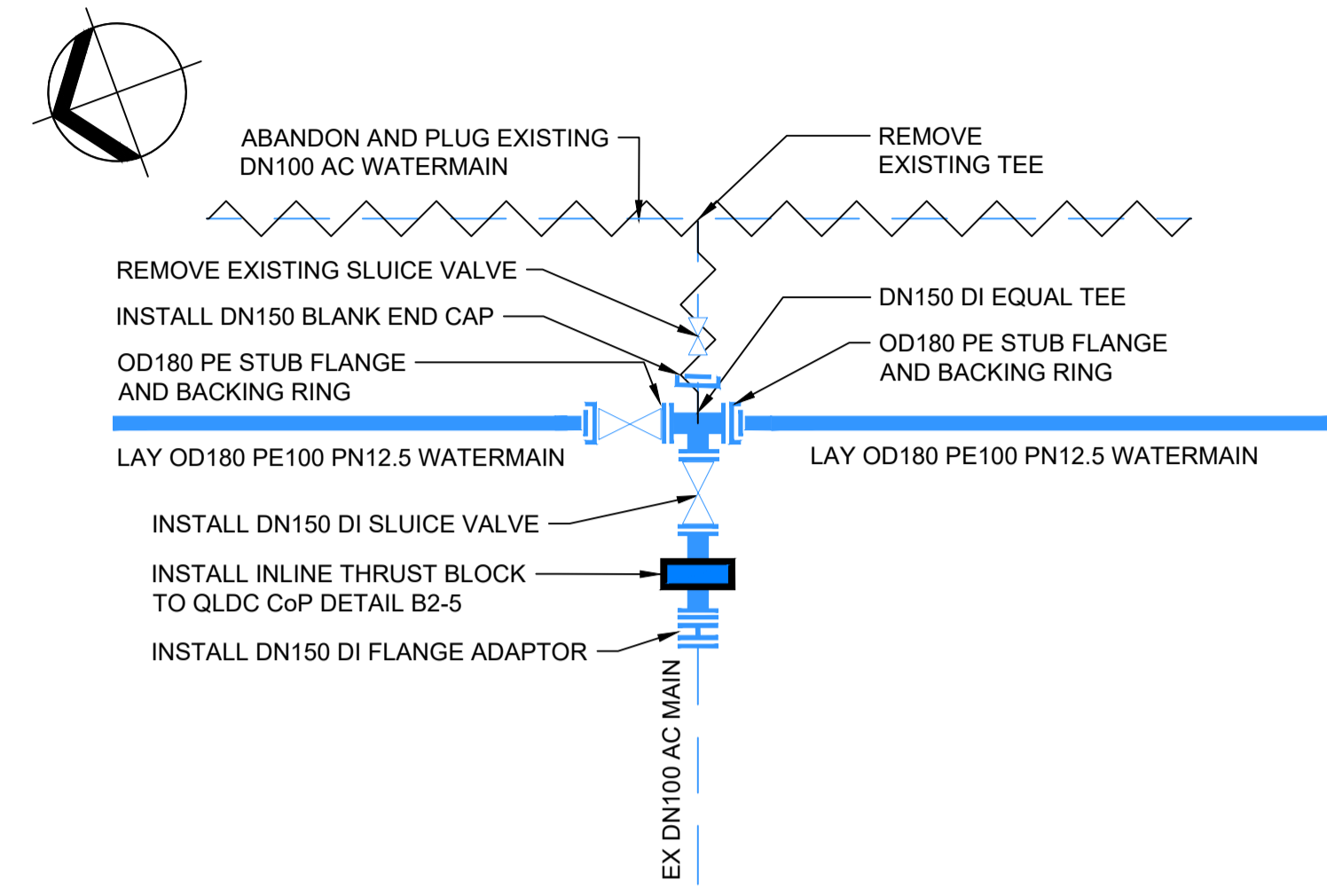
Discipline: **CIVIL ENGINEERING**

Drawing No.: **3367096-CA-002**

Rev.: **B**



**PROPOSED WASTEWATER - PLAN**  
SCALE: 1:500



**LEGEND**

PROPERTY BOUNDARY

EXISTING SERVICES

SS → GRAVITY SEWER MAIN

SEWER LATERAL

W WATER MAIN

SW STORMWATER MAIN

E POWER (UNDERGROUND)

OH POWER (OVERHEAD)

11KV / 33KV 11KV / 33KV POWER (OVERHEAD & UNDERGROUND)

