



DETAIL DESIGN REPORT

WITZENBERG MUNICIPALITY

Construction of Tierhokskloof Bulk Water Pipeline

Rev 0 – 22 May 2023

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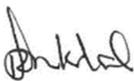
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1 EXECUTIVE SUMMARY

Witzenberg Municipality appointed ETL Consulting Engineers to investigate and design the upgrading of the existing 2.42km bulk water gravity supply line for the town of Wolseley.

The existing gravity supply line was constructed in the 1953, consisting of 250mmØ Ferro Cement piping, equipped with shut off valves at the inlet and outlet and with various air valves and scour valves in between.

After nearly 71 years in operation the pipeline needs an upgrade.

The gravity pipeline's inlet is in the Tierhokskloof, a tributary stream to the Breede River and the outlet is at the Witbrug Water Treatment Plant and runs partially above ground and partially underground.

The proposed new pipeline will follow a parallel route as the old pipeline.

Based on the population data available and water demand calculations, the preliminary design indicated to install a 300mmØ or 350mmØ STEEL & HDPE pipeline with shut off valves at the inlet and outlet and approximately 14 air valves and 7 scour valves in between.

Pipe material recommended will be Ductile Iron/Class K8 (above ground) and HDPE (under ground)

Minor upgrading at the Tierhokskloof inlet is also recommended.

Construction of the new pipeline will take in the order of 6 months, and it is a CONDITION of the Witzenberg Municipality that the existing gravity pipeline be fully operational during the upgrading process.

2 INTRODUCTION / BACKGROUND

2.1 BACKGROUND

Wolseley is a small town in the upper Breede River Valley region of the Western Cape province of South Africa. It is located 90 km northeast of Cape Town, in the Land van Waveren valley between the Waterval Mountains to the west and the Witzenberg Mountains to the east.

Wolseley is getting its water from the Water Treatment Works near the Witbrug on the R43, approximately 6km east from the town. Raw water is abstracted from a tributary stream of the Breede River in the Tierhokskloof and delivered to the Witbrug WTW via an old gravity pipeline over a distance of approximately 2.42km.

The old gravity pipeline was apparently constructed in 1953 and the integrity of the pipeline was severely damaged over its 71-year lifetime from veld fires, storm water runoff and falling rocks from the surrounding mountains.

2.2 BASIS FOR THIS REPORT

The Engineering Services: Preliminary Design Report confirms the design standards used for the design of all engineering services required for the Project, which will include:

- Water Reticulation

The purpose of this document is to present the Gauteng Department of Human Settlements with an appraisal of the engineering services standards and requirements for the Project in accordance with the Department's guidelines. The essential functions of this document provide relevant information with regard to the following:

All standards and specifications to be applied in the design and construction of all engineering services.

- Estimated project requirements based on the preliminary design-level understanding of the scope.
- The planning and design approach to be adopted.
- A thorough point of departure towards determining and quantifying the scope and time frame requirements of all bulk and link services for the project.

3 PROJECT LOCALITY

The inlet to the gravity pipeline is in the Tierhokskloof at approximately 33°25'45.24"S and 19°17'00.22"E at a height of 365m above mean sea level.

The outlet of the gravity pipeline is at the Witbrug WTW at approximately 33°25'20.11"S and 19°15'59.86"E at a height of 306m above mean sea level.

The gravity pipeline is on the western embankment of the tributary stream and follows the course of the tributary for approximately 800m in a northern direction until it reaches the Breede River.

At the Breede River it turns west and follows the course of the southern embankment for approximately 1 630m till the inlet to the Witbrug WTW.

The site is very rocky, covered with grass, Cape Fynbos and small shrubs and with no vehicular access.

All construction material will have to be carried to site, especially in the Tierhokskloof.



Figure 1: Locality Map

4 PROJECT SPECIFICATIONS – PART 1

4.1 THE WORKS

This section covers the general description of the project, the available services and the requirements as well as the applicable Standardised Specifications.

4.1.1 PS 1: LOCATION

The inlet to the gravity pipeline is in the Tierhokskloof at approximately 33°25'45"S and 19°17'00.22"E with the outlet at the Witbrug Water Treatment Works (WTW) at approximately 33°25'18.47"S and 19°16'22.04"E.

4.1.2 PS 2: DESCRIPTION OF WORKS

The contract comprises the upgrading of an old DN250 Fibre-cement gravity pipeline with a new DN350 Ductile Iron/Class K9 pipeline.

The gravity pipeline is on the western embankment of the tributary stream and follow the course of the tributary for approximately 800m in a northern direction until it reaches the Breede River. At the Breede River it turns west and follow the course of the southern embankment for approximately 1 630m till the inlet to the Witbrug WTW that consist of a gate valve and strainer for maintenance and cleaning purposes.

The existing pipeline was constructed in 1953 and is approximately 70 years old which is severely damaged due to veld fires and general wear and tare over the years. The pipeline is used to supply water to Wolseley from the Witbrug WTW near Witbrug on the R43, approximately 6km east from the town. The above mentioned existing pipeline will remain operational during the construction phase with the new pipeline following the existing pipeline route and configuration where possible. These configurations entail concrete cradles, concrete collars, concrete pedestals, steel pedestals, bedding in trenches etc. with new air-valve and scour-valve chambers located near the existing structures. Blasting will not be permitted due to the existing pipeline type and due to safety concerns. The existing pipeline will be used as a future back-up system.

The pipeline is ±2,4km long where machine accessibility is possible only for ±600m from the outlet at the WTW and further only by foot. From ±CH75-CH125 (50m) the pipe is supported by ±2m high concrete pedestals spaced ±6m bridging the pipe over a steep topography and dense vegetated area.

4.1.3 PS 3: SITE AND ACCESS

The construction site is situated in the Tierhokskloof within mountainous area about 11km south-west of Ceres.

The site access is limited for ordinary construction vehicles. The access road is narrow and the width only accommodate for one way traffic. The site consist of mostly steep topography along the pipeline within rocky and densely vegetated conditions.

The contractor must familiarise himself with the strict environmental requirements and provide a plan of execution for the works by limiting and rehabilitating all disturbed areas by any form of construction activities.

Due to the steep slopes and narrow workspace which is only accessible by foot along the pipeline is a safety concern which must be facilitated by the contractor.



4.1.3.1 PROPOSED ACCESS ROADS

The existing gravel access road, approximate length 700m, will be used during construction and future maintenance. No road upgrading is envisaged on this project, due to budget constraints.

