

**City of Johannesburg**

Johannesburg Water SOC Ltd

Turbine Hall
65 Ntemi Piliso Street
Newtown
JohannesburgJohannesburg Water
PO Box 61542
Marshalltown
2107Tel +27(0) 11 688 1400
Fax +27(0) 11 688 1528www.johannesburgwater.co.za

<u>ADDENDUM</u>	No. 01
<u>CONTRACT NUMBER:</u>	JW14406
<u>CONTRACT TITLE:</u>	LINBRO PARK TOWER
<u>SUBJECT</u>	Addendum 1
<u>Date</u>	27 November 2024
<u>Sender</u>	Gcina Ndela 011 688 1796 gcina.ndela@jwater.co.za Seemole Tleane 011 688 1470 seemole.tleane@jwater.co.za

Tenderers are required to incorporate the following documents into the tender document and return the Addendum:

1. The amendment of the Bill of Quantities and Drawing Register
2. The inclusion and publishing of additional site information
3. The amendment of mandatory requirement for a compulsory site briefing to non-compulsory site briefing
4. The extension of closing date from 5 December 2024 to 16 January 2025 at 10H30 am

Any inconvenience caused is indeed, regretted.

Yours faithfully

04.12.2024

Ithuteng Tabe

Acting General Manager: Supply Chain Management

Addendum Received
Name of Tenderer:
Signatory:
Signature:
Date:

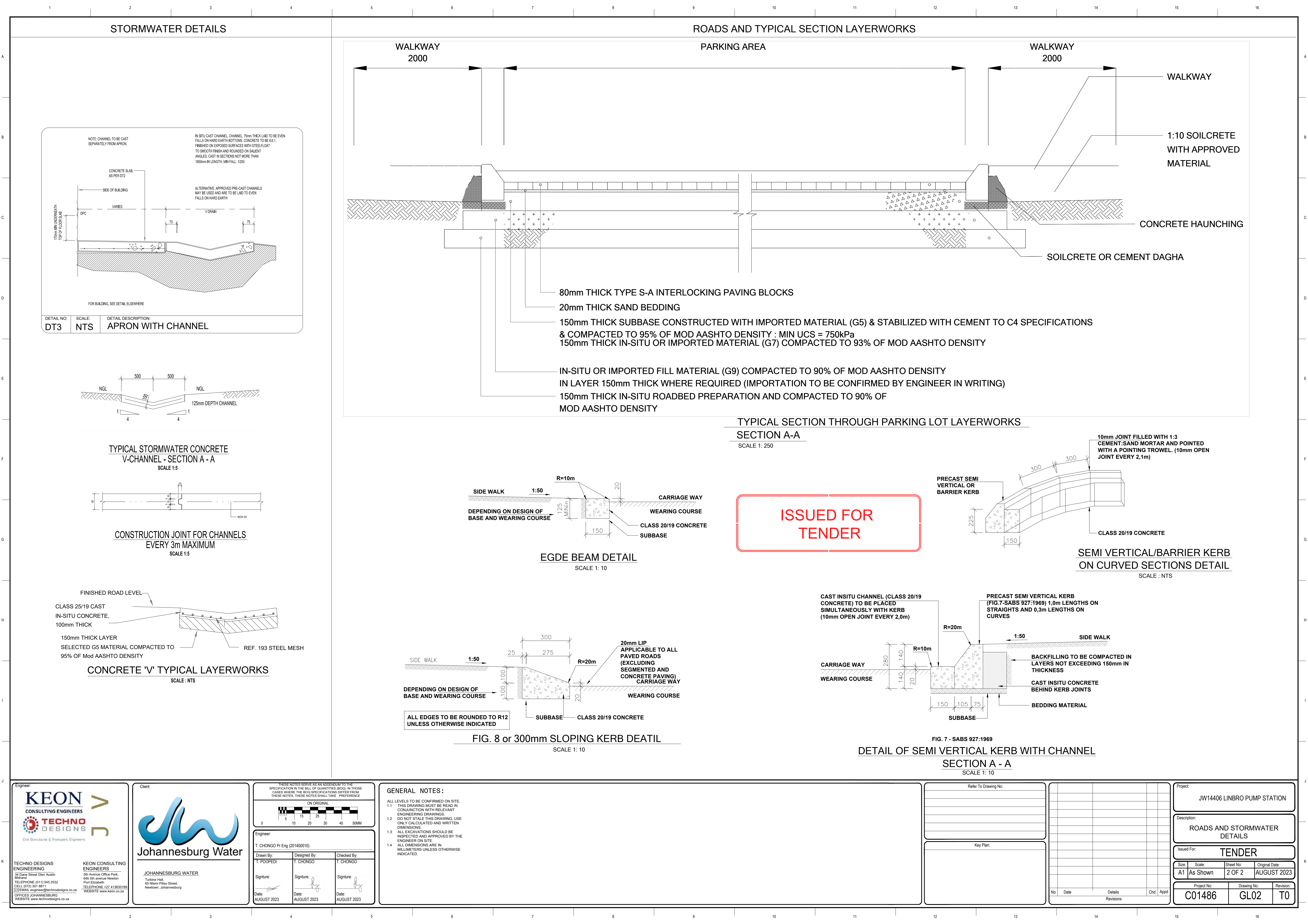
Directors:

Ms Dineo Majavu (Chairperson), Mr Ntshavheni Mukwevho (Managing Director and Executive Director),
Mr Kgaugelo Mahlaba (Chief Financial Officer and Executive Director), Mr Sipho Mthembu, Ms Zandile Meeleso, Mr Pholoso Matjele,
Mr Kgaile Mogoye, Mr Molate Mashifane, Ms Pamela Mabece, Mr Collen Sambo, Mr Makoko Makgonye, Ms Thabiso Kutumela,
Mr Kefiloe Mokoena

Ms Kethabile Mabe (Company Secretary),

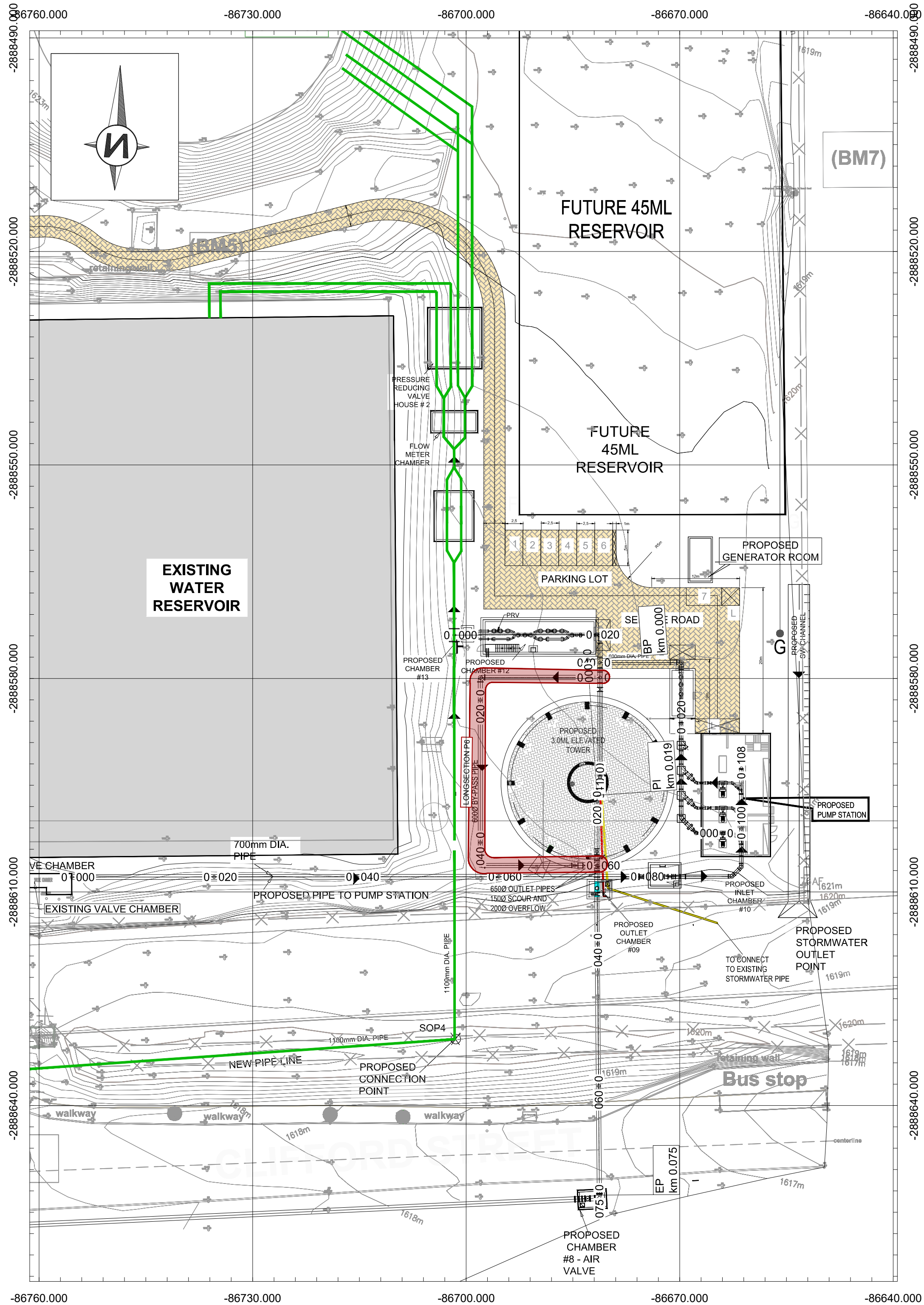
Johannesburg Water SOC Ltd

Registration Number: 2000/029271/30



HYDRAULIC GRADE (m)	PEAK FLOW
AVERAGE FLOW	
CHAINAGE	
GROUND LEVEL (m amsl)	
INVERT LEVEL (m)	
TRENCH DEPTH (m)	
PEAK FLOW CONDITIONS HEAD (m)	
STEADY-STATE HEAD (m)	
AVERAGE FLOW (l/s)	200
PEAK FLOW (l/s)	393
PIPE DETAILS	600mm DIA. STEEL PIPE
GRADIENT (m/km)	90° 00' 00" 0° 00' 00" 270° 00' 00"
VELOCITY (AVERAGE FLOW)	0.532
VELOCITY (PEAK FLOW)	1.044

LONGSECTION P6A -
TOWER BYPASS PIPELINE (SUPPLY FROM PUMP STATION)
FROM 0.000 TO 59.613



KEY PLAN - TOWER BYPASS PIPELINE (SUPPLY FROM PUMP STATION)
FROM 0.000 TO 59.613
SCALE 1: 250

ISSUED FOR
TENDER

Engineer:
KEON
CONSULTING ENGINEERS
TECHNO
DESIGNS
Civil Structural & Transport Engineers

TECHNO DESIGNS
ENGINEERING
34 Dore Street PS09en Austin
Midrand
CELL (072) 301 8811
EMAIL: engineer@technodesigns.co.za
OFFICES JOHANNESBURG
WEBSITE: www.technodesigns.co.za

KEON CONSULTING
ENGINEERS
5th Avenue Office Park,
640 5th Avenue Newton
Port Elizabeth
TELEPHONE +27 413630189
WEBSITE: www.keon.co.za

Client:
JOHANNESBURG WATER
Turbine Hall,
16 Nanni Place Street,
Newtown, Johannesburg

THESE NOTES SERVE AS AN ADDENDUM TO THE SPECIFICATION IN THE BILL OF MATERIALS (BOM) IN THOSE CASES WHERE THE BOM SPECIFICATIONS DIFFER FROM THESE NOTES. THESE NOTES SHALL TAKE PRECEDENCE.

ON ORIGINAL

Engineer:
T. CHONGO Pr Eng (201400010)

Drawn By: T. POOPEDI	Designed By: T. CHONGO	Checked By: T. CHONGO
Signature:	Signature:	Signature:
Date: AUGUST 2023	Date: AUGUST 2023	Date: AUGUST 2023

- GENERAL NOTES:
- ALL LEVELS TO BE CONFIRMED ON SITE.
 - THIS DRAWING MUST BE READ IN CONJUNCTION WITH RELEVANT ENGINEERING DRAWINGS. DO NOT SCALE THIS DRAWING. USE ONLY CALCULATED AND WRITTEN DIMENSIONS.
 - ALL EXCAVATIONS SHOULD BE INSPECTED AND APPROVED BY THE ENGINEER ON SITE.
 - ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE INDICATED.

Refer To Drawing No:

Key Plan:

No	Date	Details	Chd	Appd
		Revisions		

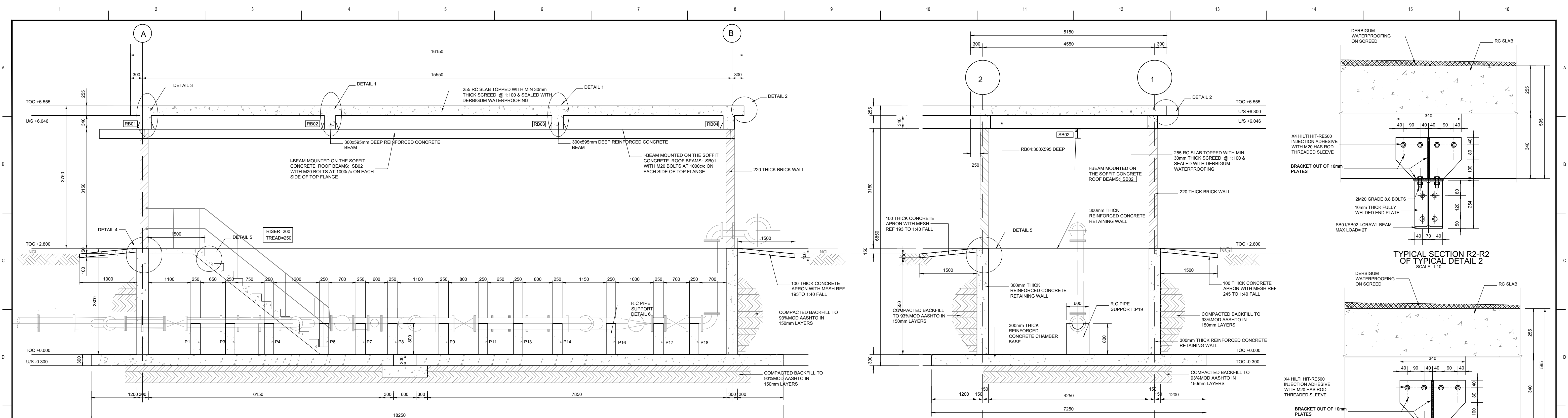
Project:
JW14406 LINBRO PUMP STATION

Description:
LONGSECTION P6A -
TOWER BYPASS PIPELINE
FROM 0.000 TO 59.613

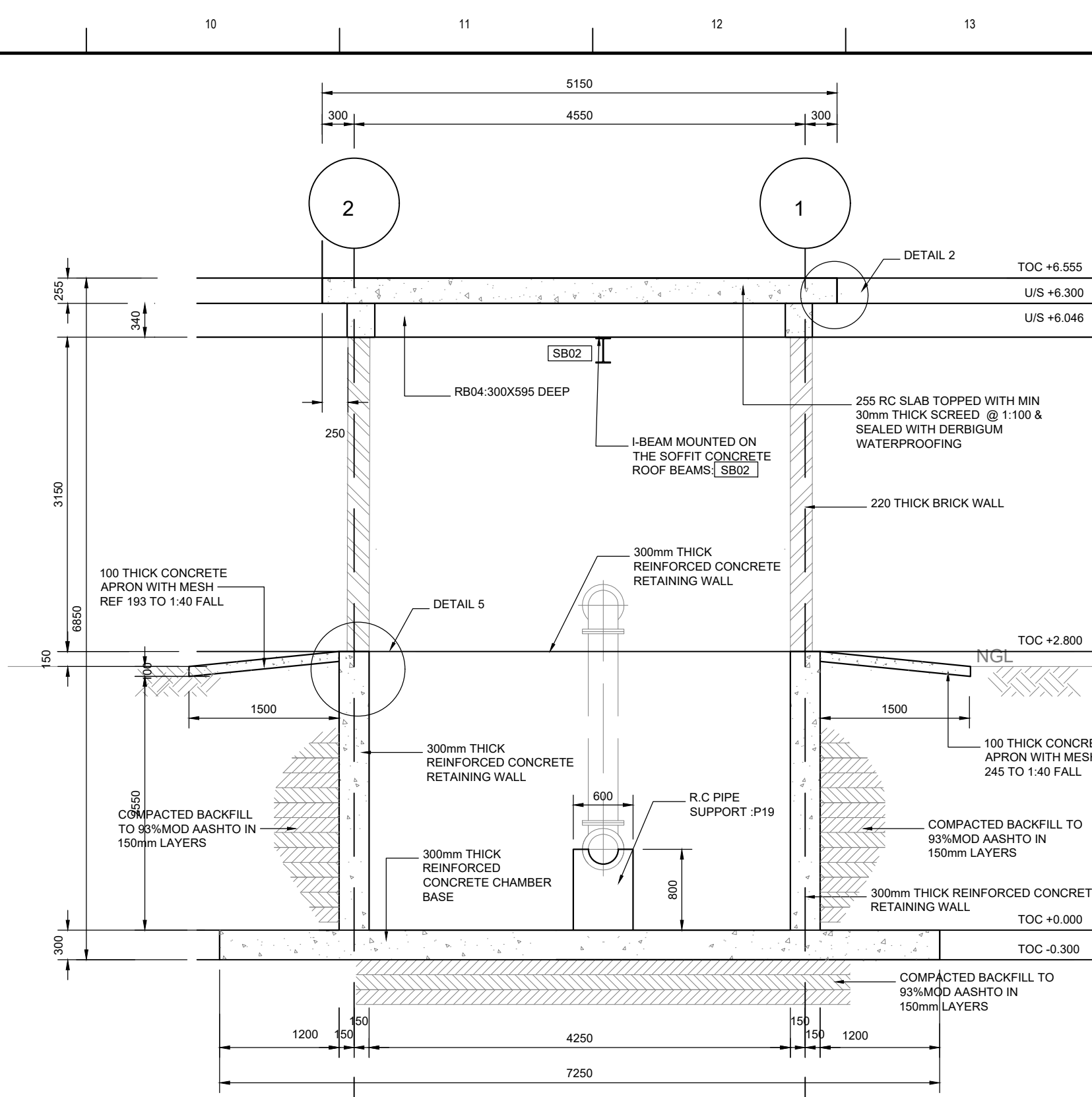
Issued For:
TENDER

Size: A1	Scale: As Shown	Sheet No: 4 OF 6	Original Date: AUGUST 2023
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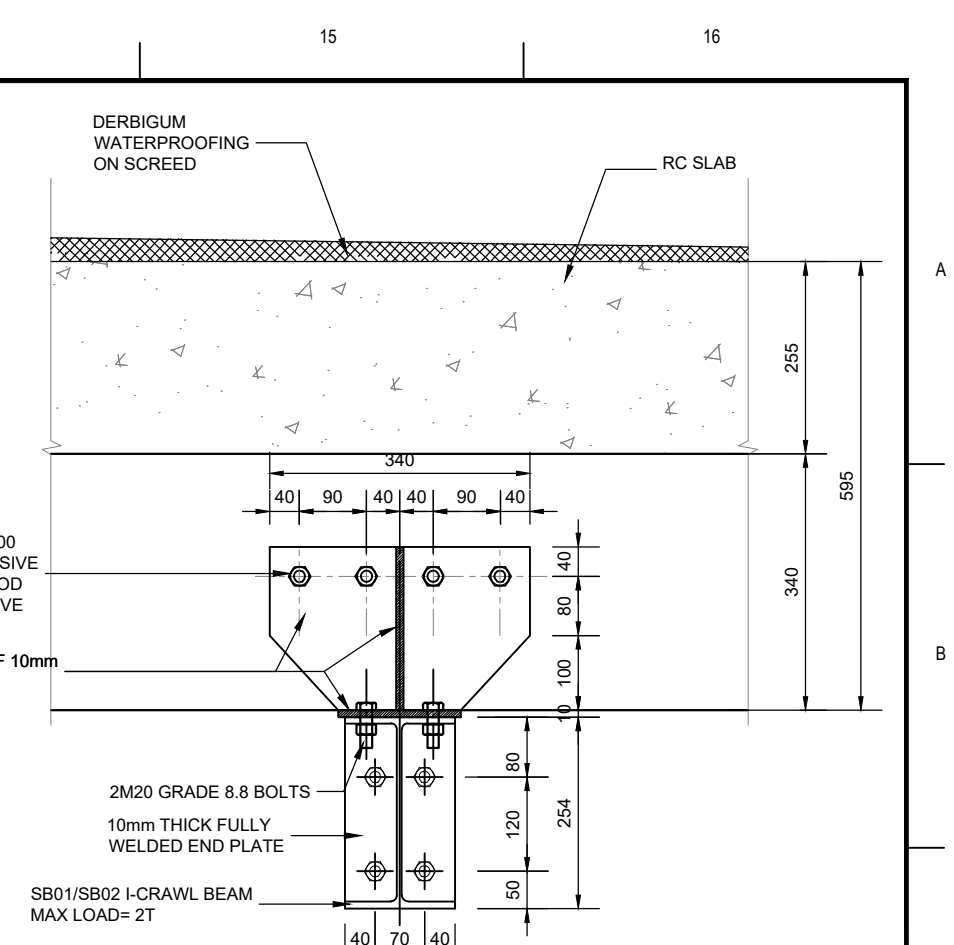
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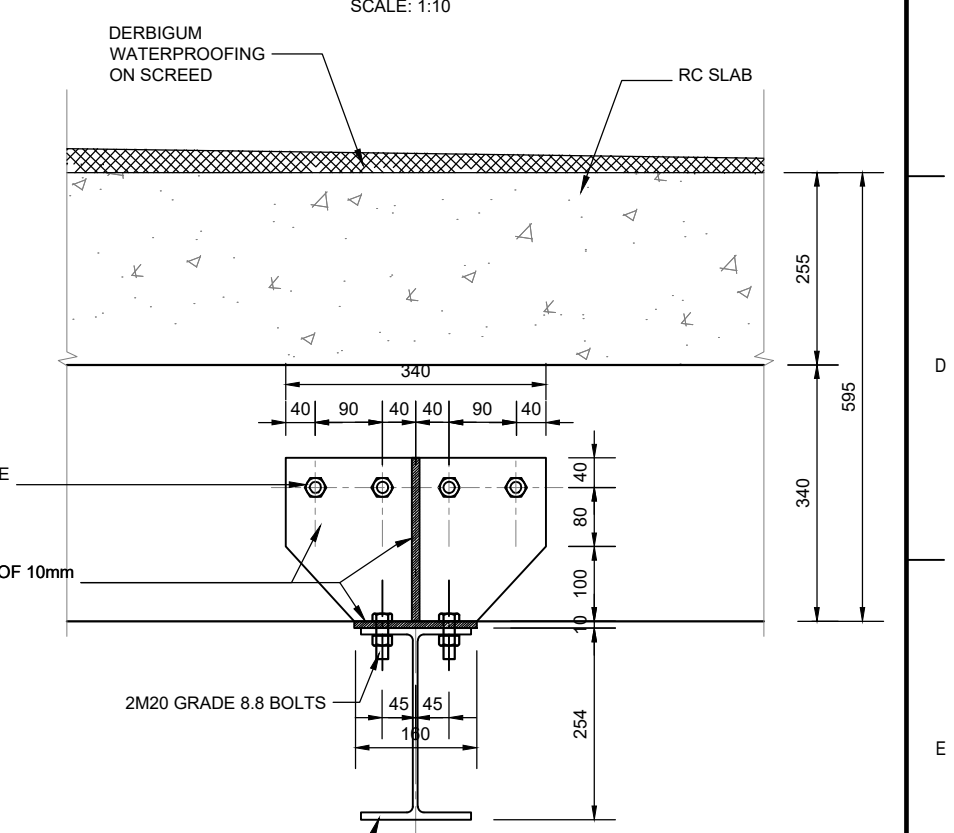
TYPICAL SECTION A-A THROUGH CHAMBER
SCALE: 1:50



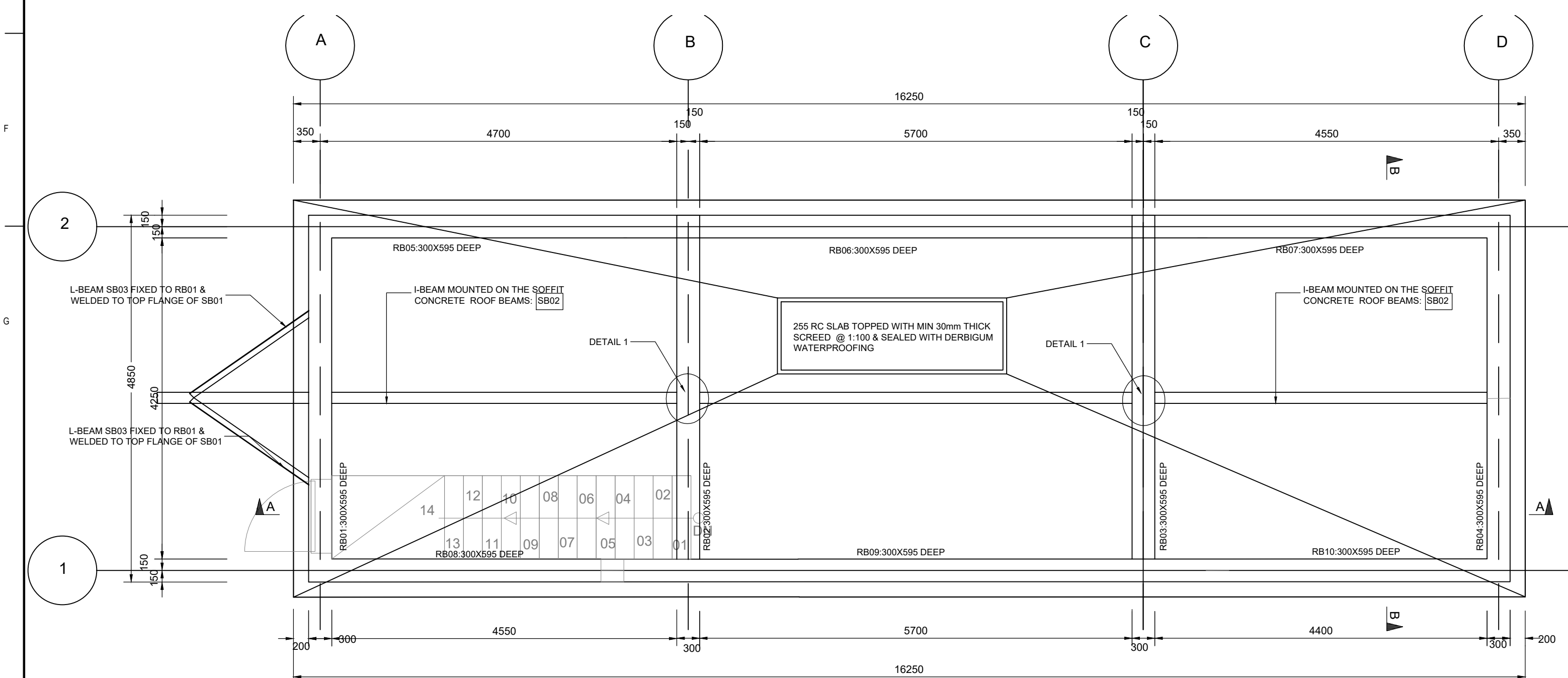
TYPICAL SECTION B-B THROUGH CHAMBER
SCALE: 1:50



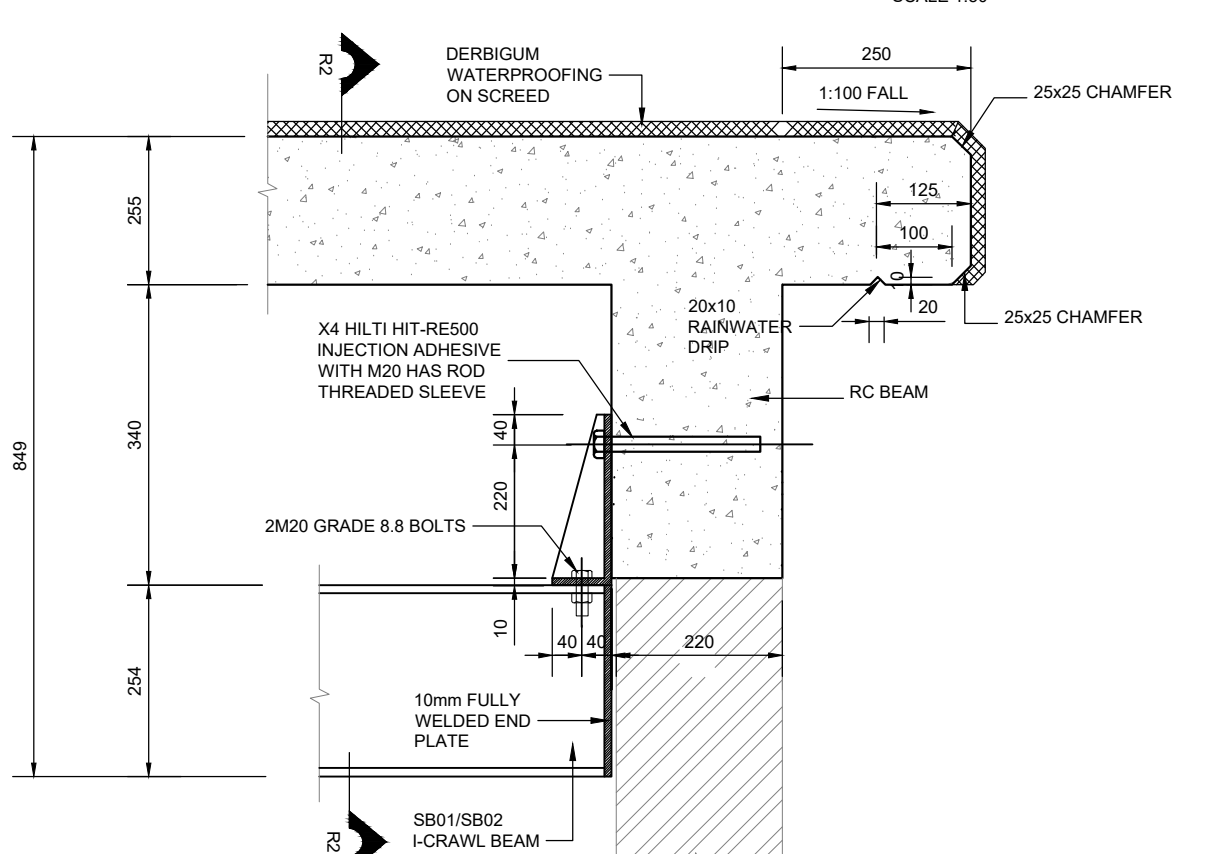
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OF TYPICAL DETAIL 2
SCALE: 1:10



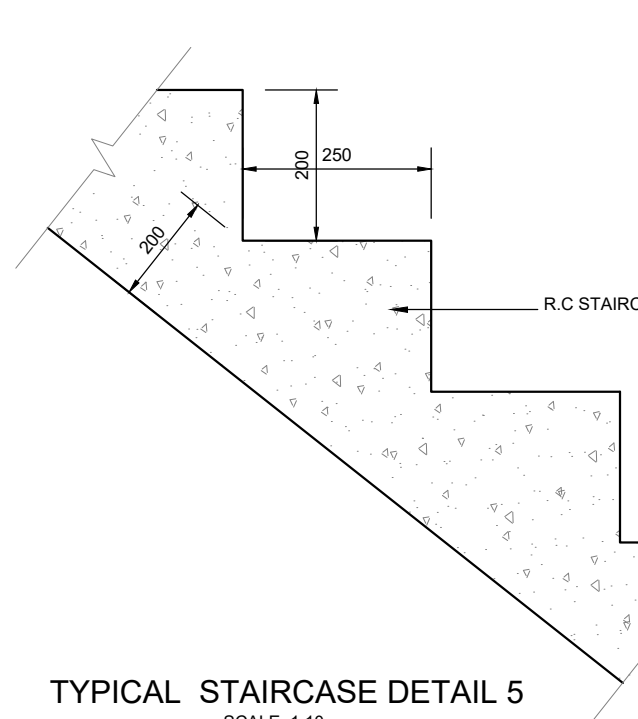
TYPICAL SECTION R1-R1
OF TYPICAL DETAIL 1&3
SCALE: 1:10



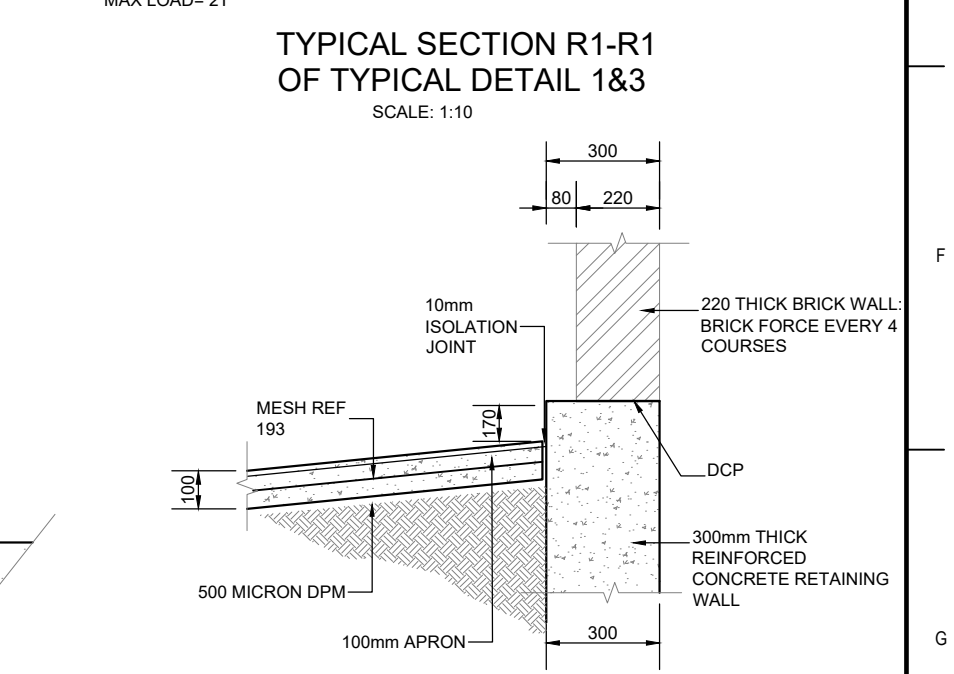
ROOF SLAB & CROW BEAM CONCRETE LAYOUT
SCALE: 1:50



TYPICAL DETAIL 2
SCALE: 1:10



TYPICAL STAIRCASE DETAIL 5
SCALE: 1:10



TYPICAL DETAIL 4
SCALE: 1:20

BEAM SIZE LEGEND

Beam No.	Size	Type
SB01	800x200 ANGLE IRON	STEEL
SB02	254x146x43KG	STEEL

PIPE SUPPORT SIZE LEGEND

Support No.	Size	Type
P1-P19	800 x 250 x 850 HIGH	RC

CONCRETE NOTES:

1. ALL BRICKWORK TO BE BUILT IN ACCORDANCE WITH GENERAL BRICKWORK SPECIFICATIONS.
2. ALL MASONRY WORK TO BE CARRIED OUT IN ACCORDANCE WITH SABS 0145 AND SABS 0164 PART 1.
3. WALL TIES TO BE PROVIDED AT RC COLUMNS AND WALLS AT INTERVALS NOT EXCEEDING 4 BRICK COURSES.
4. BUTTERFLY OR WIRE TIES TO BE PROVIDED ACROSS BRICKWORK CAVITIES AT INTERVALS NOT EXCEEDING 300mm HORIZONTALLY AND 300mm VERTICALLY WITH EACH LAYER STAGGERED BY 450mm. WIRE TIES TO CONFORM TO SABS 28.
5. BRICK FORCE REINFORCEMENT TO BE PROVIDED AT EVERY BRICK COURSE BELOW DPC AND AT EVERY 4TH COURSE ABOVE DPC. ALSO PROVIDE BRICK FORCE AT EVERY COURSE FOR THE FIRST 5 COURSES ABOVE ALL OPENINGS (WINDOWS, DOORS etc).
6. HEIGHT OF BRICK WORK ERECTED IN 24 HOURS NOT TO EXCEED 10 BRICK COURSES.

BRICK CONSTRUCTION NOTES:

1. MINIMUM OVERLAP FOR 500 MICRON DAMP PROOF MEMBRANE IS 300mm.
2. PERMISSIBLE DEVIATION DEGREE OF ACCURACY CLASS II.
3. SURFACE BED TO BE CURED BY BEING KEPT WET CONTINUOUSLY.
4. FOR AT LEAST 5 CONSECUTIVE DAYS OR BY APPLYING A CURING COMPOUND WHICH MUST FIRST BE APPROVED BY THE ENGINEER.
5. SAWN JOINTS TO BE CUT WITHIN 36 HOURS OF CONCRETE CASTING.
6. COMPACTION DENSITY TESTS RESULTS FOR LAYERWORKS BENEATH SURFACES TO BE SUBMITTED TO ENGINEER FOR APPROVAL BEFORE LAYING DPC.
7. NO BACKFILL MATERIAL TO BE BROUGHT ONTO SITE WITHOUT APPROVAL FROM THE ENGINEER.

CONCRETE NOTES:

1. SETTING OUT AND GENERAL.
2. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ARCHITECT'S DRAWINGS.
3. ALL DIMENSIONS AND HEIGHTS ARE TO BE CHECKED ON SITE BEFORE WORK IS PUT IN HAND.
4. REPORT DISCREPANCIES TO ARCHITECT OR ENGINEER.
5. THIS DRAWING MUST NOT BE USED TO SCALE OFF. USE ONLY WRITTEN DIMENSIONS. CONTACT THE ENGINEER OR ARCHITECT WHERE CLARITY IS SOUGHT.
6. FOR SETTING OUT DATA, SETTING OUT POINTS AND DATUM LEVELS REFER TO SURVEY INFORMATION AND ARCHITECT'S DRAWINGS.
7. STRUCTURAL WORK IS TO BE CARRIED OUT IN ACCORDANCE WITH THE PROJECT SPECIFICATION AND THE RELEVANT S.A.N.S. SPECIFICATIONS. ALL CONCRETE WORK IS TO BE DONE IN ACCORDANCE WITH S.A.N.S. 1200S AND EARTHWORKS IN ACCORDANCE WITH S.A.N.S. 1200S.
8. CONSULT RELEVANT ARCHITECT'S, MECHANICAL, ELECTRICAL & PLUMBING DRAWINGS AND DETAILS AS RELEVANT FOR DRAINAGE, STORMWATER OUTLETS, R/WPS AND HOLES AND SLEEVES FOR THESE SERVICES. NO HOLES ARE TO BE CORED WITHOUT ENGINEERS WRITTEN APPROVAL.
9. ALL FOUNDATION EXCAVATIONS TO BE INSPECTED AND APPROVED IN WRITING BY THE ENGINEER BEFORE CONCRETE IS CAST.
10. NO FOUNDATIONS ARE TO BE CAST IN FILL MATERIAL. A 50mm THICK LAYER OF 10MPa / 19mm BLINDING CONCRETE IS TO BE CAST UNDER ALL REINFORCED BASES, REINFORCED STRIP FOOTINGS AND GROUND BEAMS.
11. ANY OVER EXCAVATIONS ARE TO BE MADE GOOD WITH 10MPa / 19mm CONCRETE AT THE CONTRACTOR'S EXPENSE.
12. BACKFILLING OVER COLUMN BASES SHALL BE DONE WITH AN APPROVED MATERIAL, COMPACTED IN LAYERS IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS.
13. ALLOWABLE BEARING PRESSURE UNDER: CONCRETE BASES = 250kPa. STRIP FOOTINGS = 100kPa.
14. CONCRETE CHARACTERISTIC 28 DAY STRENGTH: BASES: 30MPa / 19mm. STRIP FOOTINGS: 25MPa / 19mm. SURFACE BEDS: 30MPa / 19mm. SUSPENDED SLABS & BEAMS: 30MPa / 19mm. COLUMNS: 30MPa / 19mm.
15. CONCRETE MIX DESIGNS FOR ALL GRADES OF CONCRETE TO BE GIVEN TO ENGINEER FOR PERUSAL AND COMMENT. CONCRETE MIX DESIGNS FOR SURFACE BEDS TO HAVE MINIMUM BLEED CHARACTERISTICS.
16. ALL CONCRETE TO BE ADEQUATELY CURED BY KEEPING SURFACES CONTINUOUSLY DAMP FOR AT LEAST 5 DAYS AFTER CASTING.
17. ALL CONCRETE TO BE CONSTRUCTED TO THE S.A.N.S. 1200S PERMISSIBLE DEVIATION DEGREE OF ACCURACY CLASS II. UNLESS SPECIFIED OTHERWISE.
18. CONCRETE CUBE TEST RESULTS TO BE SUBMITTED TIMELY TO ENGINEER FOR PERUSAL, RECORDS, COMMENT AND APPROVAL.
19. REINFORCEMENT CHARACTERISTIC STRENGTH: MILD STEEL: 250N/mm². HIGH YIELD STEEL: 450N/mm².
20. ALL REINFORCEMENT TO BE CHECKED AND APPROVED BY ENGINEER BEFORE ANY CONCRETE IS CAST. 48 HOURS WRITTEN NOTICE TO BE GIVEN TO ENGINEER BEFORE TIME OF INSPECTION.
21. LAP LENGTH TO REINFORCING TO BE MINIMUM 50 x SMALLER BAR DIAMETER, UNLESS OTHERWISE NOTED.
22. MESH REINFORCEMENT REFERENCE 245 TO BE PLACED IN SLAB (TOP) MINIMUM LAPS = 300mm UNLESS OTHERWISE NOTED.
23. THE CONTRACTOR MUST TAKE PARTICULAR CARE TO ENSURE THAT THE SPECIFIED COVER TO ALL REINFORCEMENT HAS BEEN ATTAINED THROUGHOUT BEFORE THE ENGINEER IS CALLED TO SITE FOR INSPECTION OF THE REINFORCEMENT.
24. COVER TO REINFORCEMENT: STRIP FOOTINGS: BASES: 50mm. COLUMNS AND WALLS: 30mm. SUSPENDED SLABS: 30mm.
25. SUSPENDED BEAMS: 30mm.
26. CONTRACTOR IS TO CONDUCT HIS OWN INSPECTION OF REINFORCEMENT BEFORE CALLING THE ENGINEER FOR INSPECTION.
27. FORMWORK AND PROPPING: STRIPPING TIMES FOR: COLUMN AND WALL SHUTTERING: 1.5 DAYS. 7 DAYS IN HOT WEATHER. 7 DAYS IN COLD WEATHER. 12 DAYS IN HOT WEATHER. 12 DAYS IN COLD WEATHER. 4 DAYS IN HOT WEATHER. 7 DAYS IN COLD WEATHER.
28. FLAT SLABS: PROPPING TIMES FOR: SLABS AND BEAMS: 14 DAYS IN HOT WEATHER. 21 DAYS IN COLD WEATHER.
29. CANTILEVER SLABS AND BEAMS: 21 DAYS (SUBJECT TO CUBE TEST RESULTS BEING SUBMITTED TIMELY TO ENGINEER FOR APPROVAL).
30. NO DEPROPPING OF SUSPENDED ELEMENTS UNTIL INSTRUCTED BY ENGINEER.
31. CONCRETE FINISHES, UNLESS NOTED OTHERWISE: COLUMNS AND WALLS: OFF SHUTTER. BEAMS AND SLAB SOFFIT: OFF SHUTTER.
32. TOP OF SUSPENDED SLABS: STEEL FLOAT.
33. SURFACE BEDS: POWER FLOAT.
34. SIDES OF GROUND BEAMS TO BE SHUTTERED.

Engineer: **KEON CONSULTING ENGINEERS**
34 Dine Street Glen Austin Midrand
TELEPHONE (011) 045 2532
CELL (072) 301 8811
EMAIL: engineer@technodesigns.co.za
OFFICES: JOHANNESBURG
WEBSITE: www.technodesigns.co.za

Client: **Johannesburg Water**
Turbine Hall, 65 Nmm Pilas Street, Newtown, Johannesburg

THESE NOTES SERVE AS AN ADDENDUM TO THE SPECIFICATION IN THE BILL OF QUANTITIES (BOQ). IN THOSE CASES WHERE THE BOQ SPECIFICATIONS DIFFER FROM THESE NOTES, THESE NOTES SHALL TAKE PRECEDENCE.

Engineer: T.Chikwata Pr Eng (20140009)

Drawn By:	Designed By:	Checked By:
K.Masika	T.Chikwata	T.Chikwata

Signature: _____ Date: Sept 2022

Signature: _____ Date: Sept 2022

Signature: _____ Date: Sept 2022

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33. SURFACE BEDS: POWER FLOAT.
34. SIDES OF GROUND BEAMS TO BE SHUTTERED.