G GAS PIPE

C CHORUS

FO FIBRE OPTIC

SEWER PUMP STATION

SEWER / STORMWATER MANHOLE

STORMWATER SOAKPIT

STORMWATER OUTLET

PP LP POWER / LIGHT POLE

PROPOSED SERVICES

ABANDONED SEWER MAIN

SS → GRAVITY SEWER MAIN

SEWER LATERAL

SEWER MANHOLE

PS → PRESSURE SEWER SUBMAIN

▲ PRESSURE SEWER UNIT

■ PRESSURE SEWER SUBMAIN FLUSHING POINT

W → NEW WATER SUPPLY MAIN

NEW WATER SUPPLY SUBMAIN

WM WATER METER CONNECTION

FH FIRE HYDRANT ON MAIN

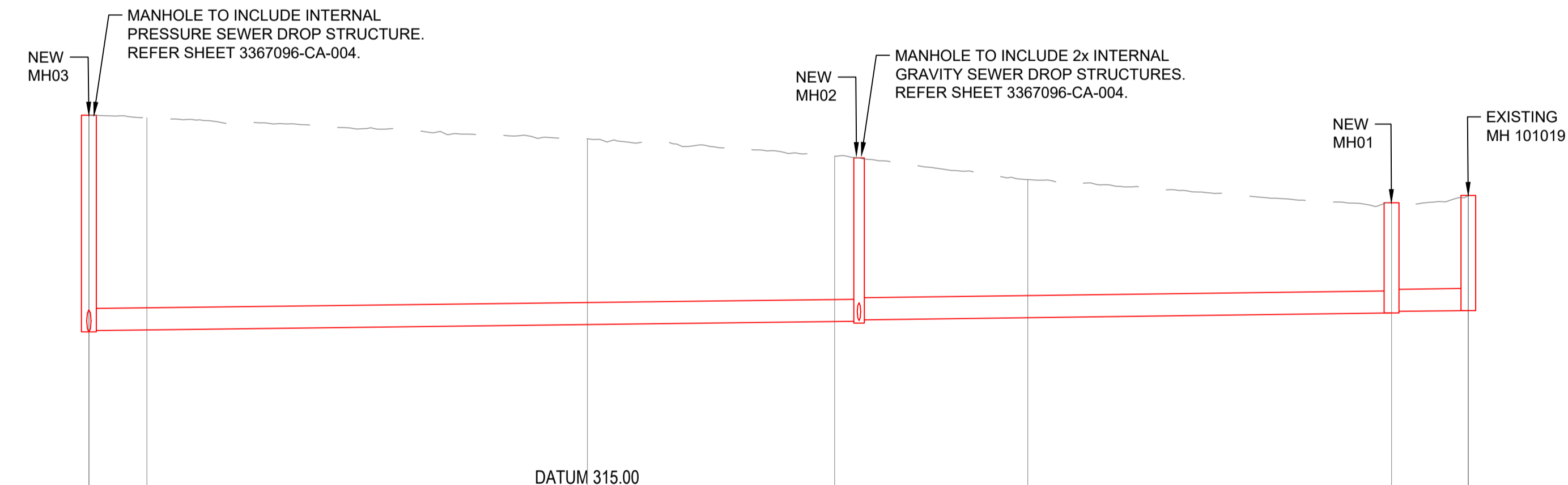
SLUICE VALVE ON MAIN

- NOTES:**
- FOR GENERAL NOTES REFER TO DRAWING 3367096-CA-001.
  - LOCATIONS OF PRESSURE SEWER UNITS ARE SHOWN AS INDICATIVE ONLY. FINAL LOCATIONS TO BE CONFIRMED FOLLOWING STAKEHOLDER CONSULTATION.
  - PRIVATE PRESSURE SEWER LATERALS TO BE OD32 PE100 PN16 UNLESS OTHERWISE STATED.
  - DETAILS OF ODOUR MITIGATION FOR MANHOLES TO BE FINALISED AT NEXT STAGE OF DESIGN.

**WARNING**  
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**ORIGINAL DRAWING IN COLOUR**

**DEVELOPED DESIGN NOT FOR CONSTRUCTION**

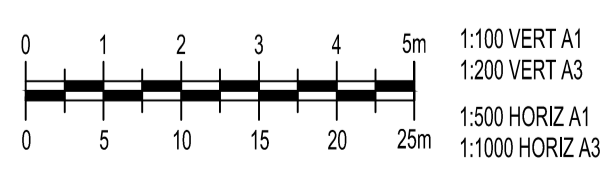


	NEW MH03	NEW MH02	NEW MH01	EXISTING MH 101019
EXISTING SURFACE LEVEL	323.55	322.58	321.57	321.73
PIPE COVER	4.37	3.16 3.19	1.95 1.99	2.09
DEPTH TO PIPE INVERT	4.88	3.67 3.70	2.47 2.50	2.61
PIPE INVERT LEVEL	318.67	318.91 318.88	319.10 319.07	319.13
PIPE SIZE AND CLASS		DN 475 PVC-U SN8	DN 475 PVC-U SN8	DN 475 PVC-U SN8
PIPE GRADE		1:413 (0.24%)	1:382 (0.26%)	1:400 (0.25%)
DISTANCE AND CHAINAGE	196.58	87.42	69.16	60.45
			8.71	8.700

DN 1500 MH

DN 1500 MH

**PROPOSED WASTEWATER - LONGITUDINAL SECTION**  
SCALE: 1:500 HOR 1:100 VER



No.	Revision	By	Chk	Appd	Date
B	ISSUED FOR DEVELOPED DESIGN	EM	PAR	RS	17.05.24
A	DRAFT DEVELOPED DESIGN	EM	PAR	RS	28.03.24

Original Scale (A1)	Design	E.MOLLOY	27.02.24	Approved For Construction*
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Reduced Scale (A3)	Dwg Verifier	P. REED	25.03.24	
1/2 SHOWN	Drg Check	R. SIMPSON	25.03.24	Date