4.1.4 PS 4: SITE SERVICES

The contractor himself must provide for all the required site services, accommodation and sanitation in terms of local requirements, and he must include the costs thereof in applicable items in the Schedule of Quantities. Should no provision be made in the Schedule of Quantities for such costs, the tenderer has to include such costs in other suitable items as he might choose; no additional compensation for these will be granted.

The contractor may negotiate with the land owners / relevant parties to utilise site(s) made available for storage of materials and/or site offices only where basic services such as water-, electricity- and sewage connections will be made available.

4.1.5 PS 5: APPLICABLE STANDARDISED SPECIFICATIONS

The following standardized specifications, as obtainable from the South African Bureau of Standards, Private Bag X191, Pretoria 0001, are part of these contract documents and the agreement, and are available for inspection at the office of the Engineer:

SANS 1200AA	1986	General (Small Works)
SANS 1200AB	1986	Engineer's Office
SANS 1200C	1980	Site Clearance
SANS 1200DA	1988	Earthworks (Small Works)
SANS 1200DB	1989	Earthworks (Pipe Trenches)
SANS 1200GA	1982	Concrete (Small Works)
SANS 1200L	1983	Medium Pressure Pipelines
SANS 1200LB	1983	Bedding (Pipes)
SANS 1200LB	1983	Structural Steelwork (Pipes)

4.1.6 PS 6: PARTICULAR SPECIFICATIONS

The following special conditions are included as part of this document under a separate section (Section 6), and will be binding as applicable on the contract.

Specification PA	Hydraulic and Special Equipment
Specification PB	Pipework and Accessories
Specification PC	Construction
Specification PD	Environmental Requirements



Specification PE	Occupational Health & Safety
Specification PF	Construction Work Permit

5 PROJECT SPECIFICATIONS: PART 2

DEVIATIONS AND ADDITIONS TO SANS 1200

This section covers all changes and additions to the above standardised specifications, applicable to this contract. Should any stipulation(s) in this Project Specifications be contradictory, with any stipulation(s) in the above standardised Specifications, then the stipulation(s) in these Project Specifications below, do prevail.

5.1 SANS/SABS 1200AA: GENERAL (SMALL WORKS)

5.1.1 PSAA-1 STAKING OUT THE WORKS (PAR 5.1.1)

Survey control beacons and markers will be indicated to the contractor whom then shall be responsible to demarcate and protect them throughout the duration of the contract or reinstate them for his own cost.

The engineer will assist with the initial staking out of the works limited to centre- and control lines and levels of structures and pipeline segments as reference pegs for detailed pegging by the contractor. All of these pegs must be protected by the contractor and remain intact until replaced by adequate alternatives.

5.1.2 PSAA-2 DEGREE OF ACCURACY (PAR 6.2)

Unless stated to the contrary somewhere else, the second degree of accuracy will apply overall.

5.1.3 PSAA-3 METHOD OF MEASUREMENT (PAR 8.1.1)

When measuring any item(s) in the Schedule of Quantities is not according to the standard method, the method contained in the Schedule of Quantities will prevail.

5.2 SANS/SABS 1200AB – ENGINEER'S OFFICE

5.2.1 PSAB-1 NAME BOARDS (PAR 3.1)

The contractor must supply and erect a sign board on the R43 near the site entrance (near the entrance of Winterberg Mountain Inn & Harvest Table Bistro) or alternative site as indicated by the engineer and maintain it for the full duration of the contract.

5.2.2 PSAB-2 ENGINEER'S OFFICES (PAR 3.2)

The engineer will operate from his offices in Ceres and no such provision is required from the contract.

5.2.3 PSAB-3 SURVEY ASSISTANTS (PAR 5.5)

The engineer has his own survey team but might need an additional assistant on occasion to be made available by the contractor on a pre-arranged basis.

5.3 SANS/SABS 1200C: SITE CLEARANCE

5.3.1 PSC-1 DISPOSAL OF MATERIAL (PAR 3.1)

The contractor shall not act in such a way that the environment is neglected nor impacted negatively. The proposed access path & the disposal of surplus construction material should be approved by the engineer before works can commence. All surplus and waste material must be spoiled at a registered site.

After completion, any disturbed areas has to be restored and rehabilitated to its original state according to the environmental requirements described under the Particular Specifications and to the satisfaction of the landowner(s).

Costs pertaining to cutting, fitting and maintaining temporary works and later restoration should be incorporated within the items provided in the Schedule of Quantities.

5.3.2 PSC-2 CUTTING OF TREES (PAR 5.2)

The contractor shall not act in such a way that the environment is neglected nor impacted negatively and no trees shall be cut outside of the dedicated and demarcated work areas without the consent of the engineer. The proposed access path should be approved by the engineer before works can commence.

5.3.3 PSC-3 CLEARING (PAR 5.3)

Clearing of vegetation will be limited to a strip footing of up to 6m in width to the agreed and demarcated work areas. The fynbos and other indigenous vegetation around the work space should not be touched or damaged.

5.4 SANS/SABS 1200DA: EARTHWORKS (SMALL WORKS)

Note: During earthworks NO blasting of any sorts will be permitted in the vicinity of the existing A/C pipeline.

5.4.1 PSDA-1 CONCEALED SERVICES (PAR 8.3.5)

Existing underground and other concealed services such as water-, stormwater- and sewage pipes, electrical- and electronic cables, telephone wires and cables, are indicated on the drawings as far as possible. However, the contractor first has to consult each landowner to ascertain whether any other pipes, services or cables on his property cross the work section or run parallel thereto which are not indicated on the drawings. The contractor has to bring such services to the attention of the engineer and honour these in the same way he does the other services while executing his contract.

Before excavation occur the position of the services must be clearly marked. Indications on the drawings are approximate and must not be deemed exact. The contractor has to take care in his search and exposure of services. Repair of any damaged service previously known will be at the cost of the contractor and repair costs of any such unknown services will only be considered if a best-effort-to-locate approach was followed by the contractor.

Compensation for the search, exposure, protection, establishment of a temporary or intermediate service, repair and afterwards the covering and finishing-off, will be dealt with individually. When more than one service occur within 2 (two) meters from each other it will be regarded as one service.

5.4.2 PSDA-2 SPOILING SURPLUS MATERIAL (PAR 5.1.6 & 5.2.1)

The contractor has to negotiate with each landowner where to spoil surplus material excavated on his land if not possible to distribute evenly over the pipe trench. The relevant cost must be included in applicable tender tariffs. Free-haul, as well as limited- and long-overhaul arrangements apply as stated in PSDA 4 below and provided for in the Schedule of Quantities.