Refer to Drawing No:

No	Date	Details	Revisions	Chd	Appd

Key Plan:

Size:	Scale:	Sheet No:	Original Date:
A1	As Shown	4 OF 6	NOV 2022

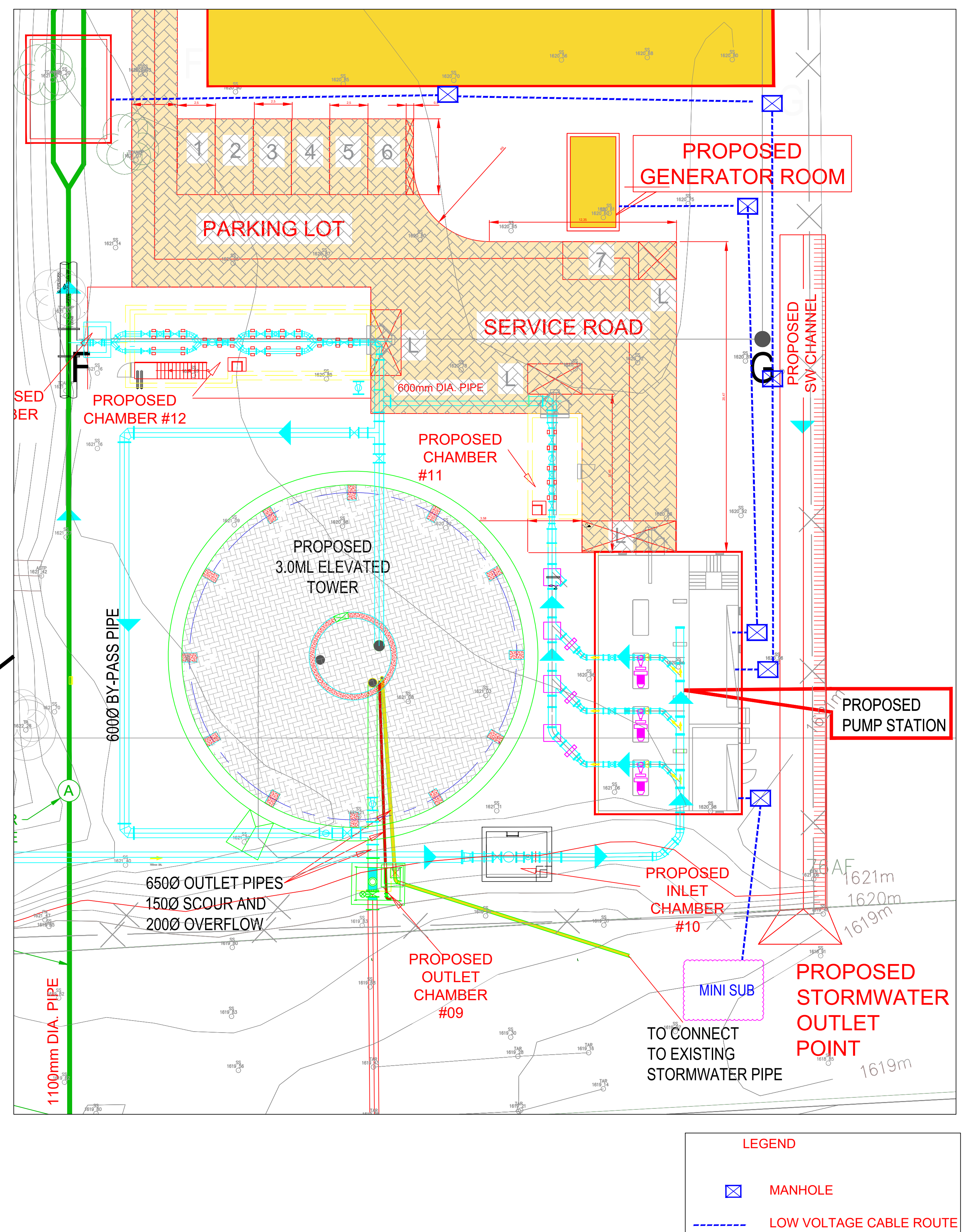
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C01486	PS-07	T0

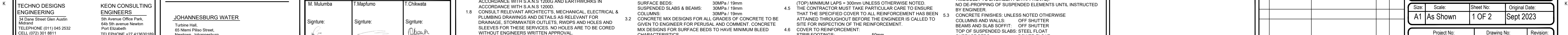
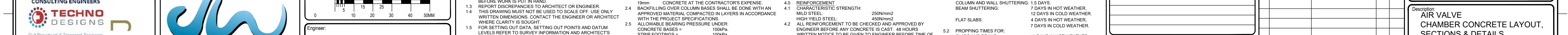
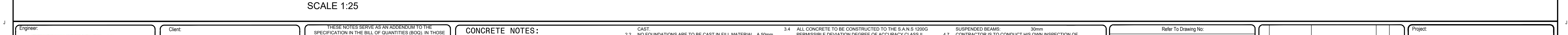
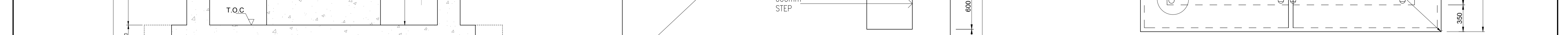
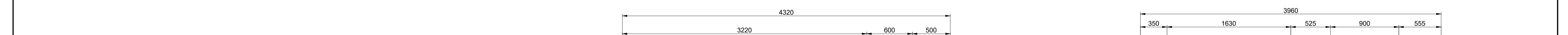
Project: LINBRO PARK TOWER (WITH ASSOCIATED WORKS)

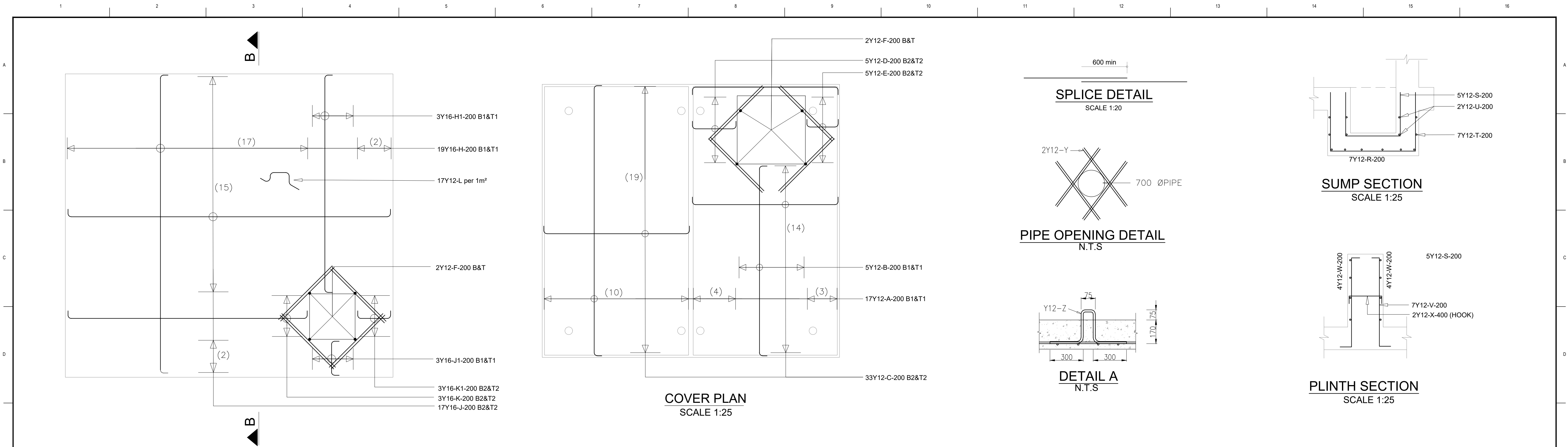
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Issued For: TENDER

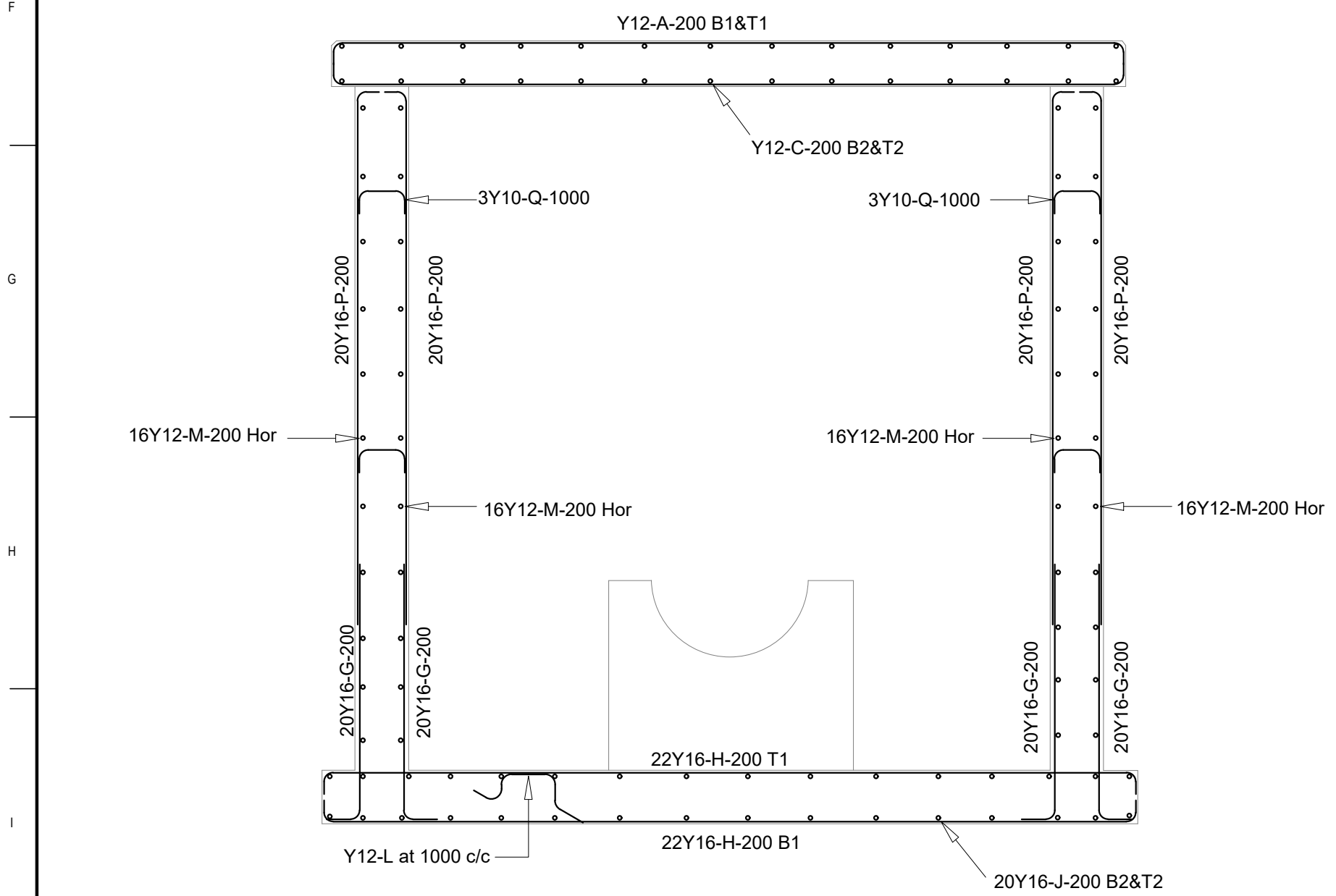
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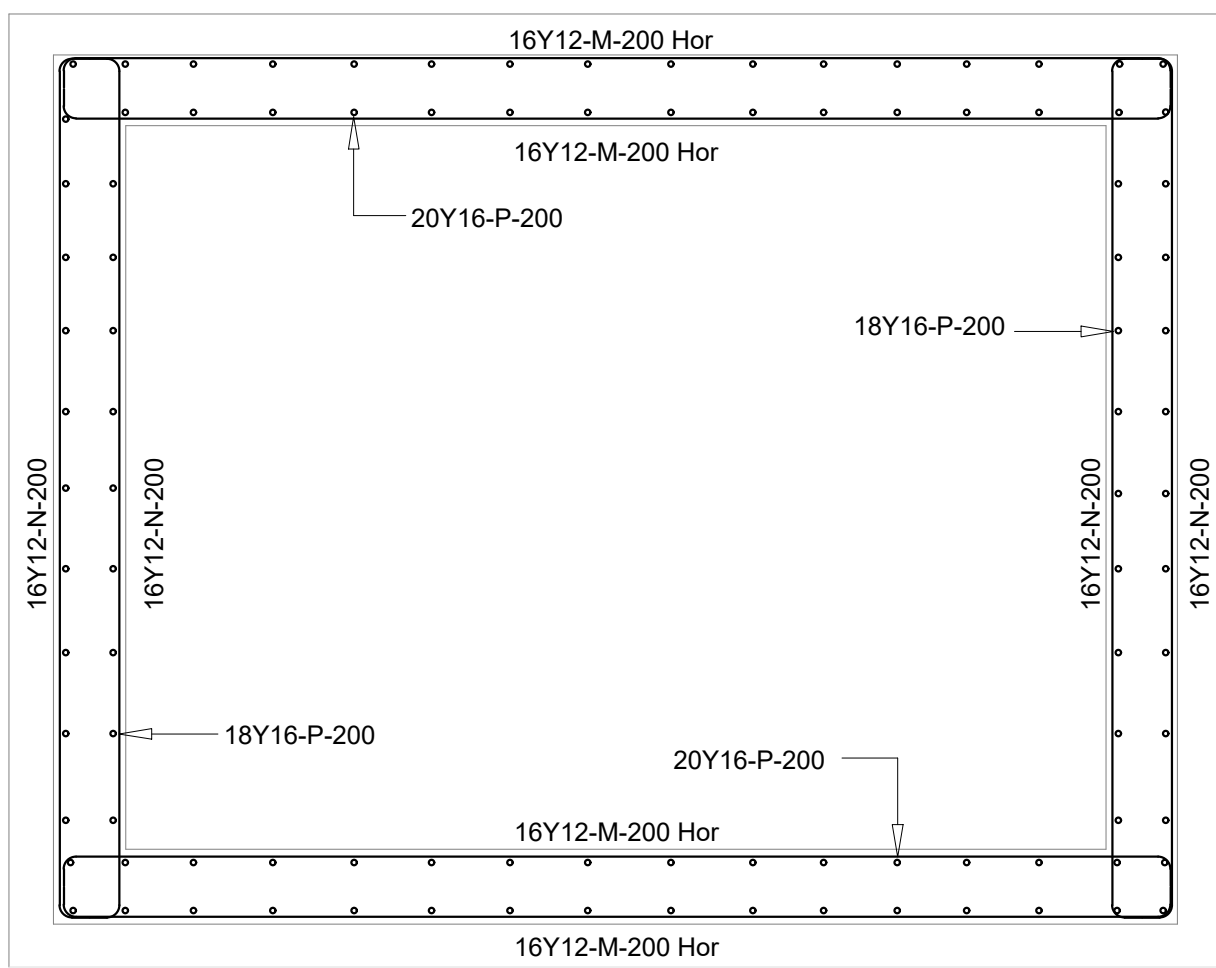




SURFACE BED REINFORCEMENT LAYOUT
SCALE 1:25

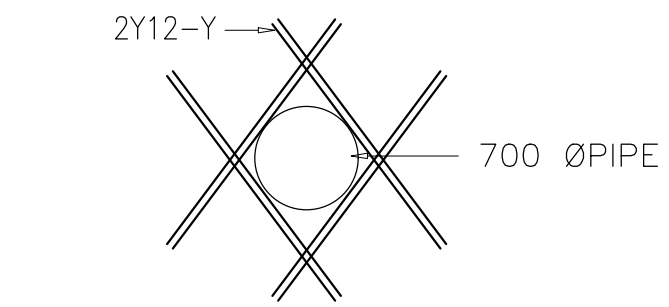


SECTION B-B
SCALE 1:25

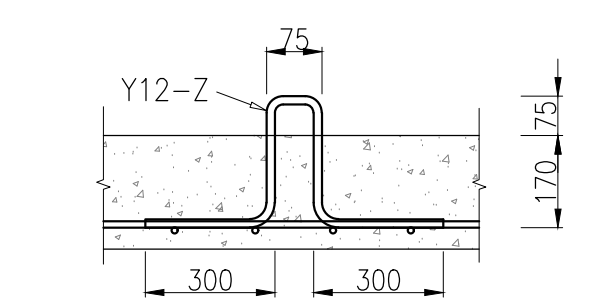


PLAN VIEW
SCALE 1:25

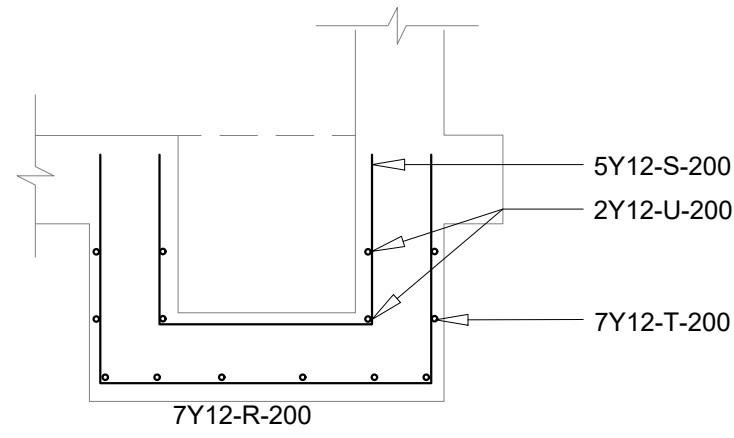
SPLICE DETAIL
SCALE 1:20



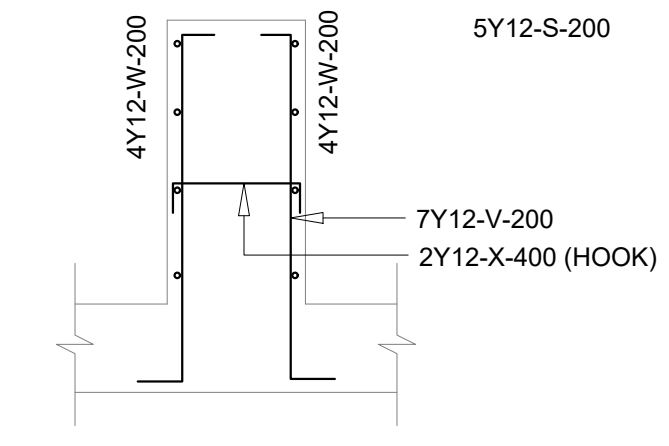
PIPE OPENING DETAIL
N.T.S



DETAIL A
N.T.S



SUMP SECTION
SCALE 1:25



PLINTH SECTION
SCALE 1:25

MEMBER	No OF	BARS PER MEMB	DIA.	LENGTH	TOTAL NUM-BER	MARK	S C	B E N D I N G				
								A	B	C	D	E/r
ROOF SLAB	2	17	Y12	3750	34	A	35	3550	(100)	(100)		
		5	Y12	2700	10	B	35	2500	(100)	(100)		
		33	Y12	2100	66	C	35	1900	(100)	(100)		
		5	Y12	750	10	D	35	550	(100)	(100)		
		5	Y12	600	10	E	35	400	(100)	(100)		
		8	Y12	1000	8	F	20	1000				
STARTER BARS		152	Y16	1200	152	G	37	150	1050			
GROUND SLAB	2	19	Y16	4100	38	H	35	3900	(100)	(100)		
		17	Y16	3700	34	J	35	4220	(100)	(100)		
		3	Y16	3350	6	K	35	3150	(100)	(100)		
		3	Y16	3000	6	H1	35	2800	(100)	(100)		
		3	Y16	600	6	J1	35	400	(100)	(100)		
		3	Y16	600	6	K1	35	400	(100)	(100)		
CHAMBER WALL	4	17	Y12	900	17	L	83	250	150			
		8	Y12	1000	16	F	20	1000				
		16	Y12	4000	64	M	35	3800	(100)	(100)		
		16	Y12	3700	64	N	35	3500	(100)	(100)		
		38	Y16	2900	152	P	37	2750	(100)	(100)		
		48	Y10	700	48	Q	35	200	(250)	(250)		
CHAMBER SUMP	2	7	Y12	2650	14	R	38	800	1100	800		
		5	Y12	1850	10	S	38	600	700	600		
		2	Y12	1550	8	T	38	100	1400	100		
		2	Y12	850	8	U	38	100	700	100		
		7	Y12	1500	14	V	54	250	1200	(100)		
		4	Y12	2200	8	W	55	150	300	1400	300	150
PIPE OPENING	2	2	Y12	450	2	X	38	100	320	(100)		
		8	Y12	1400	16	Y	20	1400				
LIFTING HOOK	2	4	Y12	1100	8	Z	53	300	245	75	245	(300)
								TOT	BENDING SCHEDULE			
									AIR VALVE CHAMBER			
R	8	10	12	16	20	25	32	40				
Y		21	873	1545					2439			
TOT		21	873	1545					2439			

Engineer:

KEON

CONSULTING ENGINEERS

TECHNO

DESIGNS

Civil Structural & Transport Engineers

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WEBSITE www.technodesigns.co.za

Client:

Johannesburg Water

JOHANNESBURG WATER

Turbine Hall,
65 Nene Pias Street,
Newtown, Johannesburg

THESE NOTES SERVE AS AN ADDENDUM TO THE SPECIFICATION IN THE BILL OF QUANTITIES (BOQ). IN THOSE CASES WHERE THE BOQ SPECIFICATIONS DIFFER FROM THESE NOTES, THESE NOTES SHALL TAKE PRECEDENCE.

ON ORIGINAL

Engineer:

T.Chikwata Pr Eng (20140009)

Drawn By:

M.Mulumba

Designed By:

T.Magumo

Checked By:

T.Chikwata

Signature:

Signature:

Signature:

Date:

September 2022

Date:

September 2023

Date:

September 2023

CONCRETE NOTES:

1.0 SETTING OUT AND GENERAL:

1.1 THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ARCHITECT'S DRAWINGS.

1.2 ALL DIMENSIONS AND HEIGHTS ARE TO BE CHECKED ON SITE BEFORE WORK IS PUT IN HAND.

1.3 REPORT DISCREPANCIES TO ARCHITECT OR ENGINEER.

1.4 THIS DRAWING MUST NOT BE USED TO SCALE OFF. USE ONLY WRITTEN DIMENSIONS. CONTACT THE ENGINEER OR ARCHITECT WHERE CLARITY IS SOUGHT.

1.5 FOR SETTING OUT DATA, SETTING OUT POINTS AND DATUM LEVELS REFER TO SURVEY INFORMATION AND ARCHITECT'S DRAWINGS.

1.6 STRUCTURAL WORK IS TO BE CARRIED OUT IN ACCORDANCE WITH THE PROJECT SPECIFICATION AND THE RELEVANT S.A.N.S SPECIFICATIONS. ALL CONCRETE WORK IS TO BE DONE IN ACCORDANCE WITH S.A.N.S 1200G AND EARTHWORKS IN ACCORDANCE WITH S.A.N.S 1200D.

1.8 CONSULT RELEVANT ARCHITECTS, MECHANICAL, ELECTRICAL & PLUMBING DRAWINGS AND DETAILS AS RELEVANT FOR DRAINAGE, STORMWATER OUTLETS, RWOPS AND HOLES AND SLEEVES FOR THESE SERVICES. NO HOLES ARE TO BE CORED WITHOUT ENGINEERS WRITTEN APPROVAL.

2.0 FOUNDATIONS

2.1 ALL FOUNDATION EXCAVATIONS TO BE INSPECTED AND APPROVED IN WRITING BY THE ENGINEER BEFORE CONCRETE IS CAST.

2.2 CAST:

NO FOUNDATIONS ARE TO BE CAST IN FILL MATERIAL. A 50mm THICK LAYER OF 10MPa / 19mm BLINDING CONCRETE IS TO BE CAST UNDER ALL REINFORCED BASES, REINFORCED STRIP FOOTINGS AND GROUND BEAMS.

2.3 ANY OVER EXCAVATIONS ARE TO BE MADE GOOD WITH 10MPa / 19mm CONCRETE AT THE CONTRACTOR'S EXPENSE.

2.4 BACKFILLING OVER COLUMN BASES SHALL BE DONE WITH AN APPROVED MATERIAL COMPACTED IN LAYERS IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS.

2.5 ALLOWABLE BEARING PRESSURE UNDER:

CONCRETE BASES = 150kPa

STRIP FOOTINGS = 100kPa

CONCRETE

3.0 CONCRETE CHARACTERISTIC 28 DAY STRENGTH:

BASES: 25MPa / 19mm

STRIP FOOTINGS: 20MPa / 19mm

SURFACE BEDS: 30MPa / 19mm

COLUMNS: 30MPa / 19mm

3.2 CONCRETE MIX DESIGNS FOR ALL GRADES OF CONCRETE TO BE GIVEN TO ENGINEER FOR PERUSAL AND COMMENT. CONCRETE MIX DESIGNS FOR SURFACE BEDS TO HAVE MINIMUM BLEED CHARACTERISTICS.

3.3 ALL CONCRETE TO BE ADEQUATELY CURED BY KEEPING SURFACES CONTINUOUSLY DAMP FOR AT LEAST 5 DAYS AFTER CASTING.

3.4 ALL CONCRETE TO BE CONSTRUCTED TO THE S.A.N.S 1200G PERMISSIBLE DEVIATION DEGREE OF ACCURACY CLASS II UNLESS SPECIFIED OTHERWISE.

3.5 CONCRETE CUBE TEST RESULTS TO BE SUBMITTED TIMEOUSLY TO ENGINEER FOR PERUSAL, RECORDS, COMMENT AND APPROVAL.

4.0 REINFORCEMENT

4.1 CHARACTERISTIC STRENGTH:

MILD STEEL: 250N/mm2

HIGH YIELD STEEL: 450N/mm2

4.2 ALL REINFORCEMENT TO BE CHECKED AND APPROVED BY ENGINEER BEFORE ANY CONCRETE IS CAST. 48 HOURS WRITTEN NOTICE TO BE GIVEN TO ENGINEER BEFORE TIME OF INSPECTION.

4.3 LAP LENGTH TO REINFORCING TO BE MINIMUM 50 x SMALLER BAR DIAMETER, UNLESS OTHERWISE NOTED.

4.4 MESH REINFORCEMENT REFERENCE 245 TO BE PLACED IN SLAB (TOP) MINIMUM LAPS = 300mm UNLESS OTHERWISE NOTED.

4.5 THE CONTRACTOR MUST TAKE PARTICULAR CARE TO ENSURE THAT THE SPECIFIED COVER TO ALL REINFORCEMENT HAS BEEN ATTAINED THROUGHOUT BEFORE THE ENGINEER IS CALLED TO SITE FOR INSPECTION OF THE REINFORCEMENT.

4.6 COVER TO REINFORCEMENT:

STRIP FOOTINGS: 50mm

COLUMNS AND WALLS: 50mm

SUSPENDED SLABS: 30mm

30mm

30mm

30mm

5.0 SUSPENDED BEAMS:

CONTRACTOR IS TO CONDUCT HIS OWN INSPECTION OF REINFORCEMENT BEFORE CALLING THE ENGINEER FOR INSPECTION.

5.1 STRIPPING TIMES FOR:

FERROWORK AND PROPPING

7 DAYS IN HOT WEATHER,

12 DAYS IN COLD WEATHER,

4 DAYS IN HOT WEATHER,

7 DAYS IN COLD WEATHER.

5.2 PROPPING TIMES FOR:

SLABS AND BEAMS: 21 DAYS

14 DAYS IN HOT WEATHER

21 DAYS IN COLD WEATHER

CANTILEVER SLABS AND BEAMS: 21 DAYS

(SUBJECT TO CUBE TEST RESULTS BEING SUBMITTED TIMEOUSLY TO ENGINEER FOR APPROVAL)

NO DE-PROPPING OF SUSPENDED ELEMENTS UNTIL INSTRUCTED BY ENGINEER.

5.3 CONCRETE FINISHES: UNLESS NOTED OTHERWISE COLUMNS AND WALLS: OFF SHUTTER BEAMS AND SLAB SOFFIT: OFF SHUTTER TOP OF SUSPENDED SLABS: STEEL FLOAT SURFACE BEDS: POWER FLOAT

5.4 SIDES OF GROUND BEAMS TO BE SHUTTERED.

Refer To Drawing No:

Key Plan:

No Date Details Chd Appd Revisions

Project:

JW14406-LINBRO PARK TOWER (WITH ASSOCIATED WORKS)

Description:

AIR VALVE CHAMBER REBAR LAYOUT, SECTIONS & DETAILS

Issued For:

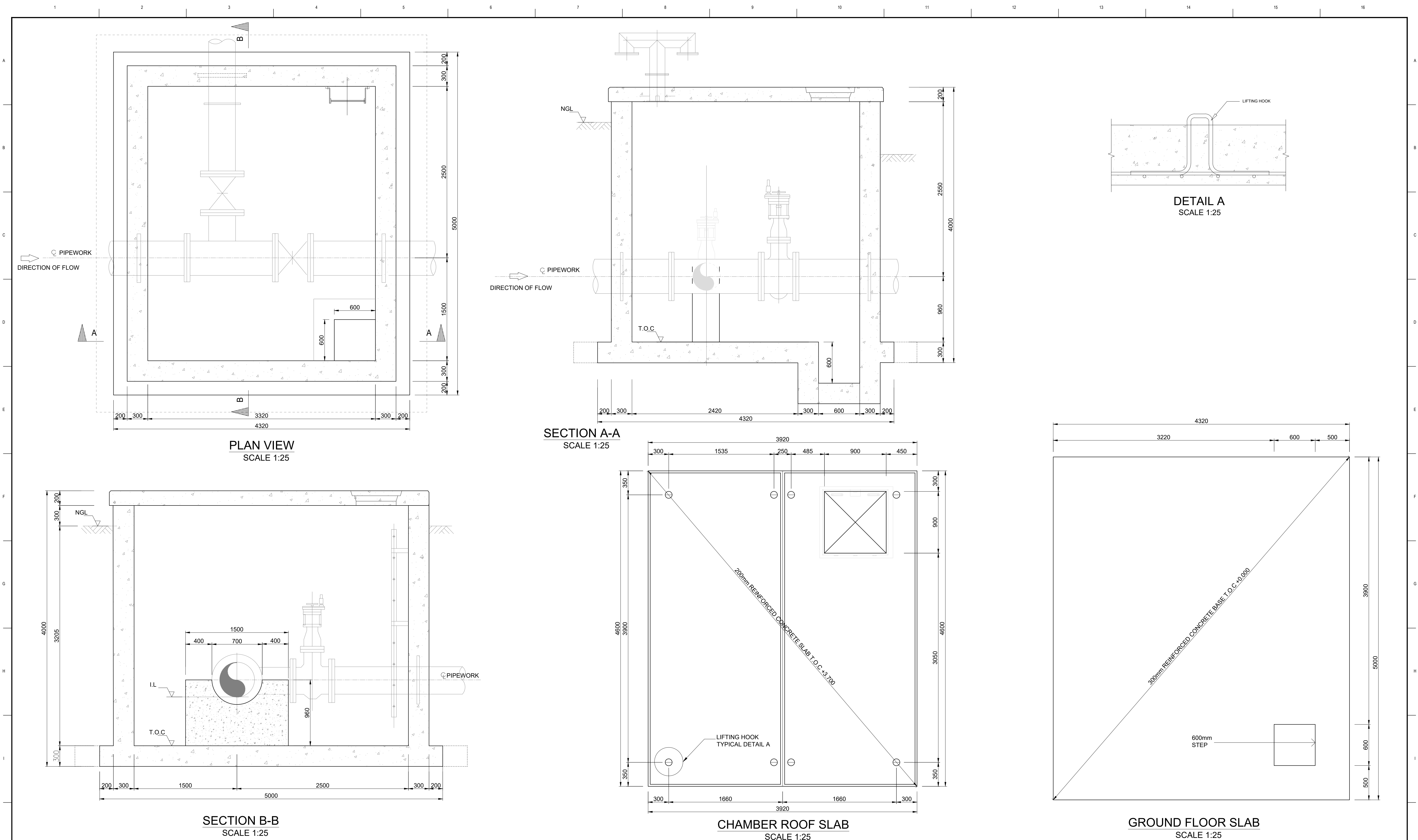
TENDER

Size Scale: Sheet No: Original Date:

A1 As Shown 2 OF 2 Sept 2023

Project No: Drawing No: Revision:

C01486 CP-19 T0



Engineer:

KEON
CONSULTING ENGINEERS

TECHNO
DESIGNS

Civil Structural & Transport Engineers

Client:

Johannesburg Water

Tutorine Hall,
65 Ntshini Place Street,
Newtown, Johannesburg

THESE NOTES SERVE AS AN ADDENDUM TO THE SPECIFICATION IN THE BILL OF MATERIALS (BOM). IN THOSE CASES WHERE THE BOM SPECIFICATIONS DIFFER FROM THESE NOTES, THESE NOTES SHALL TAKE PRECEDENCE ON ORIGINAL.

Engineer:

T.Chikwata Pr Eng (20140009)

Drawn By: M. Mulumba
Designed By: T. Mapfumo
Checked By: T. Chikwata

Signature: [Signature]
Date: Sept 2023

Signature: [Signature]
Date: Sept 2023

Signature: [Signature]
Date: Sept 2023

CONCRETE NOTES:

1.0 SETTING OUT AND GENERAL

1.1 THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ARCHITECTS' DRAWINGS.

1.2 ALL DIMENSIONS AND HEIGHTS ARE TO BE CHECKED ON SITE BEFORE WORK IS PUT IN HAND.

1.3 REPORT DISCREPANCIES TO ARCHITECT OR ENGINEER IN ACCORDANCE WITH S.A.N.S 1200G AND EARTHWORKS IN ACCORDANCE WITH S.A.N.S 1200D.

1.4 THIS DRAWING MUST NOT BE USED TO SCALE OFF. USE ONLY WRITTEN DIMENSIONS. CONTACT THE ENGINEER OR ARCHITECT WHERE CLARITY IS SOUGHT.

1.5 FOR SETTING OUT DATA, SETTING OUT POINTS AND DATUM LEVELS REFER TO SURVEY INFORMATION AND ARCHITECT'S DRAWINGS.

1.6 STRUCTURAL WORK IS TO BE CARRIED OUT IN ACCORDANCE WITH THE PROJECT SPECIFICATION AND THE RELEVANT S.A.N.S SPECIFICATIONS. ALL CONCRETE WORK IS TO BE DONE IN ACCORDANCE WITH S.A.N.S 1200G AND EARTHWORKS IN ACCORDANCE WITH S.A.N.S 1200D.

1.8 CONSULT RELEVANT ARCHITECTS, MECHANICAL, ELECTRICAL & PLUMBING DRAWINGS AND DETAILS AS RELEVANT FOR DRAINAGE, STORMWATER OUTLETS, RWOPS AND HOLES AND SLEEVES FOR THESE SERVICES. NO HOLES ARE TO BE CURED WITHOUT ENGINEERS WRITTEN APPROVAL.

2.0 ALL FOUNDATION EXCAVATIONS TO BE INSPECTED AND APPROVED IN WRITING BY THE ENGINEER BEFORE CONCRETE IS CASTING.

2.1 NO FOUNDATIONS ARE TO BE CAST IN FILL MATERIAL. A 50mm THICK LAYER OF 10MPa / 19mm BLINDING CONCRETE IS TO BE CAST UNDER ALL REINFORCED BASES, REINFORCED STRIP FOOTINGS AND GROUND BEAMS.

2.3 ANY OVER EXCAVATIONS ARE TO BE MADE GOOD WITH 10MPa / 19mm CONCRETE AT THE CONTRACTOR'S EXPENSE.

2.4 BACKFILLING OVER COLUMN BASES SHALL BE DONE WITH AN APPROVED MATERIAL COMPACTED IN LAYERS IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS.

2.5 ALLOWABLE BEARING PRESSURE UNDER: CONCRETE BASES = 150kPa STRIP FOOTINGS = 100kPa

3.0 CONCRETE

3.1 CONCRETE CHARACTERISTIC 28 DAY STRENGTH: BASES 25MPa / 19mm STRIP FOOTINGS: 25MPa / 19mm SURFACE BEDS: 30MPa / 15mm COLUMNS: 30MPa / 15mm

3.2 CONCRETE MIX DESIGNS FOR ALL GRADES OF CONCRETE TO BE GIVEN TO ENGINEER FOR PERUSAL AND COMMENT. CONCRETE MIX DESIGNS FOR SURFACE BEDS TO HAVE MINIMUM BLEED CHARACTERISTICS.

3.3 ALL CONCRETE TO BE ADEQUATELY CURED BY KEEPING SURFACES CONTINUOUSLY DAMP FOR AT LEAST 5 DAYS AFTER CASTING.

3.4 ALL CONCRETE TO BE CONSTRUCTED TO THE S.A.N.S 1200G PERMISSIBLE DEVIATION DEGREE OF ACCURACY CLASS II.

3.5 CONCRETE CUBE TEST RESULTS TO BE SUBMITTED TIMELY TO ENGINEER FOR PERUSAL, RECORDS, COMMENT AND APPROVAL.

4.0 REINFORCEMENT

4.1 CHARACTERISTIC STRENGTH: MILD STEEL 250N/mm² HIGH YIELD STEEL 450N/mm²

4.2 ALL REINFORCEMENT TO BE CHECKED AND APPROVED BY ENGINEER BEFORE ANY CONCRETE IS CAST. 48 HOURS WRITTEN NOTICE TO BE GIVEN TO ENGINEER BEFORE TIME OF INSPECTION.

4.3 LAP LENGTH TO REINFORCING TO BE MINIMUM 50 x SMALLER BAR DIAMETER, UNLESS OTHERWISE NOTED.

4.4 MESH REINFORCEMENT REFERENCE 240 TO BE PLACED IN SLAB (TOP) MINIMUM LAPS = 300mm UNLESS OTHERWISE NOTED.

4.5 THE CONTRACTOR MUST TAKE PARTICULAR CARE TO ENSURE THAT THE SPECIFIED COVER TO ALL REINFORCEMENT HAS BEEN ATTAINED THROUGHOUT BEFORE THE ENGINEER IS CALLED TO SITE FOR INSPECTION OF THE REINFORCEMENT.

4.6 COVER TO REINFORCEMENT: STRIP FOOTINGS: 50mm COLUMNS AND WALLS: 30mm SUSPENDED SLABS: 30mm

4.7 SUSPENDED BEAMS: 30mm CONTRACTOR IS TO CONDUCT HIS OWN INSPECTION OF REINFORCEMENT BEFORE CALLING THE ENGINEER FOR INSPECTION.

5.0 FORMWORK AND PROPPING

5.1 STRIPPING TIMES FOR: COLUMN AND WALL SHUTTERING: 15 DAYS BEAM SHUTTERING: 7 DAYS IN HOT WEATHER, 12 DAYS IN COLD WEATHER 4 DAYS IN HOT WEATHER, 7 DAYS IN COLD WEATHER.

5.2 PROPPING TIMES FOR: SLABS AND BEAMS: 21 DAYS

5.3 CANTILEVER SLABS AND BEAMS: 21 DAYS (SUBJECT TO CUBE TEST RESULTS BEING SUBMITTED TIMELY TO ENGINEER FOR APPROVAL).

5.4 NO DE PROPPING OF SUSPENDED ELEMENTS UNTIL INSTRUCTED BY ENGINEER.

5.5 CONCRETE FINISHES: UNLESS NOTED OTHERWISE COLUMNS AND WALLS: OFF SHUTTER BEAMS AND SLAB SOFFIT: OFF SHUTTER TOP OF SUSPENDED SLABS: STEEL FLOAT SURFACE BEDS: POWER FLOAT SIDES OF GROUND BEAMS TO BE SHUTTERED.

Refer To Drawing No:

Key Plan:

No	Date	Details	Chd	Appd
		Revisions		

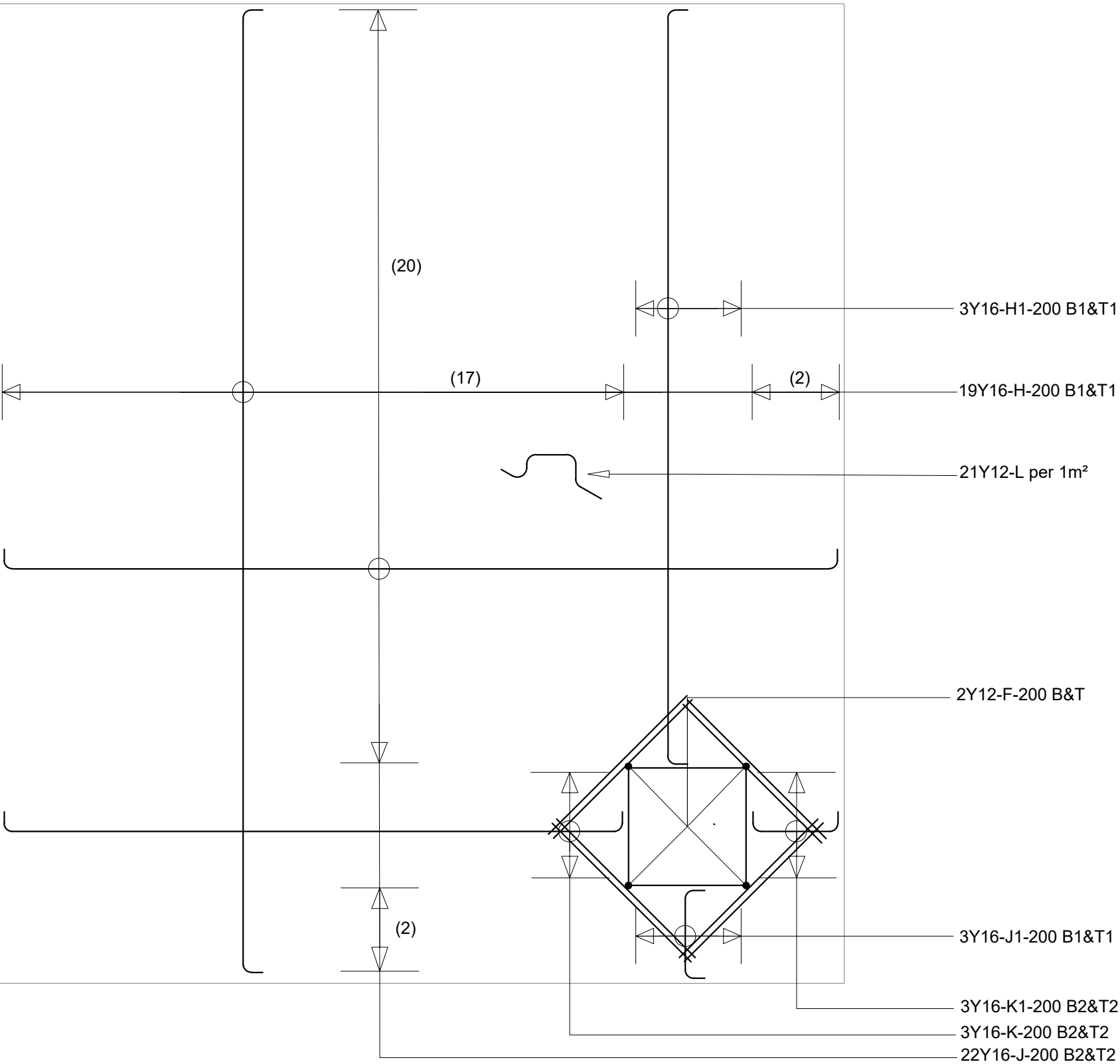
Project: JW14406-LINBRO PARK TOWER (WITH ASSOCIATED WORKS)

Description: SCOUR & ISOLATION VALVE CHAMBER CONCRETE LAYOUT, SECTIONS & DETAILS (1 OF 2)

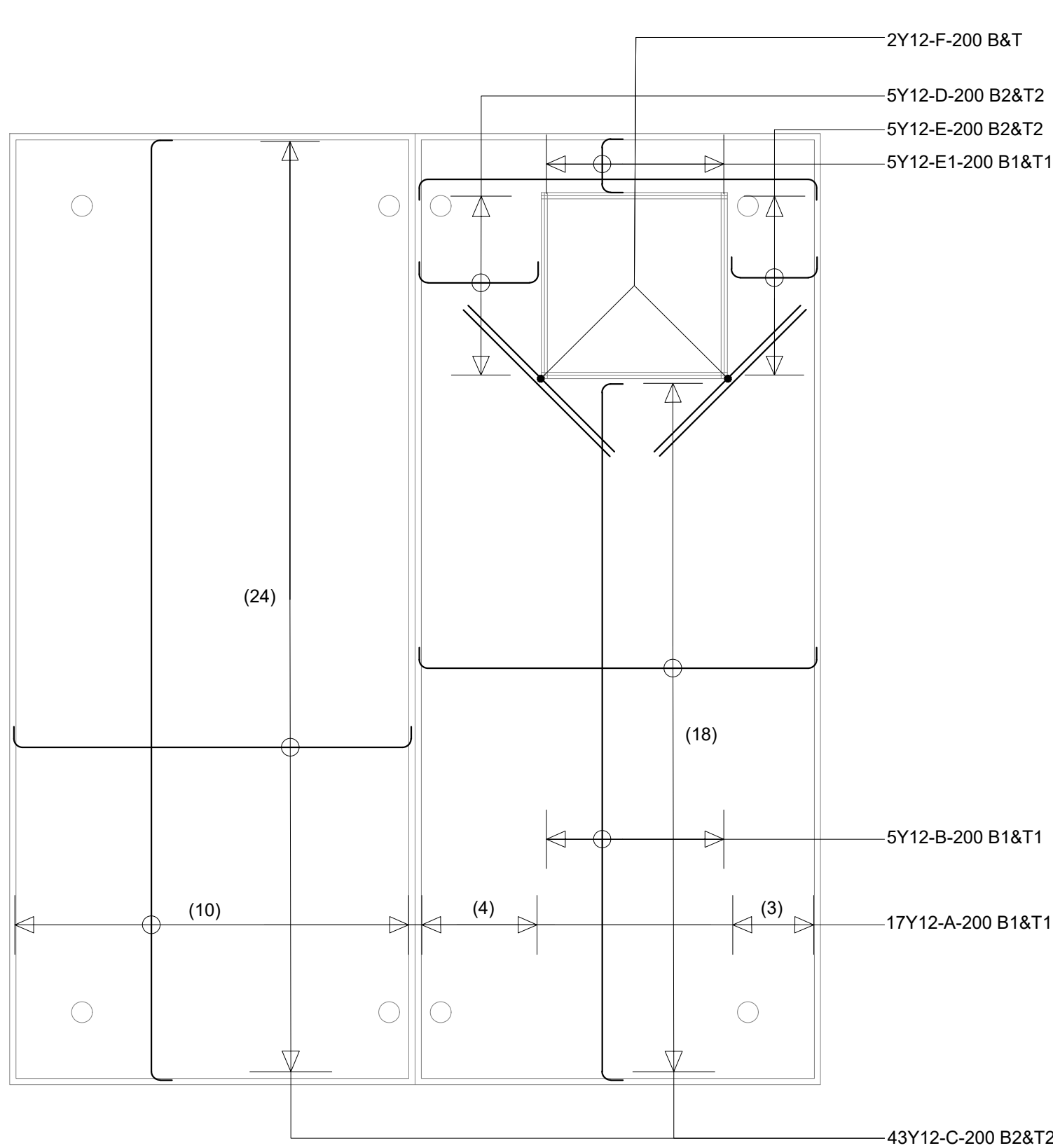
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Size	Scale	Sheet No:	Original Date:
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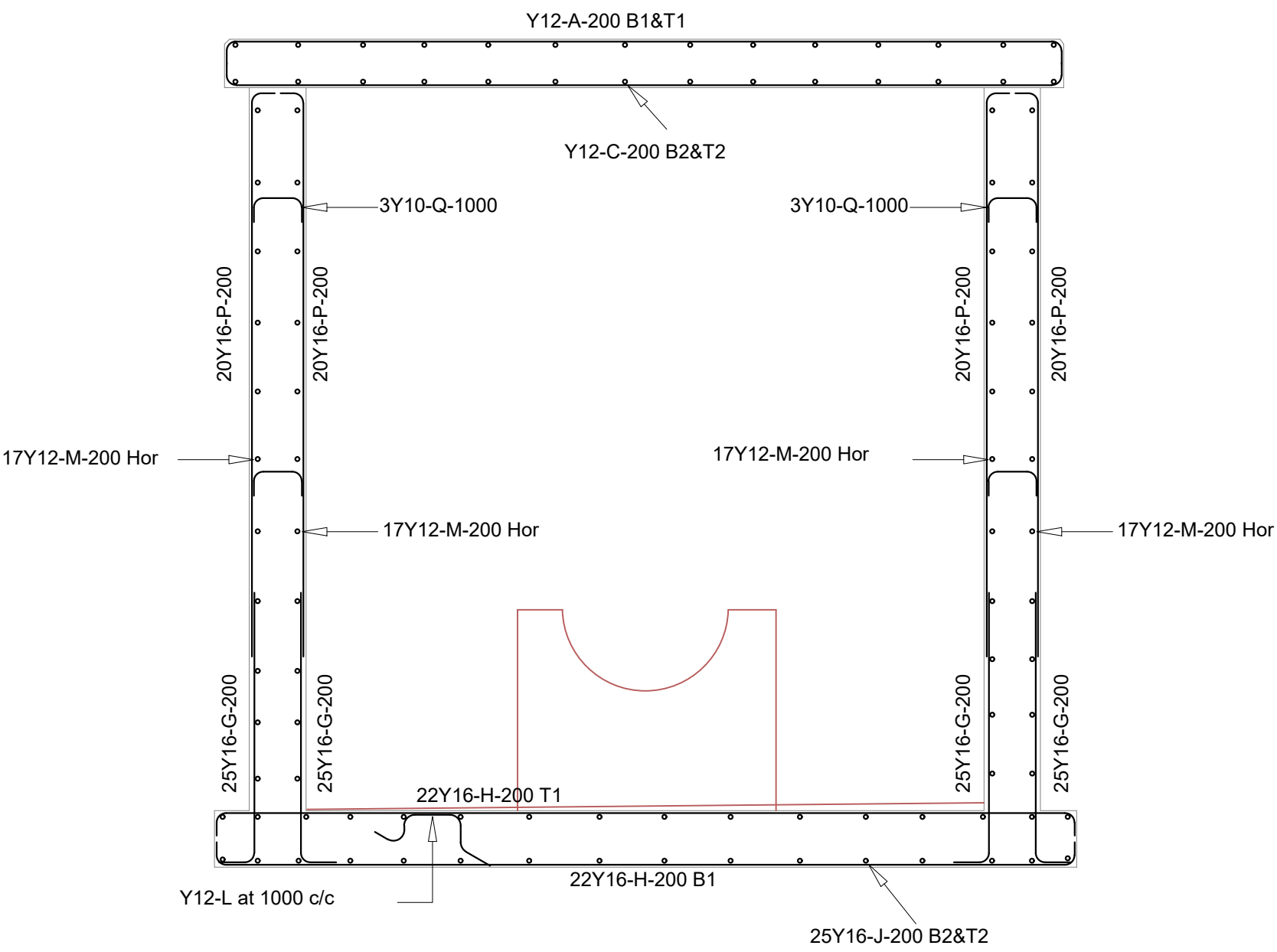
Project No:	Drawing No:	Revision:
C01486	CP-22	T0



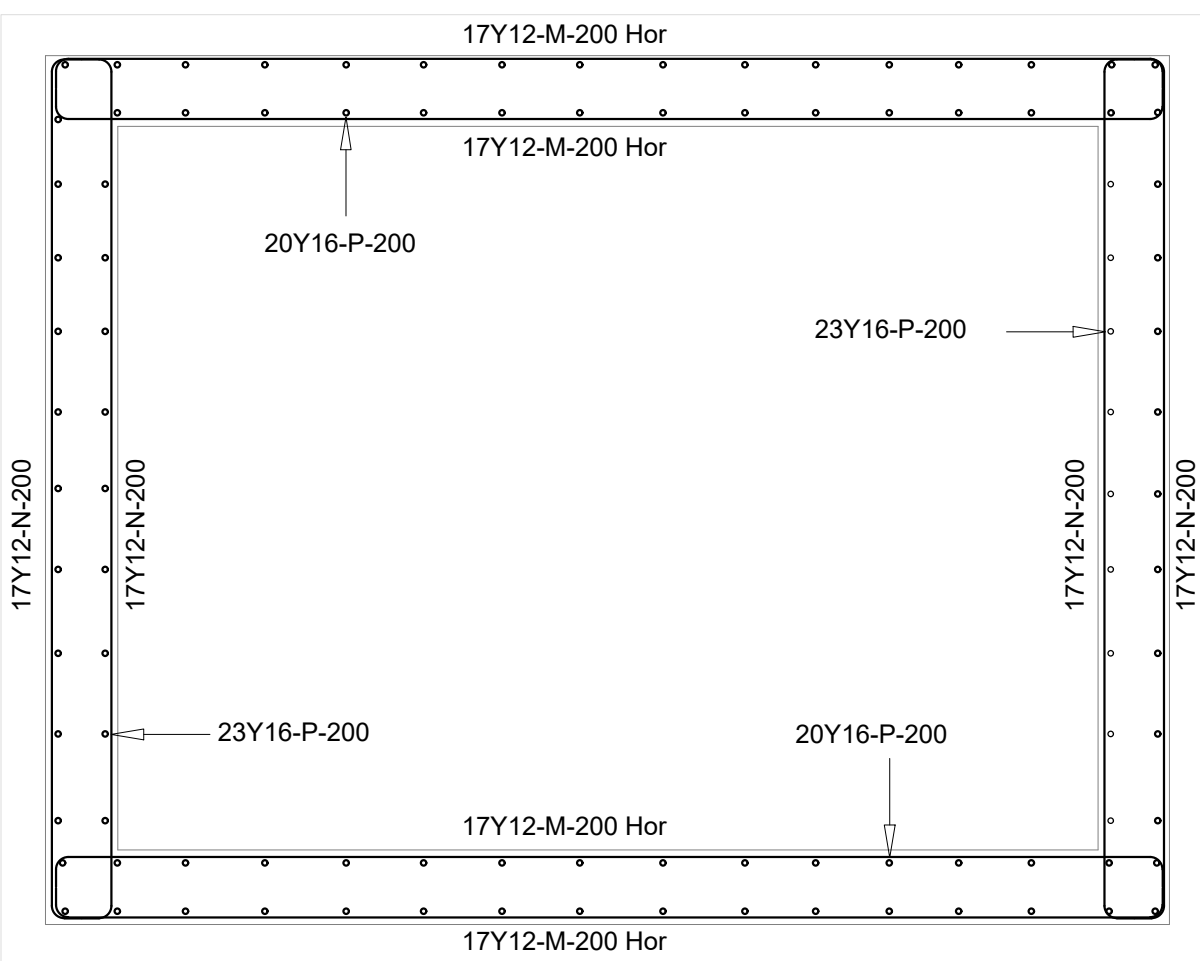
GROUND FLOOR SLAB REINFORCEMENT LAYOUT
SCALE 1:25



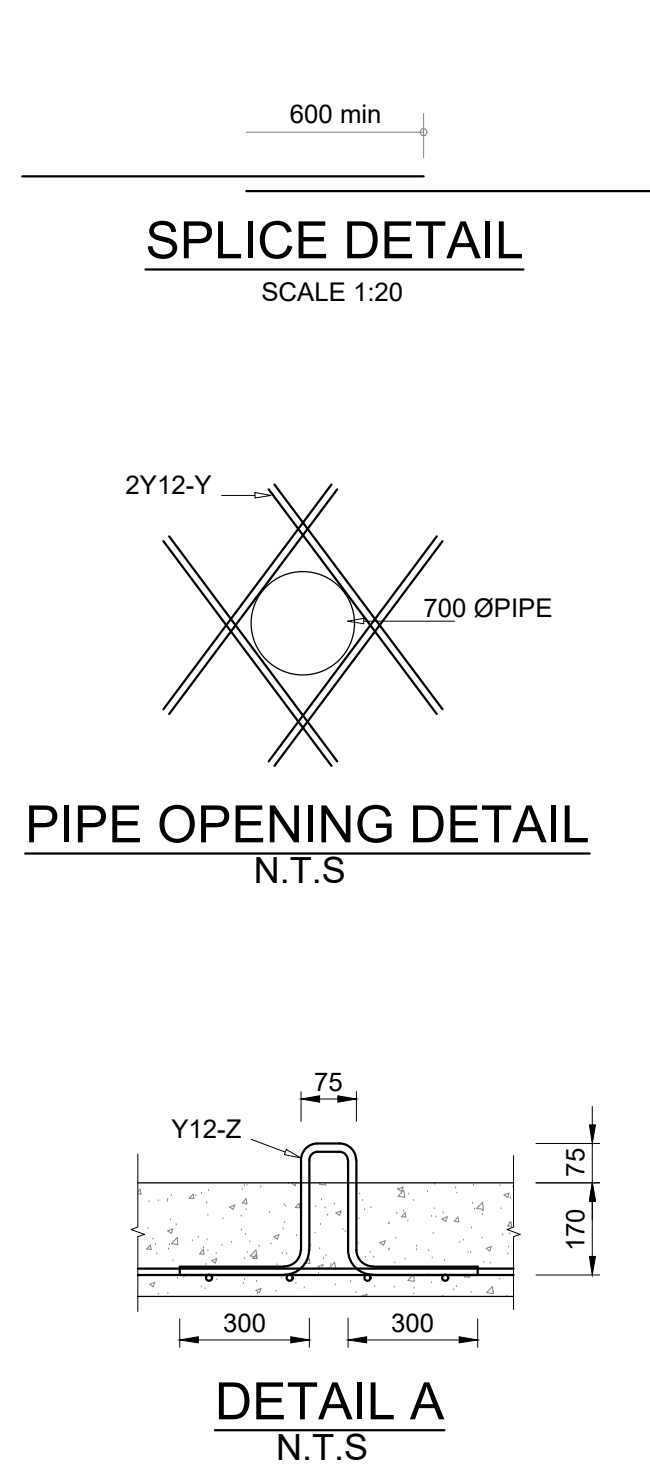
ROOF SLAB REINFORCEMENT LAYOUT
SCALE 1:25