\*Refer to Revision 1 for Original Signature



Client: QUEENSTOWN LAKES DISTRICT COUNCIL

Project: ROBINS ROAD WASTEWATER UPGRADES

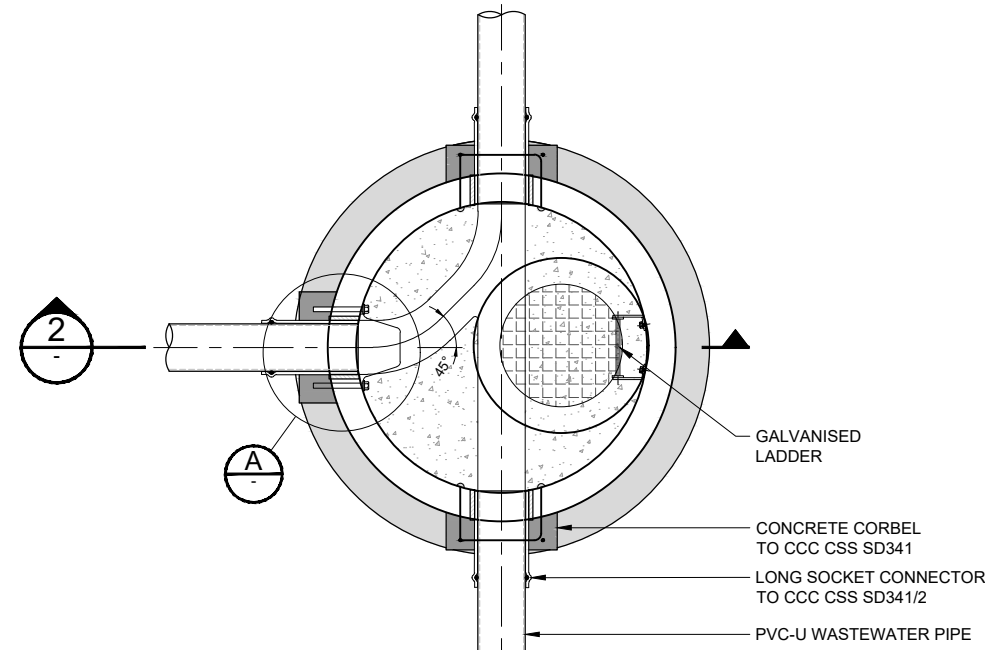
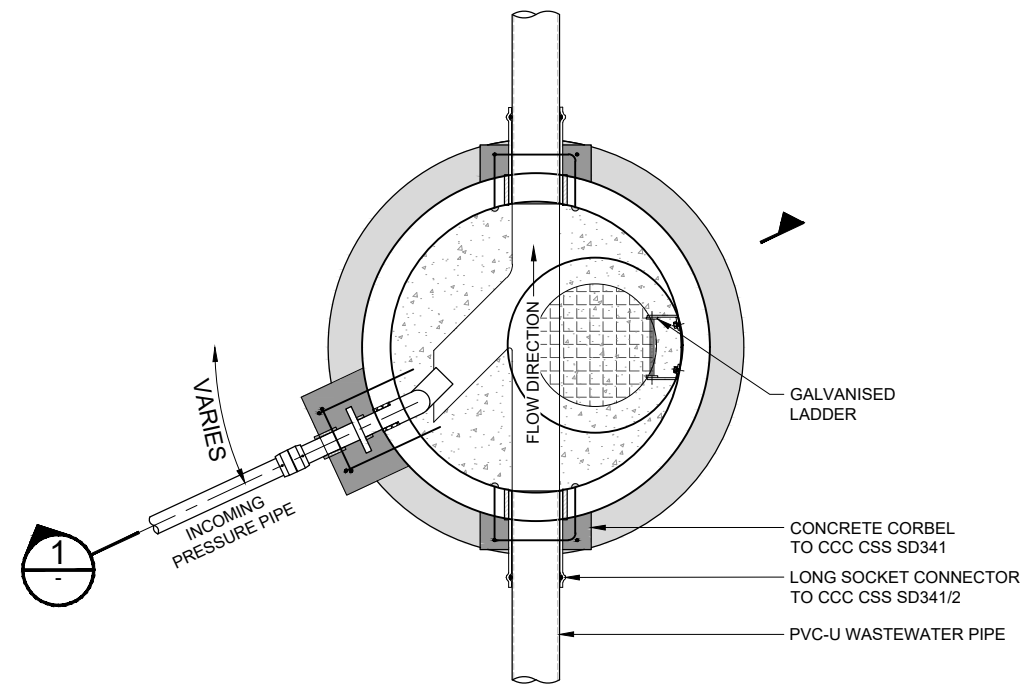
Title: ROBINS ROAD LAYOUT PLAN SHEET 2

Discipline: CIVIL ENGINEERING

Drawing No.: 3367096-CA-003

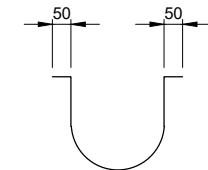
Rev.: B

MANHOLE SCHEDULE				
MANHOLE ID	DIAMETER Ø	DEPTH (m)	LADDER REQUIRED	GRP PLATFORM REQUIRED
1	DN1500	2.5	YES	NO
2		3.2		NO
3		4.9		YES
4		6.4		YES
5		4.7		YES
6		1.4		NO