5.4.3 PSDA-3 OVER-EXCAVATION (PAR 5.2.2)

Over-excavation outside the payment lines for purposes of providing sufficient workspace, dealing with site conditions and safety related matters, will be for the contractors cost unless motivated and approved by the engineer in advance.

5.4.4 PSDA-4 FREE- AND OVER-HAULAGE (PAR 5.2.6.1 & 5.2.6.2)

The free-haul distance for all transported material anywhere on site is deemed to be 1 (one) kilometre. In addition to this, limited-haul is considered beyond free-haul and up to 5 (five) kilometres while long-haul is everything over and above 5 (five) kilometres from point of loading.

This arrangement also applies with regard to SABS/SANS 1200DB - Earthworks (pipe trenches), SABS/SANS 1200LB - Bedding (Pipes), as well as to the particular specifications in part 3 below, as and where it might apply.

5.4.5 PSDA-5 EXCAVATION TYPES

Various types of excavations are depicted on Drawing 2252-S2-09 and Drawing 2252-S2-10. Each type is applicable for a specific section along the pipeline. The type of excavation method, position and size is listed below for each type.

- Type A – Machine or hand; CH 2400 to CH 1880 ($\pm 520\text{m}$); $\geq 300\text{mm}$ away from existing pipe; $\geq 200\text{mm}$ top cover.
- Type B – Hand excavation; CH 0 to CH 1800 ($\pm 720\text{m}$); $\geq 300\text{mm}$ away from existing pipe; $\geq 200\text{mm}$ top cover.
- Type C – Hand excavation; CH 0 to CH 2400 ($\pm 770\text{m}$); 750x400mm excavation for concrete collar spaced at $\pm 5\text{m}$.
- Type D – Hand excavation; CH 0 – CH1800 ($\pm 120\text{m}$); $\geq 300\text{mm}$ from existing A/C pipe, $\geq 200\text{mm}$ top cover.
- Type E – Hand excavation; CH 0 – CH1800 ($\pm 210\text{m}$); 800mmx 800mmx 400m
- Type F – No excavation



- Type G – No excavation

5.5 SABS/SANS 1200DB – EARTHWORKS (PIPE TRENCHES)

Note: Earthworks for pipe trenches will not permit any form of blasting.

5.5.1 PSDB-1 MINIMUM BASE WIDTH OF TRENCHES (PAR 5.2)

Replace the words “external diameter of pipe barrel” with “nominal pipe diameter”.

Furthermore, the side-allowance for all nominal pipe sizes above in the contract will be according to the figures in sub-clause 5.2. All excavation volumes will be calculated according to the above dimensions below the original ground level.

5.5.2 PSDB-2 SURPLUS MATERIAL (PAR 5.6.3)

See PSDA-2 above.

5.5.3 PSDB-3 FREE- AND OVER-HAULAGE (PAR 5.6.8)

See PSDA-4 above.

5.5.4 PSDB-4 CALCULATING EXCAVATION VOLUMES (PAR 8.2)

Except for other terms in this section, the excavation volumes of pipe trenches will be calculated in groups of depth as follows:

“Normal” excavations are all excavations up to 0,5 meters in depth,

“Deep” excavations are all excavations deeper than 0,5 meters.

“Deep” excavations will be paid as an extra-over on “Normal” excavations. For example, if a section of the pipe trench is 1,5 meters in depth, the upper section up to the 0,5 meter depth, will be calculated as “Normal” excavations, while the bottom portion exceeding 0,5 meter in depth (ie. 1,0m high) will be regarded as “Deep” excavations. The total excavation volume is thus reflected within the “Normal” item only.

5.5.5 PSDB-5 PROTECTION OF EXISTING SERVICES (PAR 5.1.4)

The existing A/C Ø250 pipeline must be operational during construction and must be protected and maintained. Any damages to the existing works will be at the contractors own costs.

5.6 SANS/SABS 1200GA – CONCRETE (SMALL WORKS)

5.6.1 PSGA-1 FINISHING (PAR 4.4.2)

All exposed concrete surfaces must have a wood float or wood shutter finish. Note, no smearing over or surface-layer finishing will be allowed after the shuttering is removed.

All exposed sharp concrete corners & edges must be neatly finished off with 25mm x 25mm chamfers and be included in the concrete item costs.



5.6.2 PSGA-2 REINFORCEMENT (PAR 5.1)

All concrete must be reinforced with high tensile steel rebar (Y-type steel), except otherwise stated on the drawings.

5.6.3 PSGA-3 FIXING & WELDING (PAR 5.1.2)

No welding or heating of any reinforcing steel is allowed.

5.6.4 PSGA-4 COVER (PAR 5.1.3)

The minimum cover for steel reinforcing in all water holding structures must be at least 50mm from all faces and edges. The minimum cover for steel reinforcing in mass concrete structures should be at least 75mm throughout.

The minimum cover of reinforcing steel in all other structures must be at least 40mm inside formwork and 75 mm inside earth excavations.

All cover blocks to be of high strength concrete.

5.6.5 PSGA-5 STRENGTH CONCRETE (PAR 5.4.1.5 & 8.4.1)

Unless stipulated differently elsewhere, all water holding structures should be of high strength 30/19MPa concrete and be watertight according to applicable SANS standards.

Proposed Mixing Units are: Cement (50kg bag), Lime (25kg bag), Aggregate (16mm), Sand (clean & dry) & Water (clean). Subject to this, the following mixing ratios can be used as a guidelines for further adjustment.

Note, the responsibility is on the contractor to ensure the required strength and final mix designs.

- Low strength: 1 bag of cement : 130 litre sand : 130 litre aggregate : 40 litre water
(10-15 MPa) Slump < 120mm
- Medium strength: 1 bag of cement : 100 litre sand : 100 litre aggregate : 30 litre water
(20-25 MPa) Slump 80-110mm
- High strength: 1 bag of cement : 70 litre sand : 70 litre aggregate : 25 litre water
(30-35 Mpa) Slump 60-90mm

Note, blinding or dental concrete will be regarded concrete fillings less than 150mm thick. In the case of mass or non-structural concrete fillings having a minimum of 300mm as the least outer-dimensions, 40mm aggregate may be used and the above cement content may be reduced by up to 20% and 35% respectively.

The compressive strength requirement for mass and dental concrete should be more than 15MPa.

Clean, hard filler aggregate or boulders may be used in mass concrete provided that the maximum dimensions thereof may not exceed 40% of the minimum dimension of the concrete component.