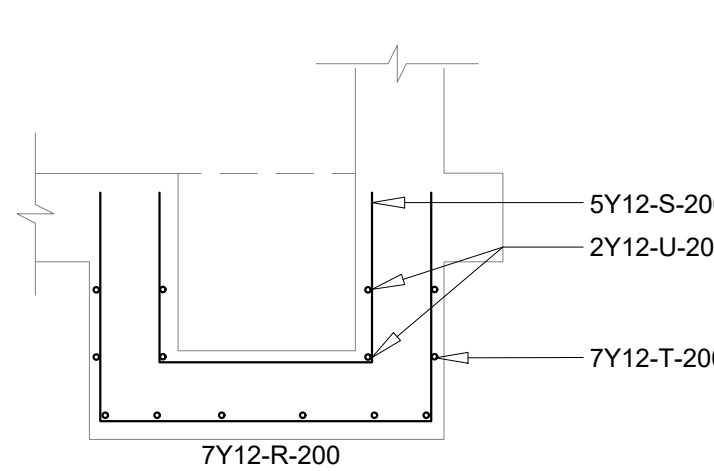
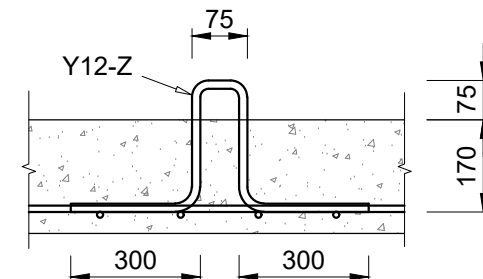
SECTION B-B REINFORCEMENT LAYOUT
SCALE 1:25



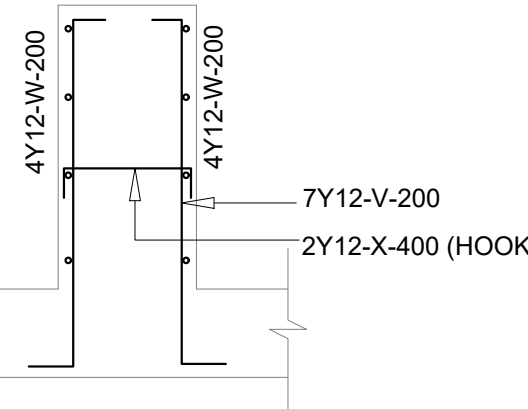
PLAN VIEW REINFORCEMENT LAYOUT
SCALE 1:25



PIPE OPENING DETAIL
N.T.S

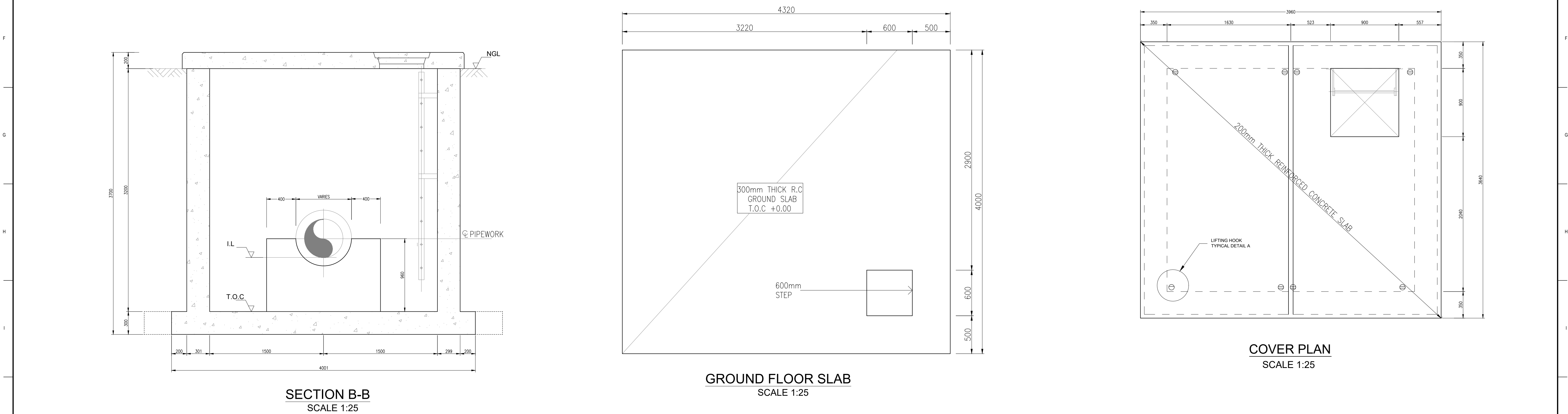
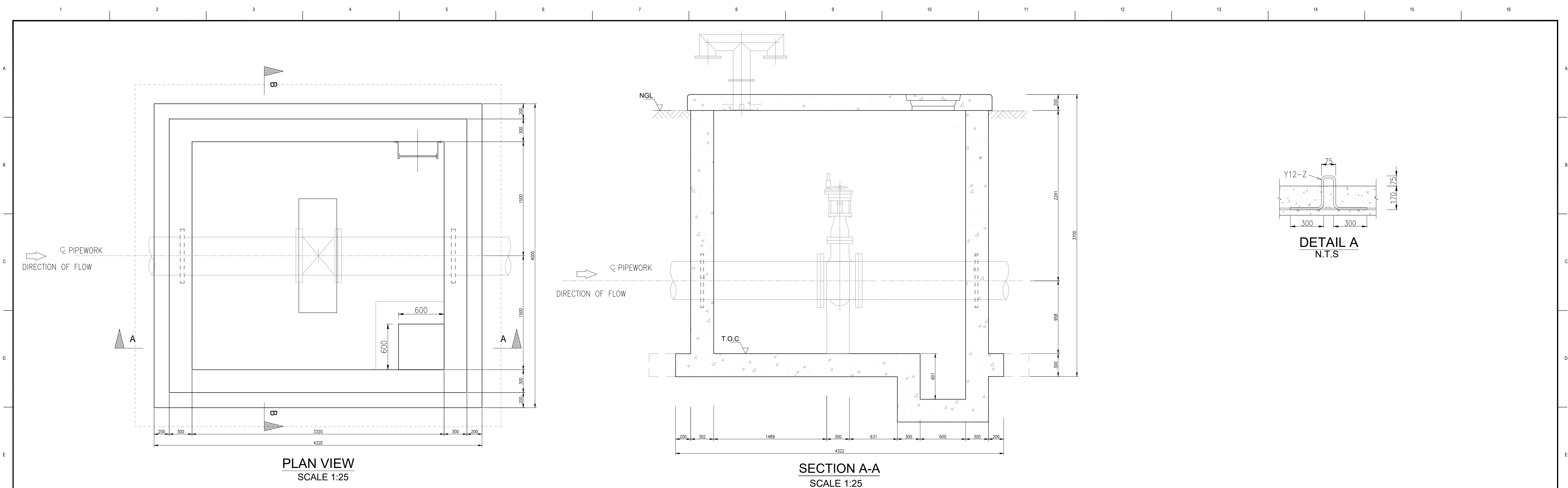


SUMP SECTION
SCALE 1:25

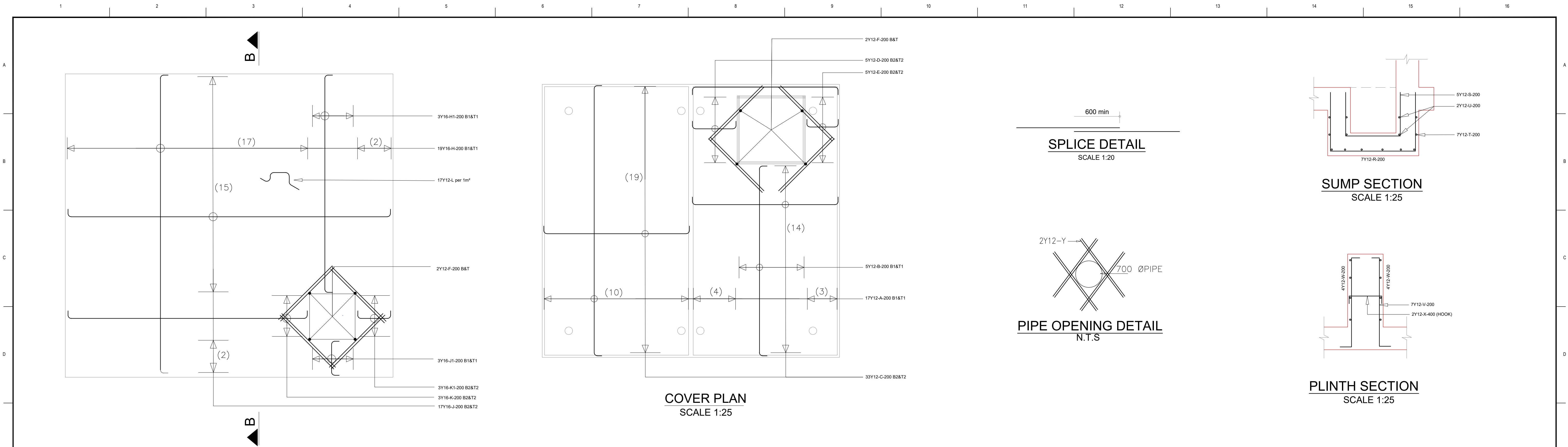


PLINTH SECTION
SCALE 1:25

MEMBER	No	BARS PER MEMB	DIA.	LENGTH		TOTAL NUM- BER	MARK	S C	B E N D I N G				
									A	B	C	D	E/r
ROOF SLAB	2	17	Y12	4750	34	A	35	4550	(100)	(100)			
		5	Y12	3500	10	B	35	3300	(100)	(100)			
		43	Y12	2100	86	C	35	1900	(100)	(100)			
		5	Y12	750	10	D	35	550	(100)	(100)			
		5	Y12	600	10	E	35	400	(100)	(100)			
	1	5	Y12	400	10	E1	35	200	(100)	(100)			
		8	Y12	1000	8	F	20	1000					
STARTER BARS		152	Y16	1500	152	G	37	150	1350				
GROUND SLAB	2	19	Y16	5100	38	H	35	4900	(100)	(100)			
		22	Y16	3700	44	J	35	4220	(100)	(100)			
		3	Y16	3350	6	K	35	3150	(100)	(100)			
		3	Y16	4000	6	H1	35	3800	(100)	(100)			
		3	Y16	600	6	J1	35	400	(100)	(100)			
	1	3	Y16	600	6	K1	35	400	(100)	(100)			
		21	Y12	900	21	L	83	250	150	200			
		2	8	Y12	1000	16	F	20	1000				
CHAMBER WALL	4	17	Y12	4000	68	M	35	3800	(100)	(100)			
		17	Y12	4700	68	N	35	4500	(100)	(100)			
		43	Y16	2900	172	P	37	2750	(100)	(100)			
	1	48	Y10	700	48	Q	35	200	(250)	(250)			
CHAMBER SUMP	2	7	Y12	2650	14	R	38	800	1100	800			
		5	Y12	1850	10	S	38	600	700	600			
	4	2	Y12	1550	8	T	38	100	1400	100			
		2	Y12	850	8	U	38	100	700	100			
PLINTH	2	7	Y12	1500	14	V	54	250	1200	(100)			
		4	Y12	2200	8	W	55	150	300	1400	300	150	
	1	2	Y12	450	2	X	38	100	320	(100)			
PIPE OPENING	3	8	Y12	1400	24	Y	20	1400					
LIFTING HOOK	2	4	Y12	1100	8	Z	53	300	245	75	245	(300)	
	8	10	12	16	20	25	32	40	TOT	BENDING SCHEDULE			
R									SCOUR AND ISOLATION VALVE CHAMBER				
Y	21	1052	1895					2968					
TOT		21	1052	1895				2968					



Engineer: KEON CONSULTING ENGINEERS TECHNO DESIGNS Dual Structural & Transport Engineers TECHNO DESIGNS ENGINEERING 34 Dane Street Glen Austin Midrand TELEPHONE: (011) 045 2532 CELL: 072 301 8811 E-MAIL: info@technodesigns.co.za OFFICES: JOHANNESBURG WEBSITE: www.technodesigns.co.za Client: Johannesburg Water JOHANNESBURG WATER Turkish Hall 16 Newlands Street Newtown, Johannesburg TELEPHONE: +27 4138301489 WEBSITE: www.jwa.co.za	THESE NOTES SERVE AS AN ADDENDUM TO THE SPECIFICATION IN THE BILL OF MATERIALS (BOM). IN THOSE CASES WHERE THE BOM SPECIFICATIONS DIFFER FROM THESE NOTES, THESE NOTES SHALL TAKE PRECEDENCE ON ORIGINAL.  Engineer: T.Chikwata Pr Eng (20140009) <i>Oba</i> Drawn By: M. Mubumba Designed By: T.Maphumlo Checked By: T.Chikwata Signature: <i>[Signature]</i> Signature: <i>[Signature]</i> Date: September 2023 Date: September 2023 Date: September 2023	CONCRETE NOTES: 1.0 SETTING OUT AND GENERAL 1.1 THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ARCHITECTS' DRAWINGS. 1.2 ALL DIMENSIONS AND HEIGHTS ARE TO BE CHECKED ON SITE BEFORE WORK IS PUT IN HAND. 1.3 REPORT DISCREPANCIES TO ARCHITECT OR ENGINEER. 1.4 THIS DRAWING MUST NOT BE USED TO SCALE. USE ONLY WRITTEN DIMENSIONS. CONTACT THE ENGINEER OR ARCHITECT WHERE CLARITY IS SOUGHT. 1.5 FOR SETTING OUT DATA, SETTING OUT POINTS AND DATUM LEVELS REFER TO SURVEY INFORMATION AND ARCHITECTS' DRAWINGS. 1.6 STRUCTURAL WORK IS TO BE CARRIED OUT IN ACCORDANCE WITH THE PROJECT SPECIFICATION AND THE RELEVANT S.A.N.S SPECIFICATIONS. ALL CONCRETE WORK IS TO BE DONE IN ACCORDANCE WITH S.A.N.S 12006 AND EARTHWORKS IN ACCORDANCE WITH S.A.N.S 12000. 1.8 CONSULT RELEVANT ARCHITECTS' MECHANICAL, ELECTRICAL & PLUMBING DRAWINGS AND DETAILS AS RELEVANT FOR DRAINAGE, STORMWATER OUTLETS, RWPS AND VOLETS AND SLEEVES FOR THESE SERVICES. NO HOLES ARE TO BE CORED WITHOUT ENGINEERS WRITTEN APPROVAL. 2.0 FOUNDATIONS 2.1 ALL FOUNDATION EXCAVATIONS TO BE INSPECTED AND APPROVED IN WRITING BY THE ENGINEER BEFORE CONCRETE IS CAST.	CAST 2.2 NO FOUNDATIONS ARE TO BE CAST IN FILL MATERIAL. A 50mm THICK LAYER OF 10MPa / 15mm BLINDING CONCRETE IS TO BE CAST UNDER ALL REINFORCING BASES, REINFORCED STRIP FOOTINGS AND COLUMN BASES. 2.3 ANY OVER EXCAVATIONS ARE TO BE MADE GOOD WITH 10MPa / 15mm CONCRETE AT THE CONTRACTORS EXPENSE. 2.4 BACKFILLING OVER COLUMN BASES SHALL BE DONE WITH AN APPROVED MATERIAL COMPACTED IN LAYERS IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS. 2.5 ALLOWABLE BEARING PRESSURE UNDER CONCRETE BASES = 100kPa. 2.6 STRIP FOOTINGS = 100kPa. 3.0 CONCRETE 3.1 CONCRETE CHARACTERISTIC 28 DAY STRENGTH: BASES: 25MPa / 15mm STRIP FOOTINGS: 20MPa / 15mm TOP MINIMUM LAYS = 300mm UNLESS OTHERWISE NOTED SUSPENDED SLABS & BEAMS: 30MPa / 19mm COAT THE SPECIFIED COVER ALL REINFORCEMENT TO BE ATTAINED THROUGHOUT BEFORE THE ENGINEER IS CALLED TO SITE FOR INSPECTION OF THE REINFORCEMENT. BASES: 50mm 30mm 30mm COLUMNS AND WALLS: 50mm 30mm 30mm SUSPENDED SLABS: 50mm 30mm 30mm	3.4 ALL CONCRETE TO BE CONSTRUCTED TO THE S.A.N.S 12006 PERMISSIBLE DEVIATION DEGREE OF ACCURACY CLASS II UNLESS SPECIFIED OTHERWISE. 3.5 CONCRETE TEST RESULTS ARE TO BE SUBMITTED TIMELY TO ENGINEER FOR PERUSAL, RECORDS, COMMENT AND APPROVAL. 4.0 CHARACTERISTIC STRENGTH: MILD STEEL: 250N/mm2 HIGH YIELD STEEL: 450N/mm2 4.1 ALL REINFORCEMENT TO BE CHECKED AND APPROVED BY ENGINEER BEFORE ANY CONCRETE IS CAST. 48 HOURS WRITTEN NOTICE TO BE GIVEN TO ENGINEER BEFORE TIME OF INSPECTION. 4.3 LAP LENGTH TO REINFORCING TO BE MINIMUM 50 X SMALLER BAR DIAMETER, UNLESS OTHERWISE NOTED. 4.4 MESH REINFORCEMENT REFERENCE 240 TO BE PLACED IN SLAB TOP MINIMUM LAYS = 300mm UNLESS OTHERWISE NOTED. 4.5 THE CONTRACTOR MUST TAKE PARTICULAR CARE TO ENSURE THAT THE SPECIFIED COVER ALL REINFORCEMENT TO BE ATTAINED THROUGHOUT BEFORE THE ENGINEER IS CALLED TO SITE FOR INSPECTION OF THE REINFORCEMENT. 4.6 DESIGNS FOR SURFACE BEDS TO HAVE MINIMUM BLEED CHARACTERISTICS. 4.7 ALL CONCRETE TO BE ADEQUATELY CURED BY KEEPING SURFACES CONTINUOUSLY DAMP FOR AT LEAST 5 DAYS AFTER CASTING.	4.7 SUSPENDED BEAMS: 30mm CONTRACTOR IS TO CONDUCT HIS OWN INSPECTION OF REINFORCEMENT BEFORE CALLING THE ENGINEER FOR INSPECTION. 5.0 FORMWORK AND PROPPING 5.1 STRIPPING TIMES FOR COLUMN AND WALL SHUTTERING: 15 DAYS 7 DAYS IN HOT WEATHER. 12 DAYS IN COLD WEATHER. 4 DAYS IN HOT WEATHER. 7 DAYS IN COLD WEATHER. 5.2 PROPPING TIMES FOR SLABS AND BEAMS: 14 DAYS IN HOT WEATHER. 21 DAYS IN COLD WEATHER. 5.3 CANTILEVER SLABS AND BEAMS: (SUBJECT TO CUBE TEST RESULTS BEING SUBMITTED TIMELY TO ENGINEER FOR APPROVAL). NO DE-PROPPING OF SUSPENDED ELEMENTS UNTIL INSTRUCTED BY ENGINEER. 5.4 CONCRETE FINISHES: UNLESS NOTED OTHERWISE: COLUMNS AND WALLS: OFF SHOOTER BEAMS AND SLAB SOFFIT: OFF SHOOTER TOP OF SUSPENDED SLABS: STEEL FLOAT SURFACE BEDS: POWER FLOAT SIDES OF GROUND BEAMS TO BE SHUTTERED.	Refer To Drawing No: Key Plan:	Project: JW14406-LINBRO PARK TOWER (WITH ASSOCIATED WORKS) Description: ISOLATION VALVE CHAMBER CONCRETE LAYOUT, SECTIONS & DETAILS Issued For: TENDER Size: A1 Scale: As Shown Sheet No: 1 OF 2 Original Date: Sept 2023 Project No: C01486 Drawing No: CP-24 Revision: T0
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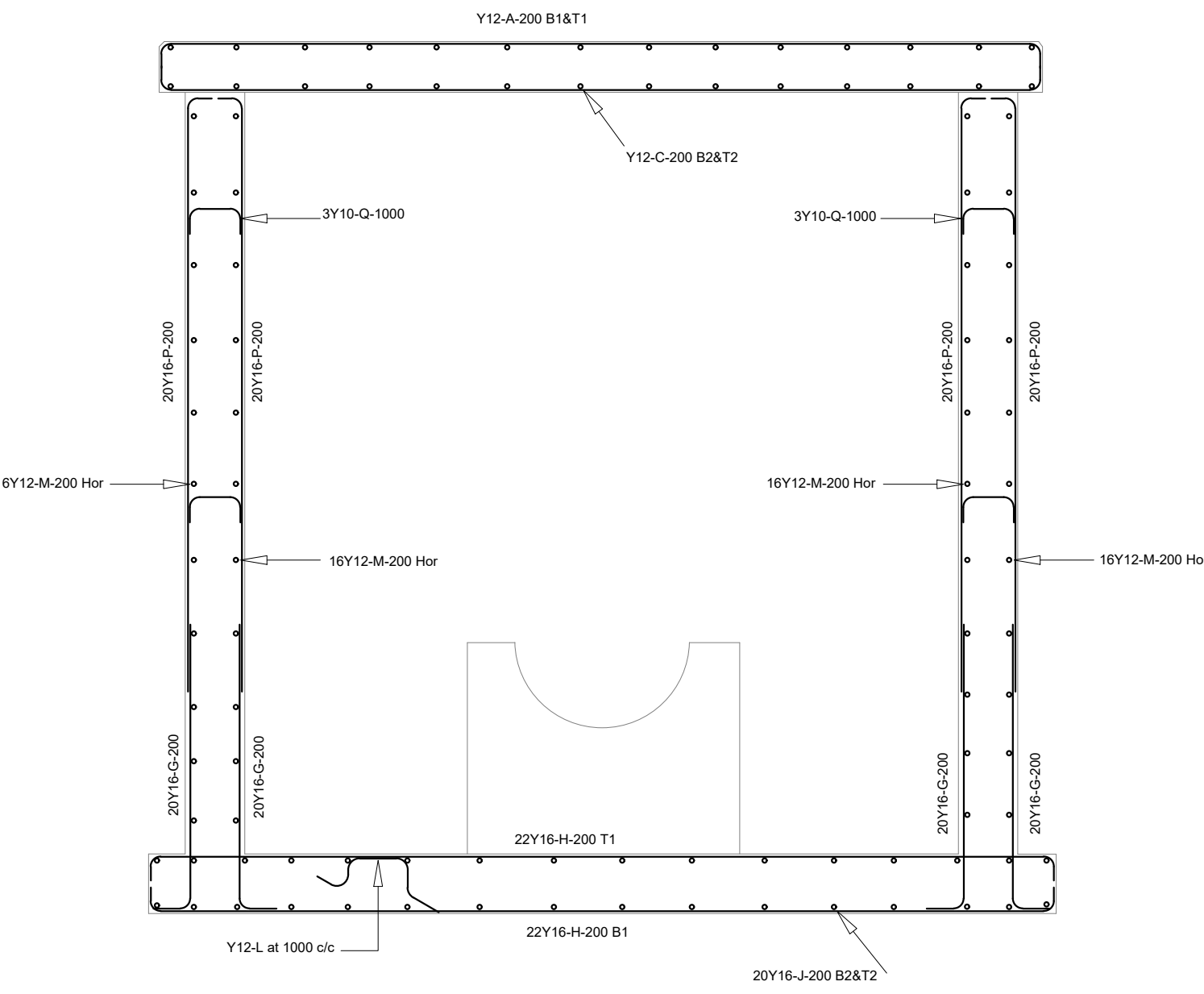
SURFACE BED REINFORCEMENT LAYOUT
SCALE 1:25

COVER PLAN
SCALE 1:25

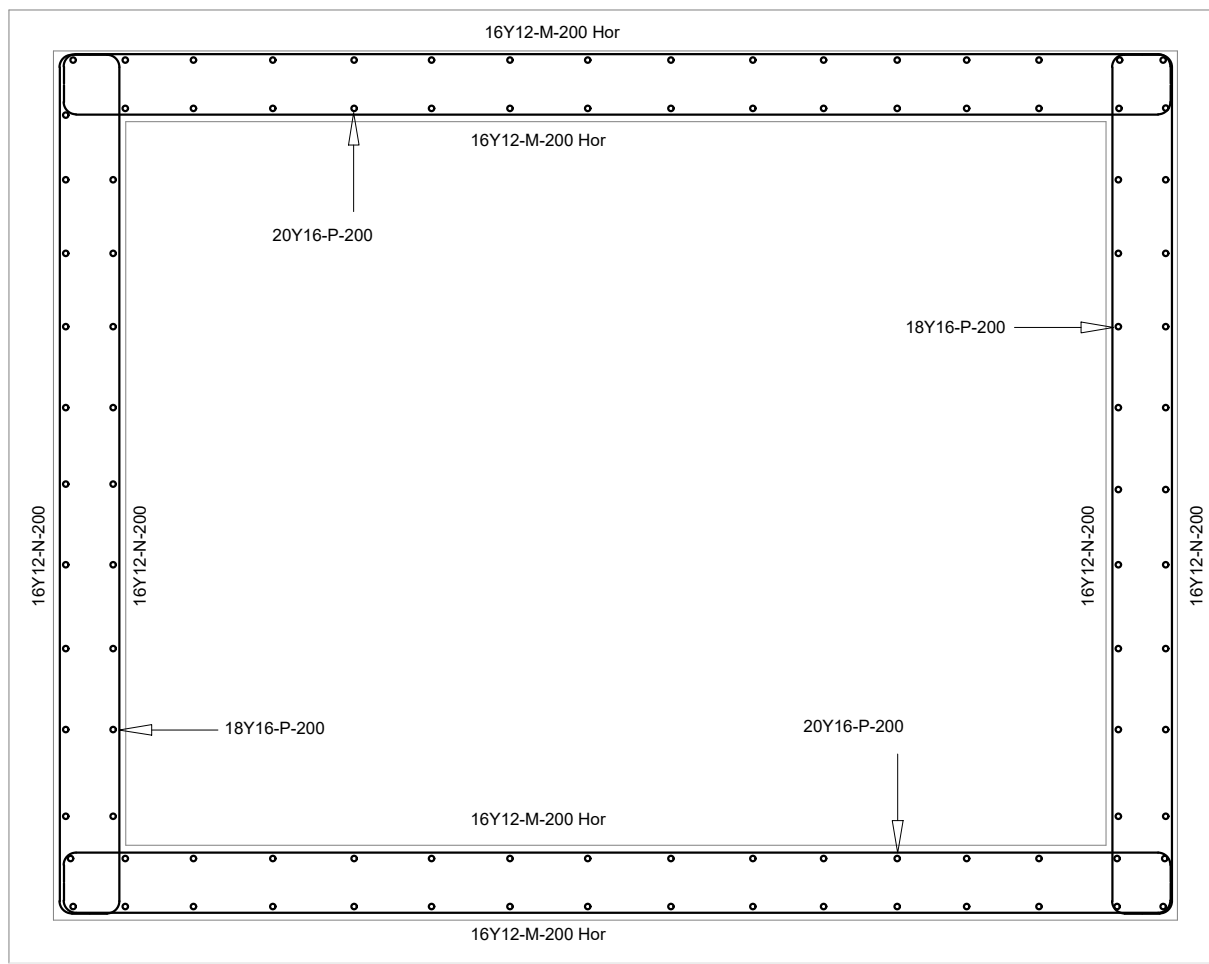
SPLICE DETAIL
SCALE 1:20

SUMP SECTION
SCALE 1:25

PLINTH SECTION
SCALE 1:25



SECTION B-B
SCALE 1:25



PLAN VIEW
SCALE 1:25

MEMBER	No OF	BARS PER MEMB	DIA.	LENGTH	TOTAL NUM-BER	MARK	S C	B E N D I N G				
								A	B	C	D	E/r
ROOF SLAB	2	17	Y12	3750	34	A	35	3550	(100)	(100)		
		5	Y12	2700	10	B	35	2500	(100)	(100)		
		33	Y12	2100	66	C	35	1900	(100)	(100)		
		5	Y12	750	10	D	35	550	(100)	(100)		
		5	Y12	600	10	E	35	400	(100)	(100)		
	1	8	Y12	1000	8	F	20	1000				
STARTER BARS		152	Y16	1200	152	G	37	150	1050			
GROUND SLAB	2	19	Y16	4100	38	H	35	3900	(100)	(100)		
		17	Y16	3700	34	J	35	4220	(100)	(100)		
		3	Y16	3350	6	K	35	3150	(100)	(100)		
		3	Y16	3000	6	H1	35	2800	(100)	(100)		
		3	Y16	600	6	J1	35	400	(100)	(100)		
	1	3	Y16	600	6	K1	35	400	(100)	(100)		
	17	Y12	900	17	L	83	250	150				
	2	8	Y12	1000	16	F	20	1000				
CHAMBER WALL	4	16	Y12	4000	64	M	35	3800	(100)	(100)		
		16	Y12	3700	64	N	35	3500	(100)	(100)		
		38	Y16	2900	152	P	37	2750	(100)	(100)		
	1	48	Y10	700	48	Q	35	200	(250)	(250)		
CHAMBER SUMP	2	7	Y12	2650	14	R	38	800	1100	800		
		5	Y12	1850	10	S	38	600	700	600		
		2	Y12	1550	8	T	38	100	1400	100		
	4	2	Y12	850	8	U	38	100	700	100		
PLINTH	2	7	Y12	1500	14	V	54	250	1200	(100)		
		4	Y12	2200	8	W	55	150	300	1400	300	150
	1	2	Y12	450	2	X	38	100	320	(100)		
PIPE OPENING	2	8	Y12	1400	16	Y	20	1400				
LIFTING HOOK	2	4	Y12	1100	8	Z	53	300	245	75	245	(300)
	8	10	12	16	20	25	32	40	TOT	BENDING SCHEDULE		
R										ISOLATION VALVE CHAMBER		
Y	21	873	1545						2439			
TOT	21	873	1545						2439			

Engineer:

KEON

CONSULTING ENGINEERS

TECHNO

DESIGNS

Civil Structural & Transport Engineers

Client:

Johannesburg Water

JOHANNESBURG WATER

Turbine Hall,
65 Nene Piloa Street,
Newtown, Johannesburg

THESE NOTES SERVE AS AN ADDENDUM TO THE SPECIFICATION IN THE BILL OF QUANTITIES (BOQ). IN THOSE CASES WHERE THE BOQ SPECIFICATIONS DIFFER FROM THESE NOTES, THESE NOTES SHALL TAKE PRECEDENCE.

0 5 10 15 20 25 30 40 50MM

Engineer:
T.Chikwata Pr Eng (20140009)

Designed By:
T.Magumo

Checked By:
T.Chikwata

Signature: _____ Date: September 2023

Signature: _____ Date: September 2023

Signature: _____ Date: September 2023

CONCRETE NOTES:

1.0 SETTING OUT AND GENERAL:

1.1 THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ARCHITECT'S DRAWINGS.

1.2 ALL DIMENSIONS AND HEIGHTS ARE TO BE CHECKED ON SITE BEFORE WORK IS PUT IN HAND.

1.3 REPORT DISCREPANCIES TO ARCHITECT OR ENGINEER.

1.4 THIS DRAWING MUST NOT BE USED TO SCALE OFF. USE ONLY WRITTEN DIMENSIONS. CONTACT THE ENGINEER OR ARCHITECT WHERE CLARITY IS SOUGHT.

1.5 FOR SETTING OUT DATA, SETTING OUT POINTS AND DATUM LEVELS REFER TO SURVEY INFORMATION AND ARCHITECT'S DRAWINGS.

1.6 STRUCTURAL WORK IS TO BE CARRIED OUT IN ACCORDANCE WITH THE PROJECT SPECIFICATION AND THE RELEVANT S.A.N.S. SPECIFICATIONS. ALL CONCRETE WORK IS TO BE DONE IN ACCORDANCE WITH S.A.N.S. 1200G AND EARTHWORKS IN ACCORDANCE WITH S.A.N.S. 1200D.

1.8 CONSULT RELEVANT ARCHITECTS, MECHANICAL, ELECTRICAL & PLUMBING DRAWINGS AND DETAILS AS RELEVANT FOR DRAINAGE, STORMWATER OUTLETS, RWOPS AND HOLES AND SLEEVES FOR THESE SERVICES. NO HOLES ARE TO BE CORED WITHOUT ENGINEERS WRITTEN APPROVAL.

2.0 FOUNDATIONS

2.1 ALL FOUNDATION EXCAVATIONS TO BE INSPECTED AND APPROVED IN WRITING BY THE ENGINEER BEFORE CONCRETE IS CAST.

2.2 CAST:

NO FOUNDATIONS ARE TO BE CAST IN FILL MATERIAL. A 50mm THICK LAYER OF 10MPa / 19mm BLINDING CONCRETE IS TO BE CAST UNDER ALL REINFORCED BASES, REINFORCED STRIP FOOTINGS AND GROUND BEAMS.

2.3 ANY OVER EXCAVATIONS ARE TO BE MADE GOOD WITH 10MPa / 19mm CONCRETE AT THE CONTRACTOR'S EXPENSE.

2.4 BACKFILLING OVER COLUMN BASES SHALL BE DONE WITH AN APPROVED MATERIAL COMPACTED IN LAYERS IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS.

2.5 ALLOWABLE BEARING PRESSURE UNDER:

CONCRETE BASES + 150kPa

STRIP FOOTINGS + 100kPa

3.0 CONCRETE

3.1 CONCRETE CHARACTERISTIC 28 DAY STRENGTH:

BASES: 25MPa / 19mm

STRIP FOOTINGS: 20MPa / 19mm

SURFACE BEDS: 30MPa / 19mm

SUSPENDED SLABS & BEAMS: 30MPa / 19mm

3.2 CONCRETE MIX DESIGNS FOR ALL GRADES OF CONCRETE TO BE GIVEN TO ENGINEER FOR PERUSAL AND COMMENT. CONCRETE MIX DESIGNS FOR SURFACE BEDS TO HAVE MINIMUM BLEED CHARACTERISTICS.

3.3 ALL CONCRETE TO BE ADEQUATELY CURED BY KEEPING SURFACES CONTINUOUSLY DAMP FOR AT LEAST 5 DAYS AFTER CASTING.

3.4 ALL CONCRETE TO BE CONSTRUCTED TO THE S.A.N.S. 1200G PERMISSIBLE DEVIATION DEGREE OF ACCURACY CLASS II UNLESS SPECIFIED OTHERWISE.

3.5 CONCRETE CUBE TEST RESULTS TO BE SUBMITTED TIMEOUSLY TO ENGINEER FOR PERUSAL, RECORDS, COMMENT AND APPROVAL.

4.0 REINFORCEMENT

4.1 CHARACTERISTIC STRENGTH:

MILD STEEL: 250N/mm²

HIGH YIELD STEEL: 450N/mm²

4.2 ALL REINFORCEMENT TO BE CHECKED AND APPROVED BY ENGINEER BEFORE ANY CONCRETE IS CAST. 48 HOURS WRITTEN NOTICE TO BE GIVEN TO ENGINEER BEFORE TIME OF INSPECTION.

4.3 LAP LENGTH TO REINFORCING TO BE MINIMUM 50 x SMALLER BAR DIAMETER, UNLESS OTHERWISE NOTED.

4.4 MESH REINFORCEMENT REFERENCE 245 TO BE PLACED IN SLAB (TOP) MINIMUM LAPS = 300mm UNLESS OTHERWISE NOTED.

4.5 THE CONTRACTOR MUST TAKE PARTICULAR CARE TO ENSURE THAT THE SPECIFIED COVER TO ALL REINFORCEMENT HAS BEEN ATTAINED THROUGHOUT BEFORE THE ENGINEER IS CALLED TO SITE FOR INSPECTION OF THE REINFORCEMENT.

4.6 COVER TO REINFORCEMENT:

STRIP FOOTINGS: 50mm

COLUMNS AND WALLS: 50mm

SUSPENDED SLABS: 30mm

4.7 SUSPENDED BEAMS:

CONTRACTOR IS TO CONDUCT HIS OWN INSPECTION OF REINFORCEMENT BEFORE CALLING THE ENGINEER FOR INSPECTION.

5.0 FORMWORK AND PROPPING

5.1 STRIPPING TIMES FOR:

COLUMN AND WALL: 7 DAYS IN HOT WEATHER, 12 DAYS IN COLD WEATHER

BEAM SHUTTERING: 7 DAYS IN HOT WEATHER, 14 DAYS IN COLD WEATHER

5.2 PROPPING TIMES FOR:

SLABS AND BEAMS: 21 DAYS

14 DAYS IN HOT WEATHER, 21 DAYS IN COLD WEATHER

5.3 CONCRETE FINISHES: UNLESS NOTED OTHERWISE COLUMNS AND WALLS: OFF SHUTTER BEAMS AND SLAB SOFFIT: OFF SHUTTER TOP OF SUSPENDED SLABS: STEEL FLOAT SURFACE BEDS: POWER FLOAT

5.4 SIDES OF GROUND BEAMS TO BE SHUTTERED.

Refer To Drawing No:

Key Plan:

No Date Details Chd Appd

Revisions

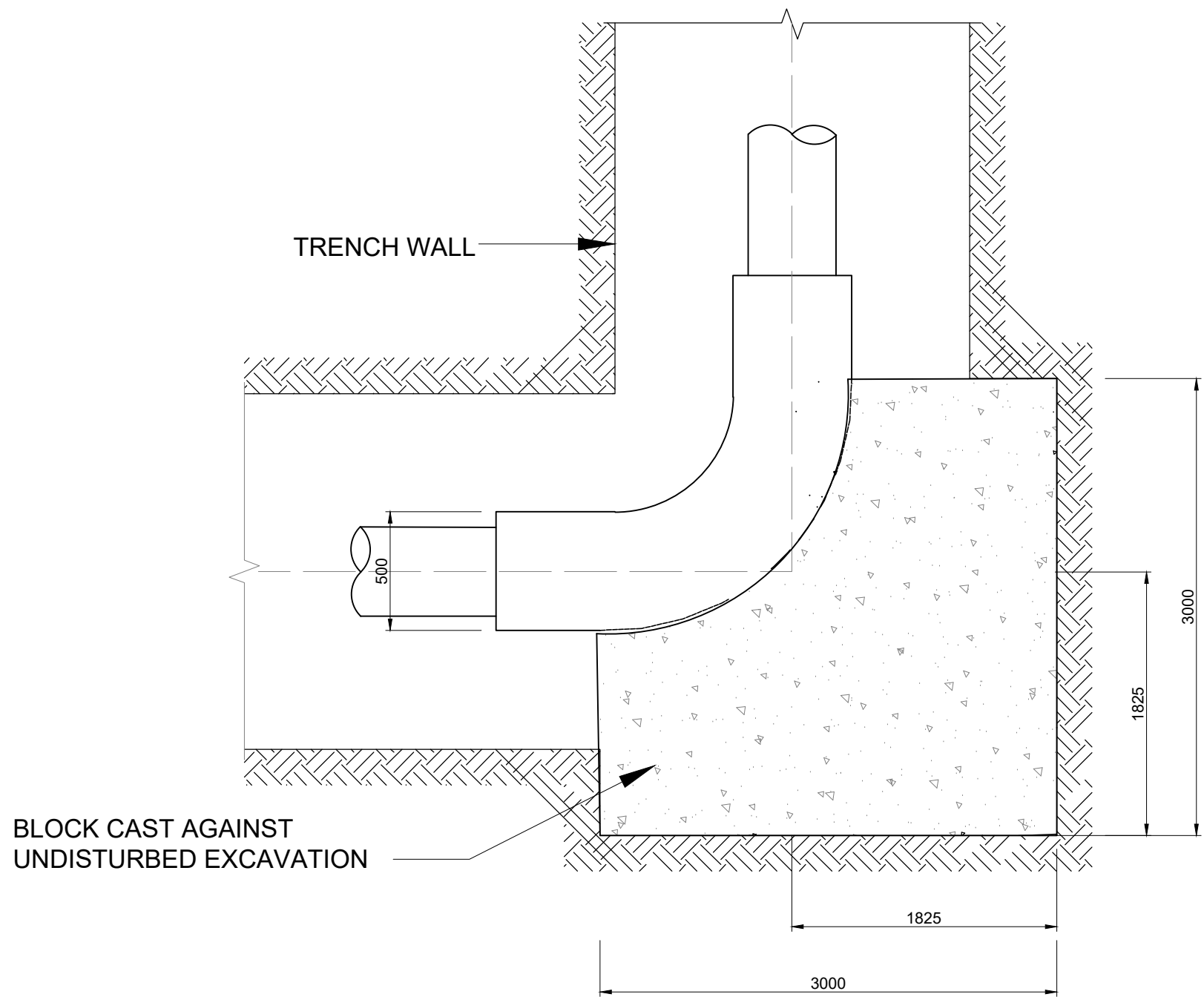
Project: JW14406-LINBRO PARK TOWER (WITH ASSOCIATED WORKS)

Description: ISOLATION VALVE CHAMBER REBAR LAYOUT, SECTIONS & DETAILS

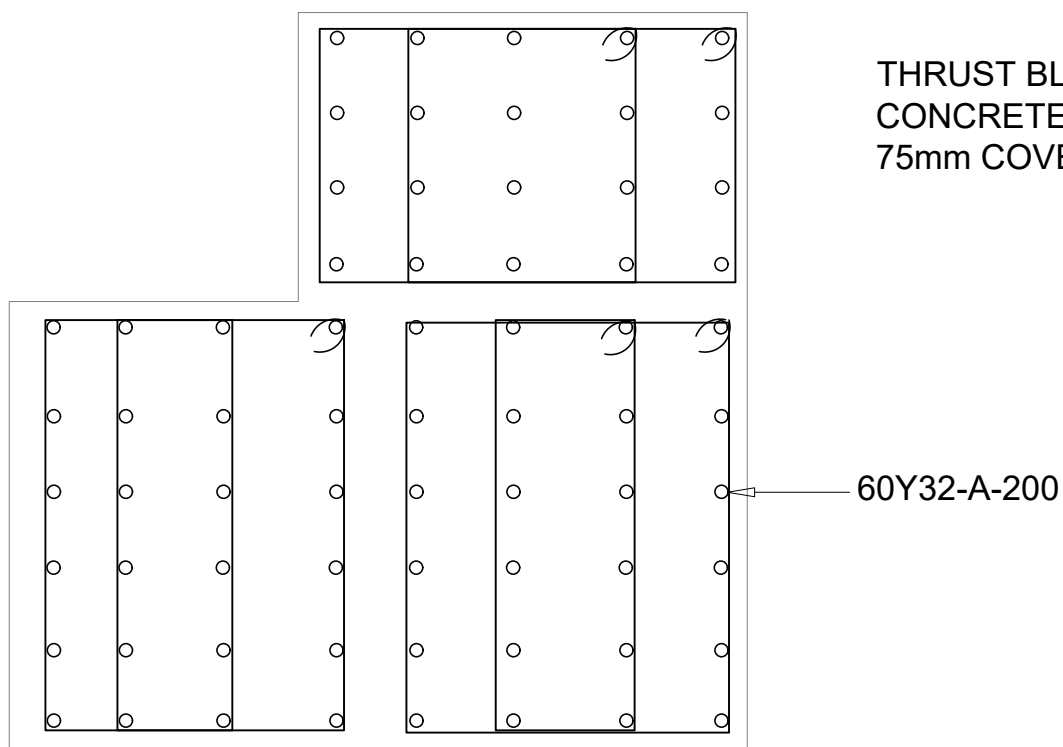
Issued For: TENDER

Size: A1 Scale: As Shown Sheet No: 2 OF 2 Original Date: Sept 2023

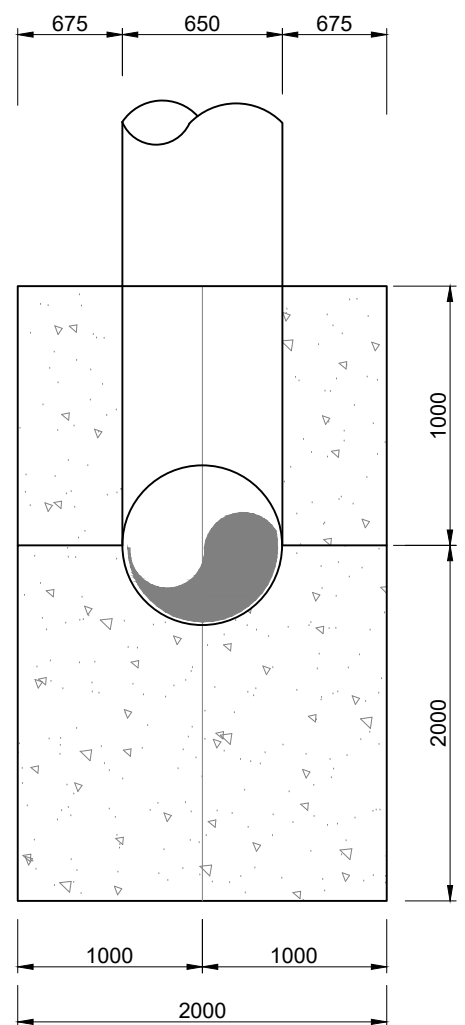
Project No: C01486 Drawing No: CP-25 Revision: T0



THRUST BLOCK A FOR 90° BEND
SCALE 25

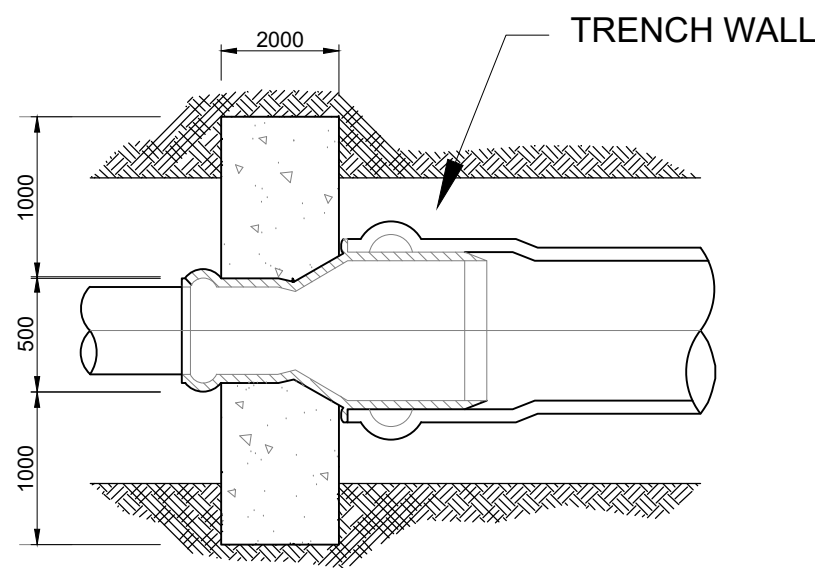


PLAN
(650mm Ø PIPE)
REINFORCEMENT FOR TRUST BLOCK



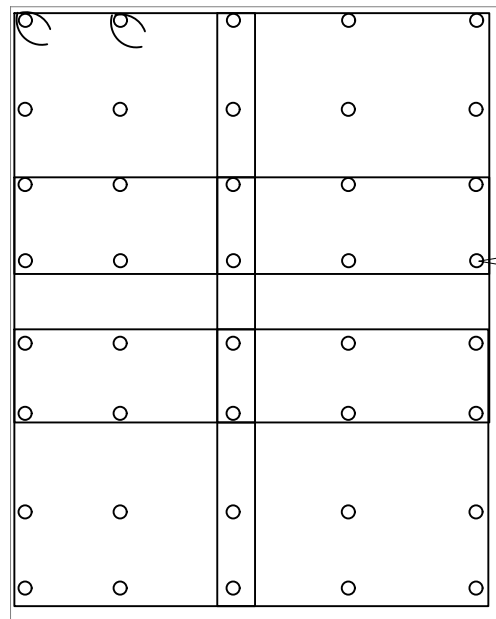
THRUST BLOCK C FOR 90°
BEND SIDE ELEVATION
SCALE 25

MEMBER	No OF	BARS PER MEMB	DIA	LENGTH	TOTAL NUM-BER	MARK	S	C	B E N D I N G				
									A	B	C	D	E/r
THRUST BLOCK	3	20	Y32	2200	60	A	34		1950				
LINKS		11	R12	5900	33	B	60		1120	1760			
		22	R10	3150	66	C	60		1120	390			
		44	R10	4200	132	D	60		260	1760			
	8	10	12	16	20	25	32	40	TOT	Date	BENDING SCHEDULE THRUST BLOCK C		
R	470	173							643	Det by			
Y							833		833	Ref Dwg			
TOT	470	173					833		1476	Job No			



REDUCER THRUST BLOCK B:PLAN
SCALE 25

THRUST BLOCK THICKNESS = 2000mm
CONCRETE CLASS = 30Mpa
75mm COVER REINFORCEMENT



36Y32-A-200

PLAN
(500mm Ø PIPE)
REINFORCEMENT FOR TRUST BLOCK

MEMBER	No OF	BARS PER MEMB	DIA	LENGTH	TOTAL NUM-BER	MARK	S C	B E N D I N G				
								A	B	C	D	E/r
THRUST BLOCK	1	36	Y32	2200	36	A	34	1950				
LINKS		9	R10	7900	9	B	60	1440	2440			
		36	R10	3650	36	C	60	1440	320			
		144	R10	5450	144	D	60	210	2440			
	8	10	12	16	20	25	32	40	TOT	Date		
R		609								609 Det by		
Y						500		500		Ref Dwg		
TOT		609				500		1109		Job No		

Engineer:
KEON
CONSULTING ENGINEERS
TECHNO
DESIGNS
Civil Structural & Transport Engineers

TECHNO DESIGNS ENGINEERING
34 Dane Street Glen Austin
Midrand
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CELL (072) 301 8811
GENERAL_email@technodesigns.co.za
OFFICES JOHANNESBURG
WEBSITE www.technodesigns.co.za

KEON CONSULTING ENGINEERS
5th Avenue Office Park
646 5th Avenue Newton
Port Elizabeth
TELEPHONE +27 413630180
WEBSITE www.keon.co.za

Client:
Johannesburg Water
JOHANNESBURG WATER
Turbine Hall,
65 Nereus Place Street,
Newtown, Johannesburg

THESE NOTES SERVE AS AN ADDENDUM TO THE SPECIFICATION IN THE BILL OF QUANTITIES (BOQ). IN THOSE CASES WHERE THE BOQ SPECIFICATIONS DIFFER FROM THESE NOTES, THESE NOTES SHALL TAKE PRECEDENCE ON ORIGINAL

Engineer:
T.Chikwata Pr Eng (20140009)
Drawn By:
M. Mumba
Designed By:
T. Mapfumo
Checked By:
T. Chikwata
Signature:
Date:
Sept 2023

CONCRETE NOTES:

1.0 SETTING OUT AND GENERAL:
1.1 THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ARCHITECT'S DRAWINGS.
1.2 ALL DIMENSIONS AND HEIGHTS ARE TO BE CHECKED ON SITE BEFORE WORK IS PUT IN HAND.
1.3 REPORT DISCREPANCIES TO ARCHITECT OR ENGINEER.
1.4 THIS DRAWING MUST NOT BE USED TO SCALE OFF. USE ONLY WRITTEN DIMENSIONS. CONTACT THE ENGINEER OR ARCHITECT WHERE CLARITY IS SOUGHT.
1.5 FOR SETTING OUT DATA, SETTING OUT POINTS AND DATUM LEVELS REFER TO SURVEY INFORMATION AND ARCHITECT'S DRAWINGS.
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1.8 CONSULT RELEVANT ARCHITECTS, MECHANICAL, ELECTRICAL & PLUMBING DRAWINGS AND DETAILS AS RELEVANT FOR DRAINAGE, STORMWATER OUTLETS, RWOPS AND HOLES AND SLEEVES FOR THESE SERVICES. NO HOLES ARE TO BE CORED WITHOUT ENGINEERS WRITTEN APPROVAL.
2.0 FOUNDATIONS
2.1 ALL FOUNDATION EXCAVATIONS TO BE INSPECTED AND APPROVED IN WRITING BY THE ENGINEER BEFORE CONCRETE IS CAST.
2.2 NO FOUNDATIONS ARE TO BE CAST IN FILL MATERIAL. A 50mm THICK LAYER OF 10MPa / 19mm BLINDING CONCRETE IS TO BE CAST UNDER ALL REINFORCED BASES, REINFORCED STRIP FOOTINGS AND GROUND BEAMS.
2.3 ANY OVER EXCAVATIONS ARE TO BE MADE GOOD WITH 10MPa / 19mm CONCRETE AT THE CONTRACTOR'S EXPENSE.
2.4 BACKFILLING OVER COLUMN BASES SHALL BE DONE WITH AN APPROVED MATERIAL COMPACTED IN LAYERS IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS.
2.5 ALLOWABLE BEARING PRESSURE UNDER:
CONCRETE BASES = 150kPa
STRIP FOOTINGS = 100kPa
CONCRETE
3.1 CONCRETE CHARACTERISTIC 28 DAY STRENGTH:
BASES: 25MPa / 19mm
STRIP FOOTINGS: 20MPa / 19mm
SURFACE BEDS: 30MPa / 19mm
COLUMNS: 30MPa / 19mm
SUSPENDED SLABS & BEAMS: 30MPa / 19mm
3.2 CONCRETE MIX DESIGNS FOR ALL GRADES OF CONCRETE TO BE GIVEN TO ENGINEER FOR PERUSAL AND COMMENT. CONCRETE MIX DESIGNS FOR SURFACE BEDS TO HAVE MINIMUM BLEED CHARACTERISTICS.
3.3 ALL CONCRETE TO BE ADEQUATELY CURED BY KEEPING SURFACES CONTINUOUSLY DAMP FOR AT LEAST 5 DAYS AFTER CASTING.