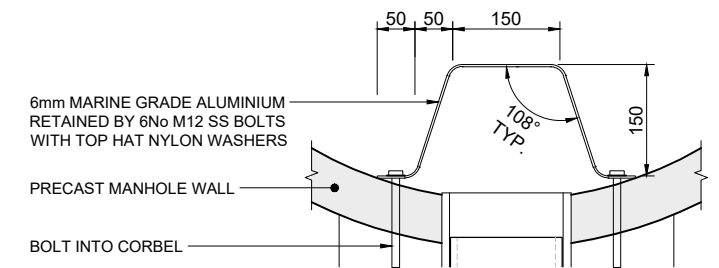
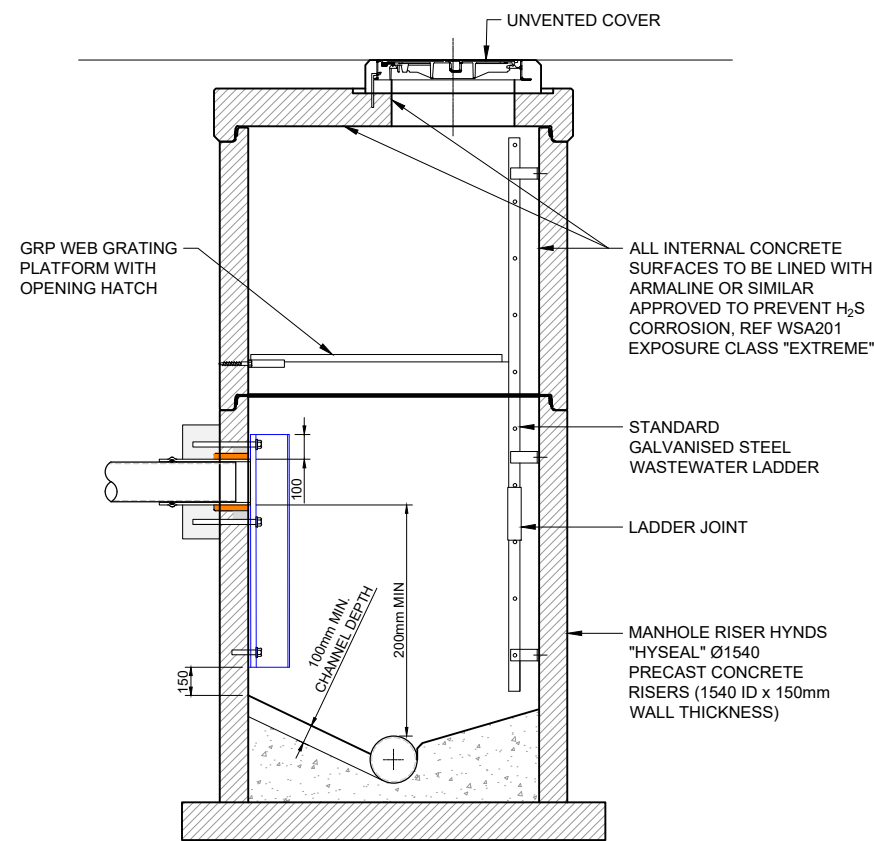
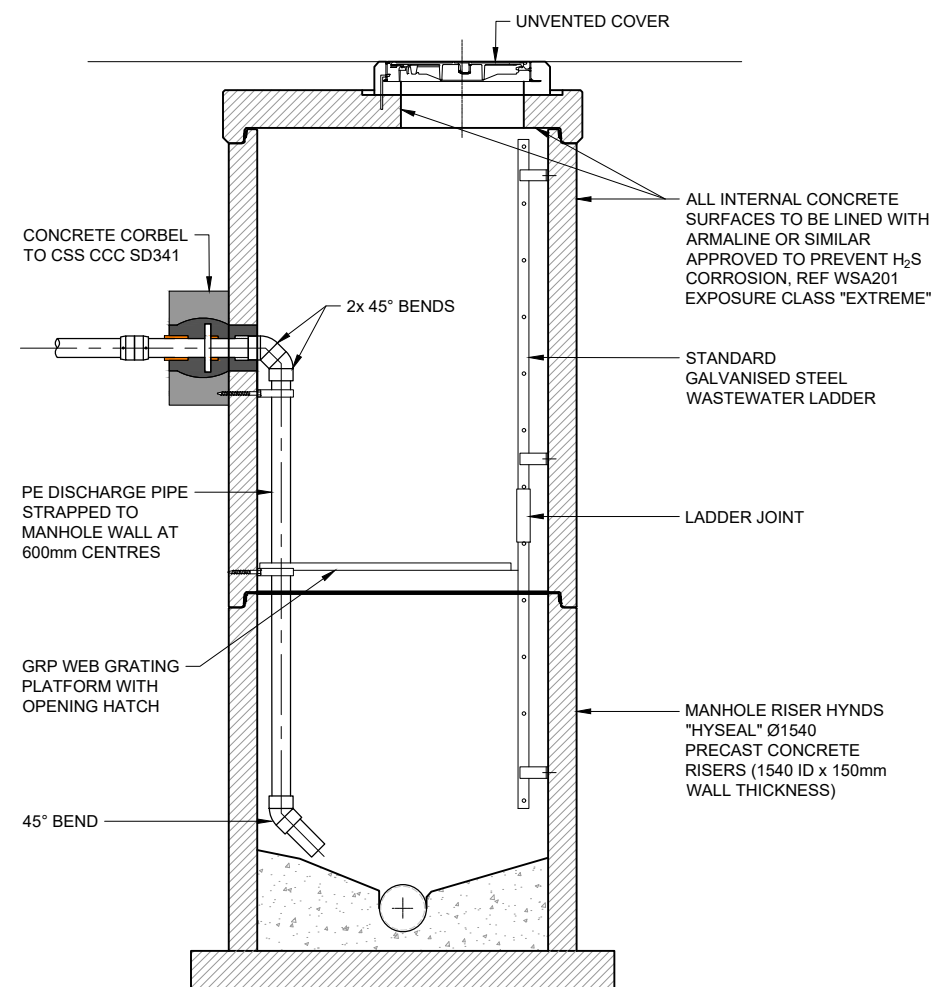


NOTES

- ALL INTERNAL CONCRETE SURFACES TO BE LINED WITH ARMALINE OR SIMILAR APPROVED TO PREVENT H<sub>2</sub>S CORROSION.