5.6.6 PSGA-6 READY-MIXED AND PUMPING CONCRETE (PAR 5.4.1.6)

Ready-mixed concrete, also for pumping purposes, may be used provided that it complies with all the applicable strength specifications.

5.6.7 PSGA-7 TESTING FREQUENCY (PAR 7.1.2)

The contractor must allow in his tariffs for the taking, curing and testing of concrete cubes. Cube tests must be done in accordance with the applicable methods as described in SANS/SABS Method 861 and pressed at 28 day strength.

All medium and high strength concrete must be tested.

A single test consists of a set of three (3) test cubes taken, cured and tested on 28 days.

A minimum of one set of cubes must be taken from every concrete batch representative of maximum 5m³ OR one set of cubes for every component or group of components of a structure poured simultaneously, whichever is the smallest.

5.6.8 PSGA-8 COST OF FORMWORK (PAR 8.2)

The cost of all shuttering and formwork must be included into the relevant concrete tariffs in the Schedule of Quantities, unless provided as separate items.

5.6.9 PSGA-9 COST OF REINFORCEMENT (PAR 8.3)

Costs pertaining to the supply and fixing of all reinforcing steel must be included in applicable items and or tariffs in the Schedule of Quantities. Provisional quantities have been calculated on the basis of kilograms of rebar required per cubic meter of concrete at specific rates for specific types of structures on average $\pm 50\text{kg/m}^3$.

However, final measurement will be based on the bending schedules to be issued during construction which will be paid at the tendered tariffs of the Schedule of Quantities.

5.7 SANS/SABS 1200L – MEDIUM PRESSURE PIPELINES AND FITTINGS

5.7.1 PSL-1 PIPES, FITTINGS AND PROTECTION (PAR 3.3, 3.4, 3.7, 3.8, 3.9)

All Ductile Iron pipes must be of Class K9 or higher, Galvanized steel pipes of Class (16 Bar) or higher and accompanying fittings must be of Class 16 unless specified differently elsewhere.

Mild-steel: All welded pipes and fittings must be manufactured according to SABS 719 and must be galvanised after manufacturing according to SABS 763 so that no unprotected (ungalvanised) steel surfaces, e.g. at bolt holes, do occur. Note, steel pipes being epoxy or bitumen protected according to SABS 1178 can be offered as alternative. The latter details must appear in full in the tender and the engineer will decide which of these will be considered. The tenderer must also ensure that the required pressure ratings and wall consistencies and thickness do comply with the specifications.



uPVC: All pipes and fittings of unplasticized polyvinyl chloride (uPVC), as well as adhesives for special joints, must be Class 6 and must comply with SANS 966. Pipe joints must be mechanical-type joints with rubber seal rings and/or appropriate flange joint combinations.

Flanges: All flanged joints or couplings must comply with SANS 1123, Table 1600, and must include all bolts, nuts and gaskets. All items must be galvanised as specified above.

Stainless Steel: All stainless steel components of certain items must be at least 3Cr12 grade.

Where the further protection of metal, under corrosive conditions, is specified, "Hydrax" or a similar bitumen-based sealant must be used as specified by the manufacturers.

5.7.2 PSL-2 PIPE INSTALLATION STAFF (PAR 5.1.1)

Pipes and auxiliary fittings may only be installed by qualified personnel, registered with the local authorities as plumber, pipe-fitter or sewage installer or someone qualified by means of running and passing a course in pipe-fitting by the Training Council of the Civil Engineering Industry.

5.7.3 PSL-3 DEPTHS AND COVER (PAR 5.1.4)

All trench dimensions shall be according to clause 5.2 of SABS/SANS 1200DB unless pre-approved otherwise by the engineer. Pipes must be positioned at the instructed depths and levels in such a way that the covering between the top of the pipe-body and the finished or original ground level, whichever being the larger, is not less than 0,2 meter as depicted by the Types A, B and D indicated on the drawings. In cases where the covering is indeed less than 0,2 meter, the engineer should be informed without delay.

5.7.4 PSL-4 SPECIAL CONNECTIONS AND COMPONENTS (PAR 8.2.5)

When incisions have to be made on pipelines in order to add special fittings or components, the contractor has to expose the section of pipe carefully, cut the pipe at the right place, finish the pipe ends suitably for the required pipe joint types, position the special fitting(s), line up, connect, fasten and finish as instructed.

No additional compensation will be calculated for such as well as for flange joints, screw joints or special flush-flange joints. The contractor must include the cutting, fitting, shaping and fastening of all types of joints in applicable tender tariffs.

5.8 SABS/SANS 1200LB – BEDDING (PIPES)

5.8.1 PSLB-1 SELECTIVE EXCAVATION FOR BEDDING (PAR 3.4.1)

In spite of requirements in terms of sub-clause 3.7 of SANS/SABS 1200DB and sub-clause 3.4.1 of SABS/SANS 1200LB with regard to applying selective excavation methods, the contractor must follow selective excavation methods and supply and use such equipment as to prevent suitable material for bedding from becoming buried or contaminated.

5.8.2 PSLB-2 CLASS OF BEDDING (PAR 5.1.2)

Unless instructed otherwise, all pipes must be bedded and protected according to directions on drawing LB - 1: Pipe Bedding Details - Rigid Pipes, drawing (c) Rigid Pipe on Class C bedding.

Placing and protection of joints must be according to drawing LB - 2: Pipe Bedding Detail (note 5.2.2).

6 PROJECT SPECIFICATIONS: PART 3

PARTICULAR SPECIFICATIONS

This section covers and contains the Special Conditions applicable to this contract of work not covered in Parts 1 and 2.

6.1 PA – HYDRAULIC AND SPECIAL EQUIPMENT

6.1.1 PA1 - GATE VALVES

All valves must be flanged and drilled according to SABS/SANS 1123, table 1600/3. Valves must comply with the requirements of SABS/SANS 664 and must:

be able to withstand 1600kPa (16 bar) work pressure,

- be of type non-rising spindle,
- be fitted with stainless steel moving and wearing parts,
- lock clockwise (to the right),
- have guaranteed tight seals at valve-rods, e.g. preferably sealed O-ring method.

Apart from the above, sluice-valves used as control or scour valves, must be provided with inlet wedge-shaped slides and cotter heads e.g. "Right & Downright Waterworks sluice-valves", class 16, by Premier Valves, or similar.