3.4 ALL CONCRETE TO BE CONSTRUCTED TO THE S.A.N.S. 1200G PERMISSIBLE DEVIATION DEGREE OF ACCURACY CLASS II UNLESS SPECIFIED OTHERWISE.
3.5 CONCRETE CUBE TEST RESULTS TO BE SUBMITTED TIMEOUSLY TO ENGINEER FOR PERUSAL, RECORDS, COMMENT AND APPROVAL.
4.0 REINFORCEMENT
4.1 CHARACTERISTIC STRENGTH: 450N/mm²
4.2 HIGH YIELD STEEL: 250N/mm²
4.3 ALL REINFORCEMENT TO BE CHECKED AND APPROVED BY ENGINEER BEFORE ANY CONCRETE IS CAST. 48 HOURS WRITTEN NOTICE TO BE GIVEN TO ENGINEER BEFORE TIME OF INSPECTION.
4.4 LAP LENGTH TO REINFORCING TO BE MINIMUM 50 x SMALLER BAR DIAMETER, UNLESS OTHERWISE NOTED.
4.5 MESH REINFORCEMENT REFERENCE 245 TO BE PLACED IN SLAB (TOP) MINIMUM LAPS = 300mm UNLESS OTHERWISE NOTED.
4.6 THE CONTRACTOR MUST TAKE PARTICULAR CARE TO ENSURE THAT THE SPECIFIED COVER TO ALL REINFORCEMENT HAS BEEN ATTAINED THROUGHOUT BEFORE THE ENGINEER IS CALLED TO SITE FOR INSPECTION OF THE REINFORCEMENT.
4.7 COVER TO REINFORCEMENT:
STRIP FOOTINGS: 50mm
BASES: 50mm
COLUMNS AND WALLS: 50mm
SUSPENDED SLABS: 30mm

SUSPENDED BEAMS: 30mm
CONTRACTOR IS TO CONDUCT HIS OWN INSPECTION OF REINFORCEMENT BEFORE CALLING THE ENGINEER FOR INSPECTION.
5.0 FERNWORK AND PROPPING
5.1 STRIPPING TIMES FOR:
COLUMN AND WALL SHUTTERING: 7 DAYS IN HOT WEATHER, 12 DAYS IN COLD WEATHER.
4 DAYS IN HOT WEATHER, 7 DAYS IN COLD WEATHER.
FLAT SLABS:
5.2 PROPPING TIMES FOR:
SLABS AND BEAMS: 21 DAYS
14 DAYS IN HOT WEATHER, 21 DAYS IN COLD WEATHER
CANTILEVER SLABS AND BEAMS: 21 DAYS
(SUBJECT TO CUBE TEST RESULTS BEING SUBMITTED TIMEOUSLY TO ENGINEER FOR APPROVAL)
NO DE-PROPPING OF SUSPENDED ELEMENTS UNTIL INSTRUCTED BY ENGINEER.
5.3 CONCRETE FINISHES: UNLESS NOTED OTHERWISE
COLUMNS AND WALLS: OFF SHUTTER
BEAMS AND SLAB SOFFIT: OFF SHUTTER
TOP OF SUSPENDED SLABS: STEEL FLOAT
SURFACE BEDS: POWER FLOAT
5.4 SIDES OF GROUND BEAMS TO BE SHUTTERED.

Refer To Drawing No:

Key Plan:

No	Date	Details	Chd	Appd
		Revisions		

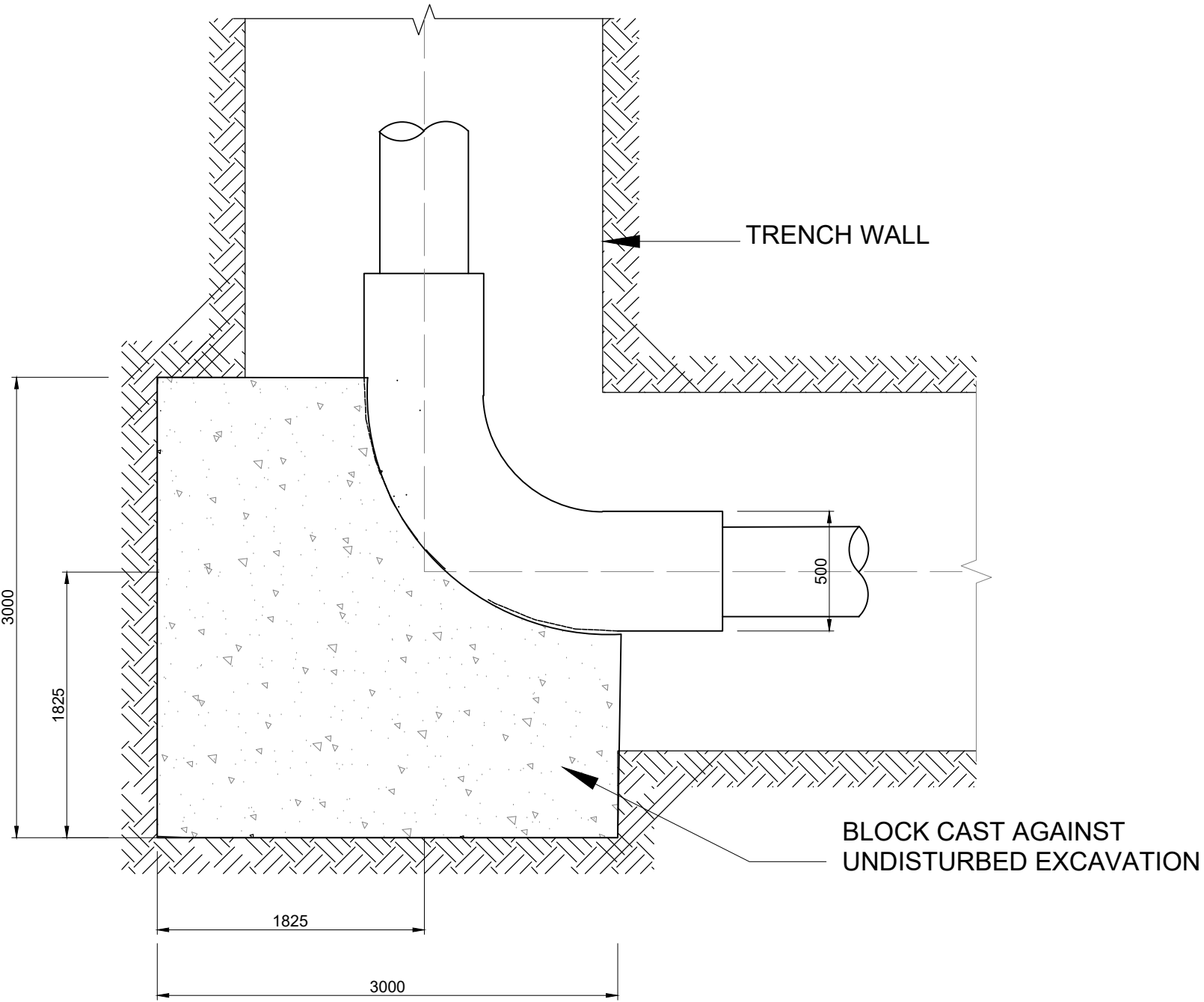
Project:
JW14406-LINBRO PARK TOWER
(WITH ASSOCIATED WORKS)

Description:
THRUST BLOCK B CONCRETE
LAYOUT&REBAR

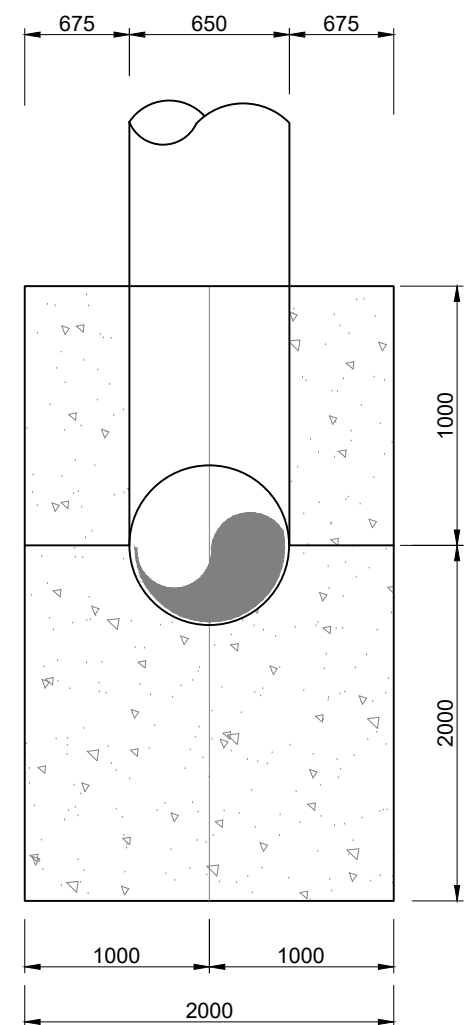
Issued For:
TENDER

Size	Scale	Sheet No	Original Date
A1	As Shown	1 OF 2	Sept 2023

Project No:	Drawing No:	Revision:
C01486	CP-27	T0

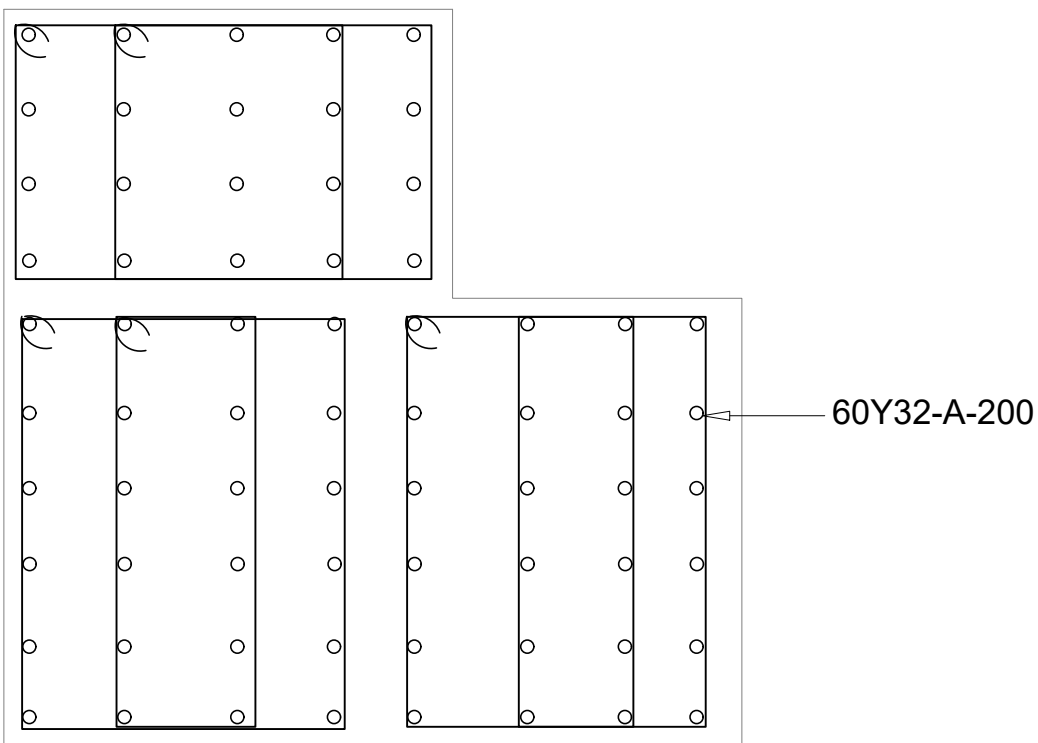


THRUST BLOCK C FOR 90° BEND
SCALE 25



THRUST BLOCK C FOR 90°
BEND SIDE ELEVATION
SCALE 25

THRUST BLOCK THICKNESS = 2000mm
CONCRETE CLASS = 30Mpa
75mm COVER REINFORCEMENT



PLAN
(500mm Ø PIPE)
REINFORCEMENT FOR TRUST BLOCK

MEMBER	No OF	BARS PER MEMB	DIA	LENGTH	TOTAL NUM-BER	MARK	S	C	B E N D I N G				
									A	B	C	D	E/r
THRUST BLOCK	3	20	Y32	2200	60	A	34		1950				
LINKS		11	R12	5900	33	B	60		1120	1760			
		22	R10	3150	66	C	60		1120	390			
		44	R10	4200	132	D	60		260	1760			
	8	10	12	16	20	25	32	40	TOT	Date		BENDING SCHEDULE	
R	470	173							643	Det by		THRUST BLOCK C	
Y							833		833	Ref Dwg			
TOT	470	173					833		1476	Job No			



LM CONSULTING

Engineering Geologists

INTERPRETIVE GEOTECHNICAL INVESTIGATION REPORT for

THE PROPOSED NEW JOHANNESBURG WATER ELEVATED
TOWER & PIPELINE IN LINBRO PARK, GAUTENG PROVINCE

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1. INTRODUCTION

1.1 Preamble

LM Consulting Engineering Geologists (LM) was appointed by Keon Techno JV to carry out a detailed geotechnical investigation for the proposed new Johannesburg Water's (JW) Elevated Tower & Bulk Water Steel pipeline in Linbro Park within the City of Johannesburg Metropolitan Municipality, Gauteng Province.

The geotechnical investigation was carried out to determine the soil and rock profile below the proposed development areas and to provide recommendations for the foundations of structures and pipeline bedding. The investigation was carried out in accordance with "SIAICE (2009) Site investigation code of practice" requirements.

The pipeline route was originally planned to travel parallel to the northern edge of Peace Street, however due to the existence of several underground utility services within the pipeline services corridor, the pipeline route was recently change and positioned along the southern road boundary. The existing service along the corridor includes a Johannesburg Water Pipelines, optic fibre, stormwater lines and electricity cables.

1.2 Objectives

The primary objective of the investigation was to assess the suitability of the site for the proposed development and obtain engineering parameters for the design of foundations at the site.

This report presents preliminary recommendations for site preparation (earthworks), soil and rock excavatability and for the design and construction of foundations. The report provides geotechnical parameters on which the foundation and superstructure designs may be based. The terms of reference for this investigation are as follows:

- Determine stratigraphy of the site and its geotechnical properties.
- To determine whether any problem soils are present at the site that would influence either founding or construction methods for the structures.
- To delineate the site into appropriate geotechnical zones according to any essential differences in founding conditions encountered.
- To evaluate the founding conditions at the site and to recommend building precautions, if necessary, for the different geotechnical zones.
- Provide recommendations on the re-use potential of existing materials.
- Comment on the founding depth and the allowable bearing capacity to be adopted for design.
- Comment on the suitability of the site for the proposed development; and
- Provide an excavatability classification for the site as per SANS1200 specification.

This report is not by any means a detailed design report; it is a geotechnical report, for preliminary design of foundations, a geotechnical engineer and structural engineer would need to be consulted.

1.3 Proposed Development

According to information communicated by the client, the proposed development comprises the construction of a new water supply system with the following structures: -

- 2 x 1500kl Elevated Tower.
- Pump Station: and
- New 0.6km, 700mm & 650mm diameter bulk water steel pipeline

The proposed pipeline invert levels (long-section) were not communicated at the time of the investigation, however three (3) pipe jacking location below Clulee Road and Peace Street are proposed.

1.4 Available Information

The following sources were consulted and/or made available:

- Previous investigations in the area undertaken by LM Consulting Engineering Geologist and other consultants.
- The 1:250 000 geological map, “No 2628 East Rand” was consulted to determine the regional geology at or near the site.
- The 1:50 000 topo-geological map “2628 AA Johannesburg” was consulted to determine the regional geology at or near the site.
- The 1:50 000 topo-cadastral map “2628 AA Johannesburg” was assessed for topography and drainage of the site.
- An A1 drawing no. JW00000-JHB-LAY-W011 entitled SERVICE LAYOUT, WATER SUPPLY SYSTEM, LINBRO PARK, ELEVATED TOWERS PUMPING STATION AND PIPELINE, at a scale of 1:1000 and dated April 2022.
- An A0 drawing no. 3021-196-100, entitled WATER SUPPLY SYSTEM, LINBRO PARK, 2 ELEVATED TOWERS PUMPING STATION AND PIPELINE, at a scale of 1:5000 and dated January 2022.
- An A1 drawing no. JW14301-DET03-0, entitled LAYOUT PLAN, at a scale of 1:2000 and dated 31/01/2020.
- An A1 drawing no. JW14301-DET02-0, entitled LOCALITY PLAN, at a scale of 1:10000 and dated 20/05/2014.
- An A1 drawing no. JW14301-DET10-0, entitled STANDARD DETAILS FOR TRENCH EXCAVATION AND BACKFILL FOR STEEL PIPES > 400mm ND, at a scale of 1:1125 and dated 31/01/2020.
- Aerial photographs sourced from Google Earth®; and

- Seismic hazard map of South Africa.

2. SITE LOCATION AND DESCRIPTION

2.1 Site Location

The two proposed elevated towers are located within the Johannesburg Water Reservoir Complex in Linbro Park, approximately 15 km north east of Johannesburg CBD, Gauteng Province, and at approximate centre coordinates Latitude 26° 6'11.15"S, Longitude 28° 8'0.33"E, whilst the area proposed for the pumping station is also located within the reservoir complex site

The proposed pipeline commences at the proposed new reservoirs and traverses parallel to Peace Street, terminating at a connection point at Hilton Road. Two pipejacking are proposed across Peace Street, whilst the other jacking point is proposed across Clulee Road.

Vegetation across the proposed development areas comprises medium to long veld grass and scattered shrubs. The location of the area being developed is indicated on the locality map, attached in Appendix A.

2.2 Site Topography

The proposed reservoir site is generally flat with a slight fall towards the north and northeast, at an average gradient of approximately 3% and at altitudes of between 1619m (south) to 1618m (north) above mean sea level.

The topography of the proposed pipeline route varies from elevations of between 1620m above mean sea-level (amsl) in the east at the Linbro Park Reservoir Complex 1611m (amsl) in the west at Hilton Road. The slope gradient of pipeline route is approximately 1.5% towards the west. Surface runoff, particularly during periods of heavy or prolonged rainfall is expected to be in the form of sheetwash towards the slope directions. The site elevations are taken from Google Earth. An extract of the topographical map of the investigated area is presented in Appendix B.

2.3 Climate

Polokwane normally receives about 700mm of rain per year, with most rainfall occurring during summer. It receives the lowest rainfall (4mm) in June and the highest (132mm) in January. The average midday temperatures for the area ranges from 10°C in July to 21°C in January.

Weinert developed an N-value which is the ratio of the annual evaporation versus annual precipitation of a region and has been defined for Southern Africa region (Weinert, 1980). Climatic regime of the present and recent past plays an important role in the soil profile below the earth's surface (A.B.A Brink). The N-values are therefore used to characterise mode of weathering of the rocks within the subcontinent.

Weinert demonstrated that chemical decomposition is the predominant mode of rock weathering in areas where climatic “N-value” is less than 5. In areas where climatic N-value is between 5 and 10, disintegration is the predominant form of weathering, although some chemical decomposition of the primary rock minerals still takes place. Where the climatic N-value is greater than 10, secondary minerals do not develop to an appreciable extent and all weathering takes place by mechanical disintegration of the rock.

Weinert’s climatic N-value for the investigated area is between 2 and 5 as indicated in Figure 1 below. This implies that rocks are extensively weathered, often to depths of several metres, and decomposition is pronounced.

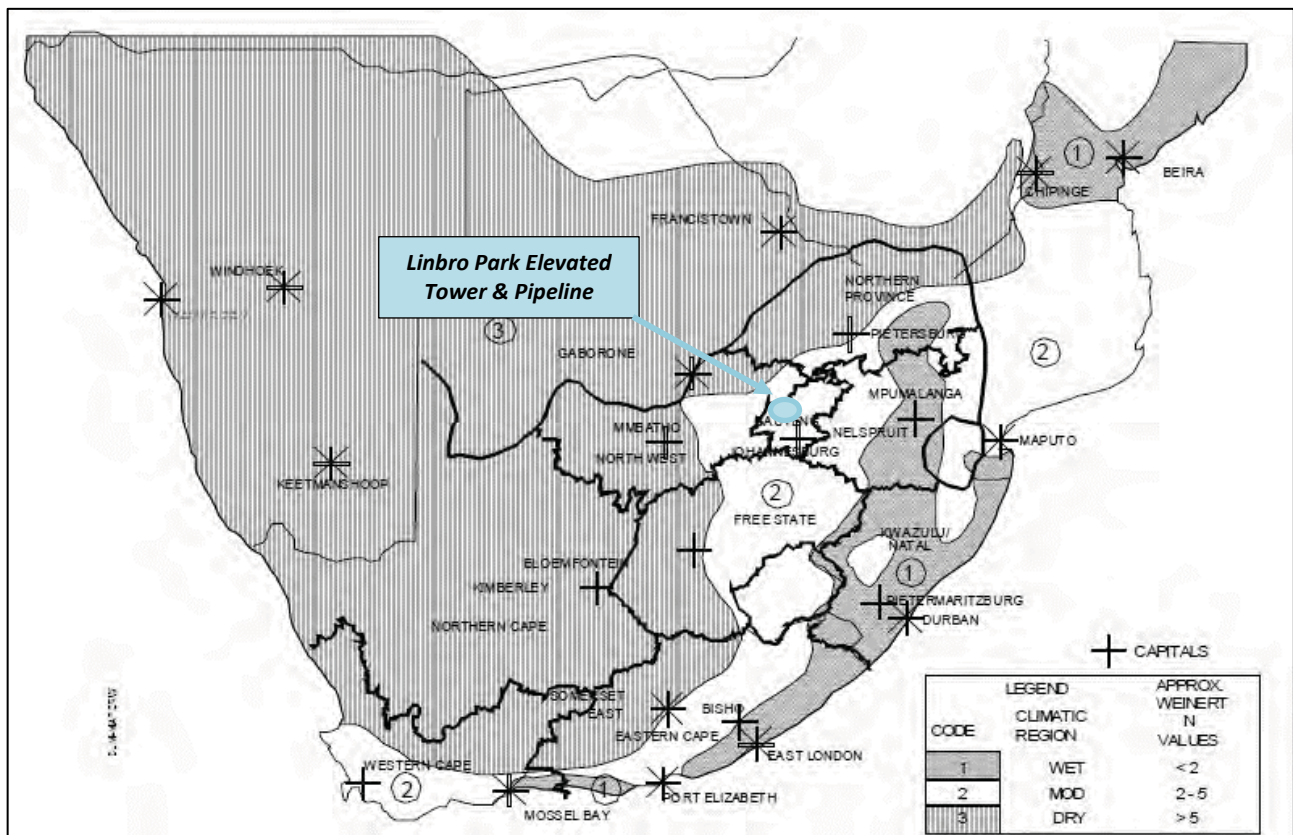


Figure 1: Macro Climatic Regions of South Africa – Taken from TRH3:2007 – adapted from Weinert, 1980

2.4 Seismicity

Seismic hazard can be described as intrinsic natural or mining-induced occurrence of earthquakes or earth tremor resulting in ground motion or other effects. Examples of such phenomenon include surface faulting, ground shaking and ground liquefaction.

A seismic hazard analysis is the probability that an earthquake will occur in each geographic area, within a given window of time, and with ground motion intensity exceeding a given threshold. The seismic hazard map of South Africa indicates that the proposed site lies within an area where there is a 10% probability that Peak Ground Acceleration (PGA) of between 0.16g and 0.12g will be exceeded in 50 years.

The peak ground acceleration is the maximum acceleration of the ground shaking during an earthquake. Two types of seismic activities occur in South Africa, namely regions of natural seismic activity (Zone I) and regions of mining-induced and natural seismic activity (Zone II).

Based on this information, the risk of seismic events for the study area is moderate to high and it falls within both natural induced regions (Zone II). An extract of the Seismic Hazard Map of South Africa is presented in Figure 2.

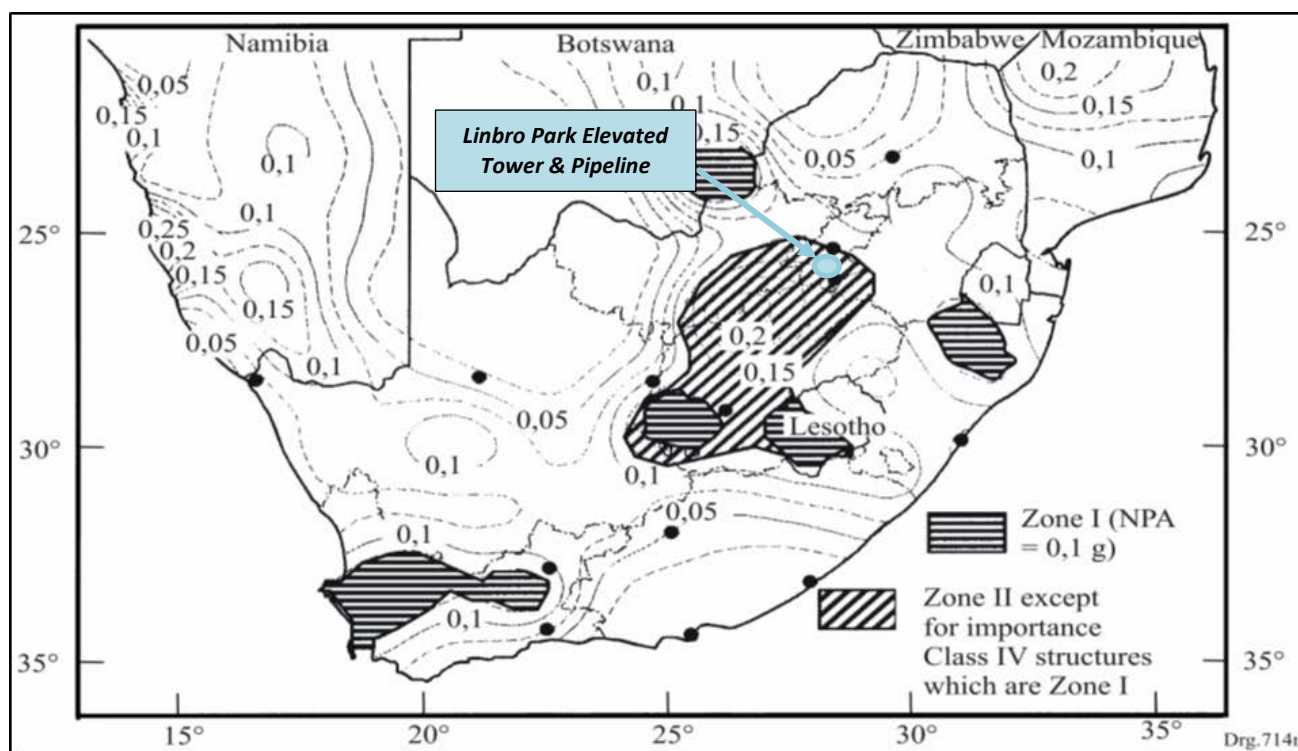


Figure 2: Seismic Hazard Map of South Africa

2.5 Sinkhole and Ground Subsidence/Dolomitic land

Sinkhole formation occurs in areas with very large to extremely large underground cavities resulting from poorly designed shallow underground activities. Dissolution of dolomites or limestones over millions of years, may lead to cavity formations which later manifest as sinkholes.

The available geological map and field observations indicate that the site is not underlain by dolomite rock at surface or at depth (<100m). The site is therefore not classified as dolomitic land and is not at risk in terms of dolomite related surface subsidence.

2.6 Undermining

No indication of the presence of undermined ground was found during the desk study. It is certain that the site is not shallowly undermined and there is no risk of surface settlements/subsidence that may be caused by mining activities.

3. GEOLOGICAL SETTING AND GEOHYDROLOGY

3.1 Hydrogeology (Groundwater)

According to the Water Resource Commission report (WRC, 1995), the area falls within the quaternary catchment A21C aquifer system management classifying as “minor”. This means potential fractured rocks with no high primary permeability or variable permeability with electrical conductivity concentrations of between 0 and 70 mS/m. This also means that the extent of the aquifer may be limited, moderately yielding with variable water quality.

The aquifer produces low quantities of water; however, they are equally important for domestic supplies and supplying the base river flow. This aquifer is rated as four (4) with regard to the Groundwater Quality Management (GQM) Index. This index means the aquifer has medium levels of vulnerability rating and requires moderate level of protection (WRC, 1995).

Information obtained from the groundwater levels map of RSA published by the Department of Water Affairs, suggest groundwater in the area is estimated to be at depths less than 20m below natural ground level. No groundwater seepage was recorded in any of the test pits excavated during this investigation. However, the groundwater rest level was measured in borehole BH01 days after completion of drilling, suggest rest water level at 13.8m below natural ground level.

3.2 Regional Geology

A review of the 1:250 000 (2628 East Rand) and the 1:50 000 (2628 AA Johannesburg) geological series maps indicate the regional geology comprises Bryanston granodiorite (**Z-g**), mafic and ultramafic (**Z**) rock belonging to the Basement Complex, as exposed in the Johannesburg-Pretoria Dome.

Typically, these Archaean intrusive igneous rocks are crosscut by dolerite / syenites dykes (**V-di**) of various ages. By experience it is known that the depth of weathering in the granitic rocks is highly variable, with the possibility of large corestone remnants and whaleback within a granite profile. Patches of highly collapsible and kaolinised residual soils are possible, particularly in the elevated areas above 1500m above mean sea level. An extract of the regional geological map is presented in Figure 3.

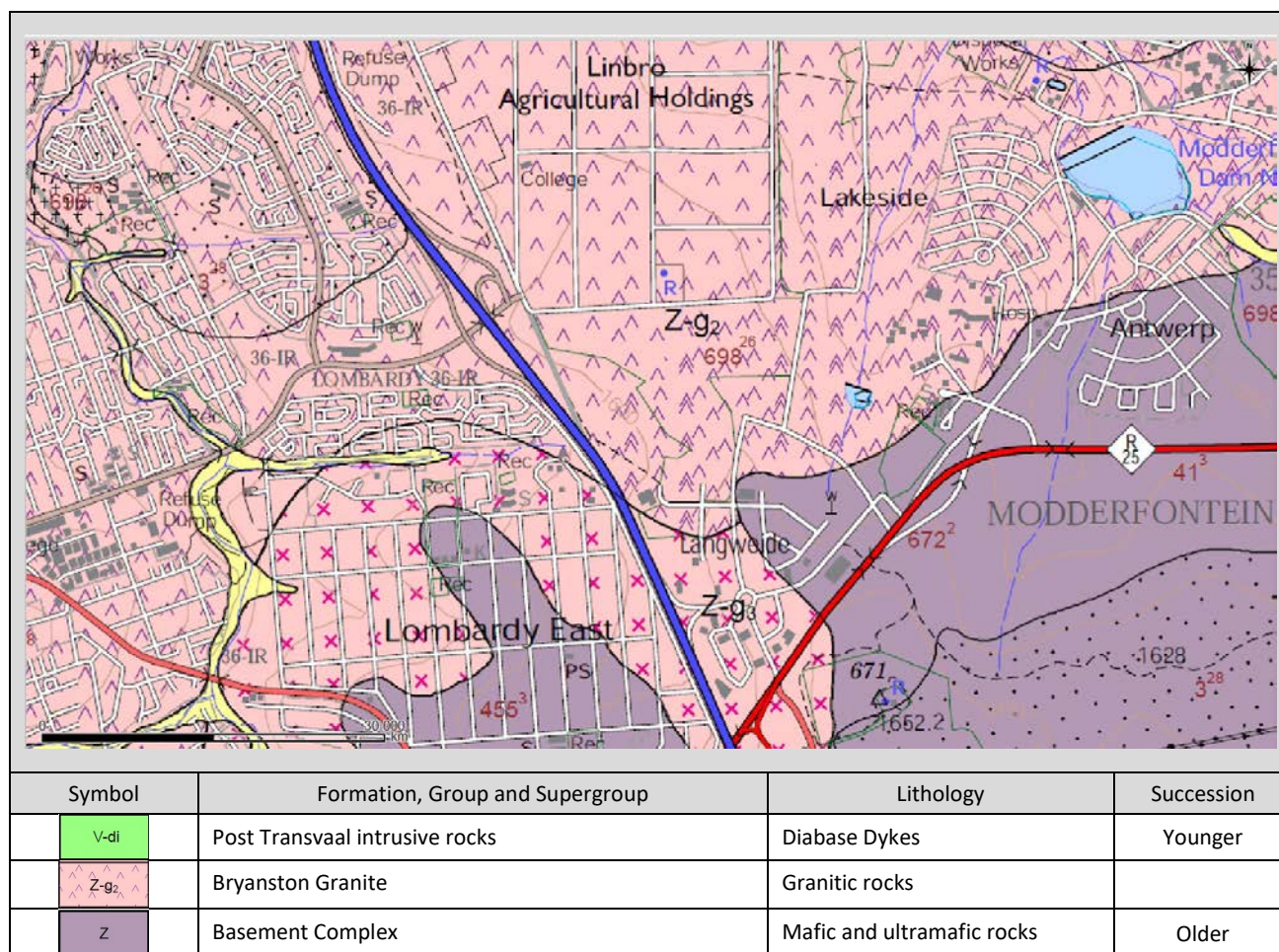


Figure 3: Regional Geology map

3.3 Site Geology

The geotechnical investigation revealed that the proposed reservoir site is predominantly underlain by transported hillwash soils which are in-turn underlain by residual granite soils of the Basement Complex indicated as (Z-g) on the geological map. The residual granite soils are underlain by soft rock to hard rock granite at depth.

The pipeline route is underlain by fill material and minor transported hillwash soils. These fill and transported soils are in-turn underlain by residual granite soils.

4. SITE INVESTIGATION METHODOLOGY

4.1 Site Reconnaissance

Surface mapping was undertaken to develop a clear perspective of the actual site conditions. The main objective of this field mapping was to evaluate the structural condition of the existing buildings, site geomorphology, geology (outcrops and boulders etc.), storm water runoff and mine/dolomite related subsidence. This reconnaissance was conducted prior to commencement of any field work.

4.2 Test Pit Excavations

The investigation was carried out across the proposed development area and in accordance to site Investigation code of practice (SAICE 2009, SANS 634:2012 and GFSH-2:2002).

On the 12th of May 2022, five (5) test pits were excavated along the proposed pipeline route using CAT 422 E Tractor-Loader Backhoe (TLB), hired from a local contractor. The test pits were excavated to depths of between 3.0m and 3.3m below current ground level. A two-person team carried out the test pitting to comply with accepted safety requirements as reflected in the South African Code of Practice (SAICE, 2007). The test pits were profiled by a competent engineering geologist in accordance with the “Guidelines for Soil and Rock Logging in South Africa”, 2nd Impression 2002, sampled as necessary and then loosely backfilled.

The test pit positions were positioned to provide broad coverage of the underlying geology and subsoil conditions and were designated TP01 through to TP05. The positions of the test pits were recorded using a handheld GPS, with their locations shown on the site layout plan included as Appendix C. The detailed test pit profiles and test pit photos are attached in Appendix D and Appendix E, respectively. A summary of test pits excavated is shown in Table 1.

Table 1: Summary of test pit information.

Test Pit ID.	Handheld GPS Coordinates		Final Depth (m) bcgl	Invert Level (m) bcgl	Ground Elevations (masl)	Water Seepage (m)	Comment
	Latitude	Longitude					
TP01	26° 6'14.71"S	28° 8'0.82"E	3.3	-*	1617	No water seepage	No refusal of TLB
TP02	26° 6'15.19"S	28° 7'57.11"E	3.0	-*	1618	No water seepage	o refusal of TLB
TP03	26° 6'15.25"S	28° 7'55.87"E	3.1	-*	1618	No water seepage	o refusal of TLB
TP04	26° 6'15.36"S	28° 7'50.37"E	3.0	-*	1617	No water seepage	o refusal of TLB
TP05	26° 6'15.54"S	28° 7'44.33"E	3.1	-*	1612	No water seepage	o refusal of TLB

Legend: masl = meter above sea level; bcgl = below current ground level; * = Not provided

4.3 Rotary Core Drilling

Between 7th and 18th March 2022, two (2) rotary core boreholes were drilled to depths of between 17.9m and 19.35m below current ground level. The boreholes were used to confirm the geological conditions within the footprint of the proposed development area. These boreholes were selected by LM Consulting Engineering Geologists and positioned on site using a hand-held GPS unit with an accuracy of 3m.

The boreholes were advanced by rotary core drilling methods using an NWD4 double tube core barrel with an inner split tube for recovery of 52mm diameter soil and rock samples. Continuous core recovery was always striven for during the drilling to ensure that the extraction of the core from the core barrel is carried out in such a way to minimize disturbance of the core. Temporary casing was installed, where required, at the discretion of the driller.

SPT tests were conducted in both the boreholes drilled on site. To determine the level of the perched or permanent water table, groundwater level measurements were taken at the start and end of each shift and days after completion of the borehole. The core was photographed and logged by an experienced engineering geologist in accordance with “Guidelines for Soil and Rock Logging in South Africa, 2nd Impression, 2002”. Selected rock samples will be taken and submitted to an approved rock laboratory for strength and deformation properties.

The layout plan, attached in Appendix E, indicates the position of the boreholes whilst the detailed borehole profiles and photographs are attached in Appendix I and Appendix J, respectively. A summary of the drilled boreholes is shown in Table 2.

Table 2: Summary of drilled boreholes

BH ID.	Handheld GPS Coordinates		Final Depth Drilled (m) bcgl	Ground Elevations (masl)	Ground Water (masl)	Comment
	Latitude	Longitude				
BH01	26° 6'12.53"S	28° 8'1.06"E	19.35	1620	13.8	Borehole terminated on hard rock granite
BH02	26° 6'12.52"S	28° 8'0.17"E	17.9	1621	-*	Borehole terminated on hard rock granite

Legend: masl = meter above sea level; bcgl = below current ground level; -* = Borehole blocked

4.4 Laboratory Tests

Representative samples recovered from the test pits and boreholes were sent to the SANAS-accredited Engineering Materials Laboratory for testing. The soil testing included determination of the Foundation Indicators (comprising sieve and hydrometer grading analyses and Atterberg Limits), compaction test and rock strength test. The laboratory test results are included as Appendix H and discussed in section 6. **Laboratory test results along the pipeline are currently still outstanding and will be incorporated as an addendum of the final report.**

4.5 Dynamic Probe Super Heavy (DPSH) Test

In addition to the test pits, Dynamic Probing Super Heavy (DPSH) tests are currently being conducted adjacent to all the test pit and selected locations along the pipeline route. The DPSH tests are carried out to estimate the density/consistency site soil material.

The DPSH is carried out using a hammer that delivers energy to the rod string by dropping a 63,5kg weight from a height of 762mm. The hammer ran using auxiliary hydraulics on the probing unit. The number of blows required to drive the cone through each successive 300mm penetration is continuously recorded. The results of DPSH test **are currently still outstanding and will be incorporated as an addendum of the final report.**

5. RESULTS OF NEAR SURFACE INVESTIGATION

5.1 Test Pits & Boreholes

The detailed descriptions of the soil profiles encountered in the test pits are presented in Appendix D, while the geological profiles are summarised Table 3 and for both the pipeline route and reservoir site. The individual layers of the geological profiles are described below.

Table 3: Summary of Test Pits

TP/BH ID.	Fill (m)	Hillwash (m)	Pebble Marker (m)	Reworked Residual Granite (m)	Residual Granite (m)	Soft to Medium Hard Rock Granite(m)	Medium Hard to Hard Rock Granite (m)
Test Pits							
TP01	-	-	-	0.0 – 0.8	0.8 – 3.3	-	-
TP02	-	-	-	0.0 – 1.0	1.0 – 3.0	-	-
TP03	0.0 – 0.8	-	-	0.8 – 1.1	1.1 – 3.1	-	-
TP04	0.0 – 1.1	-	-	1.1 – 3.0	-	-	-
TP05	0.0 – 1.1	-	1.1 – 1.3	1.3 – 3.1	-	-	-
Boreholes							
BH01	-	0.0 – 0.3	0.3 – 0.6	0.6 – 2.1	2.1 – 10.35	10.35 – 14.85	14.85 – 19.35
BH02	-	0.0 – 0.3	0.3 – 0.5	0.5 – 1.7	1.7 – 8.9	8.9 – 13.3	13.3 – 17.9

5.1.1 Fill

The fill encountered along the southern extent of the Peace Street and along the proposed pipeline servitude is highly variable and comprise: “slightly moist to moist, grey brown banded light brown and red, loose through to dense with isolated medium dense zones, intact, sandy silt to silty sand”. This material was also observed to be yellow brown in colour and was probably stockpiled during the constructions of Longmeadow Business Estate . The fill material is observed from surface and extend to depths of between 0.8m and 1.1m current ground level.

5.1.2 Transported material

The transported soils (hillwash) are typically non-cohesive and only observed in BH02 and BH02 from surface to a depth of 0.3m below current ground level. This material comprised “moist, grey brown, loose to medium dense, intact, silty sandy gravel”.

5.1.3 Pebble Marker

The pebble marker horizon represents the contact zone between the upper transported soils, and the lower residual materials. This material is observed in both boreholes drilled within the footprint of the reservoir site and in one test pit (TP05). This material generally comprises “slightly moist, dark brown, medium dense, intact, gravelly silty sand with abundant angular quartz and sub-rounded granite gravel”. The pebble marker is

intersected below the hillwash and fill soils at depths of between 0.3m and 1.1m below current ground level and is approximately 0.2m thick.

5.1.4 Reworked Residual Granite

The reworked residual granite layer was encountered in all the test pits and boreholes on site. This stratum is typically described as “moist, red brown slightly mottled orange brown, medium dense, intact, slightly clayey silty sand”. This horizon was encountered from surface and below the fill, and pebble marker soils, at depths of between 0.5m and 1.3m below current ground level. This material extends to depths of between 0.8m and 3.1m below current ground level.

5.1.5 Residual Granite

Residual granite originates from the in-situ weathering of the granite parent rock and underlies the reservoir site and the entire pipeline route. This material is encountered at depths of between 0.8m and 3.1m below ground level and extends to depths of between 8.9m and 10.35m. The residual granite generally comprises “orange brown blotched red brown and greenish grey, medium dense grading to dense and very dense, slightly relict jointed, gravelly silty sand to sand gravel”. Medium hard rock to hard rock pegmatite remnants and veins are common within the residual granite profile.

5.1.6 Soft Rock to Medium Hard Rock Granite

Soft to medium hard rock granite horizon typically described as “orange brown blotched red brown and greenish grey, highly weathered, medium to coarse grained, highly jointed, very soft rock grading to medium hard rock with depth”. The soft rock granite is intersected at depths of between 8.9m and 10.35m below ground level and extends to depths of between 12.4m and 14.84m below ground level. This material often comprised random medium hard rock zone of pegmatite granite.

5.1.7 Medium Hard Rock to Hard Rock granite

The medium hard rock to hard rock granite comprises “greenish grey blotched light grey to off-white, slightly weathered, coarse grained, moderately jointed, medium hard rock to hard rock becoming very hard rock with depth”. This horizon is intercepted at depths of between 13.3m and 17m and extends to depths greater than those investigated.

6. GEOTECHNICAL ASSESSMENT

6.1 Laboratory Testing

Representative samples were retrieved during the field investigation and submitted to a South African National Accreditation System-accredited (SANAS) laboratory. The following tests were scheduled.

6.1.1 Foundation Indicator Tests

Four (4) disturbed samples were submitted to the laboratory and subjected to foundation indicator testing (as per SANS 3001 test methods) to determine the basic engineering properties of the in-situ materials the results are attached in Appendix H and summarized in Table 4 below. **Laboratory test results for the proposed pipeline are currently still outstanding and will be incorporated as an addendum of the final report.**

Table 4: Summary of foundation Indicator laboratory results

Test Pit/BH ID.	Depth (m)	Description	Soil Composition				GM	Atterberg Limits			NMC	Activity	USCS	AASHTO
			Clay (%)	Silt (%)	Sand (%)	Gravel (%)		LL (%)	PI (%)	LS (%)				
Reworked Residual Granite														
TP05	1.3 – 3.1													
Residual Granite														
TP01	0.8 – 3.3													
TP02	1.0 – 3.0													
BH01	3.4 – 5.4	Silty Sandy Gravel	12	15	29	44	1.3	44	8	4.0	-	Low	SC	A-2-5
BH02	1.95 – 3.45	Silty Sandy Gravel	10	12	22	55	1.6	34	10	4.8	-	Low	SC	A-2-4

Legend: GM = Grading Modulus; LL = Liquid Limit; PI = Plasticity Index; LS = Linear Shrinkage; NMC = Natural Moisture Content; SC = Clayey sands, poorly graded sand-clay mixtures; SM = silty sand, poorly graded sand-silt mixtures; NP = Non-plastic; Neg = Negligible; USCS = Unified Soil Classification System; AASHTO = American Association of State Highway Officials

Based on the samples taken from BH01 and BH02, the **residual granite** layer, consists of clayey sands, poorly graded sand-clay mixtures (**SC**) in terms of the United Soils Classification System (USCS). The drainage characteristic of this material is good to fair (impervious), with low compressibility when compacted. These soils are reasonably medium in texture, with a moderate grading modulus of between 1.3 and 1.6.

These soils consist of coarse fractions (>0.060mm) of between 73% and 77% with fine fractions component of 23% and 27%. The sample tested indicate the material has a low potential of expansiveness (PI<12%) and will be subjected to low heave according to the method proposed by Van der Merwe (1973). According to the AASHTO Classification System, the material classifies as A-2-4 and A-2-5, which rates as excellent to good quality for use as a subgrade layer.

6.1.2 Compaction Tests

Two (2) bulk sample were taken for compaction (MOD and CBR) testing to determine the compaction characteristics of the in-situ material. **The results are currently outstanding** and will be included in Appendix H and summarized in Table 5 below.

Table 5 Summary of Compaction Characteristics results

Test Pit ID.	Depth (m)	Description	OMC (%)	MDD (kg/m³)	Max Swell (%)	CBR at Mod. AASHTO Compaction Effort				TRH14
						90 (%)	93 (%)	95 (%)	98 (%)	
Residual Granite										
TP01	0.8 – 3.3									
TP02	1.0 – 3.0									

Legend: OMC = Optimum Moisture Content; MDD = Maximum Dry Density; CBR = California Bearing Ratio; TRH = Technical Recommendations for Highways; Mod = Modified AASHTO = American Association of State Highway Officials.

6.1.3 Compactibility Tests

Two (2) samples were submitted for compactibility tests to determine its suitability as a selected granular material or a selected fill blanket. **The results are currently outstanding** and will be included in Appendix H and summarized in Table 6 below.

Table 6: Summary of compactibility characteristics

TP ID.	Depth (m)	Material Type	Compatibility Factor	Moisture Content (%)
Residual Granite				
TP01	0.8 – 3.3			
TP02	1.0 – 3.0			

6.1.4 Acid Soluble Sulphate Tests

One (1) sample was submitted for chloride and soluble sulphate tests. **The result is currently outstanding** and will be summarized in Table 7.

Table 7: Summary of chloride and soluble sulphate test results

Test Pit ID.	Depth (m)	Description	Soluble SO ₃ (%)
Residual Granite			
TP02	1.0 – 3.0		

6.1.5 Basson Index Tests

One (1) Basson Index testing was undertaken to determine the aggressiveness and corrosivity of the soils to buried concrete and metal. **The result is currently outstanding** and will be summarized in Table 8.

Table 8: Summary of Basson test results

Test Pit ID.	Depth (m)	Material Type	Aggressiveness Index	Langelier Index	Basson Index
Residual Granite					
TP01	0.8 – 3.3				

6.1.6 Uniaxial Compressive Strength Tests

Five (5) representative disturbed samples were taken for Uniaxial Compressive Strength Tests (UCS) to determine the strength properties of the rock. The laboratory rock testing was conducted by Rocklab Laboratory in accordance with the ISRM's (International Society for Rock Mechanics) specification. The results are summarized in Table 9.

Table 9: Summary of Uniaxial Compressive Test Characteristic Results.

Borehole ID.	Depth (m)	Description	Density (g/cm ³)	Failure Load (kN)	UCS (MPa)	Failure Mode
BH01	15.13 – 15.36	Medium Hard Rock	2.6	21.48	10.4	Failure completely on a discontinuity with an orientation of between 21° and 30° to the specimen axis
BH02	9.9 – 10.02	Very Soft Rock	2.39	9.56	4.6	Sliding shear failure
BH02	11.5 – 11.68	Soft Rock	2.4	16.24	7.6	Failure completely on a discontinuity with an orientation of between 0° and 10° to the specimen axis
BH02	12.54 – 12.7	Medium Hard Rock	2.45	23.05	10.9	Sliding shear failure
BH02	13.4 – 13.61	Hard Rock	2.55	61.03	29.7	Sliding shear failure

The classification of rock hardness (Brink and Bruin, 1990) is given in Table 10.