- 25mm WIDE x 1.25mm 316 S/S STRAP FIXED TO MANHOLE WALL WITH 2x M12 x 100mm 316 S/S THREADED STUDS. EPOXY ANCHOR WITH 50mm EMBEDMENT DEPTH.



**WARNING**  
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ORIGINAL DRAWING  
IN COLOUR

DEVELOPED DESIGN  
NOT FOR CONSTRUCTION

No.	Revision	By	Chk	Appd	Date
B	DEVELOPED DESIGN	EM	PM	RS	17.05.24
A	DRAFT DEVELOPED DESIGN	EM	PAR	RS	28.03.24

Original Scale (A1)	Design	Drawn	25.03.24	Approved For Construction*
AS SHOWN	E.MOLLOY	E.MOLLOY	25.03.24	
Reduced Scale (A3)	Design Checker	P. REED	25.03.24	
1/2 SHOWN	Design Checker	R. SIMPSON	25.03.24	



Project: ROBINS ROAD WASTEWATER UPGRADES

Title: MANHOLE DROP STRUCTURE DETAILS SHEET

Discipline: CIVIL ENGINEERING  
Drawing No: 3367096-CA-004  
Rev: B

# APPENDIX B: BRIEF CONSTRUCTION METHODOLOGY

**Multiple work fronts to achieve the required completion date**

We note that the RFQ indicates a completion date of July 2025. To achieve this, multiple work fronts will be required following on from Stage 1, and our approach involves:

Task Name
Install DN180 Watermain - Open Trenching - 217m at 15m per day
Install OD63 Submain - Open Trenching - 188m at 20m day
Install new Sewer from MH-01 to MH-02 - To be done in Trench Shield - 76.60m at 2.5m per day installed
Install new Sewer from MH-02 to MH-03 - To be done in Trench Shield - 84.5m at 2.5m per day installed
Install first half of the new Sewer from MH-03 to Ch221 - To be done in Sheet Piles - 60m at 2m per day installed
Install second half of the new Sewer from Ch221 to MH-04 - To be done in Sheet Piles - 54m at 2m per day installed
Install new Sewer from MH-04 to Ch295 - To be done in Sheet Piles - 20m at 2m per day installed
Install new Sewer from Ch295 to MH-05 - To be done in Trench Shield - Across the Road - 12m at 2m per day installed
Install new Sewer from MH-05 to MH06 - To be done in Trench Shield - 19.03 at 3m a per day
Install new Sewer from MH-06 to existing line - Open Trench - 16.8m at 6m per day installed



**Stage 2: pipe installation methodology**

- We will excavate the trench using a long reach (longer arm) 20T excavator. As the excavation progresses, shields will be installed to support the ground, and the AC watermain will be removed. Dewatering will be used to deal with ground water. 6’ pumps will be used to dewater the excavation and pump the water into a settling tank/lamella clarifier for treatment. Once the water is treated within consent limits (clarity and pH), it will be discharged into the stormwater system.



- Once the bottom of the excavation is reached, subgrade would be inspected and undercut if required (rafting). The sewer pipe will be installed, hunched (AP20), and backfill will begin. Based on the Geotechnical Report, the existing material is of poor quality and backfilling with existing material over the pipe might prove challenging. This being the case, we propose to use AP65 or River Run for backfill.
- The manholes will be installed using box shields 2.5m x 2.5m x 5m, using the same approach as above for excavation and backfill.
- Upon completion of the trench, the surfacing will be reinstated.

### Stage 3: New Sewer from MH-03 to Ch295 (Note that Ch295 is located between MH04 and MH05)

#### Stage 3: approach, alignment, and traffic management

- In this section, the sewer will be deeper than 5m. Specifically designed temporary works will be required to support the ground here, as the trench shields or slide rails will reach their limit (for details, see the temporary work designs within the appendices).
- As part of this tender, we have already developed a temporary works design detailing the sheet pile staging required to support the ground. This design is shown within the appendices. This design had been developed by our Temporary Works Team, under the direction of our national Engineering Manager Darren Bentham.
- To construct the sewer along this length, the road will have to be fully closed from MH-03 to Ch295. However, there are no residential driveways in this length, although there is a carpark exit – but this can be managed onsite. As such, impact on residents for this length of work will be reduced. For further details see the appendices for our proposed Traffic Management Plan Stage 3.

#### Stage 3: pipe installation methodology

- The first step will be to install the full length of sheet piles wall from MH-03 up to Ch220. The sheet piles will be installed using a 100T Crane with a 44B Vibro Hammer. The sheet piles will be installed as low to the ground as possible to allow safe straddling of plant over them. It is important to note that the low voltage overhead crossings will need to be temporary relocated for the crane to install some of the sheets. Temporary above-ground connections will be completed before sheetpiling in those locations, and re-instated at completion.
- The excavation will then proceed using a long reach 30T excavator. The clearance within the track of the 30T will allow the excavator to travel above the sheet pile alignment. The load surcharge of the excavator on the sheet piles has been considered during the temporary work design development.
- We will only excavate a 10 to 12m-long section at a time to depth to manage the excavation and deal with the ground water (using a 6' pump and storage tank, as in Stage 2).
- Once excavation has reached 1m deep, whaler beams and propping will be installed.
- Once the whaler and props are in place, the excavation will proceed to full depth in a similar fashion as Stage 2 (removal of AC main, and subgrade test). The pipe will then be installed and backfilled.
- Once each 10 to 12m section is complete, the sheet piles will be removed by the crawler crane and installed progressively from Ch220 up to Ch295, ensuring that the temporary work is always in place ahead of the excavation. Once all the sections from MH03 to Ch295 have been completed and all sheet piles removed, the surface will be reinstated, including any impacts due to the crawler crane.