6.1.2 PA2 - BUTTERFLY VALVES

All butterfly valves must comply with the following requirements:

- durable valve flaps with soft-rubber O-rings,
- valve flap must be removable from the stainless steel rod,
- saddle washers must be made of stainless steel for valve flaps in the "closed" position,
- sealed rubber O-rings at the rod ends,
- double-flanged for $\varnothing 100\text{mm}$ and larger,
- gearbox with a minimum rotation ratio of 1:40 (10 turns to open/close) with a hand wheel,
- capable of withstanding 16 Bar unbalanced working pressure; and
- Example: the Premier Valves product "Boving Butterfly valve" or a similar equivalent product.



6.1.3 PA3 - AIR-VALVES

All air-valves must be of anti-surge anti-shock double-action type, being able to handle both high and low volumes of air flow. They must be water-shock resisting in that the last air in the valve is released slowly during the filling process, and have a high air-inlet capacity when forming a vacuum, for example the “Vent-O-Mat series RBX” air-valves, or similar.

All ø50mm and larger air-valves must be flanged and bored according to SABS/SANS 1123 table 1600/3. Where air-valves are provided with pipe screw-thread, screw-on flanges must be supplied according to the same specifications.

6.2 PB – PIPEWORK AND ACCESSORIES

6.2.1 PB1 - MILD STEEL PIPES AND ACCESSORIES

6.2.1.1 GENERAL

The supply of all flanged or plain ended pipe specials such as bends, short sections, air-valve and scour T-pieces, additional couplings, etc are part of this contract to form part of an underground Ductile Iron water pipe system complete with thrust blocks and structures. Potable water to be piped has a pH between 6,6 - 6,9 and a conductivity of less than ±35 mS/m.

6.2.1.2 STANDARDISED SPECIFICATIONS

All mild-steel pipes and auxiliaries must comply with the following standardised specifications as applicable:

SANS 1476: 2009	Fabricated flanged steel pipework
SANS 1223: 2003	Fibre-cement pressure pipes & couplings
SANS 1178: 2010	The production of coated steel pipes using bituminous materials
SANS 719: 2011	Electric-welded low-carbon steel pipes (large bore)
SANS 1123: 2011	Pipe flanges
SANS 121: 2011 & 32: 1997	Hot dip galvanised coatings on steel articles (SABS 763)
SANS 664: 2011	Wedge gate and resilient seal valves for waterworks
SANS 62: 2009	Steel pipes, screwed pipes and fittings not exceeding 150mm
SANS 966-1: 2006	Polyvinyl chloride (uPVC) pressure pipe systems

Design Criteria

- Wall thickness shall not be less than:
 - 4,5mm for diameters smaller than 250mm
 - 6,0mm for diameters between 250mm and 600mm
 - 8,0mm for diameters greater than 600mm



- Design working pressure: All piping, fittings and other related equipment shall be suitable to withstand a working pressure of at least 10 Bar.
- All pipes and specials shall be manufactured from Grade A steel or equivalent.
- All pipes and specials shall be hydraulically pressure tested so as to produce circumferential tensile stress equal to 150% of the design stress. Design stress shall correspond to design pressure as specified above.
- The design stress shall not exceed 50% of the yield stress of the steel.

6.2.1.3 FLANGED JOINTS

All flanged joints must comply with above SABS/SANS 1123, Table 1600/2500 as applicable, and the nominal sizes directed on the drawings. Bolt holes must be provided on all flange joints. Please note that the bolt holes on some of the flanges of individual auxiliaries must have grooves. Relevant details of this appear on the drawings.

6.2.1.4 SLIP COLLAR OR PLAIN ENDED PIPE ENDS

All slip collar pipe ends with nominal diameter of 100mm and less must be manufactured according to the requirements of the above SABS/SANS 1223, regarding the outer-diameter based on the construction drawings and/or to be compatible with other new or existing components of the works.

In the case of outer-diameter flush collar pipe ends with nominal diameter of 150mm and more, SABS/SANS 1223, with regard to the outer-diameter based on the construction drawings in order to be compatible with other new or existing components of the works.

All slip collar pipe ends must comply with the outer edges slanted or rounded in order for pipe joints to fit easily.

6.2.1.5 PIPE ENDS AND COUPLINGS

All pipes with plain ended collars to receive “VJ” or “Kamflex” or similar approved couplings to withstand the specified working pressure. All slip collar or plain ended pipe ends must comply with the outer edges slanted or rounded in order for pipe joints to be easily fitted.

Removable couplings will allow a gap of 10mm at joints for expansion of the pipes.

Cast-iron couplings must be protected by bitumen while all mild steel couplings and bolts must be protected by a suitable rust-proof protective layer such as coupon paint or galvanising.

Special bends and connector pieces at river crossings and at the up- and downstream connection points into the existing pipe system will be fully flanged and drilled to the SABS/SANS 1123 & SABS/SANS 1476 and/or any other applicable specifications above.

6.2.1.6 PROTECTION

All pipe fittings and specials to be supplied under this bid will be partially installed underground and operate in conditions conducive to corrosion and shall therefore be adequately protected against or manufactured from corrosion resistant material.

6.2.2 PB2 - DUCTILE IRON PIPES AND ACCESSORIES

6.2.2.1 SOCKETED PIPES

Ductile Iron Socketed pipes shall be centrifugally cast in accordance with BSEN 545. The minimum tensile strength shall be 420 N/mm² and the minimum 0.2% proof stress shall be 300 N/mm². The quality of metal used for the manufacture of the pipes shall be of good quality grey cast iron and subject to the various quality control tests as specified in the relevant Standards.

The minimum elongation after fracture shall be 10% for nominal diameters DN 60 to DN 1000 and 7% for nominal diameters DN 1200 to DN2000.

Centrifugally cast ductile iron pipes shall be individually subjected to a works hydrostatic test of not less than 10 seconds duration. For class K9 pipes whose thickness shall be in accordance with BSEN 545, these shall be:

DN	Minimum Works Hydrostatic Test Pressure for K9 (bar)
60 – 300	50
350 – 600	40
700 – 1,000	32
1,100 – 2,000	25

All pipes supplied shall conform to class K9 unless specifically indicated otherwise on drawings or in the bills of quantities.

6.2.2.2 SOCKETED JOINTS

Socketed joints shall be of the push-on type to BSEN 545 unless otherwise specified on drawings or in bills of quantities. The material used for the rubber gaskets shall be either natural rubber or synthetic elastomer to BS 2494, and they shall be stored in accordance with ISO 2230: 1973.



6.2.2.3 FLANGED PIPES

Ductile Iron Flanged Pipes shall be centrifugally cast to BSEN 545. They shall be joined using a rubber gasket of minimum thickness of 3 mm which shall be reinforced unless otherwise indicated on drawings or in bills of quantities. The material used shall be either natural rubber or synthetic elastomer in accordance with BS2494, which shall be stored in accordance with ISO 2230: 1973. Pipe thickness shall conform to BSEN 545 class K9 unless otherwise indicated on drawings or in the bills of quantities.