Table 10: Classification of Rock Hardness

Classification	Field Test	Range of Minimum compressive strength (MPa)
Very Soft Rock	Can be pealed with a knife: material crumbles under firm blow with the sharp end of a geological pick	1 to 3
Soft Rock	Can just be scraped with a knife: indentions of 2mm to 4mm with firm blows of the pick point	3 to 10
Medium Hard Rock	Cannot be scraped or pealed with a knife: hand-held specimen breaks with firm blows of the pick	10 to 25
Hard Rock	These materials are usually only broken with some difficulty and ring when struck. Classification can be assessed by Schmidt hammer/point load test and verified by uniaxial compressive strength testing	25 to 70
Very Hard Rock		70 to 200
Extremely Hard Rock		>200

The results indicate dry densities of between 2.39 g/cm³ and 2.6 g/cm³ with a UCS values of between 4.6MPa and 7.6 MPa for the soft rock granite and between 10.4MPa and 10.9MPa for the medium hard rock. The hard rock granite material comprise a UCS value of 29.7MPa. Based on these test results, the overall strength of the rock is controlled by the presence of the fractures and not by the intact rock mass strength.

7. RECOMMENDATIONS

It is to be noted that pipeline investigation was conducted recently due to changes in location and therefor a number of laboratory test results are currently missing. Furthermore, DPSH test are also currently ongoing and therefore Spangler's Modulus of Soil Reaction and Modulus of Subgrade Reaction cannot be determined, however, based on previous experience in the area, the following can be assumed for the pipeline, assuming invert levels at between 2.5 and 3.5m:-

7.1 Spangler's Modulus of Soil Reaction (E-Values)

The Spangler's modulus of soil reaction, denoted E values (and other parameters) for pipe thickness design and design requirements are taken from the standard BS EN 1295 Table NA.1 and indicated in Table 11.

Table 11: Guide values of Spangler modulus of native soils

Table NA.1 Guide values of Spangler modulus for native soils					
Soil type	Spangler modulus for soils in various conditions (MN/m ²)				
	Very dense	Dense	Medium dense	Loose	Very loose
Gravel	Over 40	15 to 40	9 to 15	5 to 9	3 to 5
Sand	15 to 20	9 to 15	4 to 9	2 to 4	1 to 2
Clayey, silty sand	10 to 15	6 to 10	2.5 to 6	1.5 to 2.5	0.5 to 1.5
Clay	Very hard	11 to 14			
	Hard	10 to 11			
	Very stiff	6 to 10			
	Stiff	4 to 6			
	Firm	3 to 4			
	Soft	1.5 to 3			
	Very soft	0 to 1.5			

The Spangler Modulus MN/m² for soils conditions excavated on site are provided in Table 12 below:

Table 12: Summary of Spangler's modulus

Test Pit No.	Inverts Level (m)	Final Depth (m) bcgl	Soil Type at base of test pit	Consistency	E-Values (MN/m ²)
TP01		3.3	Gravelly silty sand	dense	9 – 15
TP02		3.0	Gravelly silty sand	Very dense	15 – 20
TP03		3.1	Gravelly silty sand	Very dense	15 – 20
TP04		3.0	Gravelly silty sand	Medium dense	4 – 9
TP05		3.1	Clayey silty sand	Medium dense-	2.5 - 6

7.2 Embedment Classes based on British Standards

Embedment classes tables for ductile iron pipe are defined in BS EN 1295-1:1997 and presented in Table 13.

Table 13: Embedment classes (BS9295:2010, guide to structural design of buried pipeline)

Class	Component	Materials
S1	Bed and sidefill	Gravel (single size)
S2		Gravel (graded)
S3		Sand and coarse grained soil with <12% fines
S4		Coarse grained soil with >12% fines OR Fine grained soil, liquid limit <50%, medium to no plasticity and >25% coarse grained material
S5		Fine grained soil, liquid limit <50%, medium to no plasticity and <25% coarse grained material
D	Bed	Trench bottom with joint holes to ensure that the barrel is fully supported
	Sidefill	S3 to S5

Based on the laboratory test results of the in-situ soils, the embedment classes are presented in Table 14.

Table 14: Embedment classes

Material Type	Class
Reworked residual granite	S4
Residual granite	S4

7.3 Pipeline Earthworks

In terms of the SANS 1200LB (1983), bedding material for buried flexible pipelines comprise "selected granular material", selected fill material" and "main fill" is used to blanket the buried pipeline.

7.3.1 Selected Granular Material - Bedding Cradle

Stage 1 or selected granular material is the zone that is placed beneath the pipe and extends up the sides to a specified thickness and must comprise a selected granular material of non-cohesive material that is singularly graded between 0.6mm and 19mm, is free draining and has a compatibility factor not exceeding 0.4, or other values specified under the project specifications. Singularly graded is defined as a material in which over 90 % by mass of the grains is retained on a single sieve of any specified size aperture between stated limits.

Generally, "selected granular material for Stage 1 backfill shall comprise loose fine soil being mainly sandy or clayey material with a plasticity index not exceeding 15. Selected granular material shall contain no oukclip or materials chemically deleterious to the pipe and shall be free of pebbles, stones and fragments of shattered rock with maximum dimensions exceeding 10mm.

In terms of the Unified Soil Classification System, the soil for Stage 1 backfill shall be well graded with the Coefficient of Uniformity, $C_u > 5$ and the Coefficient of Curvature (C_c) in the range $1 < C_c < 3$

The maximum dry density of the soil for Stage 1 backfill determined from the Modified AASHTO -T180 test shall be greater than 1950kg/m³. Selected granular material shall be compacted to 90% of Modified AASHTO density in 200mm maximum thick layers.

If the trench is excavated in hard rock material, then the Stage 1 material should be foam cement mortar or soilcrete". Based on the results of the sieve analysis of the soils encountered on site, the in-situ materials meets the criteria with regards to compatibility factor and dry density, however the anticipated high PI on the reworked residual granite material may throw it out. It is recommended that selected granular material is imported. The PI could be reduced by addition of lime and cement; however, this would need to be tested.

7.3.2 Selected Fill Material

Stage 2, or the selected fill blanket is the material extending from above the bedding, which is placed and compacted around and above the pipe. This material shall have a plasticity index (PI) not exceeding 6, a maximum particle size not exceeding 30mm and be free of vegetation according to SABS 1200LB.

Generally, stage 2 backfill should be compacted to 85% of Modified AASHTO density in 300mm maximum thick layers which have varying thicknesses throughout the length of the pipe. For a 1.6m wide trench, approximately 7000m³ of material will be required.

The in-situ residual granite soils on site are not suitable for use as selected fill due to its high plastic index.

7.3.3 General Backfill

This material, also known as "main fill", is an approved filling material placed in the pipe trench on top of the "selected fill material" up to ground level and normally consists of material originally removed from the trench for the pipe excavation. It has no specific stipulations in respect of material quality, other than that it must be free of excessively large boulders.

All the subsoils encountered on site may be used as general backfill provided boulder size fractions (>200mm) are removed.

7.4 Foundations for the Proposed Reservoirs

It is recommended that the proposed reservoir structures should be founded on piles, designed by a competent practitioner with all foundation loads designed to act in end-bearing. The design of a permanent pile should take into account the anticipated corrosive environment.

It is recommended that foundations are taken down through the residual material with occasional boulders / pegmatite and socketed into the underlying granite bedrock. Competent hard rock granite rockhead was encountered at depths ranging between 13m and 18m below existing ground level.

7.5 Ancillary Structure

The proposed ancillary structures such as the proposed pump stations should be founded on a reinforced concrete raft designed by a structural engineer experienced in such design. The concrete raft should be placed on at least 500mm of G6/G7 material compacted to 95% Mod AASHTO, where a maximum allowable bearing capacity of 75kPa can be achieved. Site drainage and plumbing/service precautions.

7.6 Construction material

No existing borrow pits in close proximity to site were identified. The selected granular material and selected fill blanket should be imported.

7.7 Excavation Classification

Based on the test pits and boreholes, it is anticipated that the site would classify as “soft excavation” to depths of between 8m and 10m, in accordance with of SABS 1200D: 1988 Earthworks classification. Below these depths soft rock becoming medium hard rock should be anticipated and a classification of “hard” should be expected.

All test pits excavated during the investigation of the proposed site were reported as having stable sidewalls and stood vertically, unsupported whilst profiling was carried out. It is recommended that the sides of any excavations deeper than 1.5m should be battered to 1:1.5, to ensure enough slope stability to prevent collapse of the sidewalls. During periods of heavy rainfall however, the sides of the excavations should be regularly examined, to ensure the safety of the excavation for personnel and equipment working in them.

7.8 Underground services

In some areas the proposed pipeline will be constructed in close proximity to existing pipelines and other services. This may be problematic during construction, particularly where trench instability will be encountered, as the proximity of the nearby pipelines will prevent battering back of the trench sidewalls to a stable angle. Potential loss of support to the adjacent pipelines during trenching must be taken into consideration during construction and planning.

7.9 Construction Problems

The following general construction problems are envisaged during construction: -

- Availability of suitable material for an engineering fill.
- Corestones and hard pegmatite within the residual material should also be anticipated.
- Safety for workers and pedestrians, along deep excavations, must be adequately addressed prior to the commencement of the project.
- Existing underground services may require detection to avoid damage during construction.

- Excavations need to be located such that it does not impinge into the backfill of the adjacent pipeline; and
- Attention must be paid to ensure a uniform surface and compaction of bedding material.

7.10 General

All test pits were loosely backfilled upon completion of the fieldwork. To avoid the possibility of localised settlement occurring below structures due to the consolidation settlement of this loose backfill, it is recommended that each test hole be identified and adequately backfilled in 150mm layers, to at least 90% Mod AASHTO density.

7.11 Additional Investigations

Based on the excavated test pits and drilled borehole, further near surface investigations are not deemed necessary at this stage of the project.

8. CONSTRUCTION MONITORING

8.1 Excavation Inspection

Excavations must be battered at 60° to ensure stability. All trenches and excavation works must be properly backfilled and compacted in 150 mm thick layers and compacted to 90% of modified AASHTO density.

It is recommended that during construction stage of the project all excavations and foundation trenches be inspected by a geotechnical engineer or engineering geologist to verify that the recommended founding and backfill materials are not at variance with those described herein and to ensure side wall stability.

8.2 Control Testing

Regular checks should be made on both the quality and compaction of the material used in the terrace layers to ensure design requirements is met.

9. REPORT PROVISIONS

The geotechnical conditions referred to in this report are specifically those observed from excavated test pits and boreholes. Probably, variant conditions with those discussed above can be encountered elsewhere due to the limited number of boreholes and test pits excavated. Any change from the expected ground conditions should then be considered during design and construction; hence construction supervision by a competent person is advised.

All information and deductions contained within this report are dependent not only on access to the site and previous information, but also on the accuracy of the results received from the laboratory.

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11. APPENDICES

APPENDIX A: LOCALITY PLAN

APPENDIX B: TOPOGRAPHICAL MAP

APPENDIX C: GEOTECHNICAL LAYOUT PLAN

APPENDIX D: TEST PITS PROFILES

APPENDIX E: TEST PIT AND SITE PHOTOGRAPHS

APPENDIX F: BOREHOLE PROFILES

APPENDIX G: BOREHOLE PHOTOGRAPHS

APPENDIX H: LABORATORY TEST RESULTS

APPENDIX A

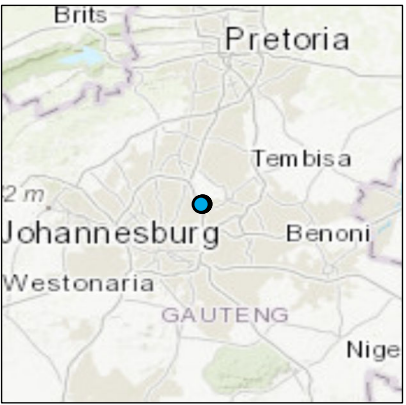
LOCALITY PLAN



LOCALITY MAP

Legend

-  Pipeline
-  Elevated Tower



CLIENT	
KEON CONSULTING ENGINEERS	 TECHNO DESIGNS Civil, Structural & Transport Engineers
PROJECT NAME	
GEOTECHNICAL INVESTIGATION FOR PROPOSED JOHANNESBURG WATER LINBRO PARK ELEVATED TOWER AND WATER PIPELINE	
PROJECT NO.	LM-22-006
DATE	2022/05/11
DRAWN BY	ASEMAHLE QOBOKA

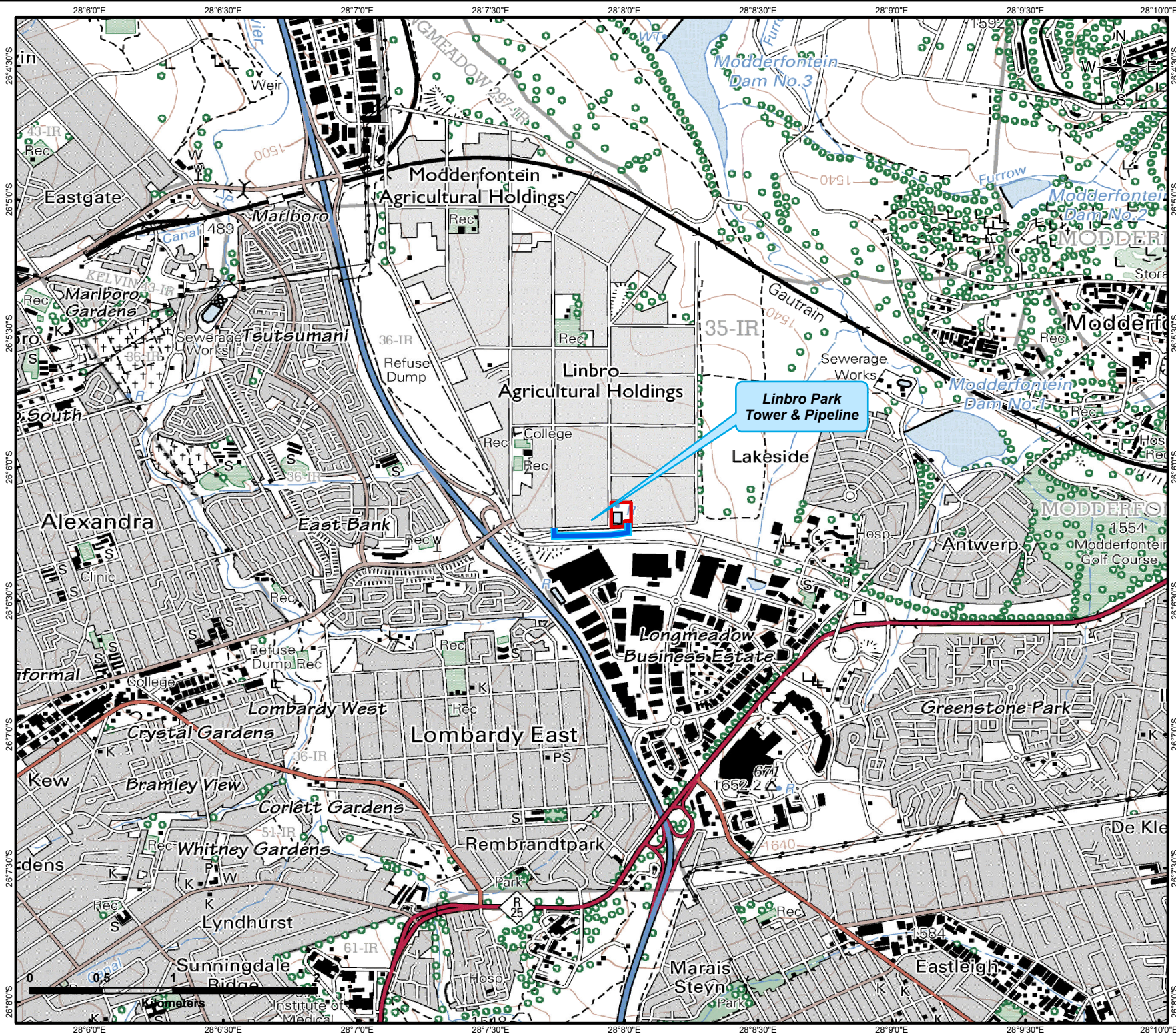


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APPENDIX B

TOPOGRAPHICAL MAP



**EXTRACT OF 1:50 000
TOPOGRAPHICAL MAP SERIES;
2628AA JOHANNESBURG**

Legend

- International Boundary
- Provincial Boundary
- Protected Area
- Perennial Water
- Non-perennial River
- Non-perennial Water
- Dry Water Course
- Dry Pan
- Marsh and Vlei
- Pipeline (agl)
- Water Tower; Reservoir; Coastal Rocks
- Prominent Rock Outcrop
- Erosion; Sand
- Woodland
- Cultivated Land
- Orchard or Vineyard
- Recreation Ground
- Row of Trees
- National Freeway & Route
- Arterial Route
- Main Road
- Secondary Road; Bench Mark
- Other Road; Bridge
- Track and Hiking Trail
- Railway; Station or Siding
- Other Railway; Tunnel
- Embankment; Cutting
- Power Line
- Built-up
- Buildings; Ruin
- Post Office; Police Station
- Place of Worship; School; Hotel
- Fence; Well
- Windpump; Monument
- Communication Tower
- Mine Dump; Excavation
- Trig Station; Marine Beacon
- Lighthouse and Marine Light
- Cemetery; Grave

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**GEOTECHNICAL INVESTIGATION
FOR PROPOSED JOHANNESBURG
WATER LINBRO PARK ELEVATED
TOWER AND WATER PIPELINE**

PROJECT NO. LM-22-006

DATE 2022/05/11

DRAWN BY ASEMAHLE QOBOKA

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APPENDIX C

GEOTECHNICAL LAYOUT PLAN



GEOTECHNICAL LAYOUT PLAN

- Legend**
- Boreholes
 - Test Pits
 - Water Pipeline
 - Linbro Park Reservoir Site
 - Proposed Reservoir

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DESIGNS
Civil, Structural & Transport Engineers

PROJECT NAME

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TOWER AND WATER PIPELINE**

PROJECT NO. LM-22-006

DATE 2022/05/12

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APPENDIX D

TEST PIT PROFILES

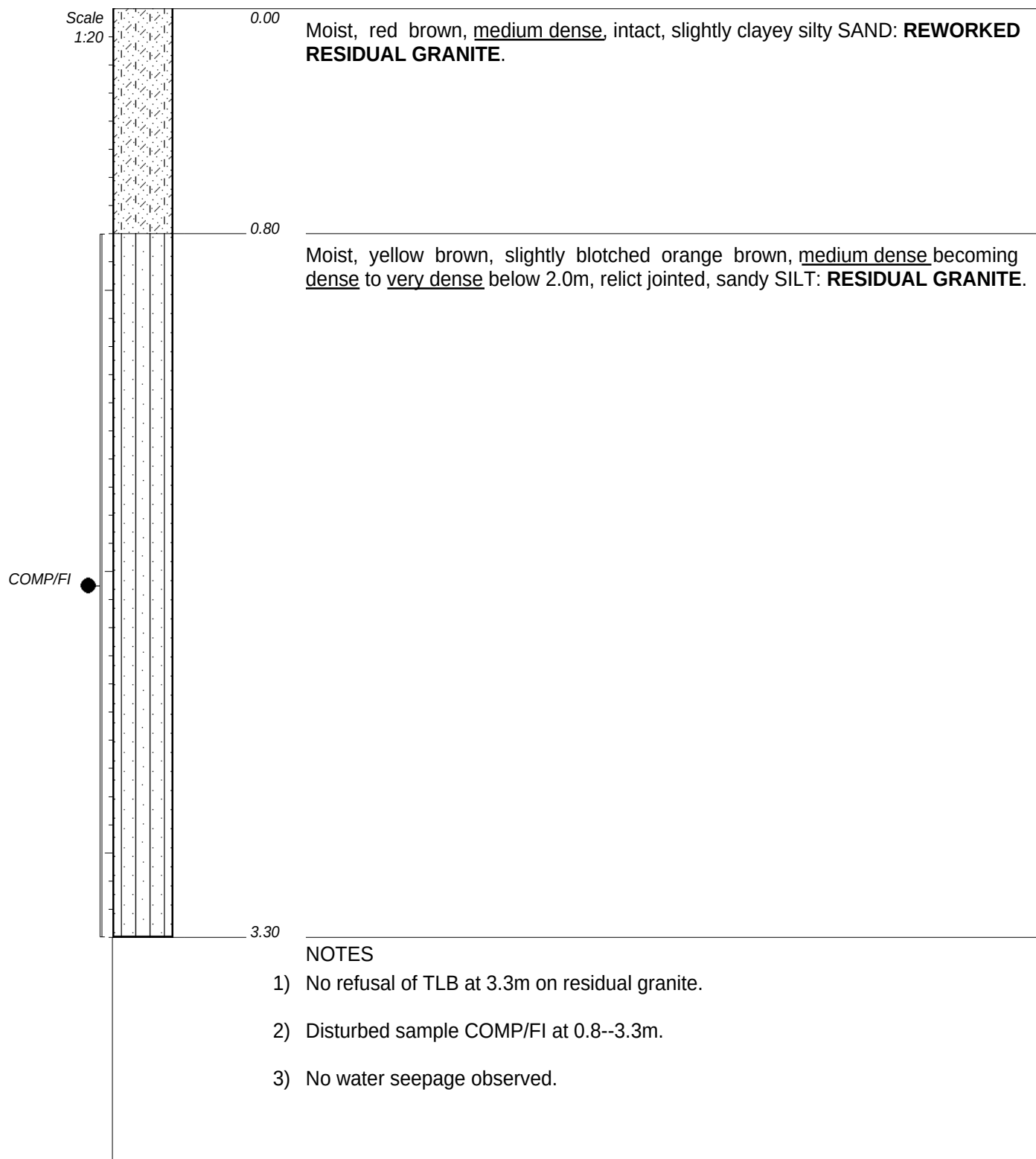


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Linbro Park
City of Johannesburg Municipality
Gauteng Province.

HOLE No: TP01
Sheet 1 of 1

JOB NUMBER: LM-22-006



CONTRACTOR : Ferro Plumbing
MACHINE : CAT 422E
DRILLED BY : Ndebele
PROFILED BY : TM

TYPE SET BY : TM
SETUP FILE : STANDARD.SET

INCLINATION : Vertical
DIAM : Test Pit
DATE : 12/05/2022
DATE : 12/05/2022
DATE : 12/05/2022 19:29
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ELEVATION : 1617m amsl
X-COORD : 28° 8'0.82"E
Y-COORD : 26° 6'14.71"S

HOLE No: TP01

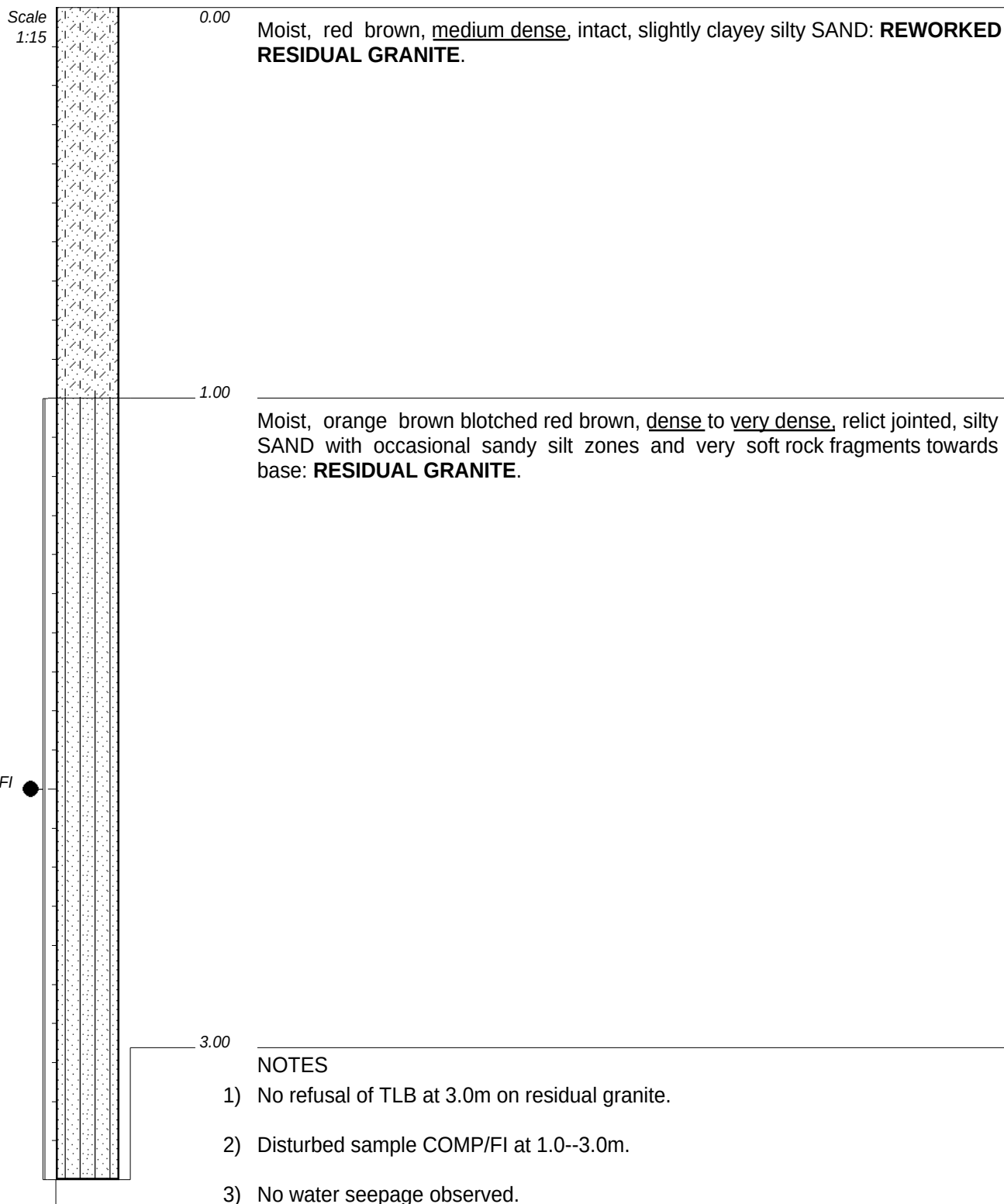


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HOLE No: TP02
Sheet 1 of 1

JOB NUMBER: LM-22-006



CONTRACTOR : Ferro Plumbing
MACHINE : CAT 422E
DRILLED BY : Ndebele
PROFILED BY : TM

TYPE SET BY : TM
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : Test Pit
DATE : 12/05/2022
DATE : 12/05/2022
DATE : 12/05/2022 19:29
TEXT : ..oParkProjectProfiles.txt

ELEVATION : 1618m amsl
X-COORD : 28° 7'57.11"E
Y-COORD : 26° 6'15.19"S

HOLE No: TP02

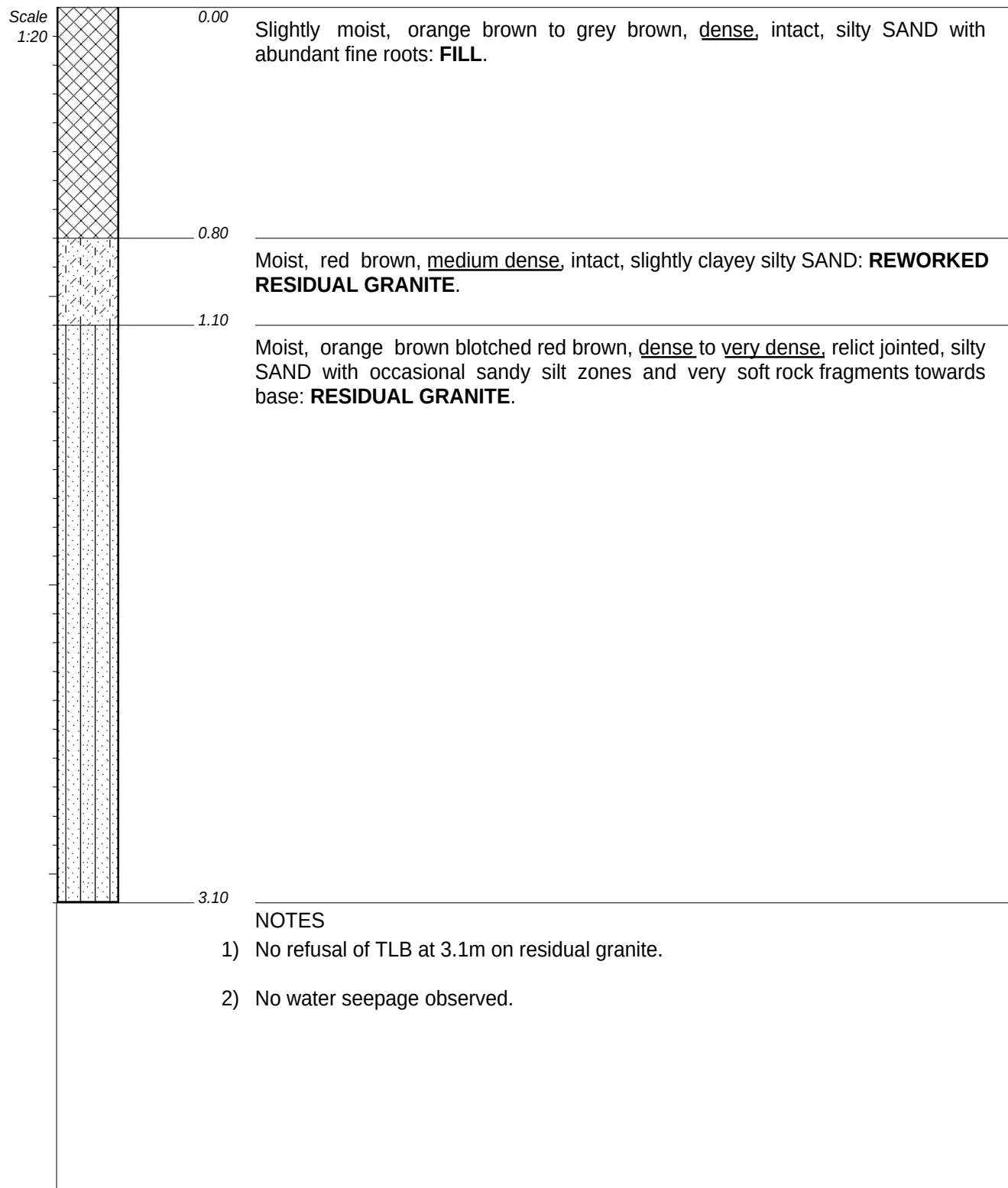


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HOLE No: TP03
Sheet 1 of 1

JOB NUMBER: LM-22-006



CONTRACTOR : Ferro Plumbing
MACHINE : CAT 422E
DRILLED BY : Ndebele
PROFILED BY : TM

TYPE SET BY : TM
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : Test Pit
DATE : 12/05/2022
DATE : 12/05/2022
DATE : 12/05/2022 19:29
TEXT : ..oParkProjectProfiles.txt

ELEVATION : 1618m amsl
X-COORD : 28° 7'55.87"E
Y-COORD : 26° 6'15.25"S

HOLE No: TP03

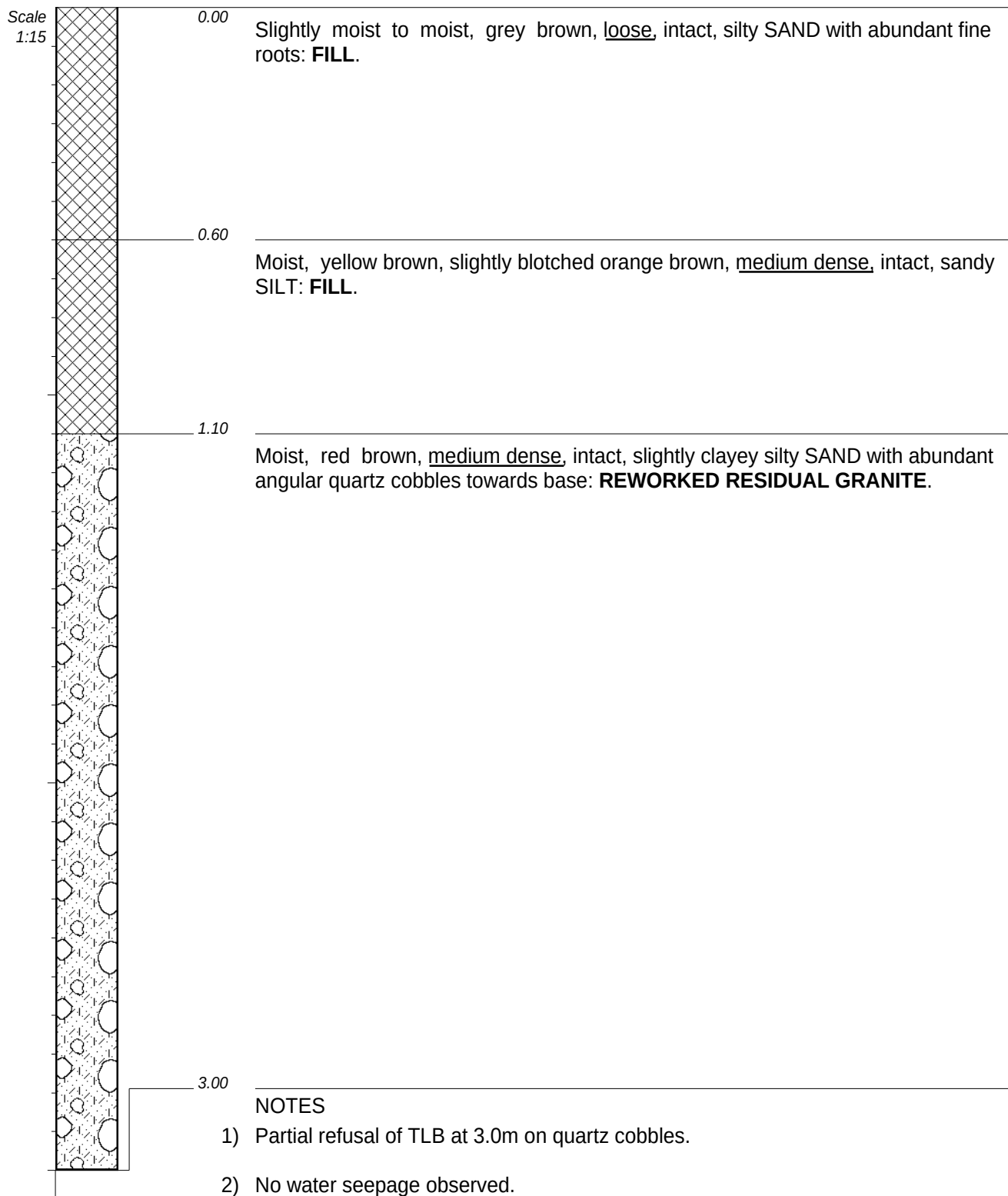


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City of Johannesburg Municipality
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HOLE No: TP04
Sheet 1 of 1

JOB NUMBER: LM-22-006



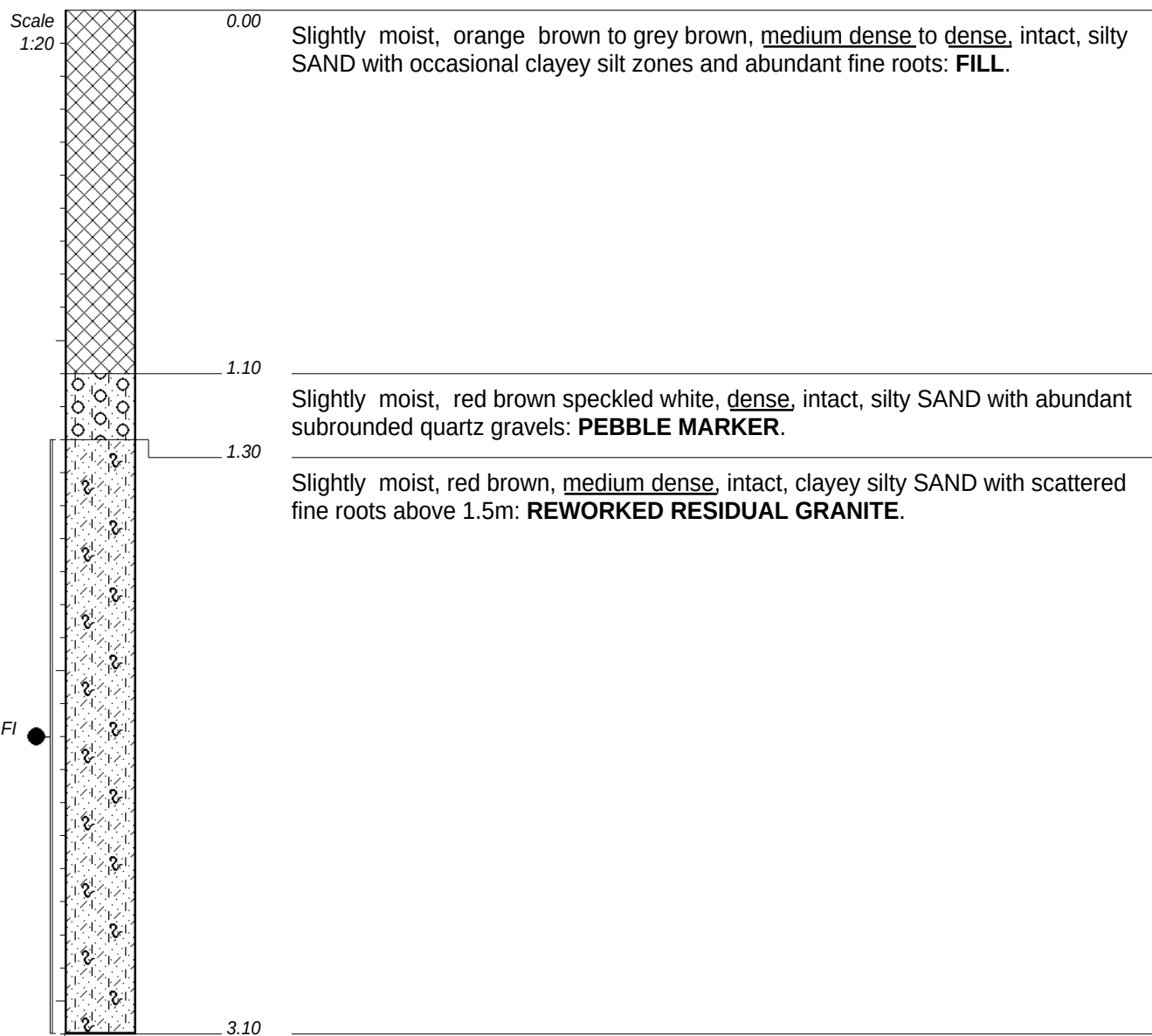
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MACHINE : CAT 422E
DRILLED BY : Ndebele
PROFILED BY : TM

TYPE SET BY : TM
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : Test Pit
DATE : 12/05/2022
DATE : 12/05/2022
DATE : 12/05/2022 19:29
TEXT : ..oParkProjectProfiles.txt

ELEVATION : 1617m amsl
X-COORD : 28° 7'50.37"E
Y-COORD : 26° 6'15.36"S

HOLE No: TP04



NOTES

- 1) No refusal of TLB at 3.1m on reworked residual granite.
- 2) Disturbed sample FI at 1.3--3.1m.
- 3) No water seepage observed.

CONTRACTOR : Ferro Plumbing
MACHINE : CAT 422E
DRILLED BY : Ndebele
PROFILED BY : TM

TYPE SET BY : TM
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM : Test Pit
DATE : 12/05/2022
DATE : 12/05/2022
DATE : 12/05/2022 19:29
TEXT : ..oParkProjectProfiles.txt

ELEVATION : 1612m amsl
X-COORD : 28°7'44.33"E
Y-COORD : 26° 6'15.54"S

HOLE No: TP05



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LEGEND
Sheet 1 of 1

JOB NUMBER: LM-22-006

Name ●

	GRAVELS	{SA02}
	SAND	{SA04}
	SANDY	{SA05}
	SILT	{SA06}
	SILTY	{SA07}
	CLAYEY	{SA09}
	FILL	{SA32}
	DISTURBED SAMPLE	{SA38}
	ROOTS	{SA40}
	COBBLES	{SA58}

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY :

TYPE SET BY : TM
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE :

DATE : 12/05/2022 19:29
TEXT : ..oParkProjectProfiles.txt

ELEVATION :
X-COORD :
Y-COORD :

LEGEND
SUMMARY OF SYMBOLS

APPENDIX E

TEST PIT AND SITE PHOTOGRAPHS



*Plate 1: View towards the south, note drilling of **BH01***



*Plate 2: View towards the east from the existing reservoir, note drilling of **BH02***



Plate 3: View towards the south from the existing reservoir



Plate 4: View towards the west from adjacent property, note deep excavations



*Plate 5: View towards the west from near **TP01***



*Plate 6: View towards the east from near **TP03**, note TLB excavating **TP02***



Plate 7: Soil profile as seen in TP01



Plate 8: Soil profile as seen in TP02



Plate 9: Typical soil profile as seen in TP03



Plate 10: View towards the south from the intersection of Cluelee Road and Peace Street, note pipe jacking location



*Plate 11: Spoil form **TP04***



*Plate 12: View towards the east from near **TP04***



*Plate 13: View towards the north from near **TP04***

APPENDIX F

BOREHOLE PROFILES

JOB NUMBER: LM-22-006

GRAIN SIZE
FG -fine grained
MG -medium grain
CG -coarse grain

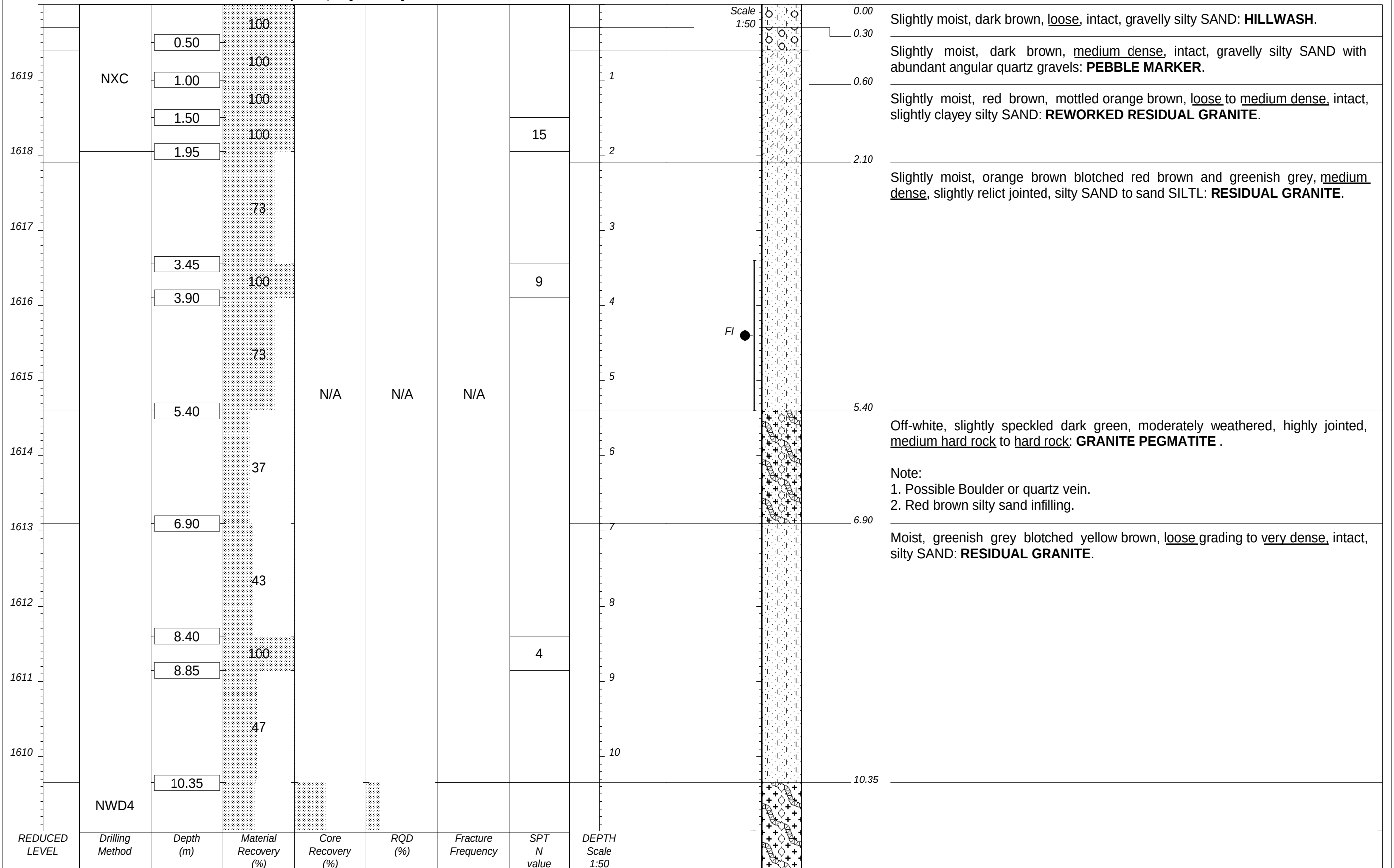
JOINT SPACING
VCJ-very close spacg
CJ -close spacing
MJ -medium spacing
WJ -wide spacing
VWJ-very wide spacng

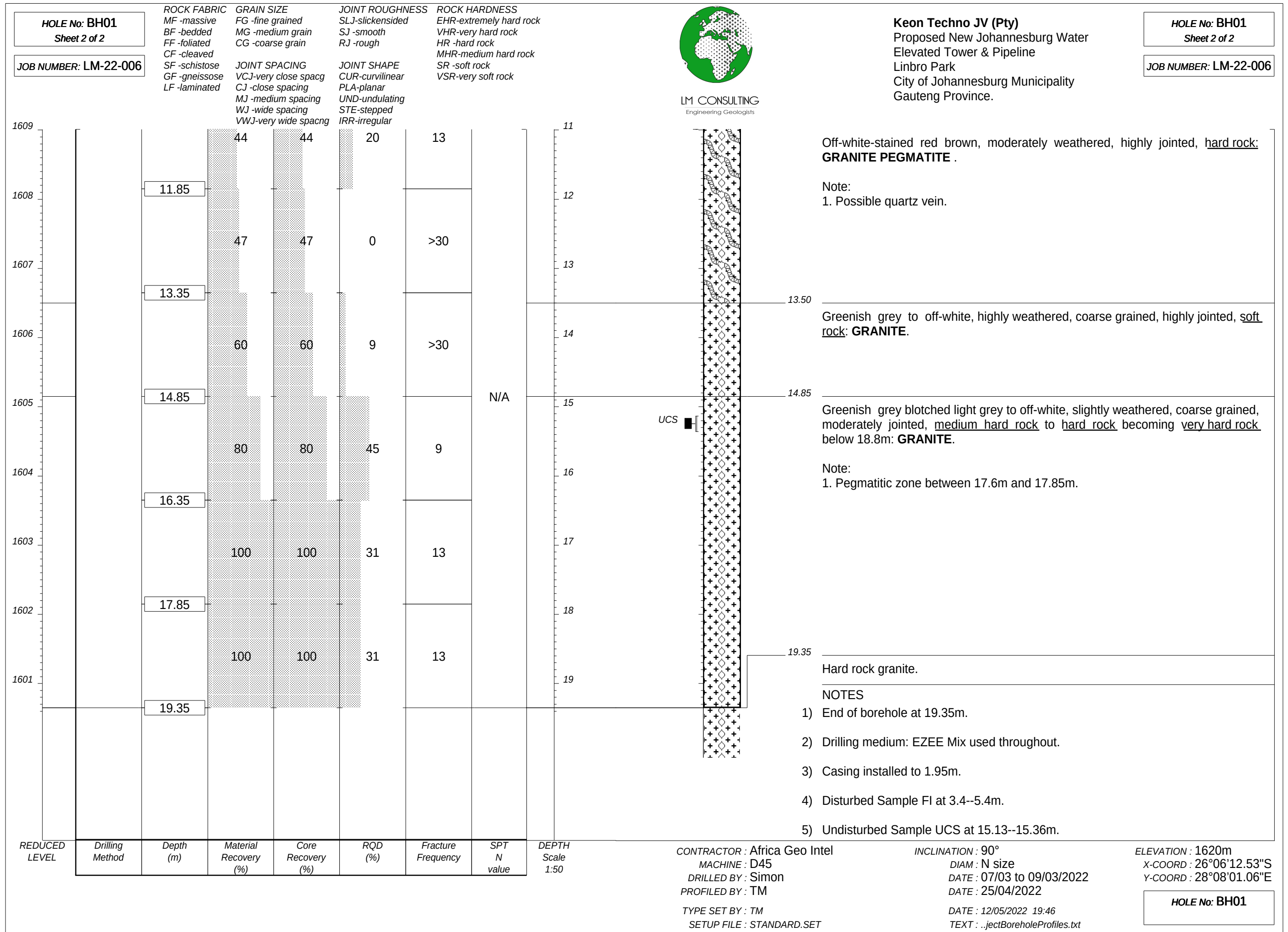
ROCK HARDNESS
EHR-extremely hard rock
VHR-very hard rock
HR -hard rock
MHR-medium hard rock
SR -soft rock
VSR-very soft rock



HOLE No: BH01
Sheet 1 of 2

JOB NUMBER: LM-22-006





HOLE No: BH02
Sheet 1 of 2

JOB NUMBER: LM-22-006

ROCK FABRIC
MF -massive
BF -bedded
FF -foliated
CF -cleaved
SF -schistose
GF -gneissose
LF -laminated

GRAIN SIZE
FG -fine grained
MG -medium grain
CG -coarse grain

JOINT SPACING
VCJ -very close spacg
CJ -close spacing
MJ -medium spacing
WJ -wide spacing
VWJ -very wide spacng

JOINT ROUGHNESS
SLJ -slickensided
SJ -smooth
RJ -rough

JOINT SHAPE
CUR -curvilinear
PLA -planar
UND -undulating
STE -stepped
IRR -irregular

ROCK HARDNESS
EHR -extremely hard rock
VHR -very hard rock
HR -hard rock
MHR -medium hard rock
SR -soft rock
VSR -very soft rock

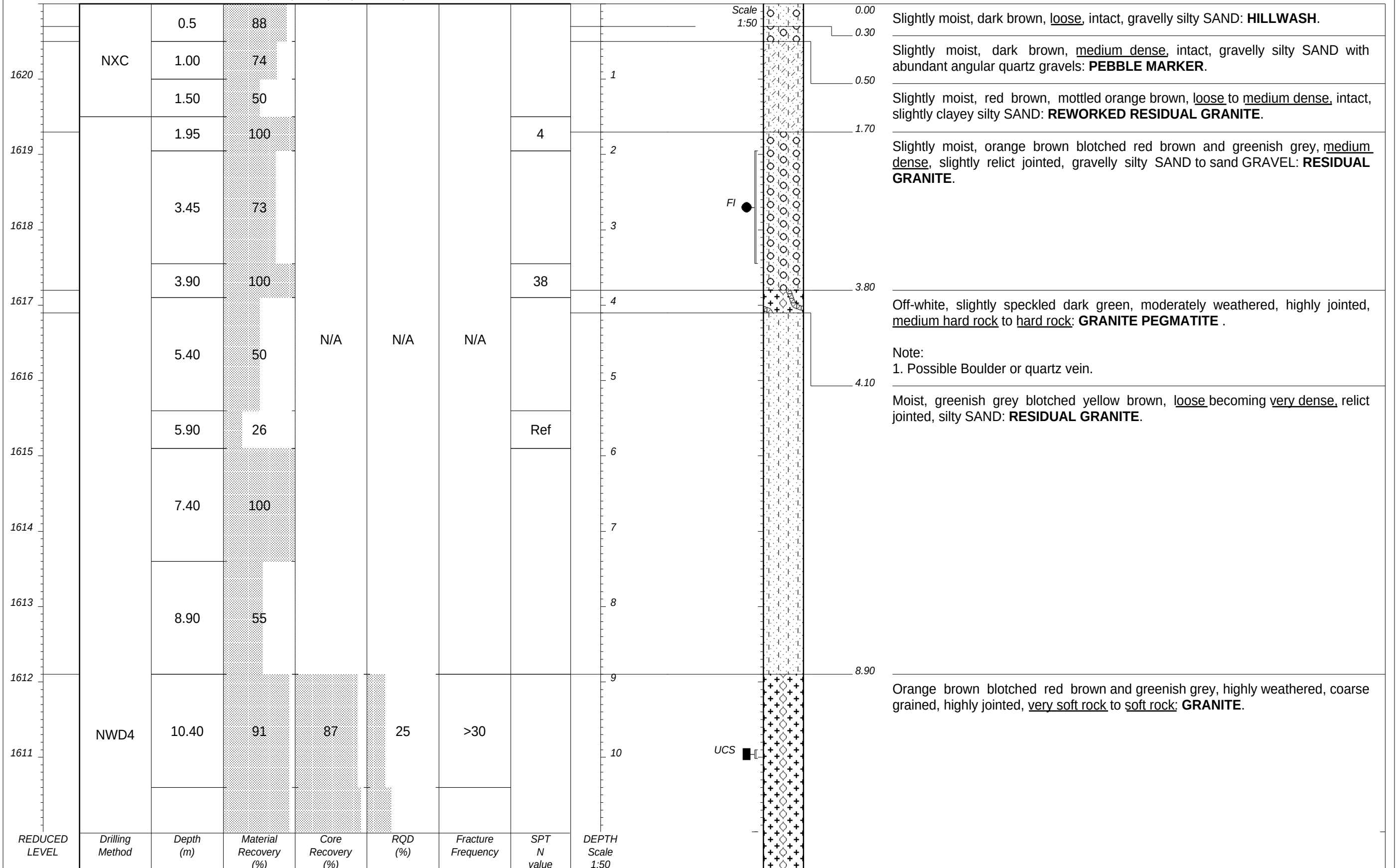


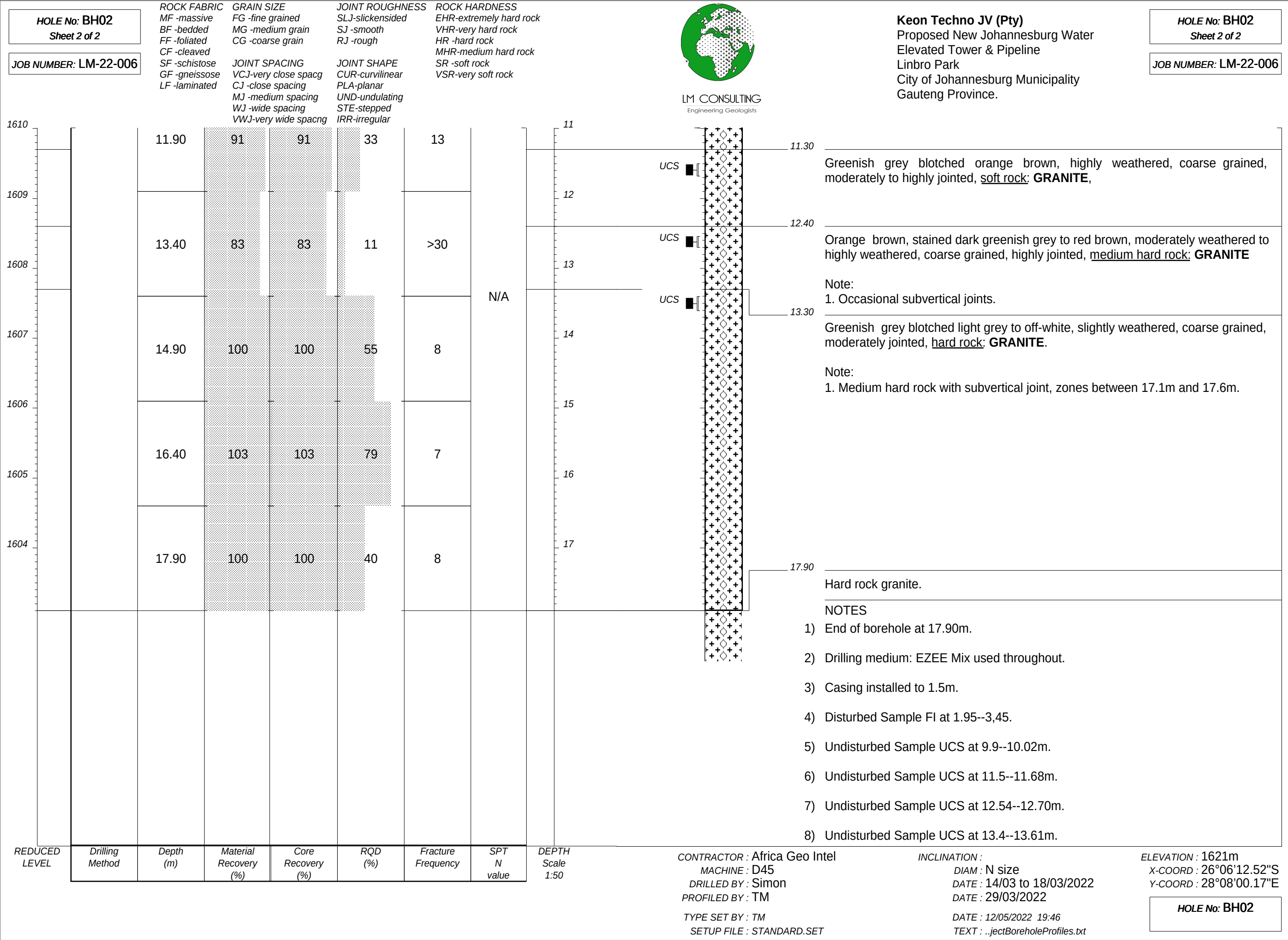
LM CONSULTING
Engineering Geologists

Keon Techno JV (Pty)
Proposed New Johannesburg Water
Elevated Tower & Pipeline
Linbro Park
City of Johannesburg Municipality
Gauteng Province.