#### Stage 4: New Sewer from Ch295 to the end

- This section will be delivered using trench shields in a similar way as Stage 2.
- The main difference will be the traffic management used. The alignment crosses the access road to the hotel which needs to be kept open at all times. We will stage this crossing one half a time to ensure constant access for hotel management and guests. For further details see the appendices for our proposed Traffic Management Plan Stage 4.
- As the existing material in the Rec Ground is contaminated, we propose to re-use this material as part of the trench backfill and cap it with AP20 and topsoil. This will reduce the dumping costs. We are very familiar excavating Rec Ground contaminated material, following our works on the Rec Ground ECI project.

## APPENDIX C: NSR WITHIN STUDY AREA

Table 3 presents the NSR within the study area, the associated use of site as per QLDC, and the shortest distance from the parcel boundary to the works.

Table 3 NSR within the study area, QLDC use of site, and the distance to the works

ADDRESS	USE OF SITE PER QLDC	DISTANCE FROM PARCEL BOUNDARY TO WORKS (m)
Unit 1-18/21 Robins Road	Residential-Public Communal (Unlicensed)	3
23 Robins Road	Residential -Single Unit (Other Than Bach)	6
47 Robins Road	Residential -Single Unit (Other Than Bach)	6
25 Robins Road	Educational	7
43 Robins Road	Residential -Single Unit (Other Than Bach)	8
29 Robins Road	Educational	8
39 Robins Road	Retail - Commercial	8
37 Robins Road	Residential -Single Unit (Other Than Bach)	9
35b Robins Road	Residential -Single Unit (Other Than Bach)	9
35 Robins Road	Residential - Multi Unit	9
35a Robins Road	Residential -Single Unit (Other Than Bach)	9
35d Robins Road	Residential -Single Unit (Other Than Bach)	9
35c Robins Road	Residential -Single Unit (Other Than Bach)	9
36 Robins Road	Residential-Public Communal (Unlicensed)	10
40 Robins Road	Residential -Single Unit (Other Than Bach)	11
53 Robins Road	Multi Use Within Commercial	11
44 Robins Road	Commercial Offices	11
20 Robins Road	Educational	12
60 Robins Road	Passive Outdoor	12
46 Robins Road	Residential -Single Unit (Other Than Bach)	13
62 Robins Road	Residential - Multi Unit	18
62a Robins Road	Residential -Single Unit (Other Than Bach)	18
62c Robins Road	Residential -Single Unit (Other Than Bach)	18
Unit 7/62 Robins Road	Residential -Single Unit (Other Than Bach)	18
62e Robins Road	Residential -Single Unit (Other Than Bach)	18
62b Robins Road	Residential -Single Unit (Other Than Bach)	18
62f Robins Road	Residential -Single Unit (Other Than Bach)	18
62g Robins Road	Residential -Single Unit (Other Than Bach)	18
66 Robins Road	Residential - Multi Unit	26
66a Robins Road	Residential -Single Unit (Other Than Bach)	26
66b Robins Road	Residential -Single Unit (Other Than Bach)	26
50 Gorge Road	Residential -Single Unit (Other Than Bach)	23
46 Gorge Road	Residential-Public Communal (Unlicensed)	28
42 Gorge Road	Residential -Single Unit (Other Than Bach)	40
38 Gorge Road	Multi Use Within Residential	45
38b Gorge Road	Commercial Offices	45

38a Gorge Road	Commercial Offices	45
32 Gorge Road	Residential-Public Communal (Unlicensed)	49
30 Gorge Road	Residential -Single Unit (Other Than Bach)	52
1 Boundary Street	Vacant Residential	27
10a-10b Boundary Street	Residential - Multi Unit	32
1 Memorial Street	Active Outdoor	89
10 Hamilton Road	Residential -Single Unit (Other Than Bach)	37
12 Hamilton Road (All units)	Residential - Multi Unit	61
14-18b Hamilton Road	Educational	76
18 Hamilton Road	Residential - Multi Unit	92
20 Hamilton Road	Residential -Single Unit (Other Than Bach)	92
18a Hamilton Road	Residential -Single Unit (Other Than Bach)	92



www.aeservices.co.nz  
 office@aeservices.co.nz  
 Auckland +64 9 917 0369  
 Wellington +64 4 890 0122  
 Christchurch +64 3 377 8952

File Ref: AC25016 – 01 – R1

4 March 2025

Rebecca Holden  
 Queenstown Lakes District Council  
 Private Bag 50072  
 QUEENSTOWN 9348

Email: Rebecca.Holden@qldc.govt.nz

Dear Rebecca

**Re: Queenstown Lakes District Council RM241070 – Robins Road Wastewater Pipeline Upgrade  
Peer review of construction noise and vibration assessment**

As requested, Acoustic Engineering Services have reviewed the WSP Construction Noise and Vibration Impact Assessment (CNVIA) and Management Plan (CNVMP) which accompanied the RM241070 Application. We have also reviewed the subsequent addendum dated the 17<sup>th</sup> of February 2025, which describes minor design changes and provides detail on a preferred micro-tunnelling construction methodology.