6.2.2.4 PROTECTIONS TO PIPES AND FITTING

Ductile Iron Pipes and fitting shall be internally lined with a cement mortar, centrifugally applied and conforming to DIN 30674. The thickness of the cement mortar shall be as specified in BSEN545.

Ductile Iron Pipes and fittings shall be externally coated with either of the following (as specified in drawings or bills of quantities): -

- (a) Factory applied heat fused extruded polyethylene coating as specified in BSEN 545, DIN 30674 Part 1.
- (b) 350 microns fusion bonded epoxy coating to AWWA C213 standards or equivalent.
- (c) Sprayed metallic zinc layer of nominal coating of 200-g zinc/m² with bituminous varnish layer of minimum average thickness of 100 microns as per DIN30674 Part 3. The pipe manufacturer shall provide a polythene sleeve for site protection purposes where specified. The sleeve shall conform to DIN 30674 Part 5 and be of minimum thickness of 200 microns.

6.2.2.5 FITTINGS

Ductile Iron Fittings shall be sand cast in accordance with BS EN 545. The minimum tensile strength shall be 400 N/mm² and the minimum 0.2% proof stress shall be 300 N/mm². The minimum elongation after fracture shall be 5%. All fittings shall be subjected to a works leak-tightness test using water to a pressure as given in BS EN 545.

Fittings shall be to thickness class K12 except for tees that shall be to thickness class K14 unless otherwise indicated in drawings or in bills of quantities.

6.2.2.6 JOINTS TO FITTINGS

Socketed fittings, except collars, shall be supplied with push-on joints unless otherwise called for on drawings or in bills of quantities. Collars shall be supplied with mechanical joint.

Flange fittings shall be fixed by rubber gaskets as indicated in (c) above for flanged pipes.

6.2.3 PB3 - DIMENSIONS OF COMPONENTS

All pipe components, bends, specials, etc must be delivered to site complete and fully protected according to the specifications. No modification of any kind to pipe lengths, -ends, -flanges or -fittings will be allowed on site.

It is the contractor's responsibility to check and verify every dimension of every special piece indicated on the drawings to be in line with either the as-built or applicable site conditions before ordering. The engineer will not be responsible for any forthcoming cost or penalties whatsoever because of faulty dimensions on any drawings.

The costs and time loss for having to re-order or modify any special pieces will be solely for the contractor's account without any claims against the contract in meeting set targets. It is the contractor's responsibility to also inform and to keep the engineer up to date in case of any such event.

6.3 PC – CONSTRUCTION

6.3.1 PC1 - PIPE LAYING & ALIGNMENT

The new pipes will follow the existing pipe route. The existing pipeline must be operational during construction. Immediate repair must be done if any damages occur to the existing pipeline at the cost of the contractor.

A standard spigot and socket pipe length of 5,5m is preferred due to the bending nature of the pipeline as well as the weight of the pipe considering the project to be labour intensive. Where the bends exceeds the spigot & socket installation capacity of 5 degrees a bend or VJ coupling can be used. The pipe socket can be cut and prepared according to the suppliers specifications.

All bends to have a thrust block and all joints to be supported by concrete collars on each side.

The horizontal-and vertical alignment as well as curvature of the pipeline must be in straight segments or at even grade of at least 5 pipe lengths ($\pm 30\text{m}$) in order to minimise the risk of air-locks while assisting with the accurate placement of the air-valves along the route.

Costs in this regard must be included in the applicable pipe laying tariffs in the Schedule of Quantities.

6.3.2 PC2 - STEELWORK & CONSTRUCTION

Steel construction must comply with the directions on the construction drawings and the full cost thereof must be included in applicable items as indicated on the Schedule of Quantities which must include the provision, manufacturing, galvanising, erection, corrosion protection and finishing of various prescribed grades of steel. When there is no specific allowance for particular steel works the contractor has to budget suitably by including these in other suitable items.

In case of galvanising, all surfaces shall be zinc coated by the hot-dip galvanising process for heavy-duty service according to SANS 121 (SABS 763) to a minimum thickness of 100 micron and galvanising mass of 700g/m². Welded pipes and fittings shall be hot-dip galvanised after welding, drilling, threading or any other damaging action and sand blasting. Flaking of galvanising over welds shall not be allowed. Damaged



galvanising due to threading etc, shall be protected with cold galvanising. Hot cloth soldering may be applied within the directions of the SANS 121 (SABS 763) but only with prior approval by the engineer.

In case of painting, all surfaces shall be suitably prepared and painted according to the paint manufacturer's instructions or as described on the construction drawings.

6.3.3 PC3 - PROTECTION OF SERVICES AND INFRASTRUCTURE

Where services or developments do exist near to, parallel to or nearly parallel to the pipe line within 4m from the centre of the pipe line or within a 4m strip around the footprint of any part of the permanent works, excluding the existing road and bridges, the contractor must protect it, temporary replace it, maintain it during construction and after completion repair it to its original status. The contractor must plan his construction activities in such a way not to disturb or to damage such services in any way. These services include the following:

- Wired fences,
- Overhead power-, telephone- and cable lines,
- Open ground-, concrete-, bitumen-, or other formed drainage channels,
- Dirt roads with wearing course and shoulders within the 6m working strip,
- Paved or tarred road surfaces within the above 4m offset distance,
- Any overland or underground water, drain or sleeve pipes,
- Any valves, including water control, air- and scour valves,
- Any pipelines above- and underground,
- River banks is regarded as sensitive and must be protected at all times,
- Any other forms of development such as orchards, etc.

The contractor is entitled to extra payment for making safe, protecting and working parallel to or crossing any of the above, over and above the normal excavation-, pipe laying- and other applicable tariffs in the contract on the basis of measured length parallel to the works and the number of such services crossed, overland or underground, within the distances mentioned above as set out in the Schedule of Quantities. Where more than one of services are within 2m from one another, it will be regarded and treated as one.

6.3.4 PC4 - RESTRICTED WORKING SPACE

The contractor is entitled to extra payment for restricted working conditions over and above the excavation-, pipe laying- and other applicable tariffs in the contract on the basis of measured length (including structures) as set out in the Schedule of Quantities.

Working parallel or adjacent to or underneath any such obstructions for more than 10m continuously will be regarded as restricted working space and be measured per running meter for stretches closer than 4m from any excavation or fill or structure within the designated working areas.