HOLE No: BH02
Sheet 1 of 2

JOB NUMBER: LM-22-006







LM CONSULTING
Engineering Geologists

Keon Techno JV (Pty)
Proposed New Johannesburg Water
Elevated Tower & Pipeline
Linbro Park
City of Johannesburg Municipality
Gauteng Province.

LEGEND
Sheet 1 of 1

JOB NUMBER: LM-22-006

	GRAVELS/gravel	{SA02}
	GRAVELLY	{SA03}
	SAND	{SA04}
	SILTY	{SA07}
	CLAYEY	{SA09}
	GRANITE	{SA17}{SA44}
	PEGMATITE	{SA20}
	UNDISTURBED SAMPLE	{SA37}
	DISTURBED SAMPLE	{SA38}

Name

Name

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY :
TYPE SET BY : TM
SETUP FILE : STANDARD.SET

INCLINATION :
DIAM :
DATE :
DATE :
DATE : 12/05/2022 19:46
TEXT : ..jectBoreholeProfiles.txt

ELEVATION :
X-COORD :
Y-COORD :

LEGEND
SUMMARY OF SYMBOLS

APPENDIX G

BOREHOLE PHOTOGRAPHS



Plate 1: Borehole **BH01** Box 1 of 4



Plate 2: Borehole **BH01** Box 2 of 4



Plate 3: Borehole **BH01** Box 3 of 4



Plate 4: Borehole **BH01** Box 4 of 4



Plate 5: Borehole **BH02** Box 1 of 4



Plate 6: Borehole **BH02** Box 2 of 4



Plate 7: Borehole **BH02** Box 3 of 4



Plate 8: Borehole **BH02** Box 4 of 4

APPENDIX H

LABORATORY TEST RESULTS

Test Report

Attention : Mr Thanduxolo Msengana Project : <i>Proposed Joburg Water Elevated Tower, Linbro Park</i> Report Date : 12-05-2022 Pages : 3 Report No. : LM/LP 22 05-001	Client : LM Consulting Engineering Geologists Contact No. : 076 570 1388 Address : 2880 Mxwiga Street Protea Glen Ext. 2 1818
--	--

1. Contents : p 2 - 3 Foundation Indicator Results

2. Deviation / Addition / Exclusion from test method / sampling method : None

3. Decision rule agreed on : None

4. Remarks : Information typed in "*Italic*" font is supplied by the Client.

Hope you find all in order.

Regards,



Bernard Conradie
Technical Signatory

Disclaimer:

This test report relates to the area/s and/or sample/s tested or as received only. Where information is supplied by the client, it may affect the validity of the test results.

If a test report is published or reproduced, it will be done so in full, without any omission and without any manual or electronic alterations.

Everything possible is done to ensure that tests are representative and are performed accurately, and reports and conclusions are quoted correctly.

Labworx or its officials can in no way be held liable for consequential damage or loss due to any erroneous statement or opinion contained in a report based on such tests.

The only information that will be placed in the public domain is upon written permission from you, or if it is required by Law or to SANAS Assessors,

Contracted Technical Signatories or Auditors who are equally bound by confidentiality undertakings.

Tests marked with a (#) are from external providers.

GRAVEL, SOIL AND SAND ANALYSIS REPORT

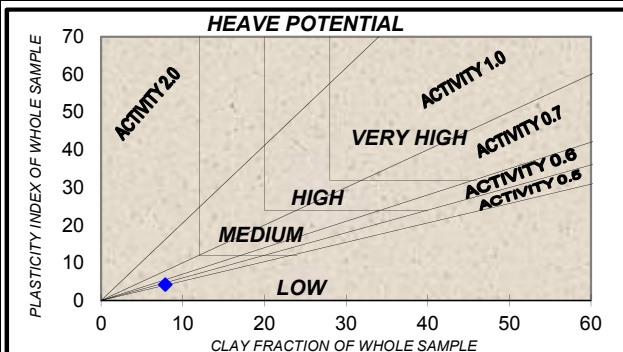
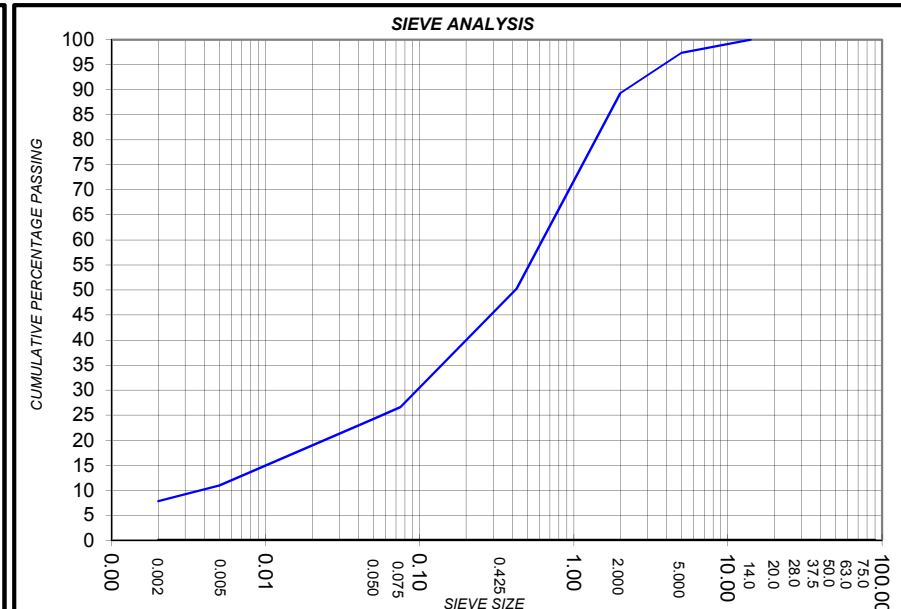
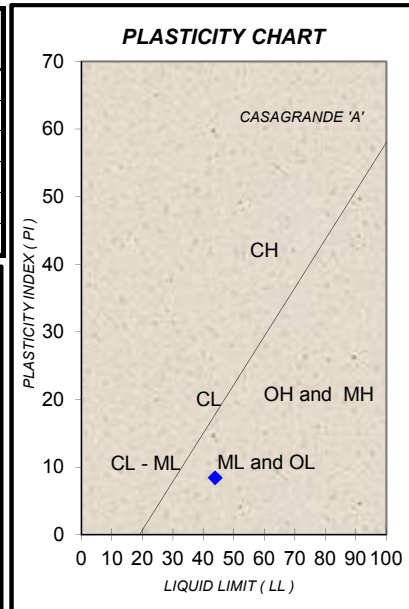
Report No.: LM/LP 22 05-001

Project :	Proposed Joburg Water Elevated Tower, Linbro Park	Date Received :	28-04-2022
Client :	LM Consulting Engineering Geologists	Report Date :	12-05-2022

Your Reference :	BH01 - 3.4 - 5.4 m	Environmental Conditions :	Not Specified	Sample No. :	22/527
Sampled By :	Client			Sampling Method :	Not Specified

Description	MDD / OMC SANS 3001-GR20 & GR30		Sieve Analysis SANS 3001-GR1 Cumulative percentage passing														Grading Modulus SANS 3001-PR5	Soil Mortar Analysis % of mat. <2,00 mm				Atterberg Limits SANS 3001-GR10			Classification				
(Unified Soil Classification)	Maximum Dry Density kg/m³	Optimum Moisture Content %	100.0mm	75.0mm	63.0mm	50.0mm	37.5mm	28.0mm	20.0mm	14.0mm	5.00mm	2.00mm	0.425mm	0.075mm	0.05 mm	0.005 mm		0.002 mm	Coarse - sand <2,0 >0,425mm	Fine - sand <0,425 >0,05mm	Silt <0,05 >0,005mm	Clay <0,005 mm	Liquid Limit %	Plasticity Index	Linear Shrinkage %	Unified Soil	Colto	US. Highway	Group Index
Dark Yellowish Brown Clayey Sand	-	-	-	-	-	-	-	-	-	100	97	89	50	27	24.2	10.9	7.8	1.3	43.7	29.1	14.9	12.3	44	8	4.0	SC	-	A-2-5	0

GENERAL :		CBR RESULTS :	
Effective size :	0.004	SANS 3001-GR40	
Uniformity co-eff. :	164.9	@ 100% comp. :	-
Curvature co-eff. :	3.9	@ 98% comp. :	-
Oversize Index :	0	@ 97% comp. :	-
Shrinkage Product :	202	@ 95% comp. :	-
Grading co-eff. :	10.4	@ 93% comp. :	-
Swell @ 100% :	-	@ 90% comp. :	-



REMARKS:

GRAVEL, SOIL AND SAND ANALYSIS REPORT

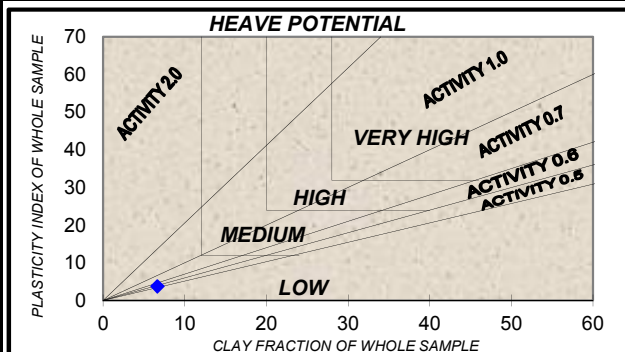
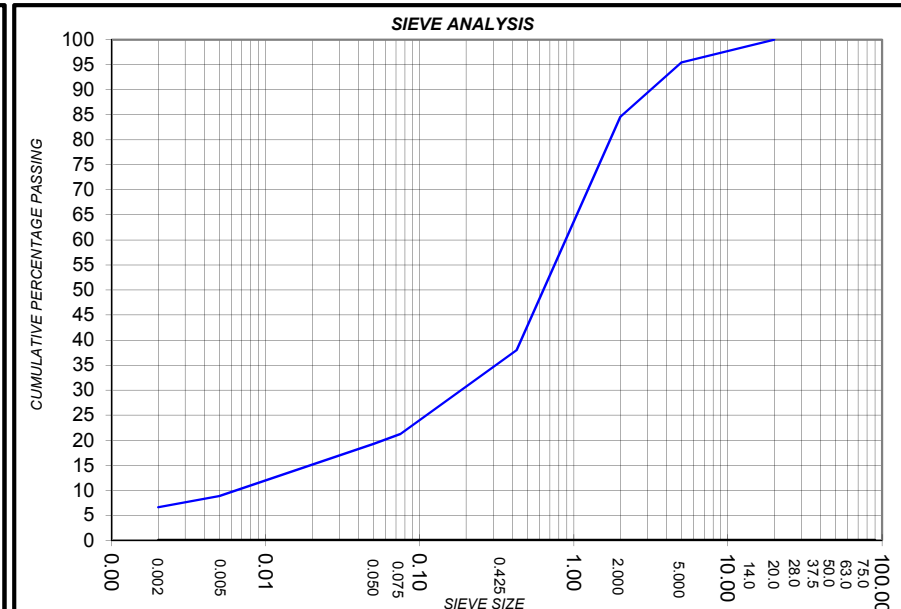
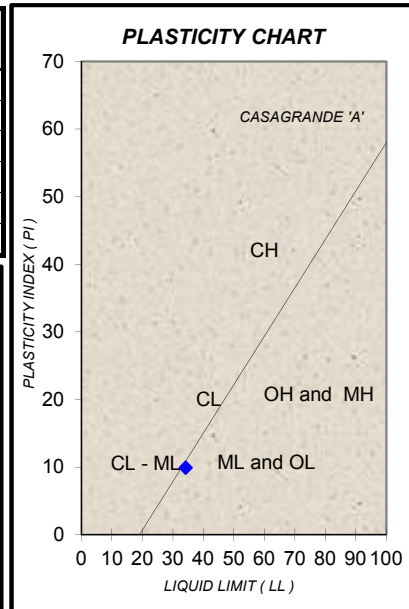
Report No.: LM/LP 22 05-001

Project :	Proposed Joburg Water Elevated Tower, Linbro Park	Date Received :	28-04-2022
Client :	LM Consulting Engineering Geologists	Report Date :	12-05-2022

Your Reference :	BH02 - 1.95 - 3.45 m	Environmental Conditions :	Not Specified	Sample No. :	22/528
Sampled By :	Client			Sampling Method :	Not Specified

Description	MDD / OMC SANS 3001-GR20 & GR30		Sieve Analysis SANS 3001-GR1 Cumulative percentage passing														Grading Modulus SANS 3001-PR5	Soil Mortar Analysis % of mat. <2,00 mm				Atterberg Limits SANS 3001-GR10			Classification				
(Unified Soil Classification)	Maximum Dry Density kg/m³	Optimum Moisture Content %	100.0mm	75.0mm	63.0mm	50.0mm	37.5mm	28.0mm	20.0mm	14.0mm	5.00mm	2.00mm	0.425mm	0.075mm	0.05 mm	0.005 mm		0.002 mm	Coarse - sand <2,0 >0,425mm	Fine - sand <0,425 >0,05mm	Silt <0,05 >0,005mm	Clay <0,005 mm	Liquid Limit %	Plasticity Index	Linear Shrinkage %	Unified Soil	Colto	US. Highway	Group Index
Dark Yellowish Brown Clayey Sand	-	-	-	-	-	-	-	-	100	99	95	85	38	21	19.2	8.8	6.6	1.6	55.1	22.2	12.3	10.5	34	10	4.8	SC	-	A-2-4	0

GENERAL :		CBR RESULTS :	
Effective size :	0.006	SANS 3001-GR40	
Uniformity co-eff. :	136.9	@ 100% comp. :	-
Curvature co-eff. :	6.0	@ 98% comp. :	-
Oversize Index :	0	@ 97% comp. :	-
Shrinkage Product :	183	@ 95% comp. :	-
Grading co-eff. :	14.7	@ 93% comp. :	-
Swell @ 100% :	-	@ 90% comp. :	-



REMARKS:

Issued by:

ROCKLAB

(ROCK MECHANICS & EXCAVATION LABORATORIES)

P O BOX 72928

LYNNWOOD RIDGE 0040

PRETORIA

SOUTH AFRICA

TEL: 012 8134910

E-MAIL: CHENJ@ROCKLAB.CO.ZA

RESULTS OF ROCK PROPERTIES TESTS

Sampling Site: Proposed JHB Water Elevated Tower

BY

DR J. F. CHEN

Submitted to:

LM Consulting

5 MAY 2022

C O N T E N T S

TABLE 1 RESULTS OF UNIAXIAL COMPRESSIVE STRENGTH TESTS

APPENDIX 1 FAILURE CODES OF MATERIAL COMPRESSION TESTS

TABLE 1 RESULTS OF UNIAXIAL COMPRESSIVE STRENGTH TESTS

Client: LM Consulting

Project : Proposed Joburg Water Elevated Tower

05-05-2022

SPECIMEN PARTICULARS					SPECIMEN DIMENSIONS					SPECIMEN TEST RESULTS			
Rocklab Specimen No.	BH No	Depth		Rock Type	Diameter	Height	Ratio of Height to Diameter	Mass	Density	Failure Load	Strength (UCS)	Failure Code	Note
		From m	To.. m										
8880-					mm	mm		g	g/cm³	kN	MPa		
UCS-01	BH01	15.13	15.36		51.26	138.0	2.7	741.62	2.60	21.48	10.4	3B	1
UCS-02	BH02	9.90	10.02		51.38	92.4	1.8	458.41	2.39	9.56	4.6	XA	1
UCS-03	BH02	11.50	11.68		52.12	138.8	2.7	711.31	2.40	16.24	7.6	1B	1
UCS-04	BH02	12.54	12.70		51.87	107.6	2.1	558.00	2.45	23.05	10.9	XA	1
UCS-05	BH02	13.40	13.61		51.13	129.1	2.5	675.22	2.55	61.03	29.7	XA	1

Note: All tests were conducted according to the ISRM's (International Society for Rock Mechanics) specification.

Failure codes refer to Appendix 1

1 - sample was weathered.

APPENDIX 2

CLASSIFICATION OF ROCK SPECIMEN FAILURE MODE INFLUENCED / NOT INFLUENCED BY DISCONTINUITIES DURING COMPRESSION TESTING

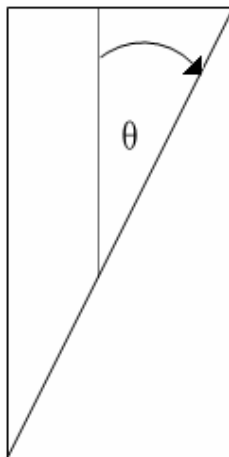
FAILURE NOT INFLUENCED BY DISCONTINUITIES (INTACT)

TYPE CODE	DESCRIPTION OF SUB CODES	
	A	B
X	SLIDING SHEAR FAILURE	COMPLETE CONE DEVELOPMENT
Y	SPLITTING	BREAKING INTO A LOT OF PIECES

FAILURE INFLUENCED BY DISCONTINUITIES

TYPE CODE	DESCRIPTION OF SUB CODES	
	A	B
	PARTIAL FAILURE ON DISCONTINUITY	FAILURE COMPLETELY ON DISCONTINUITY
1	AT 0-10° TO AXIS	AT 0-10° TO AXIS
2	AT 11-20° TO AXIS	AT 11-20° TO AXIS
3	AT 21-30° TO AXIS	AT 21-30° TO AXIS
4	AT 31-40° TO AXIS	AT 31-40° TO AXIS
5	AT 41-50° TO AXIS	AT 41-50° TO AXIS
6	AT 51-70° TO AXIS	AT 51-70° TO AXIS
7	AT 71-90° TO AXIS	AT 71-90° TO AXIS
0	Multiple Discontinuities	Multiple Discontinuities

Example: Failure Type3B: Failure completely on a discontinuity with an orientation of between 21° and 30° to the specimen axis.



ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE (R)	AMOUNT (R)
	SANS 1200 A	SECTION 1 : GENERAL				
1,1	8,3	<u>Contractual Requirements</u>				
1.1.1	PSA 8.3.1	Contractual requirements including but not limited to providing surites, insurance of the works and plant; third party or public liability; insurance for compliance with Workmans Compensation Act and any other contractual obligations.	Sum	1		
1.1.2		Fixed preliminary and general charges	Sum	1		
	8.3.2	<u>Establishment of facilities on site:</u>				
	8.3.2.1	<u>Facilities for Employers Agent</u>				
1.1.3	8.3.2.1(a)	Provision of a furnished meeting room and office for the Employers Agent's Representative (including all furnishings, facilities and equipment including toilet facilities)	Sum	1		
1.1.4		Provision of survey equipment (PSAB 4.2)	Sum	1		
1.1.5	PSAB 8.1	Contract Nameboard (2 No.) and Identity Boards (2 No.) with supports erected & moved complete. (Refer to PSAB 3.1)	No.	2		
1.1.6		Provision of survey assistants (Refer PSAB 5.5)	Sum	1		
1.1.7		Covered Parking (2 bays) (Refer PSAB 3.3)	Sum	1		
1.1.8		PPE for Engineer, assistants and students	Sum	1		
1.1.9		Security of works	Sum	1		
1.1.10		All other specified facilities (incl wifi internet connection and printer)	Sum	1		
1.1.11	8.3.2.2, 8.3.2.3	<u>Facilities for Contractor</u>				
1.1.11.1		a) Offices and storage sheds	Sum	1		
1.1.11.2		b) Workshops	Sum	1		
1.1.11.3		c) Laboratories	Sum	1		
1.1.11.4		d) Living Accommodation	Sum	1		
1.1.11.5		e) Ablution and latrine facilities	Sum	1		
1.1.11.6		f) Tools and equipment	Sum	1		
1.1.11.7		g) Water supplies, electric power and communications	Sum	1		
1.1.11.8		h) Dealing with water	Sum	1		
1.1.11.9		i) Access	Sum	1		
1.1.11.10		j) Construction Plant and Transport	Sum	1		
1.1.11.11	8.3.4	Remove all site establishment on completion	Sum	1		
1.1.11.12	PSA8.17	Dealing with conditions of permits, Wayleave Agreements, EIA, RoD. (Refer to C3.4.4.8)	Sum	1		
1.1.11.13		Notices and warnings to consumers	Sum	1		
TOTAL CARRIED FORWARD						

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE (R)	AMOUNT (R)
TOTAL BROUGHT FORWARD						
1.1.12	PSA 8.8 a	<u>OH&S Requirements (Fixed charges)</u> The sum shall cover all preparation of risk assessments (Annexure D), safe work procedures, the project H&S File, the H&S Plan, medicals for all workers, the provision of PPE and protective clothing, including hazards and potential hazard identification, Standard Working Procedures, and Method Statements and all other costs necessary in complying generally with the Occupational Health and Safety Act 85 of 1993, (as amended), the Construction Regulations 2014 and the Particular Safety Specification (Annexure C)	Sum	1		
1.1.13		Completing and checking the Project H&S File and handing over to Client on completion of the works and exit medicals for all workers.	Sum	1		
1.1.14		<u>HIV / AIDS Awareness</u> Refer to SANS 1921-6 and Annexure F Conduct HIV/AIDS awareness programme workshops on site for not less than 90% of the workers inclusive of all direct and indirect costs (at least once every 4 months)	No.	3		
1.1.15		Provide and maintain condom dispenser	No.	1		
1.1.15		Provide and maintain HIV/AIDS awareness posters	No.	1		
1.1.16		Provide information regarding the voluntary testing of construction workers, counselling, support and care in a monthly report	Sum	1		
1.1.17	PSA 8.15	<u>Environmental Management and EMP</u> The sum shall cover the cost of all activities necessary to comply with section C3.5 and Annexure M of the Environmental Management Particular Specification, and Environmental Management Plan, which incorporates the ROD requirements for the Project, which have not been included in the tendered rates for the scheduled items <i>allowed elsewhere in the bill of quantities</i>	Sum	1		
1.1.18		Extra over Item 1.1.26 for the appointment of a Specialist selected Sub-Contractor, to carry out at least 25% of the environmental rehabilitation work.	Sum	1		
		Appointment of Safety Officer	Sum	1		
		Appointment of Environmental Officer	Sum	1		
1.2	SANS 1200A	TIME RELATED ITEMS				
1.2.1	PSA 8.4.1	Contractual requirements (including, EPWP, QA and Project Reporting)	Months	18		
TOTAL CARRIED FORWARD						R

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE (R)	AMOUNT (R)
TOTAL BROUGHT FORWARD						R
	PSA 8.4.2	Operate and maintain facilities on Site				
	8.4.2.1	<u>Facilities for Engineer for duration of contract (SANS 1200AB)</u>				
1.2.2	8.4.2.1 (a)	Provision of meeting room and office for the Engineer's Representative including toilet facilities as per PSAB 5.2 & PSAB 3.2	Months	18		
1.2.3		Provision of survey equipment (Refer to PSAB 4.2)	Months	18		
1.2.4		Provision of 2 № survey assistants (Refer to PSAB 5.5)	Months	18		
1.2.5		Nameboards (2No.)	Months	18		
1.2.6		PPE for Engineer and assistants	Months	18		
1.2.7		Engineer's Office and parking facilities	Months	18		
1.2.7		Security of works	Months	18		
1.2.8	8.4.2.2 8.4.2.3	<u>Facilities for Contractor</u>				
1.2.8.1		a) Offices and storage sheds	Months	18		
1.2.8.2		b) Workshops	Months	18		
1.2.8.3		c) Laboratories	Months	18		
1.2.8.4		d) Living Accommodation	Months	18		
1.2.8.5		e) Ablution and latrine facilities	Months	18		
1.2.8.6		f) Tools and equipment	Months	18		
1.2.8.7		g) Water supplies, electric power and communications	Months	18		
1.2.8.8		h) Dealing with water	Months	18		
1.2.8.9		i) Access	Months	18		
1.2.8.10		j) Construction Plant and Transport	Months	18		
1.2.9	PSA 8.4.3	Supervision for duration of the contract (all supervisory staff not considered labour)	Months	18		
1.2.10	8.4.4	Company and Head Office overhead costs	Months	18		
1.2.11	PSAB 8.20	General responsibilities and other time related obligations	Months	18		
	PSA 8.17	<u>Permits and Wayleaves</u>				
1.2.12		Dealing with conditions of permits, Wayleave Agreements, EIA, RoD (Refer to C3.4.4.8)	Months	18		
TOTAL CARRIED FORWARD						R

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE (R)	AMOUNT (R)
TOTAL BROUGHT FORWARD						R
1.2.13	PSA 8.8 a	<u>OH&S Requirements (Time charges)</u> Updating and amending the risk assessments, safe work procedures, the project H&S File, the H&S Plan, medicals for all workers, the provision of PPE and protective clothing, including hazards and potential hazard identification, Standard Working Procedures, and Method Statements and all other costs necessary in complying generally with the Occupational Health and Safety Act 85 of 1993, (as amended), the Construction Regulations 2014 and the Particular Safety Specification (Annexure C)	Months	18		
1.2.14		Full compliance and checking the Project H&S File during construction of the works under the Contract.	Months	18		
1.2.15		The sum shall cover all activities necessary in complying with the requirements of the Health and Safety Specification in terms of Training as the Work proceeds	Months	18		
1.2.16		The sum shall cover all activities necessary in complying with the requirements of the Health and Safety Specification in terms of Monitoring and Review as the Work proceeds	Months	18		
1.2.17		The sum shall cover the cost of all activities necessary to comply with section C3.5 and Annexure M of the Environmental Management Particular Specification, and Environmental Management Plan, which incorporates the ROD requirements for the Project, which have not been included in the tendered rates for the scheduled items allowed elsewhere in the bill of quantities	Months	18		
1.2.18	PSA 8.4.5	Security in accordance with C3.4.4.6	Months	18		
1.2.19		Any other time related obligations	Months	18		
1.2.20	PSA 8.5.4	<u>EME's or QSE's</u> Contractor to provide manager for dealing with EME's or QSE's for duration of contract to meet local employment and local enterprise targets (Refer to C1.8, C1.9 and C3.4.10 & PSA 5.10)	Months	18		
1.2.21		Dealing with conditions of EME's or QSE's sub-contractors and local/target labour (Refer to C1.9, C3.4.10 & C3.3.2).The tendered rate shall cover all costs including but not limited to procurement, management, administration, overheads, finance costs, transportation, training, risk and profit and any other costs associated on work allocated to EME's or QSE's and targeted labour in order to achieve the required participation goals. (Contractor to allocate packages)	Months	18		
TOTAL CARRIED FORWARD						R

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE (R)	AMOUNT (R)
TOTAL BROUGHT FORWARD						R
1.3	8,5	SUMS STATED PROVISIONALLY BY ENGINEER				
1.3.1		Quality assurance and management plan	Sum	1,0		
1.3.2		Provisional sum for Independent OHS, EMP and Electrical practitioners	Prov. Sum	1,0	300 000,00	300 000,00
1.3.3		Provisional sum for Cathodic Protection	Prov. Sum	1,0	1 500 000,00	1 500 000,00
1.4	8,8	TEMPORARY WORKS				
	C3.1.5					
	PSA 8.7.2	Dealing with traffic or accommodation of traffic and erecting signage (also refer to SANS 1921-2)	Sum	1		
1.4.1						
	8.8.1	Access to works including all temporary roads, excavations and ramps, etc.	Sum	1		
1.4.2	PSA 5.8					
1.4.3	PSA 8.7.6	Dealing with water	Sum	1		
1.4.4	PSA 8.8.4	Dealing with existing infrastructure	Sum	1		
1.4.5	PSA 8.22	Dealing with Public	Sum	1		
1.4.6	PSA 8.18	Barricading of Trenches	Sum	1		
1.4.7	PSA 8.19	Fencing	Sum	1		
	PSLD 8.2.2	Equipment supplied for testing and disinfection of structures and pipelines from existing infrastructure, including transportation costs (Prov.).	Sum	1		
1.4.8	PSL 5.10					
1.4.9	PSA 8.22	Allow for the attendance of other Contractors, JW staff and public within the parameters of the site.	Sum	1		
TOTAL FOR SECTION 1 CARRIED FORWARD TO SUMMARY						R

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE (R)	AMOUNT (R)
2	SANS 1200A	SECTION 2: DAYWORKS, PROVISIONAL SUMS AND PRIME COST ITEMS				
2,1	8,7 PSA 8.6	DAYWORKS				
		<u>Labour</u>				
2.1.1	8.5 (b.1)	Allow for total remuneration paid to workers	Prov Sum	1	500 000,00	500 000,00
2.1.2	PSA 8.5	Overheads, charges and profit on 2.1.1 above	%	500 000,00		
2.1.3		Team Leader / charge hand	hr	120		
2.1.4		Artisan	hr	150		
2.1.5		Skilled	hr	150		
2.1.6		Semi-skilled	hr	250		
2.1.7		Unskilled	hr	500		
2.1.8		Engineer	hr.	5,0		
2.1.9		Technician	hr.	5,0		
2.1.10		Foreman	hr.	10,0		
2.1.11		Driver (LDV,machine, trucks, etc.)	hr.	10,0		
2.1.12		Certified Blaster	hr.	10,0		
2.1.13		Steel fixer	hr.	10,0		
2.1.14		Concretor	hr.	10,0		
2.1.15		Charge hand	hr.	10,0		
2.1.16		Security guard	hr.	10,0		
		<u>Plant and equipment</u>				
2.1.17		(a) Tractor loader backhoe (TLB) (i) Tractor Loader Backhoe (Bigger than 45kW but smaller than 70kW)	hr.	10,0		
2.1.18		(b) Crawler Excavators (i) Smaller than 93kW (small)	hr.	10,0		
2.1.19		(ii) Bigger than 93kW but smaller than 200kW (Medium)	hr.	10,0		
2.1.20		(c) Tipper Trucks (i) Tipper trucks (3m³) Small	hr.	10,0		
2.1.21		(ii) Tipper trucks (5m³) Medium	hr.	10,0		
2.1.22		(iii) Tipper trucks (10m³) Large	hr.	10,0		
2.1.23		(d) Flat Bed Trucks (i) Flat bed 5t capacity	hr.	8,0		
2.1.24		(ii) Flat bed 7t capacity	hr.	8,0		
2.1.25		(e) LDV (i) 1t Pick-up	hr.	10,0		
2.1.26		(f) Mobile Crane 5t at 3m radius	hr.	10,0		
2.1.27		(g) Walk behind vibrating rollers (i) Model - Bomag 60 or similar (small)	hr.	10,0		
2.1.28		(ii) Model - Bomag 76 or similar (medium)	hr.	10,0		
2.1.29		(iii) Model - Bomag 90 or similar	hr.	10,0		
TOTAL CARRIED FORWARD					R	

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE (R)	AMOUNT (R)
TOTAL BROUGHT FORWARD						R
2.1.30		(h) Plate compactors (i) Vipac or similar	hr.	10,0		
2.1.31		(i) Rammers (i) Model - Wacker or similar	hr.	10,0		
2.1.32		(j) Concrete mixers				
2.1.33		(i) Volume 100 litre wet (small, towable)	hr.	8,0		
2.1.34		(ii) Volume 175 litre wet (medium)	hr.	8,0		
2.1.35		(iii) Volume 250 litre wet (large)	hr.	8,0		
2.1.36		(k) Diesel compressors including hoses and tools	hr	10,0		
2.1.37		(i) Capacity smaller than 200 cfm (small) (ii) Capacity bigger than 200 cfm smaller than 400 cfm (medium)	hr.	10,0		
2.1.38		(iii) Capacity bigger than 400 cfm (large)	hr.	10,0		
2.1.39		(l) Waterpump				
2.1.40		(i) Capacity smaller than 400 litre/min	hr	10,0		
2.1.41		(ii) Capacity bigger than 400 but smaller than 600 litre/min (medium)	hr	10,0		
2.1.42		(iii) Capacity bigger than 600 but smaller than 1 100 litre/sec (large)	hr	10,0		
Materials						
2.1.43	8.5 (a, b1)	Net cost of goods or materials	Prov Sum	1	500 000,00	500 000,00
2.1.44	PSA 8.5	Overheads, charges and profit on 2.1.43 above	%	500 000,00		
Contractors own Plant						
2.1.45	8.5 (a)	Allow for all-inclusive cost of using Contractor's own plant on site.	Prov Sum	1	800 000,00	800 000,00
Plant hired by the Contractor						
2.1.46	8.5 (b.1)	Net cost of hired plant	Prov Sum	1	250 000,00	250 000,00
2.1.47	PSA 8.5	Overheads, charges and profit on 2.1.46 above	%	250 000,00		
Survey Beacons/Pegs						
2.1.48	8.5 (a)	Search for, record, reference and protect survey stations, bench marks, erf boundary pegs and other reference pegs and expose on completion of works	Sum	1		
2,2	8,5	SUMS STATED PROVISIONALLY BY THE ENGINEER				
2.2.1	PSA 8.5	Cellphone allowance for the Employers Agent Representative and their assistant for the duration of the contract (R1000 pm)	Prov Sum	1	18 000,00	18 000,00
2.2.2		Overheads, charges and profit on 2.2.1 above	%	18 000,00		
TOTAL CARRIED FORWARD						R

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE (R)	AMOUNT (R)
TOTAL BROUGHT FORWARD						R
2.2.7		Equipment for the Employers Agent Representative and their assistant for the duration of the contract	Prov Sum	1	80 000,00	80 000,00
2.2.8		Overheads, charges and profit on 2.2.7 above	%	80 000,00		
		<u>Survey</u>				
2.2.9		Ad-hoc topographical survey as requested by the Engineer during the contract	Prov Sum	1	30 000,00	30 000,00
2.2.10		Overheads, charges and profit on 2.2.9 above	%	30 000,00		
	PSA 8.5.3	<u>Community Liason Officer and Consultant</u>				
2.2.11	a)	Employment of the CLO for duration of contract who shall be appointed by the Contractor and shall report to the Engineer and the Client (R8500 pm plus R500 pm cellphone allowance) (refer C3.4.7)	Prov Sum	1	162 000,00	162 000,00
2.2.12	b)	Overheads, charges and profit on 2.2.11	%	162 000,00		
2.2.13		Employment of a social consultant for duration of contract	Prov Sum	1	550 000,00	550 000,00
2.2.14	PSA 8.5	Overheads, charges and profit on 2.2.13	%	550 000,00		
	PSA 8.12 PSA 8.13	<u>Training</u>				
2.2.15		Allowance for training of local unskilled labour	Prov Sum	1	200 000,00	200 000,00
2.2.16	PSA 8.5	Overheads, charges and profit on 2.2.15	%	200 000,00		
2.2.17	PSA 8.14	Allowance for transport	Prov Sum	1	100 000,00	100 000,00
2.2.18		Overheads, charges and profit on 2.2.17	%	100 000,00		
	Spec PC	<u>Re-vegetation</u>				
2.2.19		Re-vegetation of the site	Prov Sum	1	100 000,00	100 000,00
2.2.20	PSA 8.5	Overheads, charges and profit on 2.2.19	%	100 000,00		
		<u>Pipework</u>				
2.2.21		Connection to existing / proposed pipework	Prov Sum	1	200 000,00	200 000,00
2.2.22		Overheads, charges and profit on 2.2.21	%	200 000,00		
		<u>Control Testing</u>				
2.2.23	PSA 8.5.1	Acceptance Control Testing	Prov Sum	1	200 000,00	200 000,00
2.2.24	8.5 (b)	Overheads, charges and profit on 2.2.23	%	200 000,00		
TOTAL CARRIED FORWARD						R

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE (R)	AMOUNT (R)
TOTAL BROUGHT FORWARD						R
	PSA 8.5	<u>Students</u>				
2.2.25		Provisional Sum for employing students on the Contract	Prov Sum	1	360 000,00	360 000,00
2.2.26		Overheads, charges and profit on 2.2.25 above	%	360 000,00		
2,3	PSA 8.4.7	MISCELLANEOUS				
2.3.1		General Signage, as per the Engineer's instructions (Prov)	Prov Sum	1	20 000,00	20 000,00
2.3.2		Overheads, charges and profit on 2.3.1	%	20 000,00		
2.3.3	PSA 8.22	Allow for the attendance of EME's or QSE's and other Contractors within the parameters of the site (refer C3.5.26)	Sum	1		
TOTAL FOR SECTION 2 CARRIED FORWARD TO SUMMARY						R

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
3	SABS 1200 C	SECTION 3: SITE CLEARANCE (PIPELINE)				
3.1	8.2.1	CLEAR SITE Clear and grub site and remove any obstruction that may occur and spoil to designated site. Only areas indicated in writing by Engineer must be cleared:				
3.1.1	PSC 5.1	Clear and grub including all vegetation for pipe route 3m wide.	m	560		
3.1.2	PSC 3.1	Transport spoil material to unspecified sites and dump (provisional)	m³.km	560		Rate Only
TOTAL FOR SECTION 3 CARRIED FORWARD TO SUMMARY						R

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
4	SABS 1200 C	SECTION 4: SITE CLEARANCE (TOWER ONLY)				
4.1	8.2.1	CLEAR SITE Clear and grub site and remove any obstruction that may occur and spoil to designated site. Only areas indicated in writing by Engineer must be cleared:				
4.1.1		Clear and grub including all vegetation for Elevated Tower	m ²	468		
4.1.2	PSC 3.1	Transport spoil material to unspecified sites and dump (provisional)	m ³ .km	1 400		Rate Only
4.1.3	8.2.10	SITE PREPARATION Remove top soil to nominal depth 75 mm, stockpile and maintain	m ³	35		
TOTAL FOR SECTION 4 CARRIED FORWARD TO SUMMARY						R

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
5	SABS 1200 C	SECTION 5: SITE CLEARANCE (PUMPSTATION AND TOWER SITE)				
5.1	8.2.1	CLEAR SITE Clear and grub site and remove any obstruction that may occur and spoil to designated site. Only areas indicated in writing by Engineer must be cleared:				
5.1.1		Clear and grub including all vegetation for Site footprint (Pump Station and Valve Chambers)	m²	450		
5.1.2	PSC 5.1	Clear and grub including all vegetation for inlet-pipe route 3m wide.	m	120		
5.1.3	PSC 3.1	Transport spoil material to unspecified sites and dump (provisional)	m³.km	2 500		Rate Only
5.1.4	8.2.10	SITE PREPARATION Remove top soil to nominal depth 75 mm, stockpile and maintain	m³	80		
TOTAL FOR SECTION 5 CARRIED FORWARD TO SUMMARY						R

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
6	SABS 1200 D	SECTION 6: EARTHWORKS (PIPELINES)				
6.1	PSD 8.3.2 8.3.2a	EXCAVATION Excavate in all materials and use for backfill, or dispose as ordered: Refer to drawing CO1486-CP10 & 11, 18, 19, 22,				
6.1.1		(a) Air-Valve Chamber L.P.C 1	m³	120		
		Extra over items D1.1				
6.1.1.1		(i) Intermediate material	m³	12		
6.1.1.2		(ii) Hard rock material	m³	6		
6.1.3		(b) Air-Valve Chamber L.P.C 2	m³	120		
		Extra over items D1.4				
6.1.3.1		(i) Intermediate material	m³	12		
6.1.3.2		(i) Hard rock material	m³	6		
6.1.4		(c) Air-Valve Chamber L.P.C 3	m³	120		
		Extra over items D1.7				
6.1.4.1		(i) Intermediate material	m³	120		
6.1.4.2		(ii) Hard rock material	m³	6		
6.1.5		(d) Air-Valve Chamber L.P.C 4	m³	120		
		Extra over items D1.10				
6.1.5.1		(i) Intermediate material	m³	12		
6.1.5.2		(ii) Hard rock material	m³	6		
6.1.6		(e) Scour&Isolation Valve Chamber L.P.C 5	m³	150		
		Extra over items D1.13				
6.1.6.1		(i) Intermediate material	m³	15		
6.1.6.2		(ii) Hard rock material	m³	6		
6.1.7		(f) Air-Valve Chamber L.P.C 6	m³	120		
		Extra over items D1.16				
6.1.7.1		(i) Intermediate material	m³	12		
6.1.7.2		(ii) Hard rock material	m³	12		
6.1.8		(h) Air-Valve Chamber L.P.C 7	m³	120		
		Extra over items D1.19				
6.1.8.1		(i) Intermediate material	m³	12		
6.1.8.2		(ii) Hard rock material	m³	6		
6.1.9		(i) Isolation Valve Chamber L.P.C 8	m³	150		
		Extra over items D1.1				
6.1.9.1		(i) Intermediate material	m³	15		
6.1.9.2		(ii) Hard rock material	m³	6		
6.1.10		(i) Isolation Valve Chamber L.P.C 9	m³	150		
		Extra over items D1.1				
6.1.10.1		(i) Intermediate material	m³	15		
6.1.10.2		(ii) Hard rock material	m³	6		
TOTAL CARRIED FORWARD						R

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
TOTAL BROUGHT FORWARD						R
6.2	PSD8.3.8.1	EXISTING SERVICES Hand excavation for locationg and exposing existing services in:				
6.2.1		(a) All other areas	m³	250		
6.2.2	PSD 8.3.10	Topsoiling from stockpile 75 mm layer: Level on Site	m³	51		
6.2.3	PSD 8.3.14	Extra over items PSD 8.3.2. for (a) Temporary stockpiling	m³	970		
6.2.4	PSD 8.3.15	(b) Disposing of spoil material on a site provided by The Contractor	m³	1 020		
TOTAL FOR SECTION 6 CARRIED FORWARD TO SUMMARY						R

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
7	SABS 1200 DB	SECTION 7:EARTHWORKS (PIPE TRENCHES)				
7.1	PSDB8.3.2a	EXCAVATION Excavate by machine in all materials for trenches, backfill, compact and dispose of surplus or unsuitable material for pipes up to 700 mm diameter for depths:				
		Over and up to				
7.1.1		(a) 0,0 m 1,0 m	m³	0		
7.1.2		(b) 1,0 m 2,0 m	m³	0		
7.1.3		(c) 2,0 m 3,0 m	m³	2 520		
7.2	8.3.2b	Extra-over items DB1.1 to DB1.3 for excavation in (provisional):				
7.2.1		(a) Intermediate material	m³	1 000		
7.2.2		(b) Hard rock material	m³	10		
7.2.3	8.3.2c	Excavate unsuitable material from trench bottom and dispose of it	m³	13		
7.3	8.3.3	EXCAVATION ANCILLARIES				
	8.3.3.1a	Imported backfill materials from trench excavation or stockpiles on site:				
7.3.1		Acquire, deliver, place and compact imported selected backfill to fill over-excavation under pipe bedding where unsuitable material under item DB1.5 is removed	m³	13		
7.3.2	PSDB8.3.2(4)	Backfill stabilized with 5% cement where directed by the Engineer	m³			Rate only
7.3.3	PSDB8.3.2(5)	Soilcrete backfill where directed by the Engineer	m³			Rate Only
TOTAL FOR SECTION 7 CARRIED FORWARD TO SUMMARY					R	

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
8	SABS 1200 D	SECTION 8: EARTHWORKS (ELEVATED TOWER)				
8.1	PSD 8.3.2	EXCAVATION				
	PSD 8.3.2	Excavate to level in all materials and stockpile and maintain suitable material for future use for backfill or dispose as specified. Rate to include for selective removal of unsuitable material and compaction of base to 93% MOD AASHTO and allow at least 1000mm working space around structure:				
8.1.1		Pile Caps	m³	520		
8.1.2		Pile Cap Ring	m³	128		
8.1.3		Straight RC Ground Beams	m³	161		
8.1.4		Circular RC Ground Beams (Ring Beam)	m³	102		
8.1.5		Trimming down of Piles	m³	335		
8.1.6	8.3.2b	Extra over Items 8.1.1 to 8.1.4 for excavation in hard rock material.	m³	274		
8.1.7	8.3.2d	Extra over items 8.1.1 to 8.1.4 for excavation in:				
8.1.7.1		Hand excavation or other method (excluding blasting) to remove rock outcrops or rock underbreak after bulk excavation to form level site (alternative for soilcrete backfilling	m³	182		
8.1.7.2	8.3.9	Backfill to structures from existing stockpile in 200mm compacted layers to 95% MOD ASSHTO using material from stockpile on site as directed by the Engineer	m³	575		
8.1.8	PSD8.3.8.1	Exsting Services Hand excavation for locating and exposing existing services in:				
8.1.8.1		(a) Roadways	m³	50		
8.1.8.2		(b) All other areas	m³	50		
8.1.9	PSA 8.4.7	Disposal of material from stockpile to designated municipal disposal sites	m³	900		
TOTAL FOR SECTION 8 CARRIED FORWARD TO SUMMARY						R