We understand that while micro-tunnelling is the preferred methodology (Methodology A), the original open cut construction method described in the CNVIA will be used if ground investigations show this is not viable and still forms part of the Application (as Methodology B).

Please find our comment below.

## 1.0 ASSESSMENT CRITERIA

Table 3 of the WSP CNVIA describes the framework used to describe the magnitude of noise and vibration effects. Where noise and vibration levels are predicted to comply with the relevant NZS 6803:1999 and DIN 4150-3:1999 limits referenced by the District Plan, effects are described as “acceptable”. This equates to less than minor according to the addendum. Where these noise and vibration levels are exceeded, but other factors, for example timing, mean that noise and vibration effects are expected to be low, the terminology “reasonable” is used (i.e. minor). Where noise and vibration effects may be disturbing, and have a medium impact on receivers, the CNVIA uses the term “obvious” (i.e. more than minor). Although the terminology is different to what we would use, this scaled approach is generally consistent with the way we approach our own construction noise and vibration assessments.

The closest noise sensitive receivers are highlighted in Figure 2 of the CNVIA. A figure showing the possible extent of non-complying sheet piling levels is also shown in Appendix A of the addendum. This covers more properties than Figure 2 of the CNVIA – because sheet piling occurs further east to accommodate one of the micro-tunnelling pits. More detail on the properties expected within the setback for key activities is also provided in Appendix A of the addendum. We agree that the properties most likely to be affected by noise and vibration from the proposed works have been correctly identified by WSP.

## 2.0 PREDICTION METHODOLOGY

The WSP assumptions and predicted noise levels / vibration setbacks are of the general order we would expect for properties closest to the works. We have the following specific notes which we have accounted for in our later discussion about noise effects:

- The setback distances don't include an allowance for façade reflection, as per the NZS 6803 assessment method. This means that for properties which have a facade close to the site boundary, measured noise levels may be up to 3 dB higher than WSP demonstrate (or the setback distance further to achieve compliance). We note that the District Plan, by referencing a boundary assessment location, instead of a façade as per the NZS 6803:1999 assessment method creates uncertainty about how to approach this.
- The concrete saw and plate compactor sources include a -5 dB screening allowance. While we agree that it should generally be practical to screen a concrete saw with localised screening, it may be more difficult to screen a moving source like a plate compactor in the same manner.
- The WSP calculation is a distance adjustment only and does not include any allowance for screening from buildings. This is likely conservative for many construction sources as the distance from the work site increases and there are intermediate buildings providing screening.
- A much lower 45 dB  $L_{Aeq}$  noise limit applies to construction noise at night-time (defined as 2000 – 0630 on weekdays) to provide protection against sleep disturbance. The complying setbacks for activities proposed at night-time, for example use of a dewatering pump/generator, will be larger than the daytime setbacks identified by WSP. If operating together in a similar location, the pump and generator, with line-of-sight screening as proposed, would need to be setback in the order of 55 metres from a noise sensitive receiver to achieve a level of 45 dB  $L_{Aeq}$  at a façade (no adjustment for façade effect). We have provided further commentary on possible effects later in this letter.
- The CNVMP discusses how the use of a hydro-vac shall be avoided after 2200 hours. This source is not described in the table of WSP sources and we are not sure how likely it is that this will be used on site. While it may be louder than traditional excavation, it will still fit within the range of construction noise sources discussed in this table.

## 3.0 NOISE AND VIBRATION EFFECTS

Sheet piling is the loudest sustained noise source outlined in the CNVIA and is a focus of the noise effects discussion. Sheet piling will still occur with the change to a micro-tunnelling methodology – although over a less extensive area, and for a shorter duration, to establish pits for micro-tunnelling.

For the original methodology, Appendix C of the CNVIA describes how sheet piling may progress two metres per day. This means that some noise sensitive receivers on the stretch of Robins Road where sheet piling may occur (approximately between Queenstown Park Boutique Hotel, and The Flaming Kiwi Backpackers) could be exposed to levels of more than 80 dB  $L_{Aeq}$  from sheet piling over in the order of 30 working days. While noise levels would not be sustained at that level for the entire working period, as piles will not be driven the entire time, this will still be disruptive (as noted by WSP). For receivers closest to the works, where external noise levels are predicted to approach 100 dB  $L_{Aeq}$ , we agree with the WSP assessment that this will become intolerable when it occurs for long periods of time. Given the relatively high level, this is also likely to be intolerable for relatively short periods.

With the micro-tunnelling methodology, at each pit, sheet piling is expected to occur for a 6 – 7 day period when sheet piles are inserted, and 5 – 6 days when removed. While the micro tunnelling itself also generates moderately high noise levels, this activity can be screened. Micro-tunnelling is proposed to occur for 40 days (across the total project and four maintenance holes). We agree that this method appears to result in more favourable noise and vibration effects given the reduced duration of sheet piling near any one location.

The other works described (excavation, installation and backfilling, dewatering, reinstatement of the road, shallow excavation works, and night-time connection tie-in works) occur for similar durations for both methodologies.