Access to the pipe route is partially limited at pipe elevated areas up to ± 4 m high. The contractor is responsible to foresee all access related costing in the applicable items in the Schedule of Quantities.

6.3.5 PC5 - USE OF EXISTING ACCESS ROADS

The contractor is responsible for the protection, maintenance and rehabilitation of all existing access roads used for construction purposes against any excessive form of damage to the surface wearing coarse (gravel road).

Note, the contractor must take, compile and hand to the engineer a set of well annotated base-line photo's of all the roads or tracks intended to be used for construction purposes before commencement of any work.

Any form of punching, breaking up or damage to the wearing course of the gravel road outside the working area by heavy machinery, trucks or equipment, must be repaired or rehabilitated to the same standard as at site hand-over.

A Provisional Sum (PSUM) item has been allowed for a certain amount of repair works due to construction damage. All minor repairs to the road surface shall be even and blend in with the existing surrounding surface and be for the cost of the contractor. Nevertheless, the contractor must take special care not to damage the road surface outside of the working area.

6.4 PD – ENVIRONMENTAL REQUIREMENTS (TO BE SUPPLIED)

The environmental requirements are available from Government notices R385, R386 and R387 of 21 April 2006, promulgated as Chapter 5 of the National Environmental Management Act, 1998 (Act 107 of 1998), also known as the "NEMA" process.

The Environmental Management Plan (EMP) AND the Environmental Authorization (ROD) is included as addendums to this document indicating what is required from the tenderer with particular reference to responsible persons, plant usage and arrangement of site facilities, water pollution control, rehabilitations and restoration of vegetation etc.

The contractor's attention is focused, with specific reference, on the environmental requirements in terms of Government notices R385, R386 and R387 of 21 April 2006, promulgated as Chapter 5 of the National Environmental Management Act (NEMA), 1998 (Act 107 of 1998).

Note, the client is responsible to appoint an Environmental Control Officer (ECO) or responsible person to guide and oversee the process giving practical and reasonable input regarding general environmental requirements as well as monitoring and reporting on such implementation as required.

Provision for all the related costs for complying with the aspects listed below including the compilation of pre-approved method statements should be made under the allowed items of the schedule of quantities.

6.4.1 ACCESS:

Access to the site will strictly be limited to existing gravel road and tracks as agreed with the landowners.



Pre-approval by the ECO or the appointed responsible person will be required for any additional access as and where required.

6.4.2 WORK AREAS:

Space is limited and certain areas will be pointed out where site camps (no accommodation allowed) can be set up for each of the two components of the contract. The purpose would be for a site office and storage yard). Areas where pipes could be offloaded and stored will also be made available.

One mobile toilet will be required for every group of up to 15 people within walking distance of at least 300m.

All work areas will have to be demarcated.

Topsoil from natural veld areas has to be stripped, piled and protected, also against wind and water.

After completion, all disturbed and partially compacted work areas and access ways will have to be scarified, veld areas be topsoiled and rehabilitated to acceptable standards in accordance with the maintenance management plan.

6.4.3 POLLUTION CONTROL:

Pollution incidents shall be dealt with in accordance with the Act.

The contractor is responsible for and must provide suitable and adequate methods and measures to collect, contain and remove all waste material generated as part of the process.

Any incident that may cause pollution of any water resource must immediately be reported to the Responsible Authority and an incident report shall be kept.

Pollution of any kind, such as waste water, cement, chemicals, oil, fuel, etc, is strictly prohibited and should be prevented at all costs. Any spills should be collected, removed and sealed in proper containers to be dumped at registered sites.

Stream protection and storm water management:

Apart from the work to be carried out, no other access points, work stations or any other form of disturbance will be allowed within 32m on either side of any natural water stream.

Work during the rainy periods should be prevented or minimised. In case of wet and rainy conditions increased run-off due to vegetation clearance and/or soil compaction must be managed and steps must be taken to ensure that storm water does not lead to bank instability and excessive levels of erosion and silt entering the watercourses.

Temporary construction camps, toilet facilities, equipment and material stockpiles must be located outside the extent of the watercourse and must be recovered and removed within one month after completion of activity.

Natural drainage ways and wetlands outside the footprint of the works must be treated as sensitive areas with highly restricted use. Permissible activities inside these areas must be clearly stipulated and treated as unique situations and exceptions approved by the ECO or appointed responsible person.

All areas susceptible to erosion must be protected and it must be ensured that there is no undue soil erosion resultant from activities within and adjacent to the construction camp and work areas.

6.4.4 HABITAT & REHABILITATION:

No indigenous vegetation, including dead trees, outside the limits of disturbance indicated in the site plans may be removed from the area at all. No harvesting of indigenous plants and animals in and adjacent to the construction area is allowed.

Alien and invader vegetation must not be allowed to further colonise the area as a result of the work.

Soil that have become compacted through the activities must be loosened to an appropriate depth to allow seed germination before replacing topsoil. Disturbed areas must be shaped to the natural form and allow to follow the original contour while bank stabilisation measurements must be implemented.

6.4.5 REPORTING:

A photographic record must be kept with dated photographs of all sites to be disturbed prior, during and after rehabilitation.

6.4.6 MONITORING & APPROVAL:

Regular monitoring & guidance will be done by the ECO or an appointed responsible person and all rehabilitation will have to be approved before leaving the site.

6.5 PE – OCCUPATIONAL HEALTH & SAFETY (TO BE SUPPLIED)

The Contractor is responsible for, and will be held accountable to ensure that all construction or related activities be executed in terms of the Occupational Health and Safety Act (OHSA) of 1993, (Act 85 of 1993) including the OHS Amendment Act 181 of 1993 along with the accompanying regulations and must therefore provide for and appoint an accredited Officer to handle his affairs.

Both the "Factories, Machinery and Building Work Act (Act 22 of 1941)" and the "Machinery and Occupational Safety Act (Act 6 of 1983)" must, wherever it appears in the SANS/SABS 1200 standardised specifications, be substituted by the "Occupational Health and Safety Act (Act 85 of 1993)".

Independently of the above, the client will also appoint an accredited Agent responsible for Health & Safety related matters on his behalf including the compilation of the Safety Specifications.

The successful contractor shall then provide and demonstrate a suitable and sufficiently documented Health and Safety Plan based on the Safety Specifications above, which shall apply from the date of commencement of, and for the duration of the construction works.