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
9	SABS 1200 D	SECTION 9: EARTHWORKS (PUMPSTATION)				
9.1	PSD 8.3.2	EXCAVATION				
9.1.1	8.3.2a	Excavate in all materials and use for backfill, or dispose as ordered:				
9.1.1.1		(a) Pump Station	m ³	1 200		
9.1.1.2		(b) Valve Chambers No. 9, 10, 11, 12, 13, 14) - Ref Draw No. C01486-PS01	m ³	950		
9.1.2	8.3.2b	Excavate in all materials to spoil:				
9.1.2.1		(a) Pump Station Foundation	m ³	400		
9.1.2.2		(b) Valve Chamber	m ³	300		
9.1.3	8.3.2c	Extra over items D1.1 to D1.4 for excavation in:				
9.1.3.1		(a) Intermediate material	m ³	300		
9.1.3.2		(b) Hard rock material	m ³	100		
	8.3.2d	Extra over items D1.1 to D1.4 for excavation in:				
9.1.4		Hand excavation or other method (excluding blasting) to remove rock outcrops or rock underbreak after bulk excavation to form level site (alternative for soilcrete backfilling in rock overbreak)	m ³	300		
		FILLINGS ETC				
9.1.5		Compaction of ground beam, etc including scarifying for a depth of 150mm, breakdown oversize material, adding suitable material where necessary and compacting to 93% Mod AASHTO density.	m ²			
9.1.6		Pump House	m ²	350		
9.1.7		Chambers	m ²	60		
9.2	PSD8.3.8.1	EXISTING SERVICES				
9.2.1		Hand excavation for locating and exposing existing services in:				
9.2.1.1		(a) Roadways	m ³	0		
9.2.1.2		(b) All other areas	m ³	20		
9.2.2	PSD 8.3.10	Topsoiling from stockpile 75 mm layer: Level on Site	m ³	50		
9.2.3		Extra over items PSD 8.3.2. for				
9.2.3.1	PSD 8.3.14	(a) Temporary stockpiling	m ³	950		
9.2.3.2	PSD 8.3.15	(b) Disposing of spoil material on a site	m ³	700		
9.2.4	PGENRD 8	Grassing Grassing (Kikuyu instant lawn)	m ²	100		
TOTAL FOR SECTION 9 CARRIED FORWARD TO SUMMARY						R

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
10	SABS 1200 DB	SECTION 10: EARTHWORKS (PIPE TRENCHES)				
10.1		EXCAVATION				
10.1.1	PSDB8.3.2a	Excavate by machine in all materials for trenches, backfill, compact and dispose of surplus or unsuitable material for pipes up to 700 mm diameter for depths:				
		Over and up to				
10.1.1.1		(a) 0,0 m 1,0 m	m	20		
10.1.1.2		(b) 1,0 m 2,0 m	m	10		
10.1.1.3		(c) 2,0 m 3,0 m	m	15		
10.1.1.4		(d) Over 3,0 m	m	120		
10.1.2	8.3.2b	Extra-over items DB1.1 to DB1.3 for excavation in (provisional):				
10.1.2.1		(a) Intermediate material	m³	500		
10.1.2.2		(b) Hard rock material	m³	200		
10.1.3	8.3.2c	Excavate unsuitable material from trench bottom and dispose of it	m³	200		
10.2	8.3.3	EXCAVATION ANCILLARIES				
	8.3.3.1a	Imported backfill materials from trench excavation or stockpiles on site:				
10.2.1		Acquire, deliver, place and compact imported selected backfill to fill over-excavation under pipe bedding where unsuitable material under item DB1.5 is removed	m³	200		
10.2.2	PSDB8.3.2(4)	Backfill stabilized with 5% cement where directed by the Engineer	m³	0		Rate Only
10.2.3	PSDB8.3.2(5)	Soilcrete backfill where directed by the Engineer	m³	0		Rate Only
TOTAL FOR SECTION 10 CARRIED FORWARD TO SUMMARY						R

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
11	SABS 1200 G	SECTION 11: CONCRETE (PIPELINE CHAMBERS)				
11.1		CHAMBER L.P.C 1 - AIR VALVE Refer to drawing CO1486-CP18 & 19 Formwork				
11.1.1		Smoth vertical plane to air-valve chamber	m²	90		
		BOX OUT HOLES/FORM VOIDS				
		Small circular holes of diameter 0.35m up to 0.65m sealed with a bentonite strip when grouted.				
11.1.2		Inflow and Outflow pipes	No	2		
		High-tensile steel bars reinforcement				
11.1.3		Diameters 10 mm to 40 mm: average price as indicated on schedules	t	3		
11.2		CONCRETE Blinding layer in 15 MPa/19 mm concrete:				
11.2.1		50 mm minimum thickness	m²	20		
		Strength concrete: 20 MPa/19 mm: Concrete for Air-valve chamber base	m³	6		
		Strength concrete: 35 MPa/19 mm: Air-Valve chamber walls	m³	15		
		Strength concrete: 35 MPa/19 mm: Air-Valve chamber roof cover	m³	3		
11.3		UNFORMED SURFACE FINISHINGS				
		Wood floated finishings:				
11.3.1		Air-Valve chamber base	m²	20		
11.3.2		Air-Valve chamber roof	m²	20		
		CHAMBER L.P.C 2 - AIR VALVE Refer to drawing CO1486-CP18 & 19 Formwork				
11.3.3		Smoth vertical plane to air-valve chamber	m²	90		
		BOX OUT HOLES/FORM VOIDS				
		Small circular holes of diameter 0.35m up to 0.65m sealed with a bentonite strip when grouted.				
11.3.4		Inflow and Outflow pipes	No	2		
		High-tensile steel bars reinforcement				
11.3.5		Diameters 10 mm to 40 mm: average price as indicated on schedules	t	3		
TOTAL CARRIED FORWARD						R

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
TOTAL BROUGHT FORWARD						R
11.4		CONCRETE Blinding layer in 15 MPa/19 mm concrete:				
11.4.1		50 mm minimum thickness	m ²	20		
11.4.2		Strength concrete: 20 MPa/19 mm: Concrete for Air-valve chamber base	m ³	6		
11.4.3		Strength concrete: 35 MPa/19 mm: Air-Valve chamber walls	m ³	15		
11.4.4		Strength concrete: 35 MPa/19 mm: Air-Valve chamber roof cover	m ³	3		
11.5		UNFORMED SURFACE FINISHINGS				
11.5.1		Wood floated finishings: Air-Valve chamber base	m ²	20		
11.5.2		Air-Valve chamber roof	m ²	20		
11.5.3		CHAMBER L.P.C 3 - AIR VALVE Refer to drawing CO1486-CP18 & 19 Formwork Smoth vertical plane to air-valve chamber	m ²	90		
11.5.4		BOX OUT HOLES/FORM VOIDS Small circular holes of diameter 0.35m up to 0.65m sealed with a bentonite strip when grouted. Inflow and Outflow pipes	No	2		
11.5.5		High-tensile steel bars reinforcement Diameters 10 mm to 40 mm: average price as indicated on schedules	t	3		
11.5		CONCRETE Blinding layer in 15 MPa/19 mm concrete:				
11.5.1		50 mm minimum thickness	m ²	20		
11.5.2		Strength concrete: 20 MPa/19 mm: Concrete for Air-valve chamber base	m ³	6		
11.5.3		Strength concrete: 35 MPa/19 mm: Air-Valve chamber walls	m ³	15		
11.5.4		Strength concrete: 35 MPa/19 mm: Air-Valve chamber roof cover	m ³	3		
11.6		UNFORMED SURFACE FINISHINGS				
11.6.1		Wood floated finishings: Air-Valve chamber base	m ²	20		
11.6.2		Air-Valve chamber roof	m ²	20		
TOTAL CARRIED FORWARD						R

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
TOTAL BROUGHT FORWARD						R
11.6.3		CHAMBER L.P.C 4 - AIR VALVE CHAMBER Refer to drawing CO1486-CP18,19 Formwork Smoth vertical plane to Air valve chamber	m ²	90		
11.6.4		BOX OUT HOLES/FORM VOIDS Small circular holes of diameter 0.35m up to 0.65m sealed with a bentonite strip when grouted. Inflow and Outflow pipes	No	2		
11.6.5		High-tensile steel bars reinforcement Diameters 10 mm to 40 mm: average price as indicated on schedules	t	3		
11.7		CONCRETE Blinding layer in 15 MPa/19 mm concrete:				
11.7.1		50 mm minimum thickness	m ²	20		
11.7.2		Strength concrete: 20 MPa/19 mm: Concrete for Air Valve chamber base	m ³	6		
11.7.3		Strength concrete: 35 MPa/19 mm: Air Valve chamber walls	m ³	15		
11.7.4		Strength concrete: 35 MPa/19 mm: Air Valve chamber roof cover	m ³	3		
11.8		UNFORMED SURFACE FINISHINGS				
11.8.1		Wood floated finishings: Air Valve chamber base	m ²	20		
11.8.2		Air Valve chamber roof	m ²	20		
11.8.3		CHAMBER L.P.C 5 - ISOLATION-SCOUR VALVE CHAMBER Refer to drawing CO1486-CP22 & 23 Formwork Smoth vertical plane to Isolation-Scour valve chamber	m ²	110		
11.8.4		BOX OUT HOLES/FORM VOIDS Small circular holes of diameter 0.35m up to 0.65m sealed with a bentonite strip when grouted. Inflow and Outflow pipes	No	3		
11.8.5		High-tensile steel bars reinforcement Diameters 10 mm to 40 mm: average price as indicated on schedules	t	3		
11.9		CONCRETE Blinding layer in 15 MPa/19 mm concrete:				
11.9.1		50 mm minimum thickness	m ²	25		
TOTAL CARRIED FORWARD						R

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
TOTAL BROUGHT FORWARD					R	
11.9.2		Strength concrete: 20 MPa/19 mm: Concrete for Air-valve chamber base	m³	5		
11.9.3		Strength concrete: 35 MPa/19 mm: Isolation-Scour-Valve chamber walls	m³	25		
11.9.4		Strength concrete: 35 MPa/19 mm: Isolation-Scour Valve chamber roof cover	m³	5		
11.10		UNFORMED SURFACE FINISHINGS				
11.10.1		Wood floated finishings: Isolation-Scour Valve chamber base	m²	25		
11.10.2		Isolation-Scour Valve chamber roof	m²	25		
CHAMBER L.P.C 6 - AIR VALVE Refer to drawing CO1486-CP18 & 19						
Formwork						
11.10.3		Smoth vertical plane to air-valve chamber	m²	90		
BOX OUT HOLES/FORM VOIDS						
Small circular holes of diameter 0.35m up to 0.65m sealed with a bentonite strip when grouted.						
11.10.4		Inflow and Outflow pipes	No	2		
High-tensile steel bar reinforcement						
11.10.5		Diameters 10 mm to 40 mm: average price as indicated on schedules	t	3		
11.11		CONCRETE				
Blinding layer in 15 MPa/19 mm concrete:						
11.11.1		50 mm minimum thickness	m²	20		
11.11.2		Strength concrete: 20 MPa/19 mm: Concrete for Air-valve chamber base	m³	6		
11.11.3		Strength concrete: 35 MPa/19 mm: Air-Valve chamber walls	m³	15		
11.11.4		Strength concrete: 35 MPa/19 mm: Air-Valve chamber roof cover	m³	3		
11.12		UNFORMED SURFACE FINISHINGS				
11.12.1		Wood floated finishings: Air-Valve chamber base	m²	20		
11.12.2		Air-Valve chamber roof	m²	20		
CHAMBER L.P.C 7 - AIR VALVE Refer to drawing CO1483-CP18 & 19						
Formwork						
11.12.3		Smoth vertical plane to isolation-scour valve chamber	m²	20		
BOX OUT HOLES/FORM VOIDS						
Small circular holes of diameter 0.35m up to 0.65m sealed with a bentonite strip when grouted.						
11.12.4		Inflow and Outflow pipes	No	2		
TOTAL CARRIED FORWARD					R	

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
TOTAL BROUGHT FORWARD						R
11.12.5		High-tensile steel bars reinforcement Diameters 10 mm to 40 mm: average price as indicated on schedules	t	3		
11.13		CONCRETE Blinding layer in 15 MPa/19 mm concrete:				
11.13.1		50 mm minimum thickness	m ²	20		
11.13.2		Strength concrete: 20 MPa/19 mm: Concrete for isolation-scour valve chamber base	m ³	6		
11.13.3		Strength concrete: 35 MPa/19 mm: isolation-scour valve chamber walls	m ³	15		
11.13.4		Strength concrete: 35 MPa/19 mm: isolation-scour valve chamber roof cover	m ³	3		
11.14		UNFORMED SURFACE FINISHINGS				
11.14.1		Wood floated finishings: Air valve chamber base	m ²	20		
11.14.2		Air valve chamber roof	m ²	20		
11.14.3		CHAMBER L.P.C 8 - ISOLATION VALVE Refer to drawing CO1486-CP24 & 25 Formwork Smoth vertical plane to air-valve chamber	m ²	90		
11.14.4		BOX OUT HOLES/FORM VOIDS Small circular holes of diameter 0.35m up to 0.65m sealed with a bentonite strip when grouted. Inflow and Outflow pipes	No	2		
11.14.5		High-tensile steel bars reinforcement Diameters 10 mm to 40 mm: average price as indicated on schedules	t	3		
11.15		CONCRETE Blinding layer in 15 MPa/19 mm concrete:				
11.15.1		50 mm minimum thickness	m ²	20		
11.15.2		Strength concrete: 20 MPa/19 mm: Concrete for Air-valve chamber base	m ³	6		
11.15.3		Strength concrete: 35 MPa/19 mm: Air-Valve chamber walls	m ³	15		
11.15.4		Strength concrete: 35 MPa/19 mm: Air-Valve chamber roof cover	m ³	3		
11.16		UNFORMED SURFACE FINISHINGS				
11.16.1		Wood floated finishings: Air-Valve chamber base	m ²	20		
11.16.2		Air-Valve chamber roof	m ²	20		
TOTAL CARRIED FORWARD						R

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
TOTAL BROUGHT FORWARD						R
11.16.3		CHAMBER L.P.C 9 - ISOLATION VALVE Refer to drawing CO1486-CP24 & 25 Formwork Smoth vertical plane to air-valve chamber	m ²	90		
11.16.4		BOX OUT HOLES/FORM VOIDS Small circular holes of diameter 0.35m up to 0.65m sealed with a bentonite strip when grouted. Inflow and Outflow pipes	No	2		
11.16.5		High-tensile steel bars reinforcement Diameters 10 mm to 40 mm: average price as indicated on schedules	t	3		
11.17		CONCRETE Blinding layer in 15 MPa/19 mm concrete:				
11.17.1		50 mm minimum thickness	m ²	20		
11.17.2		Strength concrete: 20 MPa/19 mm: Concrete for Air-valve chamber base	m ³	6		
11.17.3		Strength concrete: 35 MPa/19 mm: Air-Valve chamber walls	m ³	15		
11.17.4		Strength concrete: 35 MPa/19 mm: Air-Valve chamber roof cover	m ³	3		
11.18		UNFORMED SURFACE FINISHINGS				
11.18.1		Wood floated finishings: Air-Valve chamber base	m ²	20		
11.18.2		Air-Valve chamber roof	m ²	20		
11.19		THRUST BLOCK				
11.19.1		Strength concrete: 20 MPa/19 mm: Thrust block	m ³	12		
11.19.2		CONCRETE CUBE-TESTING MACHINE Testing of concrete cubes	No	72		
11.19.3		Supply cube-testing machine on site with recent calibration certificate and water trough	Sum	1		
TOTAL FOR SECTION 11 CARRIED TO SUMMARY						R

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
12	SABS 1200 G	SECTION 12: CONCRETE (ELEVATED TOWER)				
12.1	8.2	FORMWORK				
	8.2.2	<u>Smooth vertical plane to:</u>				
12.1.1		Roof edge upstand Beam	m ²	80		
12.1.2		Arch Shaped Beam at level 1645,15	m ²	215		
12.1.3		Circular RC Beam (400mm in tank floor) at Level 1645,15 soffit	m ²	33		
12.1.4		Straight RC Beams at level 1645,15	m ²	248		
12.1.5		Columns from level 1644,75 to 1638,75	m ²	230		
12.1.6		Circular Ring Beam at level 1638,75	m ²	109		
12.1.7		Straight RC Beams at level 1638,75	m ²	142		
12.1.8		Columns from level 1638,75 to 1632,75	m ²	230		
12.1.9		Circular Ring Beam at level 1632,75	m ²	109		
12.1.10		Straight RC Beams at level 1632,75	m ²	142		
12.1.11		Columns from level 1632,75 to 1626,75	m ²	230		
12.1.12		Circular Ring Beam at level 1626,75	m ²	109		
12.1.13		Straight RC Beams at level 1626,75	m ²	142		
12.1.14		Columns from level 1626,75 to 1621,15	m ²	215		
12.1.15		Pile Caps	m ²	249		
12.1.16		Pile Cap Ring	m ²	42		
12.1.17		Straight RC Ground Beams	m ²	129		
12.1.18		Circular RC Ground Beams (Ring Beam)	m ²	136		
12.1.19		900mm Wide V-Channel	m ²	19		
12.1.20		Central Core Stair Landings	m ²	20		
12.1.21		Pipe Support Plinths	m ²	19		
		<u>25x25mm Chamfers to Edges of :</u>				
12.1.22		Roof Edge Upstand Beam	m	168		
12.1.23		Arch Shaped Beam at level 1645,15	m	134		
12.1.24		Circular RC Beam (400mm in tank floor) at Level 1645,15 soffit	m	84		
12.1.25		Straight RC Beams at level 1645,15	m	381		
12.1.26		Columns from level 1644,75 to 1638,75	m	288		
12.1.27		Circular Ring Beam at level 1638,75	m	271		
12.1.28		Straight RC Beams at level 1638,75	m	355		
12.1.29		Columns from level 1638,75 to 1632,75	m	288		
12.1.30		Circular Ring Beam at level 1632,75	m	271		
12.1.31		Straight RC Beams at level 1632,75	m	355		
TOTAL CARRIED FORWARD						R

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
TOTAL BROUGHT FORWARD						R
12.1.32		Columns from level 1632,75 to 1626,75	m	288		
12.1.33		Circular Ring Beam at level 1626,75	m	271		
12.1.34		Straight RC Beams at level 1626,75	m	355		
12.1.35		Columns from level 1626,75 to 1621,15	m	269		
12.1.36		Around Staircase Landings	m	33		
	8.2.2	<u>Special (circular formwork) smooth vertical plane to:</u>				
12.1.37		Tank External Walls (External Face)	m ²	610		
12.1.38		Tank External Walls (Internal Face)	m ²	548		
12.1.39		Tank Internal Walls (External Face)	m ²	88		
12.1.40		Tank Internal Walls (Internal Face)	m ²	66		
12.1.41		Central Core Walls (External Face)	m ²	430		
12.1.42		Central Core Walls (Internal Face)	m ²	371		
	8.2.2	<u>Smooth horizontal to:</u>				
12.1.43		Roof Edge Upstand Beam	m ²	34		
12.1.44		Upper Landing	m ²	20		
12.1.45		Tank Floor	m ²	539		
12.1.46		Arch Shaped Beam at level 1645,15	m ²	40		
12.1.47		Circular RC Beam (400mm in tank floor) at Level 1645,15 soffit	m ²	13		
12.1.48		Straight RC Beams at level 1645,15	m ²	93		
12.1.49		Circular Ring Beam at level 1638,75	m ²	34		
12.1.50		Straight RC Beams at level 1638,75	m ²	44		
12.1.51		Circular Ring Beam at level 1632,75	m ²	34		
12.1.52		Straight RC Beams at level 1632,75	m ²	44		
12.1.53		Circular Ring Beam at level 1626,75	m ²	34		
12.1.54		Straight RC Beams at level 1626,75	m ²	44		
12.1.55		Central Core Stair Landings	m ²	25		
	8.2.4	<u>Smooth domed formwork:</u>				
12.1.56		Domed Roof Soffit formwork	m ²	558		
	PSG 8.10	BOX OUT HOLES/FORM VOIDS				
		Small circular holes of diameter up to 0.35m sealed with a bentonite strip when grouted.				
12.1.57		Scour and overflow pipes	No	4		
	PSG 8.10	Small circular holes of diameter 0.35m up to 0.65m sealed with a bentonite strip when grouted.				
12.1.58		Inflow and Outflow pipes	No	5		
	PSG 8.10	<u>Rectangular box outs:</u>				
12.1.59		1200mm x 300mm openings for air ventilation	No	16		
12.1.60		2100mm x 900mm door opening	No	1		
TOTAL CARRIED FORWARD						R

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
TOTAL BROUGHT FORWARD						R
12.2	8.3	REINFORCEMENT				
		Columns:				
12.2.1	8.3.1	<u>Mild steel bars:</u> Diameters 8 mm to 40 mm: average price as indicated on schedules	t	8		
12.2.2	8.3.1	<u>High-tensile steel bars average price:</u> Diameters 10 mm to 40 mm: average price as indicated on schedules	t	26		
		Central Core, Bracing Beams and Stair Landings:				
12.2.3	8.3.1	<u>Mild steel bars:</u> Diameters 8 mm to 40 mm: average price as indicated on schedules	t	7		
12.2.4	8.3.1	<u>High-tensile steel bars average price:</u> Diameters 10 mm to 40 mm: average price as indicated on schedules	t	31		
		Tank Floor Beams:				
12.2.5	8.3.1	<u>Mild steel bars:</u> Diameters 8 mm to 40 mm: average price as indicated on schedules	t	0,2		
12.2.6	8.3.1	<u>High-tensile steel bars average price:</u> Diameters 10 mm to 40 mm: average price as indicated on schedules	t	32		
		Tank Internal Walls:				
12.2.7	8.3.1	<u>Mild steel bars:</u> Diameters 8 mm to 40 mm: average price as indicated on schedules	t	0,1		
12.2.8	8.3.1	<u>High-tensile steel bars average price:</u> Diameters 10 mm to 40 mm: average price as indicated on schedules	t	7		
		Tank External Walls:				
12.2.9	8.3.1	<u>Mild steel bars:</u> Diameters 8 mm to 40 mm: average price as indicated on schedules	t	0,7		
12.2.10	8.3.1	<u>High-tensile steel bars average price:</u> Diameters 10 mm to 40 mm: average price as indicated on schedules	t	40		
		Floor Slab:				
12.2.11	8.3.1	<u>Mild steel bars:</u> Diameters 8 mm to 40 mm: average price as indicated on schedules	t	0,1		
12.2.12	8.3.1	<u>High-tensile steel bars average price:</u> Diameters 10 mm to 40 mm: average price as indicated on schedules	t	18		
TOTAL CARRIED FORWARD						R

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
TOTAL BROUGHT FORWARD						R
12.3	8.4	CONCRETE				
	8.4.3	<u>Strength concrete: 25 MPa/19 mm:</u>				
12.3.1		150mm Thick Mesh RC Floor	m³	3		
12.3.2		900 Wide V-Channel	m³	9		
12.3.3		Pipe Support Plinths	m³	2		
	8.4.3	<u>Strength concrete: 40 MPa/19 mm:</u>				
12.3.4		Dome Roof	m³	139		
12.3.5		Roof Edge Upstand Beam	m³	25		
12.3.6		Upper Landing	m³	6		
12.3.7		Tank External Walls	m³	223		
12.3.8		Tank Internal Walls	m³	24		
12.3.9		Tank Floor	m³	215		
12.3.10		Arch Shaped Beam at Level 1645,15	m³	65		
12.3.10		300x800mm Circular RC Beam (400mm in tank floor) at Level 1645,15	m³	5		
12.3.11		Straight RC Beams at Level 1645,15	m³	66		
12.3.12		Columns from level 1644,75 to 1638,75	m³	43		
12.3.13		Circular Ring Beam at Level 1638,75	m³	27		
12.3.14		Straight RC Beam at Level 1638,75	m³	36		
12.3.15		Columns from level 1638,75 to 1632,75	m³	43		
12.3.16		Circular Ring Beam at Level 1632,75	m³	27		
12.3.17		Straight RC Beam at Level 1632,75	m³	36		
12.3.18		Columns from level 1632,75 to 1626,75	m³	43		
12.3.19		Circular Ring Beam at Level 1626,75	m³	27		
12.3.20		Straight RC Beam at Level 1626,75	m³	36		
12.3.21		Columns from level 1626,75 to 1621,15	m³	40		
12.3.22		Central Core Walls	m³	160		
12.3.23		Central Core Stair Landings	m³	8		
12.3.24		Pile Caps	m³	190		
12.3.25		Pile Cap Ring	m³	81		
12.3.26		Straight RC Ground Beams	m³	32		
12.3.27		Circular RC Ground Beams (Ring Beam)	m³	34		
12.3.28		Waterproofing Crystalline Concrete Admixture in Tank Roof, Walls and Floor	Kg	10 374		
TOTAL CARRIED FORWARD						R

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
TOTAL BROUGHT FORWARD					R	
12.4	8.4.4	UNFORMED SURFACE FINISHINGS				
		Steel floated finishings:				
12.4.1		Top of Dome Roof	m ²	558		
12.4.2		Top of Roof Edge Upstand Beam	m ²	34		
12.4.3		Top of Upper Landing	m ²	20		
12.4.4		Top of Tank Floor	m ²	539		
12.4.5		Top of Circular Ring Beam at level 1638,75	m ²	34		
12.4.6		Top of Straight RC Beams at level 1638,75	m ²	44		
12.4.7		Top of Circular Ring Beam at level 1632,75	m ²	34		
12.4.8		Top of Straight RC Beams at level 1632,75	m ²	44		
12.4.9		Top of Circular Ring Beam at level 1626,75	m ²	34		
12.4.10		Top of Straight RC Beams at level 1626,75	m ²	44		
12.4.11		Top of Central Core Stair Landings	m ²	25		
12.4.12		Top of Pile Caps	m ²	112		
12.4.13		Top of Pile Cap Ring	m ²	48		
12.4.14		Top of Straight RC Ground Beams	m ²	32		
12.4.15		Top of Circular RC Ground Beams (Ring Beam)	m ²	34		
12.4.16		Top of 150mm Thick Mesh RC Floor	m ²	20		
12.4.17		Top of 900 Wide V-Channel	m ²	66		
12.5		PROVISIONAL SUMS FOR PILE FOUNDATIONS				
12.5.1		Site Establishment including Plant and Equipment	Prov. Sum	1	600 000,00	600 000,00
12.5.2		Preliminaries and General (Fixed and Time-Related)	Prov. Sum	1	806 000,00	806 000,00
12.5.3		Piling Guarantee, Contractual Insurances, Design Engineer fees and completion certificate	Prov. Sum	1	100 000,00	100 000,00
12.5.4		Setting Out and Surveying	Prov. Sum	1	60 000,00	60 000,00
12.5.5		Installation of 600mm dia. Auger Piles up to 18m below NGL including Reinforcement and Concrete.	Prov. Sum	1	3 200 000,00	3 200 000,00
12.5.6		Pile Integrity Testing	Prov. Sum	1	70 000,00	70 000,00
12.5.7		Mark-up for items 12.5.1 to 12.5.6.	%			
TOTAL CARRIED FORWARD					R	

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
TOTAL BROUGHT FORWARD						R
12.6	8,5	JOINTS <u>Horizontal construction joints in accordance with 5.5.7.3 of SANS 1200G including for 100mm bandage type sealant on internal face (Sikadur combiflex or similar approved):</u>				
12.6.1		Tank External Walls	m	248		
12.6.2		Tank Internal Walls	m	29		
12.6.3		Surface Bed	m	16		
12.7		MISCELLANEOUS Stone Ballast				
12.7.1		75mm thick layer of 40mm crushed stone placed on dome roof	m²	558		
	PSA 8.4.7	Water Tightness Testing				
12.7.2		3,0ML Water Tower	Sum	1		
	PSA 8.4.7	Sterilisation				
12.7.3		3,0ML Water Tower	Sum	1		
		Protection Systems				
12.7.4		Aircraft warning light Signage	Prov. Sum	1	120 000,00	120 000,00
12.7.5		Johannesburg Water (JW) Signage on Tank Wall	Sum	1		
	8.3.12	Security Door				
12.7.6		Supply and Install "TDL" type door from STRONG DOOR or similar approved.	No	1		
12.8	SANS 1200 ME	SUBBASE				
12.8.1	8.3.2	Construct subbase in 150mm layers with G5 quality material from commercial source and compact to 97% Mod AASHTO for paved areas	m³	321,46		
	SANS 1200 MJ	SEGMENTED PAVING				
		Construction of paving complete with bedding sand compacted to 100% Mod AASHTO Density:				
12.8.2	8.2.2	60mm paving blocks 35MPa interlocking grey or similar approved CBP on 20mm bedding sand	m²	357		
12.8.3	8.2.3	Cut paving units to fit edge restraints for :				
12.8.3.1		i) Straight Cutting	m	20		
12.8.3.2		ii) Curved cutting up to 12m radius	m	69		
TOTAL FOR SECTION 12 CARRIED TO SUMMARY						R

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
13	SABS	SECTION 13: CONCRETE (PUMPSTATION)				
	1200 G					
13.1	8.2	FORMWORK				
	8.2.2	Smooth vertical plane to:				
13.1.1		Pump Station Foundations	m ²	85		
13.1.2		Thrust blocks	m ²	30		
13.2	8.2	FORMWORK				
	8.2.2	Special smooth vertical plane to:				
13.2.1		Internal and External Pumpstation Walls	m ²	400		
13.2.2		Pump Station Beams	m ²	130		
13.2.3		Pump Station Columns and Buttresses	m ²	550		
13.2.4		Chamber 9 Internal and External Walls	m ²	120		
13.2.5		Chamber 10 Internal and External Walls	m ²	160		
13.2.6		Chamber 11 Internal and External Walls	m ²	20		
13.2.7		Chamber 12 Internal and External Walls	m ²	310		
13.2.8		Chamber 13 Internal and External Walls	m ²	80		
13.2.9		Chamber 14 Internal and External Walls	m ²	120		
	8.2.2	Smooth horizontal to:				
13.2.10		Pumpstation Roof Slab & Stairs	m ²	300		
13.2.11		Pump Station Beams	m ²	50		
13.2.12		Chamber 9 soffits	m ²	15		
13.2.13		Chamber 10 soffits	m ²	25		
13.2.14		Chamber 11 soffits	m ²	30		
13.2.15		Chamber 12 soffits	m ²	110		
13.2.16		Chamber 13 soffits	m ²	6		
13.2.17		Chamber 14 soffits	m ²	15		
	8.2.5	Formwork to sides				
		Edges, risers, ends, reveals not exceeding 30mm high or wide				
13.2.18		Pumpstation	m	75		
13.2.19		Chamber 9 Bases & Roofs	m	30		
13.2.20		Chamber 10 Bases & Roofs	m	40		
13.2.21		Chamber 11 Bases & Roofs	m	50		
13.2.22		Chamber 12 Bases & Roofs	m	100		
13.2.23		Chamber 13 Bases & Roofs	m	25		
13.2.24		Chamber 14 Bases & Roofs	m	30		
13.2.25		Stairs	m	60		
13.3	PSG 8.10	BOX OUT HOLES/FORM VOIDS				
		Circular holes of diameter up to 0.7m sealed with a bentonite strip when grouted.				
13.3.1		Inlet and outlet pipes	No	22		
13.3.2	PSG 8.10	Circular holes of diameter 0.5m sealed				
		Outlet pipe from existing reservoir	No	1		
13.4	8.3	REINFORCEMENT				
	8.3.1	Mild steel bars:				
13.4.1		Diameters 8 mm to 40 mm: average price for Pump Station	t	3		
13.4.2		Diameters 8 mm to 40 mm: average price for chambers				
	8.3.1	High-tensile steel bars average price:				
13.4.3		Diameters 10 mm to 40 mm: average price as indicated on schedules	t	55		
TOTAL CARRIED FORWARD					R	

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
TOTAL BROUGHT FORWARD						R
13.5	8.4	CONCRETE				
	8.4.2	Blinding layer in 15 MPa/19 mm concrete:				
		50 mm minimum thickness				
13.5.1		Pump Station	m ²	2		
13.5.2		Chamber 9	m ²	2		
13.5.3		Chamber 10	m ²	3		
13.5.4		Chamber 11	m ²	3		
13.5.5		Chamber 12	m ²	10		
13.5.6		Chamber 13	m ²	2		
13.5.7		Chamber 14	m ²	2		
13.5.8	8.4.3	Mass concrete: 15MPa/19 mm: Below tower foundation	m ³			Rate Only
13.5.9	8.4.3	Strength concrete: 35 MPa/19 mm: Pump Station base	m ³	200		
13.5.10		Pump Station surface-bed	m ³	40		
13.5.11		Pump Station walls	m ³	120		
13.5.12		Pump Station column bases	m ³	5		
13.5.13		Pump Station columns	m ³	110		
13.5.14		Pump Station stairs	m ³	5		
13.5.15		Pump Station raft foundation	m ³	12		
13.5.16		Chamber 9 Base and Thrust blocks	m ³	5		
13.5.17		Chamber 10 Base and Thrust blocks	m ³	7		
13.5.18		Chamber 11 Base and Thrust blocks	m ³	12		
13.5.19		Chamber 12 Base and Thrust blocks	m ³	50		
13.5.20		Chamber 13 Base and Thrust blocks	m ³	2		
13.5.21		Chamber 14 Base and Thrust blocks	m ³	3		
13.5.22		Thrust blocks and plinths	m ³	5		
13.5.23	8.4.3	Strength concrete: 20 MPa/19 mm: Concrete apron	m ³	8		
13.5.24		Ramps	m ³	2		
13.5.25	8.4.3	Strength concrete: 40 MPa/19 mm: Tank Walls	m ³			
13.6	8.4.4	UNFORMED SURFACE FINISHINGS				
13.6.1		Wood floated finishings: Top of pump station base	m ²	240		
13.6.2		Top of pump station surface-bed	m ²	130		
13.6.3		Chamber 9 Base	m ²	5		
13.6.4		Chamber 10 Base	m ²	8		
13.6.5		Chamber 11 Base	m ²	12		
13.6.6		Chamber 12 Base	m ²	45		
13.6.7		Chamber 13 Base	m ²	3		
13.6.8		Chamber 14 Base	m ²	5		
13.6.9		Wood floated finishings: Top of pump station floor screed	m ²	130		
13.6.10		Chamber 9 floor screed	m ²	1		
13.6.11		Chamber 10 floor screed	m ²	2		
13.6.12		Chamber 11 floor screed	m ²	3		
13.6.13		Chamber 12 floor screed	m ²	10		
13.6.14		Chamber 13 floor screed	m ²	1		
13.6.15		Chamber 14 floor screed	m ²	1		
13.6.16		Wood floated finishings: Top of pump station roof	m ²	225		
13.6.17		Pump Room Stairs	m ²	50		
13.6.18		Chamber 9 roof	m ²	15		
13.6.19		Chamber 10 roof	m ²	20		
13.6.20		Chamber 11 roof	m ²	30		
13.6.21		Chamber 12 roof	m ²	110		
13.6.22		Chamber 13 roof	m ²	6		
13.6.23		Chamber 14 roof	m ²	15		
TOTAL CARRIED FORWARD						R

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
TOTAL BROUGHT FORWARD						R
13.7		MOVEMENT JOINTS ETC				
		Isolation joints with 10mm "Jointex" filler between vertical concrete surfaces or between vertical concrete and brick work surfaces				
13.7.1		10mm joints not exceeding 300mm high	m	140		
13.8	PSG8.9	CONCRETE CUBE-TESTING MACHINE				
13.8.1		Testing of concrete cubes	No	100		
13.8.2		Supply cube-testing machine on site with recent calibration certificate and water trough	Sum	5		
TOTAL FOR SECTION 13 CARRIED TO SUMMARY						R

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
14	SABS 1200 L	SECTION 14: PIPELINE (MAINS)				
14.1	8.2.2	PIPE LINE				
		Supplying, laying, and jointing of water pipes API 5L Grade X42, 6mm thick ,RPU external coating, solvent free epoxy (SFE) internal lining 600 microns.				
14.1.1		(a) 650mm diameter Steel	m	303		
		Supplying, laying, and jointing of steel water pipes API 5L Grade X42, 8mm thick, RPU external coating , solvent free epoxy (SFE) internal lining 600 microns in accordance to SANS 719. The coatings are according to SANS 1217. The pipeline is flanged to standard SANS 1123, Table 1600/3				
14.1.2		(b) 500mm diameter Steel	m	255		
14.1.3		(c) 300mm diameter Steel	m	15		
14.1.4		(d) 250mm diameter Steel	m	19		
		CONNECTION INTO TOWER MAIN				
14.1.5		Connection to 650mm diameter water main at Tower, pipejack 1 point T1 as shown on Drawings CO1486-CP11,12	No	1		
		CONNECTION INTO EXISTING 200mm DIAMETER PIPELINE				
14.1.6		Connection to existing 200mm diameter water main as shown on the drawings CO1486-CP15	No.	1		
		Bends				
14.1.7		(a) Item 1.1: S.S 90 deg 650mm dia	No	1		
14.1.8		(b) Item 1.1: S.S 90 deg 500mm dia	No	1		
14.1.9		(c) Item 1.2: S.S 45 deg 650mm dia	No	9		
14.1.10		(d) Item 1.2: S.S 45 deg 500mm dia	No	5		
14.1.11		(e) Item 1.3: S.S 22.5 deg 650mm dia	No	9		
		Pressure Testing of steel pipeline and other tests as per Engineer requirements				
14.1.12		Hydrostatic pressure testing of the steel water main and any other tests as per Engineer requirement	Prov Sum	1	250000,00	250 000,00
		Valves				
14.1.13		(a) Item 2.1: 200mm dia, air valve (See SANS1123 Table 1600)	No	6		
14.1.14		(b) Item 2.2: 300mm dia, isolation valve, wedge gate valve (See SANS1123) Table	No	1		
14.1.15		(c) Item 2.3: 160mm dia, isolation valve, wedge gate valve (See SANS1123) Table 1600)	No	1		
14.1.16		(d) Item 2.4: 300mm dia, scour Valve	No	1		
14.1.17		(e) Item 2.5: 500mm dia, isolation valve, wedge gate valve (See SANS1123) Table 1600)	No	1		
14.1.18		(f) Item 2.6: 400mm dia, isolation valve, wedge gate valve (See SANS1123) Table 1600)	No	1		
TOTAL CARRIED FORWARD					R	

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
TOTAL BROUGHT FORWARD					R	
14.1.19	PSL 8.2.18 PL GD	Reducers Item 5.5: MS 650 x 500mm dia Concentric reducer	No	1		
14.1.20		Item 5.6: MS 500 x 300mm dia Concentric reducer	No	1		
14.1.21		Item 5.7: MS 400 x 160mm dia Concentric reducer	No	1		
14.1.22		T-Piece Item 5.7: T-Piece	No	4		
14.1.23		Water Sampling Points Water sampling point as per drawings	No	1		
14.1.24		Wrapping of butt welded Joints Wrapping of butt welded joints along the 500mm diameter pipeline	Prov Sum	1	10 000,00	10 000,00
14.1.25		Pipeline route markers Route markers are to be constructed with a 100mm pvc sleeve filled with 20MPa concrete, as per drawing CO1486-CP11	No	5		
14.1.26		Sundries Sundries	Prov Sum	1	500 000,00	500 000,00
14.1.27		Replacement of existing infrastructure	Prov Sum	1	600 000,00	600 000,00
TOTAL CARRIED FORWARD					R	

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
TOTAL BROUGHT FORWARD						R
14.2		DAYWORKS				
		Personnel during normaal working hours				
14.2.1		(a) Unskilled labour	hr	120		
14.2.2		(b) Semi-skilled labour	hr	120		
14.2.3		(c) Skilled labour	hr	120		
14.2.4		(d) Ganger	hr	120		
14.2.5		(e) Flagmen	hr	120		
		Personnel outside normal working hours				
14.2.6		(a) Personnel outside normal working hours and Saturdays				
14.2.6.1		(i) Unskilled labour	hr	120		
14.2.6.2		(ii) Semi-skilled labour	hr	120		
14.2.6.3		(iii) Skilled labour	hr	120		
14.2.6.4		(iv) Ganger	hr	120		
14.2.6.5		(v) Flagmen	hr	120		
14.2.7		(b) Sunday and Public Holidays				
14.2.7.1		(i) Unskilled labour	hr	60		
14.2.7.2		(ii) Semi-skilled labour	hr	60		
14.2.7.3		(iii) Skilled labour	hr	60		
14.2.7.4		(iv) Ganger	hr	60		
14.2.7.5		(v) Flagmen	hr	60		
		Plant				
14.2.8		(a) Grader (CAT 140G or similar)	hr	40		
14.2.9		(b) Pedestrian Roller (Bomag BW 90 ro similar)	hr	40		
14.2.10		(c) Water truck (5000 litres)	hr	40		
14.2.11		(d) Tipper truck, 10. m ³	hr	24		
14.2.12		(e) Backhoe TLB type (Cat 428 or equivalent)	hr	24		
14.2.13		(f) Dewatering pump including generators and accessories (50mm pump, 600 litres per minute.)	hr	24		
14.2.14		(g) Compressor including hoses and tools (180 cfm)	hr	24		
		Materials				
14.2.15		(a) Procurement of materials	Prov. Sum	1	250 000,00	250 000,00
14.2.16		(b) Contractors handling costs, profit and all other charges in respect of sub-item (a) above.	%	250 000.00		
TOTAL FOR SECTION 14 CARRIED FORWARD TO SUMMARY						R

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
15	SABS 1200 LB	SECTION 15: PIPELINE (BEDDING AND FILLING FOR PIPES)				
15.1	8.2.1	PROVISION OF BEDDING Available from trench excavation without the need for screening or treatment:				
		Steel pipes (non flexible pipe bedding)				
15.1.1		(a) Selected granular material	m³	510		
15.1.2		(b) Selected fill material	m³	510		
		Including screening and/or other treatment:				
		Steel pipes (non flexible pipe bedding)				
15.1.3		(a) Selected granular material	m³	0		
15.1.4		(b) Selected fill material	m³	0		
	8.2.2	Supply of imported bedding material from:				
	8.2.2.2 & 8.2.2.3	Borrow pits or commercial sources (Provisional)				
15.1.5		(a) Selected granular material	m³	0		
15.1.6		(b) Selected fill material	m³	0		
15.1.7		Supply and place 6-20 mm graded stone as directed by the Engineer	m³	0		
15.1.8	PSLB 8.2.6	Extra over items 8.2.1 and 8.2.2 for bedding stabilized with 5% cement	m³	0		Rate Only
15.2		PROVISION OF FILLING				
15.2.1		Filling with imported material from commercial sources	m³	2 300		
TOTAL FOR SECTION 15 CARRIED FORWARD TO SUMMARY						R

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
16	SABS 1200 L	SECTION 16: PIPELINE (PUMPSTATION)				
16.1	8.2.2	PIPE LINE Supplying, laying, and jointing of water pipes SAW to API 5L Grade X42, 6mm thick with 6mm CML and Rigid Polyurethane coating. The pipeline is flanged to standard SANS 1123, Table 1600/3				
16.1.1		(a) 700mm Steel	m	120		
16.1.2		(b) 650mm Steel	m	45		
16.1.3		(c) 600mm Steel	m	80		
16.1.4		(d) 500mm Steel	m	10		
16.1.5		(e) 300mm Steel	m	5		
16.1.6		(e) 200mm Steel	m	60		
16.1.7		(f) 150mm Steel	m	50		
	8.2.2	PIPE LINE FITTINGS Supply, deliver and install complete with all jointing material, the following items:				
		Inlet Pipe from reservoir to pumpstation				
16.1.8		a) 700mmØ non-rising class 16 anti-clockwise closing wedge gate valve with cap top	No.	1		
16.1.9		b) 500mmØ Cut length pipe, 1260mm long, both sides flanged	No	2		
16.1.10		c) 500mmØ 135° long bend, flanged all ends	No	2		
16.1.11		d) 700 x 500mmØ special concentric reducer, flanged all sides	No	1		
		Outlet Pipe from pumpstation to elevated tower				
16.1.12		a) 500mmØ 90° short radius bend, flanged both ends	No	1		
16.1.13		b) 500mmØ Cut length pipe, 500mm long, both sides flanged	No	2		
		Inlet Pipe from 1100Ø pipe to elevated tower				
16.1.14		a) 300mmØ 90° short radius bend, flanged both ends	No	1		
16.1.15		b) 500mmØ Cut length pipe, 2000mm long, both sides flanged	No	1		
16.1.16		c) 500mmØ Cut length pipe, 700mm long, both sides flanged	No	2		
16.1.17		d) 300mmØ Cut length pipe, 500mm long, both sides flanged	No	1		
16.1.18		e) 500 x 300mmØ special concentric reducer, flanged all sides	No	1		
16.1.19		f) 500mmØ equal "T" piece, all sides flanged	No	2		
16.1.20		g) 500mmØ non-rising class 16 anti-clockwise closing wedge gate valve with cap top	No.	1		
TOTAL CARRIED FORWARD					R	

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
TOTAL BROUGHT FORWARD						R
16.1.21		Tower Bypass Pipeline to Outlet pipe a) 600mmØ 90° short radius bend, flanged both ends	No	2		
16.1.22		b) 600mmØ Cut length pipe, 1300mm long, both sides flanged	No	1		
16.1.23		c) 600mmØ equal "T" piece, all sides flanged	No	2		
16.1.24		d) 650mmØ to 600mmØ Reducing "T" piece, all sides flanged	No	1		
16.1.25		e) 600Ø PN16 cast iron Non Return Valve swing type	No.	1		
16.1.26		f) 600mmØ non-rising class 16 anti-clockwise closing wedge gate valve with cap top	No.	1		
		CONNECTION INTO EXISTING Connection to existing pipeline complete as shown on drawings including excavation and all specials				
16.1.27		Connection to existing pipe junctions including excavation and making good. (On the 1100mm dia pipeline)	No	1		
16.1.28		Connection to existing pipe junction at Reservoir site including excavation, breaking through walls and making good.	No	1		
	8.2.1	VALVE CHAMBER 09 - Outlet from Elevated Tower Supply, deliver and install complete with all jointing material, the following items as shown on drawing C01486-PS15				
16.1.29		a) 650mmØ Puddle pipe, 1000mm long, flanged one side, plain ended the other side, with puddle flange	No	2		
16.1.30		b) 150mmØ non-rising class 16 anti-clockwise closing wedge gate valve with cap top	No.	1		
16.1.31		c) 150mmØ 90° short radius bend, flanged one side	No	1		
16.1.32		d) 650mmØ non-rising class 16 anti-clockwise closing wedge gate valve with cap top	No.	1		
16.1.33		e) 150mmØ Cut length pipe, 200mm long, both sides flanged	No	1		
		f) 650Ø PN16 cast iron Non Return Valve swing type	No.	1		
16.1.34		g) 600Ø PN16 dynamic turbine flowmeter with flanges drilled to SANS 1123-1600	No	1		
	8.2.1	VALVE CHAMBER 10 - Inlet to Pump Station Supply, deliver and install complete with all				
16.1.35		a) 700 x 500mmØ special flanged concentric	No	1		
16.1.36		b) 500mmØ Puddle pipe, 1000mm long,	No	2		
16.1.37		c) 500mmØ Cut length pipe, 500mm long, both	No	2		
16.1.38		d) 500mmØ non-rising class 16 anti-clockwise closing wedge gate valve with cap top	No.	1		
TOTAL CARRIED FORWARD						R

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
TOTAL BROUGHT FORWARD						R
16.1.39	8.2.1	e) 500ø PN16 flanged strainer with flanges drilled to SANS 1123-1600	No	1		
16.1.40		f) 500ø PN16 dynamic turbine flowmeter with flanges drilled to SANS 1123-1600	No	1		
		VALVE CHAMBER 11 - Outlet from Pump Station Supply, deliver and install complete with all jointing material, the following items as shown on drawing C01486-PS15				
16.1.41		a) 500mmø Puddle pipe, 1000mm long, flanged all sides, with puddle flange	No	1		
16.1.42		b) 500 x 300mmø special flanged concetric reducer, 500mm long, flanged both ends	No	1		
16.1.43		c) 600mmø 90° short radius bend, flange both ends flanged to SANS 1123 Table 1600	No	1		
16.1.44		d) 300mmø Cut length pipe, 500mm long, both sides flanged	No	5		
16.1.45		e) 300mmø non-rising class 16 anti-clockwise closing wedge gate valve with cap top	No.	2		
16.1.46		f) 300ø PN16 flanged strainer with flanges drilled to SANS 1123-1600	No	1		
16.1.47		g) 300ø PN16 dynamic turbine flowmeter with flanges drilled to SANS 1123-1600	No	1		
16.1.48		h) 300ø PN16 cast iron Non Return Valve swing type	No	1		
16.1.49		i) 600 x 300mmø special flanged concetric reducer, 500mm long, flanged both ends.	No	1		
16.1.50		j) 600mmø Puddle pipe, 1000mm long, flanged all sides, with puddle flange	No	1		
		8.2.1	VALVE CHAMBER 12 - PRV & Altitude Flow Control Supply, deliver and install complete with all jointing material, the following items as shown on drawing C01486-PS16			
16.1.51	a) 300mmø Puddle pipe, 1000mm long, flanged one side, plain ended the other side, with puddle flange	No	2			
16.1.52	b) 300mmø 135° short radius bend, flanged ends	No	6			
16.1.53	c) 300mmø special gusset Y-piece, flanged one end, plain ended on the two branch sides, one branch with concetric reducer to 200mm	No	2			
16.1.54	d) 300mmø special gusset Y-piece, flanged all sides	No	2			
16.1.55	e) 300mmø non-rising class 16 anti-clockwise closing wedge gate valve with cap top	No.	6			
16.1.56	f) 200mmø non-rising class 16 anti-clockwise closing wedge gate valve with cap top	No.	1			
16.1.57	g) 300ø PN16 flanged strainer with flanges drilled to SANS 1123-1600	No	1			
16.1.58	h) 300ø PN16 dynamic turbine flowmeter with flanges drilled to SANS 1123-1600	No	1			
16.1.59	i) 300ø PN16 cast iron Non Return Valve swing	No	1			
TOTAL CARRIED FORWARD						R