We understand that dewatering will need to occur between Hamilton Road and Gorge Road of the alignment 24/7, for in the order of 40 days. As discussed in section 2, at the equipment sound levels assumed by WSP (and allowing for screening as proposed), a setback in the order of 55 metres may be required to achieve night-time compliance. This may not be possible given the layout of the site, and location of the closest noise sensitive receivers. There appear to be a mixture of commercial, residential and visitor accommodation along this stretch of road – which will have different noise sensitivities at night. Where a level of 45 dB  $L_{Aeq}$  is exceeded at a dwelling / visitor accommodation, there may be the potential for sleep disturbance. However, if ambient night-time noise levels are already higher than this, bedrooms are on a sheltered side of a dwelling, or occupants sleep with windows closed, the likelihood of this occurring would be reduced.

Tie-in works will also occur for approximately seven nights (when usage is lowest) and WSP have proposed controls that will ensure that any sensitive receivers are not exposed to more than three consecutive nights of night-works.

The overall WSP conclusion is that noise and vibration effects can be managed to be “reasonable” (i.e. minor) for Methodology A and “reasonable to obvious” (i.e. minor to more than minor) for Methodology B. We generally agree with the conclusion that noise and vibration effects are likely to be minor, or more than minor for noise sensitive receivers closest to the works, given the overall duration of works, the fact that noise levels from sheet piling is likely to cause disruptive noise levels for a length of time (particularly if Methodology B needs to be implemented), and the potential for night-works to cause sleep disturbance. For visitor accommodation activities especially, this may be difficult to manage.

Noise and vibration effects will reduce with distance from the worksite. For receivers at the outer extent of Figure 2 on the last page of the addendum (for example those south of Gorge Road and 17a Fryer Street), it is likely that noise levels will generally comply with the construction noise limits for the majority of the works, due to distance and likely screening effects – although this is difficult to confirm without undertaking a more detailed review of relative heights. The properties south of Gorge Road will also be exposed to higher traffic noise levels, which may reduce apparent noise effects.

#### 4.0 MITIGATION

The CNVMP reflects the approach to site management we would expect for a site like this (both physical and managerial mitigation procedures). We have suggested several small clarifications in this section, although overall we consider the mitigation provided to be appropriate.

In this case “*equipment selection, siting and operation*” and “*adoption of site hoardings or other physical barriers*” are the key physical mitigation proposed for this site. The general descriptions of intended location (and equipment) where screening will be used appear reasonable – although as noted previously it may be difficult to screen a moving source like a plate compactor with localised screens in a meaningful way.

Specific procedures are given for night-works, to ensure louder equipment will be used prior to 2200 hours where practicable, any one receiver will not be exposed to noise from more than three consecutive night-work shifts, and temporary relocation is available should a receiver complain about sleep disturbance. This appears to be a reasonable approach to reducing effects from night-time noise, although the CNVMP may benefit from more clarity in what is to be done in the following instances:

- Where the receiver is a visitor accommodation facility with multiple rooms, rather than a dwelling.
- Whether the comments regarding night-works are intended to cover dewatering activity (as it is possible that this may also cause sleep disturbance).

A temporary movement / relocation procedure is provided for receivers close to sheet piling activity, where receivers within 15 metres of the piling rig, are identified and offered relocation if upon detailed review of the location of internal spaces it is decided that noise levels may not be reasonable. The internal target is

not given and will depend on the use of the space. This setback will have the effect of requiring a more detailed investigation where sheet piling levels may exceed in the order of 87 dB  $L_{Aeq}$  (depending on the actual level generated by the piling rig). Given the approach in the remainder of the assessments, it is not clear whether this setback is intended to be from the building façade or property boundary. If it is from the dwelling façade, there may be benefit in increasing the trigger setback to 20 – 25 m. While it is only provided as an example, we also note that the WSP assessment discusses short term relocations (i.e. over a lunch period), where sheet piling may be present at elevated levels for days, or weeks at a time depending on the methodology.

On community consultation and engagement, it would be typical to provide a timeframe “in advance” for the written warning outlined in section 6 of the CNVMP (i.e. minimum 10 days in advance of works commencing) to allow nearby residents to plan for the upcoming disruptions. We recommend this is included in the CNVMP.

The CNVMP also notes that consultation will be undertaken with “*all properties that are potentially impacted by construction noise and/or vibration to determine...*”. We assume this means all properties within 100 metres of the project, as this is given as the extent of the written warning in the same section, although this is not explicit and could be clarified.

The noise and vibration triggers and general procedures, including building condition surveys, and monitoring to confirm that vibration will not cause building damage, appear reasonable.

## 5.0 CONCLUSIONS

We consider the WSP assumptions regarding construction noise and vibration to generally be appropriate. We also agree that effects can be managed to be in a range considered minor, or more than minor for noise sensitive receivers closest to the works (i.e. the receivers identified in Figure 2 of the final addendum page). Since noise and vibration effects will reduce with distance from the worksite, some receivers at the outer extent of this area, for example sites to the south of Gorge Road, or at 17A Fryer Street will not be impacted in the same way as the closest row of properties on Robins Road, and noise levels may generally comply with the District Plan Standards for the majority of the construction period.

The CNVMP reflects the approach to site management we would expect for a site like this (both physical and managerial mitigation procedures). We have suggested several small clarifications in this section to ensure the intent is clear.

Please do not hesitate to contact me to discuss further as required.

Kind Regards,



William Reeve  
BE(Hons) MASNZ  
Senior Associate  
**Acoustic Engineering Services**