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
TOTAL BROUGHT FORWARD						R
16.1.60		j) 300ø Singer 106-A Type 4 with Differential Control One-Way Flow Altitude Valve or Equivalent	No.	1		
16.1.61		k) 300mmø Cut length pipe, 300mm long, both sides flanged	No	2		
16.1.62		l) 300mmø Cut length pipe, 400mm long, both sides flanged	No	11		
16.1.63		m) 300mmø 90° short radius bend, flanged both ends	No	3		
16.1.64		n) 600 x 300mmø concentric reducer, 500mm long, flanged both ends	No	1		
16.1.65		o) 300mmø Cut length pipe, 2500mm long, both sides flanged	No	1		
16.1.66		p) 300mmø length pipe, 1900mm long, both sides flanged	No	1		
16.1.67		q) 200mmø Cut length pipe, 2550mm long, both sides flanged	No	1		
16.1.68		l) 200mmø 135° short radius bend, flanged	No	2		
16.1.69		m) 300mmø clayton PRV, or similar approved	No	1		
16.1.70		q) 200mmø Cut length pipe, 1100mm long, both sides flanged	No	1		
16.1.71		k) 300mmø Cut length pipe, 500mm long, both sides flanged	No	1		
	8.2.1	VALVE CHAMBER 13 - Bypass connection Supply, deliver and install complete with all jointing material, the following items as shown on drawing C01486-PS18				
16.1.72		a) 1100 x 300mmø special flanged concentric reducing Tee with 300mm spool piece	No	1		
16.1.73		b) 300mmø non-rising class 16 anti-clockwise closing wedge gate valve with cap top	No.	1		
16.1.74		c) 300mmø Puddle pipe, 500mm long, flanged both side, with puddle flange	No	1		
		PUMP STATION Supply, deliver, install complete with all jointing material and commission the following items:				
16.1.75		KSB SA OMEGA 250-370A (389 impeller) with a WEG 160kW 380v 315 S/M 4p motor or similar approved including base plate, supply and delivery pipe modifications to ensure fit, capable of following duty: 280l/s at 45.0m with NPSH _r max of 5m.	Item	3		
16.1.76		Provisional sum for pipe work modifications to suit selected pump on inlets and outlets	Prov Sum	1	150 000,00	150 000,00
		General Fittings				
16.1.78		a) 500mmø/300mmø custom made 135° reducing Y-piece, flanged all ends	No	3		
16.1.79		b) 300mmø 135° short bend, flanged all ends	No	3		
16.1.80		c) 250mmø 90° short radius bend, flanged both ends	No	6		
TOTAL CARRIED FORWARD						R

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
TOTAL BROUGHT FORWARD					R	
16.1.81		d) 250mmø 135° short bend, flanged all ends	No	3		
16.1.82		e) 500mmø 135° short bend, flanged all ends	No	1		
16.1.83		f) 500mmø x 250mmø concentric reducer, flanged both ends	No	3		
16.1.84		g) 250mmø dismantling joint	No	3		
16.1.85		h) Clamp-on Ultrasonic Flow Meter with ±2% accuracy for a Steel pipe DN250mm with vibration resistance up to 50Hz	No.	3		
16.1.86		i) 500mmø Custom made 135° Y-piece, flanged all ends	No.	3		
16.1.87		j) 500mmø end cap flanged	No.	2		
		Valves				
16.1.88		a) 300mmø non-rising class 16 anti-clockwise closing wedge gate valve with cap top	No.	3		
16.1.89		b) 250mmø non-rising class 16 anti-clockwise closing wedge gate valve with cap top	No.	3		
16.1.90		c) 250mmø PN16 cast iron Non Return Valve swing type	No	3		
		Cut Lengths				
16.1.91		a) 300mmø Cut length pipe, 315mm long, both sides flanged	No	3		
16.1.92		b) 250mmø Cut length pipe, 580mm long, both sides flanged	No	3		
16.1.93		c) 250mmø Puddle pipe, 1175mm long, flanged all sides, with puddle flange	No	3		
16.1.94		d) 250mmø Cut length pipe, 400mm long, flanged both sides	No	3		
16.1.95		e) 300mmø Cut length pipe, 150mm long, both sides flanged	No	3		
16.1.96		f) 500mmø Cut length pipe, 2080mm long, both sides flanged	No	1		
16.1.97		g) 500mmø Cut length pipe, 1950mm long, both sides flanged	No	1		
16.1.98		h) 500mmø Cut length pipe, 1240mm long, both sides flanged	No	2		
16.1.99		i) 250mmø Cut length pipe, 3755mm long, both sides flanged	No	3		
16.1.100		j) 250mmø Cut length pipe, 500mm long, both sides flanged	No	3		
16.1.101		k) 250mmø Cut length pipe, 1885mm long, both sides flanged	No	3		
16.1.102		l) 500mmø Puddle pipe, 2700mm long, flanged both side, with puddle flange	No	1		
16.1.103		m) 500mmø Cut length pipe, 2360mm long, both sides flanged	No	1		
16.1.104		n) 300mmø Cut length pipe, 265mm long, both sides flanged	No	3		
TOTAL CARRIED FORWARD					R	

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
TOTAL BROUGHT FORWARD					R	
16.1.105		Supply a portable Submersible Drainage Pump with a float switch with a minimum capacity of 6L/s at 10m head. <i>The pump should fit narrow spaces (30cm dia) and should handle a maximum submersion depth of 7m.</i>	No.	2		
16.1.106	PSL 8.2.18	Pipeline route markers Route markers are to be constructed with a 100mm pvc sleeve filled with 20MPa concrete, as per drawing	No	8		
TOTAL FOR SECTION 16 CARRIED FORWARD TO SUMMARY					R	

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
17	SABS 1200 LB	SECTION 17: PUMPSTATION (BEDDING FOR PIPES)				
17.1	8.2.1	PROVISION OF BEDDING Available from trench excavation without the need for screening or treatment: Steel pipes (non flexible pipe bedding)				
17.1.1		(a) Selected granular material	m³	50		
17.1.2		(b) Selected fill material	m³	1 200		
		Including screening and/or other treatment: Steel pipes (non flexible pipe bedding)				
17.1.3		(a) Selected granular material	m³	100		
17.1.4		(b) Selected fill material	m³	500		
	8.2.2	Supply of imported bedding material from:				
	8.2.2.2 & 8.2.2.3	Borrow pits or commercial sources (Provisional)				
17.1.5		(a) Selected granular material	m³	50		
17.1.6		(b) Selected fill material	m³	500		
17.1.7		Supply and place 6-20 mm graded stone as directed by the Engineer	m³	30		
17.1.8	PSLB 8.2.6	Extra over items 8.2.1 and 8.2.2 for bedding stabilized with 5% cement	m³	3		Rate Only
TOTAL FOR SECTION 17 CARRIED FORWARD TO SUMMARY						R

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
18		SECTION 18: ELEVATED TOWER PIPEWORK				
18.1	SABS 1200 L	STEEL PIPES & FITTINGS				
	PSL 8.2.5 PSL 8.2.7 PB 8.2 PB 8.3	(Refer also to specification PSL, PA, PB, PD, PE, PX & PI Supply, deliver, install, handle, lay, bed, joint, Unless otherwise specified all steel pipes and specials in this sections shall be Grade - Flanges to Table 1000/3 SANS 1123 - Rates to include for 'denso-wrapping' - Rates to include for casting into - Puddle pipes to be tape wrapped to specifications Elevated Tower Inlet Pipework Item IN1: 500mm Ø 90° steel short radius bend, FBE Item IN2: 500mmØ,steel pipe 1236mm long, FBE Item IN3: 500mmØ steel pipe 3200 mm long, FBE Item IN4: 500mmØ steel pipe 3133 mm long, FBE Item IN5: 500mm Ø 90° steel short radius bend with puddle flange and base plate, FBE Item IN6: 500mmØ steel pipe 4000 mm long, FBE Item IN7: 500mmØ steel pipe 3002 mm long, FBE Item IN8: 500mmØ steel pipe s-bend, FBE Item IN9: 500mmØ steel pipe 3226 mm long, FBE Item IN10: 500mm Ø 90° steel short radius bend with puddle flange and bellmouth OE and FOE				
18.1.1		500mm Ø 90° steel short radius bend, FBE	N°	2		
18.1.2		500mmØ,steel pipe 1236mm long, FBE	N°	1		
18.1.3		500mmØ steel pipe 3200 mm long, FBE	N°	2		
18.1.4		500mmØ steel pipe 3133 mm long, FBE	N°	1		
18.1.5		500mm Ø 90° steel short radius bend with puddle flange and base plate, FBE	N°	1		
18.1.6		500mmØ steel pipe 4000 mm long, FBE	N°	4		
18.1.7		500mmØ steel pipe 3002 mm long, FBE	N°	1		
18.1.8		500mmØ steel pipe s-bend, FBE	N°	1		
18.1.9		500mmØ steel pipe 3226 mm long, FBE	N°	2		
18.1.10		500mm Ø 90° steel short radius bend with puddle flange and bellmouth OE and FOE	N°	1		
TOTAL CARRIED FORWARD					R	

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
TOTAL BROUGHT FORWARD						R
		Elevated Tower Outlet Pipework				
18.1.11		Item OT1: 500mm Ø 90° steel short radius bend, FBE	N°	3		
18.1.12		Item OT2: 500mmØ,steel pipe 1236mm long, FBE	N°	1		
18.1.13		Item OT3: 500mmØ steel pipe 3000 mm long, FBE	N°	2		
18.1.14		Item OT4: 500mmØ steel pipe 2989 mm long, FBE	N°	1		
18.1.14		Item OT5: 500mm Ø 90° steel short radius bend with puddle flange and base plate, FBE	N°	1		
18.1.15		Item OT6: 500mmØ steel pipe 4000 mm long, FBE	N°	4		
18.1.16		Item OT7: 500mmØ steel pipe 2994 mm long, FBE	N°	1		
18.1.17		Item OT8: 500mmØ steel pipe 2257 mm long, FBE	N°	1		
		Elevated Tower Overflow Pipework				
18.1.18		Item OV1: 200mm Ø 90° steel short radius bend, FBE	N°	3		
18.1.19		Item OV2: 200mmØ,steel pipe 1236mm long, FBE	N°	1		
18.1.20		Item OV3: 200mmØ,steel pipe 3000mm long, FBE	N°	2		
18.1.21		Item OV4: 200mmØ,steel pipe 3060mm long, FBE	N°	1		
18.1.22		Item OV5: 200mmØ,steel pipe 2276mm long, FBE	N°	1		
18.1.23		Item OV6: 200mmØ,steel pipe 1172mm long, FBE	N°	1		
18.1.24		Item OV7: 200mm Ø 90° steel short radius bend with puddle flange and base plate, FBE	N°	1		
18.1.25		Item OV8: 200mmØ,steel pipe 4000mm long, FBE	N°	4		
18.1.26		Item OV9: 200mmØ,steel pipe 4323mm long, FBE	N°	1		
TOTAL CARRIED FORWARD						R

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
TOTAL BROUGHT FORWARD						R
18.1.27		Item OV10: 200mmØ,steel s-bend, FBE	Nº	1		
18.1.28		Item OV11: 200mmØ,steel pipe 2600mm long, FBE	Nº	2		
18.1.29		Item OV12: 200mm Ø 90° steel short radius bend, FBE	Nº	1		
18.1.30		Item OV13: 200mm Ø 90° steel short radius bend, FBE	Nº	1		
18.1.31		Item OV14: 200mmØ,steel pipe 463mm long, FBE	Nº	1		
Elevated Tower Scour Pipework						
18.1.32		Item SC1: 150mm Ø 90° steel short radius bend, FBE	Nº	3		
18.1.33		Item SC2: 150mmØ,steel pipe 1236mm long, FBE	Nº	1		
18.1.34		Item SC3: 150mmØ,steel pipe 3000mm long, FBE	Nº	2		
18.1.35		Item SC4: 150mmØ,steel pipe 3060mm long, FBE	Nº	1		
18.1.36		Item SC5: 200mmØ,steel pipe 1038mm long, FBE	Nº	1		
18.1.37		Item SC6: 200mmØ,steel pipe 1038mm long, FBE	Nº	1		
18.1.38		Item SC7: 150mm Ø 90° steel short radius bend with puddle flange and base plate, FBE	Nº	1		
18.1.39		Item SC8: 150mmØ,steel pipe 4000mm long, FBE	Nº	4		
18.1.40		Item SC9: 150mmØ,steel pipe 2362mm long, FBE	Nº	1		
18.1.41		Item SC10: 150mmØ,steel pipe 2738mm long, FBE	Nº	1		
TOTAL FOR SECTION 18 CARRIED FORWARD TO SUMMARY						R

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
19	SANS 1200LG	SECTION 19: PIPE JACKING				
19.1	8.2.1	PIPE JACKING AT ROAD CROSSINGS Jacking Establishment for Pipejack 1 - Pipejack 3 position:				
19.1.1		Fixed charges	Sum	3		
19.1.2		Time related charges	Hours	1		Rate Only
	8.3	PIPE JACK 1 (refer to drawing CO1486-CP12)				
19.1.3	8.3.1	Excavate jacking pit ,face,provision for safe guarding and stabilizing of excavations.	No.	1		
19.1.4		a) soft and intermediate	m³	50		
19.1.5		Extra Over Item:8.3a in rock SANS 1200 R1-R5	m³	1		Rate Only
	8.3.2	Supply Pipes Supply pipes to be jacked				
19.1.6		a) 1430 diameter class 100D with in-the wall SABS677	m	20		
19.1.7		b) Soft and intermediate	m³	32		
19.1.8		c) Extra over item 7.6 excavation in rock SANS 1200 R1-R5	m³	1		Rate Only
	8.3.3	Jacking of pipes Jacking of pipes into their final positions				
19.1.9		a) 1430mm diameter class 100D with in the-wall pipes SABS677	m	20		
19.1.10		Standing time for pipe jacking ganag complete with equipement(where approved)	hr	1		Rate Only
	8.3.4	Grouting Grouting by injection of cement/sand grout mix (ratio of 1:4) where ordered				
19.1.11		Provision and establishment of equipment on site and removal on completion	sum	1		
19.1.12		Operation of equiment	days	3		
19.1.13		Grout	m³	5		
TOTAL CARRIED FORWARD					R	

TOTAL BROUGHT FORWARD						R
19.2	8.4.1	8.4 PIPE JACK 2 (refer to drawing CO1483-CP13)				
		Excavate jacking pit ,face,provision for safe guarding and stabilizing of excavations.	No.	1		
19.2.1		a) soft and intermediate	m³	50		
19.2.2		Extra Over Item:8.4.1a in rock as per SANS - R1 to R5	m³	1		Rate Only
	8.4.2	Supply Pipes Supply pipes to be jacked				
19.2.3		a) 1430 diameter class 100D with in-the wall SABS677	m	35		
19.2.4		a) Soft and intermediate	m³	51		
19.2.5		b) Extra over item 8.4.2a excavation in rock SANS 1200 R1-R5	m³	1		Rate Only
	8.4.3	Jacking of pipes Jacking of pipes into their final positions				
19.2.6		a) 1430mm diameter class 100D with in the-wall pipes SABS677	m	35		
19.2.7		Standing time for pipe jacking ganag complete with equipement(where approved)	hr	1		Rate Only
	8.4.4	Grouting Grouting by injection of cement/sand grout mix (ratio of 1:4) where ordered				
19.2.8		Provision and establishment of equipment on site and removal on completion	Sum	1		
19.2.9		Operation of equiment	days	3		
19.2.10		Grout	m³	5		
19.3		8.5 PIPE JACK 3 (refer to drawing CO1483-CP14)				
19.3.1	8.5.1	Excavate jacking pit ,face,provision for safe guarding and stabilizing of excavations.	No.	1		
19.3.2		a) soft and intermediate	m³	6		
19.3.3		Extra Over Item 8.5.1a as per SANS 1200 - R1 to R5	m³	1		Rate Only
	8.5.2	Supply Pipes Supply pipes to be jacked				
19.3.4		SABS677	m	15		
TOTAL CARRIED FORWARD						R

TOTAL BROUGHT FORWARD					R	
19.3.5		a) Soft and intermediate	m³	6		
19.3.6		Extra over item 8.5.2a in rock as per SANS 1200-R1 to R5	m³	1		Rate Only
	8.5.3	Jacking of pipes				
		Jacking of pipes into their final positions				
19.3.7		a) 1430mm diameter class 100D with in the-wall pipes SABS677	m	15		
19.3.8		Standing time for pipe jacking ganag complete with equipement(where approved)	hr	1		Rate Only
	8.5.4	Grouting				
		Grouting by injection of cement/sand grout mix (ratio of 1:4) where ordered				
19.3.9		Provision and establishment of equipment on site and removal on completion	Sum	1		
19.3.10		Operation of equiment	Days	3		
19.3.11		Grout	m³	5		
TOTAL SECTION 19 CARRIED TO SUMMARY					R	

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
20	SABS 1200 HA	SECTION 20 : STRUCTURAL STEELWORK (ELEVATED TOWER)				
20.1		<u>Supply and Fabrication</u>				
20.1.1		Preparation and submission to the Engineer for approval of shop detail drawings.	t	3,1		
	8.3.1	<u>Supply and fabrication of steelwork:</u>				
20.1.2		200 x 75 mm PFC Sections	t	3,1		
20.1.3		Rectagrid Grating RS40-40x4,5 Bearer Bar Size- Banded Finish: Hot Dip Galvanised	m ²	25		
	8.3.2	<u>Deliver</u>				
20.1.4	8.3.2.1	Delivery of steelwork to site of all items under 8.3.1 above	t	3,1		
	8.3.3	<u>Erection</u>				
20.1.5		Offloading of steel, stacking on site, and erection of steelwork of all items under 8.3.1 above	t	3,1		
	8.3.4	<u>Erection Bolts</u>				
		Supply, deliver and storage of bolts, washer and nuts as indicated on drawing C01486-SC 01 - C01486-SC 07				
20.1.6		M16	t	0,1		
	8.3.7	<u>Handrails</u>				
20.1.7		Handrails assembly complete as per drawing C01486-SC 01 - C01486-SC 07				
20.1.7.1		a) Horizontal	m	18		
20.1.7.2		b) Sloping on stairs at 45 deg angle	m	66		
	8.3.8	<u>Ladders</u>				
20.1.8		Supply and install Hot dip galvanized mild steel Catladders as detailed on drawing C01486-SC 01 - C01486-SC 07	m	11		
20.1.9		Supply and install Stainless Steel Catladders as detailed on drawing C01486-SC 01 - C01486-SC 07	m	8		
		<u>Air Vents</u>				
20.1.10		Supply and install one pair of 150mm Ø galvanised steel air vents as detailed on Drg C01486-SC 01 - C01486-SC 07	No	6		
		<u>Manholes</u>				
	PSA 8.4.7	Supply and install hot dip galvanised lockable manhole cover and frame to access openings, rate includes for all fixings, locks, etc:				
	PSA 8.4.8	Supply and install hot dip galvanised lockable manhole cover and frame to access openings, rate includes for all fixings, locks, etc:				
20.1.11		1000 x 1000mm	No.	3		
		<u>Rain Water Outlets</u>				
20.1.12		Supply and install 110mm Ø C.I rain water outlets with 12x3.3mm Ø stainless steel Mesh 1260mm long 550mm wide and bolted with 6 No. 6 Ø SS masonry anchor bolts	No.	12		
TOTAL FOR SECTION 20 CARRIED TO SUMMARY						R

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
21	SABS 1200 HA	SECTION 21 : STRUCTURAL STEELWORK (PUMPSTATION)				
21.1	8.3.1	SUPPLY AND FABRICATION				
21.1.1	8.3.1.1	Preparation and submission to the Engineer for approval of shop detail drawings.	t	1,2		
		Supply and fabrication of steelwork A. Hot rolled steel (a) PFC Sections for platforms				
21.1.2		1. 230 x 90 mm	t	0,0		Rate Only
21.1.3		Trial assembly of platforms	No	0,0		Rate Only
	8.3.2	DELIVERY				
21.1.4	8.3.2.1	Delivery of steelwork to site of all items under 8.3.1 above	t	1,2		
	8.3.3	ERECTION				
21.1.5		Offloading of steel, stacking on site, and erection of steelwork of all items under 8.3.1 above	t	1,2		
	8.3.4	ERECTION BOLTS				
		Supply, deliver and storage of bolts, washer and nuts as indicated on drawing 1440a/WA/DET09				
21.1.6		(a) M16	t	0,1		
	8.3.7	HANDRAILS				
		Handrails assembly complete as per drawings C01486-PS14				
21.1.7		a) Horizontal	m	30		
21.1.8		b) Sloping on stairs at 45 deg angle	m	60		
	8.3.8	LADDERS				
21.1.9		Supply and install Hot dip galvanized mild steel Catladders as detailed on drawing C01486-PS14	m	15		
	8.3.10	NON-DESTRUCTIVE TESTING				
21.1.10		Testing of welding as indicated by the engineer including supply of test certificates.	No.	10		
	PSH 8.3.17	CRAWL BEAMS				
21.1.11		254 x 146 mm x 43kg/m I-section beams with cast in plates and bolts	t	1,20		
21.1.12		UC254x254x132	t			
21.1.13		UB533x210x101 with cast in plates and bolts	t			
21.1.14	PSH 8.3.18	Security Concrete desk steel support structure Equal angles (50x50x5), to include installation, and connections.	t	1		
21.1.15	PSH 8.3.19	Equal angles (40x40x5) with lugs to be cast into concrete edges	t	0,10		
21.1.16	PSH 8.3.20	Mentis grid as detailed in Pump station drawings	m²	40		
TOTAL CARRIED FORWARD						R

TOTAL BROUGHT FORWARD					R
21.2		MISCELLANEOUS			
21.2.1	BD 08.02.01a	Customised 1525x3060mm steel doors with DV vent at the bottom. Including frame refer to dwg C01486-PS09	No.	2	
21.2.2	BD 08.02.01a	2700x3000mm steel doors with DV vent at the bottom. Including frame	No.	1	
21.2.3	BD 08.02.01a	915mm X 2135mm Standard Steel Door and Frame Type B (Vermin Proofed Single Louvre) and Painted To Specifications	No.	2	
		Hold down pipe clamps (250mmØ discharge pipes in pump station)			
21.2.4	BD 08.02.01c	400mm x 400mm Steel Ventilation Louvr, including the frame.	No.	46	
21.2.5	BD 08.05	Coring through concrete walls	Prov Sum	1	40 000,00
					40 000,00
21.2.6	8.3.12	SECURITY ACCESS DOOR Supply and Install steel door "L1"- L shape profile, multi-point locking system, with four 16mm locking bolts and drill resistant plate as shown on drawing C01486-PS05	No	2	
21.3	SABS 1200 HC	SECTION HC: CORROSION PROTECTION OF STRUCTURAL STEELWORK			
	8.2.3	SURFACE PREPARATION AND COATING APPLICATION			
		Shopwork:			
21.3.1		Surface preparation (acid bath) and cleaning	t	2,7	
21.3.2		Hot dip Galvanzied coating	t	2,7	
TOTAL FOR SECTION 21 CARRIED TO SUMMARY					R

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
22	SECTION 22: ELECTRICAL EQUIPMENT: LINBRO PUMP STATION				
22.1	LV MCC EQUIPMENT				
	<u>LV Motor Control Centre (MCC)</u>				
	LV MCC in accordance with applicable Clauses of the Particular Specification.				
	Procurement/Manufacture/Testing of Pump station MCC and delivery to Site and off loading				
22.1.1	MCC- LINBRO Pump Station	Item	1,00		
	Installation, testing and commissioning of Pump station MCC				
22.1.2	MCC- LINBRO Pump Station	Item	1,00		
	<u>Generator</u>				
	Generator in accordance with applicable of the Particular Specification				
	Procurement/Manufacture/Testing of Generator and delivery to Site and off loading				
22.1.3	500kVA Prime Power Generator - Linbro PS	Item	1,00		
22.1.4	Site acceptance testing and commissioning the 500kVA, 400V, 3-phase diesel generator set as specified complete with the fuel tank system	Item	1,00		
	Installation, testing and commissioning of Generator				
22.1.5	500kVA Prime Power Generator - Linbro PS	Item	1,00		
22.1.6	Site acceptance testing as specified and all paper work	Item	1,00		
22.1.7	Diesel Fuel For All Tests and First Tank Fill including delivery to site	L	1 200,00		
	<u>Generator Room - Small Power and Lighting</u>				
	Generator room Small power and lighting Distribution				
	Supply, delivery and offloading				
22.1.8	Smal Power Lighting Distriution	Item	1,00		
	Site Installation				
22.1.9	Smal Power Lighting Distriution	Item	1,00		
	<u>Area Lighting Kiosks</u>				
	Supply, delivery, offloading and storage				
22.1.10	Area lighting Kiosks	Item	2,00		
22.1.11	Concerete Plinth for Kiosks	Item	2,00		
	Site Installation and Testing				
22.1.12	Area lighting Kiosks	Item	2,00		
22.1.13	Concerete Plinth for Kiosks	Item	2,00		
22.1.14	Site Acceptance testing and commissioning	Item	2		
Total Carried Forward					

ITEM NO	DESCRIPTION	UNIT	QTY		
Brought Forward					
	<u>LV Cables</u>				
	PVCPVCSWAPVC 600/1000V copper conductor cables in accordance with applicable clause of the Particular Specification.				
	Supply, delivery, offloading and storage				
22.1.15	4c x 185mm ²	m	200,00		
22.1.16	4c x 150mm ²	m	150,00		
22.1.17	4c x 70mm ²	m	100,00		
22.1.18	4c x 2.5mm ²	m	40,00		
	Site installation and testing				
22.1.19	4c x 185mm ²	m	200,00		
22.1.20	4c x 150mm ²	m	150,00		
22.1.21	4c x 70mm ²	m	100,00		
22.1.22	4c x 2.5mm ²	m	40,00		
	<u>LV Cables Terminations</u>				
	LV Cable terminations in accordance with applicable clause 12 of the Particular Specification				
	Supply, delivery, offloading and storage				
22.1.23	4c x 185mm ²	No	6		
22.1.24	4c x 150mm ²	No	6		
22.1.25	4c x 70mm ²	No	6		
22.1.26	4c x 2.5mm ²	No	2		
	Site installation and testing				
22.1.27	4c x 185mm ²	No	6		
22.1.28	4c x 150mm ²	No	6		
22.1.29	4c x 70mm ²	No	6		
22.1.30	4c x 2.5mm ²	No	2		
	<u>Earthing Conductors</u>				
	Earthing conductors in accordance with Clause 14 of the Particular Specification.				
	Supply, delivery, offloading and storage				
22.1.31	95m ² BCEW	m	200,00		
22.1.32	70mm ² BCEW	m	150,00		
22.1.33	2m long 16 mm diam. earthing rods	No	4,00		
Total Carried Forward					

ITEM NO	DESCRIPTION	UNIT	QTY		
Brought Forward					
	Site installation and testing				
22.1.34	95m² BCEW	m	200,00		
22.1.35	70mm² BCEW	m	150,00		
22.1.36	2m long 16 mm diam. earthing rods	No	4,00		
	Earthing Cables Terminations				
	Supply, delivery, offloading and storage				
22.1.37	95m² BCEW	No	6,00		
22.1.38	70mm² BCEW	No	6,00		
	Site installation and testing				
22.1.39	95m² BCEW	No	6,00		
22.1.40	70mm² BCEW	No	6,00		
22.1.41	Supply and Install Main LV earth bar	Item	1		
22.1.42	Bonding of all electrical equipment in accordance with applicable Clause of the Particular Specification in	Item	1,00		
22.1.43	Earth electrode resistance measurement	Item	1,00		
22.1.44	Bonding and earthing conductors continuity tests, report and C.O.C for entire site	Item	1,00		
22.1.45	Earthing and Lightning protection System	Prov Sum	1	R50 000,00	R50 000,00
	Cable Trench Excavations				
	Excavation and backfilling of cable trenches in accordance with Standard Specification				
	Trench 600mm wide by 600mm deep.				
22.1.46	Excavation in soft material	m	150,00		
22.1.47	Hard rock excavations	m	70,00		
22.1.48	Boulder excavations, Class A	m	40,00		
22.1.49	Boulder excavations, Class B	m	40,00		
22.1.50	Backfilling and Compacting	m³	60,00		
	Supply and Installation of danger tape 300mm above cables as specified				
22.1.51	Cable marking tape - Supply	m	150,00		
22.1.52	Cable marking tape - Install	m	150,00		
	SAFEGUARDING OF EXCAVATIONS				
22.1.53	Provide adequate barricading at all times to safeguard all open excavations.	Item	1,00		
Total Carried Forward					

ITEM NO	DESCRIPTION	UNIT	QTY		AMOUNT R
Brought Forward					
	Cable Ladder Support Cable ladders and cable trays in accordance with applicable Clause of the Particular Specification, including all , splice sets, reducers, elbows, threaded rods, screws, washers,unistrut, clamps and rawl-bolts.				
	Supply, delivery, offloading and storage				
22.1.54	1000mm wide (cable ladder straight lengths)	m	30,00		
22.1.55	300mm wide (cable ladder straight lengths)	m	150,00		
	Site installation and testing				
22.1.56	1000mm wide (cable ladder strait lengths)	m	30,00		
22.1.57	300mm wide (cable ladder strait lengths)	m	150,00		
	Supply, delivery, offloading and storage				
22.1.58	1000mm wide (cable ladder horizontal bends)	No.	2,00		
22.1.59	300mm wide (cable ladder horizontal bends)	No.	6,00		
	Site installation and testing				
22.1.60	1000mm wide (cable ladder horizontal bends)	No.	2,00		
22.1.61	300mm wide (cable ladder horizontal bends)	No.	6,00		
	Supply, delivery, offloading and storage				
22.1.62	1000mm wide (cable ladder vertical bends)	No.	2,00		
22.1.63	300mm wide (cable ladder vertical bends)	No.	6,00		
	Site installation and testing				
22.1.64	1000mm wide (cable ladder vertical bends)	No.	2,00		
22.1.65	300mm wide (cable ladder vertical bends)	No.	6,00		
	Supply, delivery, offloading and storage				
22.1.66	OL - 1000 Galvanized unistrut for cable support	m	150,00		
22.1.67	25mm dia galvanized conduit for cable support complete with brass bushes on the ends	m	60,00		
22.1.68	32mm dia galvanized conduit for cable support complete with brass bushes on the end	m	20,00		
	Site installation and testing				
22.1.69	OL - 1000 Galvanized unistrut for cable support	m	150,00		
22.1.70	25mm dia galvanized conduit for cable support complete with brass bushes on the ends	m	60,00		
22.1.71	32mm dia galvanized conduit for cable support complete with brass bushes on the end	m	20,00		
Total Carried Forward					

ITEM NO	DESCRIPTION	UNIT	QTY		
Brought Forward					
	Field Control Stations				
22.1.72	Supply Field E-Stop Station	No	3,00		
22.1.73	Install Field E-Stop Station	No	3,00		
	Field Control Station Cables				
22.1.74	Supply 7C 1.5mm ²	m	200,00		
22.1.75	Install 7C 1.5mm ²	m	200,00		
22.1.76	Supply Termination 7C 1.5mm ²	No	6,00		
22.1.77	Install Termination 7C 1.5mm ²	No	6,00		
	Accessories				
	Three way Y type Pratley/CCG weather proof boxes complete with connector blocks				
	Supply, delivery, offloading and storage				
22.1.78	Ezee-Fit Size 1	No	12,00		
	Site installation and testing				
22.1.79	Ezee-Fit Size 1	No	12,00		
	Area Lighting				
	LED Floodlights and Aircraft Warning Light complete as per and in accordance with applicable Clause of the Particular Specification.				
	Supply, delivery, offloading and storage				
22.1.80	4 x 279W Flood light luminaire complete with suitable mounting bracket for attachment to high mast pole	No.	4,00		
22.1.81	2 x 279W Flood light luminaire complete with suitable mounting bracket for attachment to high mast pole	No	4,00		
22.1.82	1 x 279W Flood light luminaire complete with suitable mounting bracket for attachment to high mast pole	No	2,00		
22.1.83	10 meter heavy duty glass reinforced polyester (GRP) poles complete with pole dressing, clips and fixings as required	No	10,00		
	Install				
22.1.84	4 x 279W Flood light luminaire complete with suitable mounting bracket for attachment to high mast pole	No.	4,00		
22.1.85	2 x 279W Flood light luminaire complete with suitable mounting bracket for attachment to high mast pole	No	4,00		
22.1.86	1 x 279W Flood light luminaire complete with suitable mounting bracket for attachment to high mast pole	No	2,00		
22.1.87	10 meter heavy duty glass reinforced polyester (GRP) poles complete with pole dressing, clips and fixings as	No	10,00		
Total Carried Forward					

ITEM NO	DESCRIPTION	UNIT	QTY		AMOUNT R
Brought Forward					
22.2	SMALL POWER AND LIGHTING The schedule is for the supply (including delivery to site, quality assurance and temporary storage), factory testing, taking delivery, handling, erection, installation, testing, final painting and quality assurance of the following plant and equipment: Distribution Boards Supply				
22.2.1	DB Generator Room	Item	1,00		
22.2.2	DB Pump house	Item	1,00		
	Install				
22.2.3	DB Generator Room	Item	1,00		
22.2.4	DB Pump house	Item	1,00		
	Miscellaneous				
22.2.5	FAT costs including accomodation and travel	Sum	1,00		
22.2.6	SAT costs and commssioing	Sum	1,00		
	PVC insulated stranded copper conductors (L,N,E) installed in couduits, Prices must include for all terminations				
	Supply				
22.2.7	2.5mm ²	m	250,00		
22.2.8	4mm ²	m	100,00		
	Install				
22.2.9	2.5mm ²	m	250,00		
22.2.10	4mm ²	m	100,00		
	Conduit for Electrical Installation Complete as specified including draw boxes, fittings, couplings, adaptors,locknuts, bushes, saddles and accessories. Installed surface against walls,chased into brickwork, casted in concrete and fixed to roof structures.				
	Supply				
22.2.11	PVC 20mm Ø	m	300,00		
22.2.12	Conduits boxes and accessories	Sum	1,00		
	Install				
22.2.13	PVC 20mm Ø	m	300,00		
22.2.14	Conduits boxes and accessories	sum	1,00		
	Light Switches Supply				
22.2.15	16A 1-lever 1-way switch (IP65)-Metal clad complete with Photo-cells	No	4,00		
22.2.16		No	2,00		
	Install				
22.2.17	16A 1-lever 1-way switch (IP65)-Metal clad complete with Photo-cells	No	4,00		
22.2.18		No	2,00		
	Socket Outlets Supply				
22.2.19	16A double socket outlet, 3-pin, flushed complete with box	No	5,00		
22.2.20	32A 3ph welding socket outlet (IP65), surface mounted complete with box	No	1,00		
Total Carried Forward					

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT R
Brought Forward					
	Install				
22.2.21	16A double socket outlet, 3-pin, flushed complete with box	No	5,00		
22.2.22	32A 3ph welding socket outlet (IP65), surface mounted complete with box	No	1,00		
	Luminaires				
	Supply				
22.2.23	Type L1 Beka Vapourline: IK08 IP65 46W with SS clips & Brackets	No	9,00		
22.2.24	Type L1E Beka Vapourline: IK08 IP65 46W with SS clips & Brackets	No	7,00		
22.2.25	Type L2 Beka LEDNOVA: IK07 IP66 70W suitable for wall mounting	No	10,00		
22.2.26	Install				
22.2.27	Type L1: Beka Vapourline: IK08 IP65 46W with SS clips & Brackets	No	9,00		
22.2.28	Type L1E: Beka Vapourline: IK08 IP65 46W with SS clips & Brackets	No	7,00		
22.2.29	Type L2: Beka LEDNOVA: IK07 IP66 70W with suitable for wall mounting	No	10,00		
	Temporary Works				
22.2.30	Temporary Works	Sum	1,00		
	Miscellaneous.				
	Supply and installation:				
22.2.31	Danger Signs and Notices	No	2,00		
22.2.32	Fire Extinguishers and First Aid Kits	No	1,00		
22.2.33	Supply all tools and accessories as specified	Item	1,00		
22.2.34	21 Strand Electric Fence including Energizer (250m)	m	250,00		
	Testing and Commissioning				
22.2.35	Testing and commissioning of the complete electrical installation including all relevant Test Certificates and Certificates of Compliance for electrical installations for each and every distribution board and all equipment related to the Works	Sum	1,00		
22.2.36	Operating instruction and/or literature of all major items of equipment supplied and installed, bound into a manual.	Sum	1,00		
22.2.37	Drawings and Other Project Documentation	Sum	1,00		
22.2.38	On-site instruction and training of client's staff	Sum	1,00		
22.2.39	Travel and accommodation for Engineer and a representative of the Employer to attend factory tests outside Gauteng for items if applicable	Item	3,00		
22.2.40	All other items not included above but which are nevertheless necessary to meet the Scope of Work and/or are required for the proper, safe and effective operation of the plant (Specify):	Sum	1,00		
Total Carried Forward To Summary					

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY		AMOUNT R
23		SECTION 23: ELECTRONIC EQUIPMENT: TELEMETRY, CONTROL AND INSTRUMENTATION				
23.1		Programmable Logic Controllers Design, supply, programming, configuration and delivery to site of PLC hardware, software and all associated panel and components to equip the PLC compartments/tiers as detailed in the Particular Specification				
23.1.1		- PLC Linbro Pump Station Installation, testing and commissioning of	Item	1,00		
23.1.2		- PLC- Linbro Pump station Human Machine Interface Design, supply, programming, configuration and delivery to site of HMI hardware, software and all associated panel and components to equip the PLC compartments/tiers as detailed in the Particular Specification	Item	1,00		
23.1.3		- HMI- Linbro PS Installation, testing and commissioning of	Item	1,00		
23.1.4		- HMI- Linbro PS Field Instrumentation Design, supply, installation, connection (incl. all mounting brackets, enclosures and posts where necessary) of field instrumentation as described in the Particular Specification	Item	1,00		
23.1.5		- Linbro PS Level Transmitter -Ultrasonic	Item	4,00		
23.1.6		- Linbro PS Flow Meter -Electromagnetic DN 300	Item	3,00		
23.1.7		- Linbro PS Flow Meter -Electromagnetic DN 700	Item	1,00		
23.1.8		- Linbro PS Flow Meter -Ultrasonic DN 700	Item	1,00		
23.1.8		- Linbro PS Pressure Transmitter	Item	8,00		
23.1.9		- Linbro PS Proximity Switch Installation, testing and commissioning of	Item	12,00		
23.1.10		- Linbro PS Level Transmitter -Ultrasonic	Item	4,00		
23.1.11		- Linbro PS Flow Meter -Electromagnetic DN	Item	3,00		
23.1.12		- Linbro PS Flow Meter -Electromagnetic DN 700	Item	1,00		
23.1.13		- Linbro PS Flow Meter -Ultrasonic DN 700	Item	1,00		
23.1.14		- Linbro PS Pressure Transmitter	Item	8,00		
23.1.15		- Linbro PS Proximity Switch Control And Instrumentation Cabling Supply, and deliver to site of C&I cabling as described in the Particular Specification	Item	12,00		
23.1.16		Trenching and excavation	Prov Sum	1,00	25000,00	R25 000,00
Total Carried Forward						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY		
Brought Forward						
23.1.17		Excavation of Hard material (estimated 15%)	m³	15.00		
23.1.18		Excavation of intermediate material (estimated	m³	35.00		
23.1.19		Excavation of soft material (50% estimated)	m³	50.00		
23.1.20		Back filling and compacting	m³	105.00		
23.1.21		Control Cabling				
		- 4 Core Cable	m	200.00		
23.1.22		- 2 IOS pair cable	m	200.00		
23.1.23		- 4 IOS pair Cable	m	200.00		
23.1.24		- 16 IOS pair Cable	m	200.00		
		Networking Asseccsories				
23.1.25		CAT 6 Cable and accessories	m	100.00		
23.1.26		Managed Network Switch	Item	1		
		Installation, termination, testing and commissioning of Control and instrumentation cabling				
23.1.27		- Trenching and excavation	Prov	1.00		
23.1.28		Excavation of Hard material (estimated 15%)	m³	15.00		
23.1.29		Excavation of intermediate material (estimated 35%)	m³	35.00		
23.1.30		Excavation of soft material (50% estimated)	m³	50.00		
23.1.31		Back filling and compacting	m³	105.00		
		Control Cabling				
23.1.32		- 4 Core Cable	m	200.00		
23.1.33		- 2 IOS pair cable	m	200.00		
23.1.34		- 4 IOS pair Cable	m	200.00		
23.1.35		- 16 IOS pair Cable	m	200.00		
		Networking Accessories				
23.1.36		CAT 6 Cable and accessories	m	100.00		
23.1.37		Managed Network Switch	each	1.00		
		Terminations				
23.1.38		- CAT 6 Cabling	each	10.00		
23.1.39		- 4 Core Cable	each	20.00		
23.1.40		- 2 IOS pair cable	each	20.00		
23.1.41		- 4 IOS pair Cable	each	30.00		
23.1.42		- 16 IOS pair Cable	each	20.00		
Total Carried Forward						

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY		AMOUNT R
Brought Forward						
		Field Instrumentation Enclosures				
		Design, supply, of field instrumentation enclosures Stainless steel posts 1m high 60 mm diameter, complete with baseplate for fixing to concrete for mounting of instrument transmitters as described in the Particular Specification				
23.1.43		- Linbro PS Level Transmitter -Ultrasonic - Enclosures	Item	4,00		
23.1.44		- Linbro Flow Meter -Electromagnetic -	Item	7,00		
23.1.45		- Linbro instrument Junction boxes	Item	7,00		
		Erection, reinforcing, termination and commissioning of instrumentation Enclosures				
23.1.46		- Linbro PS Level Transmitter -Ultrasonic - Enclosures	Item	4,00		
23.1.47		- Linbro Flow Meter -Electromagnetic - Enclosures	Item	7,00		
23.1.48		- Linbro instrumnet Junction boxes	Item	7.00		
		UPS Equipment				
		Design, supply and installation of UPS hardware and all associated panel and components to equip the PLC compartments/tiers as detailed in the Particular Specification				
23.1.49		- UPS- Linbro Pump station	Item	1,00		
		Installation, testing and commissioning of UPS System				
23.1.50		- UPS- Linbro Pump station	Item	1,00		
		Specialist Services				
23.1.51		New Telemetry System	PC Sum	1,00	R600 000,00	
23.1.52		- Contractors Mark up	%			
23.1.53		Update of SCADA mimics at Head Office	PC Sum	1,00	R100 000,00	
23.1.54		- Contractors Mark up	%			
23.1.55		Earthing and Lighting Protection Specialist	PC Sum	1,00	R300 000,00	
23.1.56		- Contractors Mark up	%			
		Temporary Works Labour				
23.1.57		Temporary Works Labour	PC Sum	1,00	150000,00	R150 000,00
23.1.58		- Contractors Mark up	%			
		Inspection and Tests				
		Carrying out inspections and test and issuing				
23.1.59		- Thin slice testing of PLC control objects	Item	1,00		
23.1.60		- Thin Slice testing of HMI mimic objects	Item	1,00		
Total Carried Forward						

ITEM NO		DESCRIPTION	UNIT	QTY		AMOUNT R
Brought Forward						
23.1.61		- FAT PLC panel construction	Item	1,00		
23.1.62		- FAT-PLC software configuration	Item	1,00		
23.1.63		- FAT HMI construction	Item	1,00		
23.1.64		- FAT - UPS system	Item	1,00		
23.1.65		- Practical and Final completion	Item	1,00		
		Documentation and Drawings				
		Supply of documentation, manuals training, spares and tools as described in Clause C6 of the Particular Specification				
23.1.66		- Design Data Pack	Item	1,00		
23.1.67		- P&ID - Linbro Pumpstation	Item	1,00		
23.1.68		- HAZOP Study Facilitator fees	hrs	40,00		
23.1.69		- HAZOP Study Coordination	Item	1,00		
23.1.70		- Updated pump Control Philosophy	Item	1,00		
23.1.71		- PLC/Topology drawing	Item	1,00		
23.1.72		- PLC FDS	Item	1,00		
23.1.73		- PLC I/O listing	Item	1,00		
23.1.74		- PLC Panel GA drawings	Item	1,00		
23.1.75		- PLC Panel schematic drawings	Item	1,00		
23.1.76		- Filed Instrumentation loop drawings	Item	1,00		
23.1.77		- Cable schedule	Item	1,00		
23.1.78		- Instrumentation List	Item	1,00		
23.1.79		- Quality plan/Manual	Item	1,00		
23.1.80		- Electronic copy in DXF format on CD	Item	1,00		
23.1.81		- As Built Drawings	Item	1,00		
23.1.82		-Operational and Maintenance Manuals	Item	3,00		
		Training				
		Provide requisite training as described in the				
23.1.83		- Maintenance Training	Item	1,00		
23.1.84		- Operator Training	Item	1,00		
23.1.85		All other items not included above but which are nevertheless necessary to meet the Scope of Work and/or are required for the proper, safe and effective operation of the plant (Specify):				
Total Carried Forward						

PAYMENT REFERS TO	ITEM NO	DESCRIPTION	UNIT	QUAN- TITY	RATE	AMOUNT
24	1.00	<u>SECTION 24: LINBRO PARK PUMP STATION MECHANICAL</u>				
24.1	1.01	Supply and installation of new Water Pumps, including commissioning				
24.1.1	.01	Horizontal split casing centrifugal pump with a delivery of 280l/s, a total head of 45 m coupled to 160 kW electric motor. Assembly should be complete with base plate, coupling and ancillaries	No.	3		
	.02	Gauges and Sensors Personnel				
24.1.2		Supply and install gauges for suction and delivery including horizontal vibration sensors.	Sum	1		
	.03	Training of Maintenance and Operations Personnel				
24.1.3		Conduct training	Sum	1		
	.04	Operation and Maintenance Manuals				
24.1.4		Prepare and supply three sets of detailed Operation and Maintenance Manuals including as-built drawings. An electronic version of the drawings shall also be supplied on compact disc in AutoCAD format. The manuals and compact disc shall be handed over to the Engineer.	Sum	1		
	TOTAL SECTION 24 - CARRIED TO SUMMARY					

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
25		SECTION 25 :PAVING				
25.1		CONSTRUCT PRECAST CONCRETE SEGMENTED PAVING				
25.1.1	PSMJ 8.2.2	Provide and construct segmented paving lain in Herringbone pattern 60 mm thick, 25 Mpa Type S-A concrete paving blocks. Price must include bedding, sand layer, compaction and finishing (Colour to suit Client)	m ²	650		
25.1.2	8.2.4	Roll to Locked-up Condition as Specified in clause 5.6.2 (provisional)	m ²	650		
	1200MJ 8.2.2	SURFACE DRAINS				
25.1.3		Construct surface concrete V-drains as per Drawing No. GL-01	m	60		
	1200GA	CONCRETE PAVING				
25.1.4	8.4.1	Concrete apron, 100mm thick apron slab, class 20/19 concrete with wood float finish	m ³	20		
TOTAL FOR SECTION 25 CARRIED FORWARD TO SUMMARY						R

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
26		SECTION 26: KERBING AND CHANNELLING				
26.1	8.2.1	CONCRETE KERBING				
		Figure 8b precast kerbs				
26.1.1		Radius over 20m	m	40		
26.1.2		Radius less than 20m	m	25		
26.1.3		Figure 7 precast kerbs	m	250		
		TRANSITIONS				
26.1.4		From mountable kerb to vertical kerb	No	4		
		TRIMMING				
26.1.5		Trimming of excavations for mountable kerbs :				
26.1.5.1		(a) Soft	m ²	80		
26.1.5.2		(b) Intermediate	m ²	20		
TOTAL FOR SECTION 26 CARRIED FORWARD TO SUMMARY						R

ITEM NO	PAYMENT REFERS	SHORT DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
27		SECTION 27: MISCELLANEOUS WORK FOR PUMP STATION AND VALVE CHAMBERS				
27.1		MASONRY				
27.1.1	BD.03.01	230mm Facebrick wall	m²	600		
27.1.2	BD.03.01	330 mm Facebrick wall	m²	0		
27.1.3	BD.03.01	115 mm Facebrick wall	m²	200		
27.2		Brickwork reinforcement				
27.2.1		a) Brick reinforcement 75mm wide built into brick walls with sufficient laps at end joints, angles and intersections (measured net)	m	200		
27.2.2		b) Brick reinforcement 150mm wide built into brick walls with sufficient laps at end joints, angles and intersections (measured net)	m	450		
27.3		Brickwork sundries				
27.3.1		a) Supply and install 6mm thick double glaze clear glass panel over half brickwall to ceiling (Isolate DB in Pumphouse). 12mm (Total thickness) Thermo-Safe GP ® ClearTSG or Equally approved.	m²	25		
27.4	SANS 1200G	JOINTS IN WALLS, FLOORS AND ROOF				
27.4.1		Isolating joints on floor and apron	m	75		
27.4.2		Isolating joints on walls	m	44		
27.4.3		Maltoid on walls	m	60		
27.4.4		Saw cut joints on floor and apron	m	30		
27.5		CONCRETE LINING /WATERPROOFING. 4mm "Derbigum SP4" or equal and approved fully bonded waterproofing system carried out strictly in accordance with the manufacturer's instructions and under a Ten Year Insurance Backed Guarantee on materials and workmanship (On Concrete).				
27.5.1		Waterproofing of trench and sump walls	m²	180		
27.5.2		Roof slab waterproofing(Laid to fall)	m²	400,00		
27.5.3		Damp-proofing of walls and floor	m²	400,00		
27.5.4		One unpunctured layer 250 micron waterproof sheets sealed at overlaps				
27.5.5		Under surface beds	m²	400,00		
27.5.6		Epoxy to floors. "EPOXY 319/20" epoxy floor and wall coating applied in strict accordance with the manufacturer's instructions.	m²	250,00		
27,6	SANS 1200L	MANHOLES FOR VALVER CHAMBERS				
		Supply and Install 700mm ø Heavy Duty Concrete Manhole covers including the manhole frame for all Valve Chambers	No	15,00		
TOTAL FOR SECTION 27 CARRIED TO SUMMARY					R	

SUMMARY OF SCHEDULE OF QUANTITIES		
SECTION	DESCRIPTION	TOTAL
SECTION 1:	PRELIMINARY AND GENERAL	R
SECTION 2:	DAYWORKS	R
SECTION 3:	SITE CLEARANCE (PIPELINE)	R
SECTION 4:	SITE CLEARANCE (ELEVATED TOWER ONLY)	R
SECTION 5:	SITE CLEARANCE (PUMPSTATION AND TOWER SITE)	R
SECTION 6:	EARTHWORKS (PIPELINE VALVE CHAMBERS)	R
SECTION 7:	EARTHWORKS (PIPELINE TRENCHES)	R
SECTION 8:	EARTHWORKS (ELEVATED TOWER)	R
SECTION 9:	EARTHWORKS (PUMPSTATION)	R
SECTION 10:	EARTHWORKS (PUMPSTATION PIPELINE TRENCHES)	R
SECTION 11:	CONCRETE (PIPELINE VALVE CHAMBERS)	R
SECTION 12:	CONCRETE (ELEVATED TOWER)	R
SECTION 13:	CONCRETE (PUMPSTATION)	R
SECTION 14:	PIPELINES (MAIN)	R
SECTION 15:	PIPELINES (BEDDING AND FILLING)	R
SECTION 16:	PIPELINES (PUMPSTATION)	R
SECTION 17:	PIPELINES (PUMPSTATION BEDDING AND FILLING)	R
SECTION 18:	PIPELINES (ELEVATED TOWER)	R
SECTION 19:	PIPE JACKING	R
SECTION 20:	STRUCTURAL STEEL (ELEVATED TOWER)	R
SECTION 21:	STRUCTURAL STEEL AND CORROSION PROTECTION (PUMPSTATION)	R
SECTION 22:	ELECTRICAL WORKS	R
SECTION 23:	ELECTRONIC WORKS	R
SECTION 24:	MECHANICAL WORKS	R
SECTION 25:	PAVING	R
SECTION 26:	KERBING AND CHANNELLING	R
SECTION 27:	MISCELLANEOUS WORK FOR PUMP STATION AND VALVE HOUSE	R
TOTAL FOR SCHEDULE OF QUANTITIES		R
ADD 10% CONTINGENCIES		R
SUB-TOTAL		R
ADD 10% ESCALATION		R
SUB-TOTAL		R
ADD 15 % VAT		R
TOTAL FOR TENDER (FORWARD TO THE FORM OF TENDER)		R