6.6 PF – CONSTRUCTION WORK PERMIT (TO BE SUPPLIED)

The Department of Labour requires a Construction Work Permit under the following conditions:

The qualification criteria for projects that require a Work Permit is either one of the following:



(a) when the construction period will exceed 365 days AND when it involves more than 3600 person-days of construction work (typically a project of this nature would be around 3 months equalling approximately 1000-1500 person-days); OR

(b) when Construction Industry Development Board (CIDB) grading equals grade level 7 or higher (R40 mill or more).

7 SCHEDULE OF QUANTITIES

Construction of New Tierhokskloof Pipeline.

Value Added Tax (VAT), valid as on the tender closing date, must be fully excluded from the tariffs presented in the Bill of Quantities below.

Value Added Tax (VAT), must be added separately as allowed for in the summary sheet at the end of this Bill of Quantities.

The General Conditions of Contract, Project Specifications and Tender Drawings must be read together with this Bill of Quantities, in addition to the appropriate references referred to therein.

The contractor may fill in rates for each listed item, calculated according to the contractor's discretion as follows:

Item:	The item identification number;
Reference:	The reference to the relevant Project Specifications Part 1, 2 or 3;
Description:	The description of the relevant tender item;
Quantity:	The number of units with regard to each item;
Unit:	The measurement unit for each item in terms of the Project Specifications;
Rate:	The payment per unit against which the tenderer tender to do the work; and
Amount:	The product of the quantity and the tariff against which an item is tendered.

BILL OF QUANTITIES ATTACHED AS APPENDIX A.



8 APPENDICES

APPENDIX A: BILL OF QUANTITIES

APPENDIX B: CONSTRUCTION DRAWINGS

Appendix A – Bill of Quantities

Contract 1
Schedule 1

Section 1

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
1	1200AA/AB PSAA PSAB	PRELIMINARY & GENERAL					
1.1		Fixed Costs:					
1.1.1	8.3.1	Camp-site, contract guarantees, insurance, public liability, accident and unemployment insurance, provisional and general obligations, etc. - 70% payable at the start, rest upon completion	Sum	1.0			
1.1.2	8.3.2(b)	Facilities Required by Contractor	Sum	1.0			
1.1.3	PSAB-1	Name Board: Provide, Erect and Remove after completion	Sum	1.0			
1.1.4	8.3.3	Other original obligations and all other fixed costs items not included above	Sum	1.0			
1.1.5	8.3.4	De-establish and Rehabilitate camp-site after completion	Sum	1.0			
1.2		Time-related Costs:					
1.2.1	8.4.1	All general, current liabilities, payable in relation to progress	Sum	1.0			
1.2.2	8.4.2(b)	Facilities and services for contractor	Sum	1.0			
1.2.3	8.4.3	General obligations and other time-related costs including compulsory testing, etc	Sum	1.0			
1.2.4	PD	Compliance with all Environmental Requirements for EMP in terms of applicable legislation	Sum	1.0			
1.2.6	PE	Compliance with all Occupational Health & Safety requirements in terms of applicable legislation	Sum	1.0			
1.2.7		Geotechnical Investigations as instructed by the Engineer	PSUM	1.0	10,000.00	10,000	00
1.2.8		Site Access to Works - Comprehensive Methodology accessing site and delivery of material due to limited site access	Sum	1.0			
1.3		Dayworks:					
1.3.1		Unskilled labourer	h			Rate Only	
1.3.2		Skilled labourer	h			Rate Only	
1.3.3		Helicopter	h			Rate Only	
1.3.4		20T Excavator	h			Rate Only	
1.3.5		Tipper truck 10m ³	h			Rate Only	
1.4		Environmental					
Total Carried Forward						10,000	00

Contract 1
Schedule 1

Section 2

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
2		Deforest, clear and strip all work areas, access ways and preserve topsoil for reuse:					
2.1	8.2.1 PSC3	Clear and Grub ≤6m wide pipeline & work areas (CH0 – CH2400)	m	2,400.0			
2.2	8.2.3 PSC2	Remove & Grub all trees & stumps regardless of girth	ha	2.5			
2.3	8.2.9 PSDA-4	Limited-haul: Spoil unsuitable material between 1km and 5km to and from site.	m³.km	30.0			
2.4	8.2.9 PSDA-4	Long-haul: Spoil unsuitable material beyond 5km to and from site.	m³.km	450.0			
2.5	8.2.5 PC3	Dismantle and re-install fence at outlet works	m	3.0			
2.6	PC5	Allowance for repair work on existing road surface at site entry	PSUM	1.0	20,000.00	20,000	00
Total Carried Forward To Summary						20,000	00

Contract 1
Schedule 1

Section 4

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
4	1200DB PSDB	EARTHWORKS (Pipe Trenches)					
		All preparation and excavation inclusively -(Note, transport, placing and compaction included)					
4.1		Site Clearance and Removal of Topsoil:					
4.1.1	8.3.1(c)	Remove topsoil to nominal depth of 150mm, stockpile and preserve for rehabilitation with machinery ($\leq 3m$ strip along pipe trench)	m ²	2,300.0			
4.1.2	8.3.1(c)	Remove topsoil to nominal depth of 150mm, stockpile and preserve for rehabilitation by hand ($\leq 2m$ strip along pipe trench)	m ²	3,400.0			
4.2		Excavation with machinery in all materials for trenches, sorting, backfill, compact and dispose of surplus material for Ø350 HDPE pipe for depths of:					
4.2.1	8.3.2(a) PSDB-4	0m – 1.0m	m	750.0			
4.3		Extra-over on item D3 for depths:					
4.3.1	PSDB-4	1m - 2m	m	350.0			
4.4		Extra-over on item D3 for:					
4.4.1	8.3.2(a) PSDB-4	Intermediate excavation	m ³	260.0			
4.4.2	8.3.2(a) PSDB-4	Hard rock excavation	m ³	50.0			
4.4.3	8.3.2(a) PSDB-4	Boulders class A & B excavation	m ³	10.0			
4.5		Excavation by hand in all materials for trenches, sorting, backfill, compact and dispose of surplus material for Ø350 Ductile Iron pipe for depths of:					
4.5.1		0m – 0,5m	m	1,550.0			
4.6		Extra-over on item D7 for depths:					
4.6.1	8.3.2 (b1) PSDB-4	0,5m – 1m	m	200.0			
4.6.2	8.3.2 (b1) PSDB-4	1m – 1,5m	m	70.0			
4.6.3	8.3.2(b1) PSDB-4	1,5m – 2m	m	50.0			
4.7		Extra-over on item D7 for:					
4.7.1	8.3.2(b)	Intermediate excavation	m ³	30.0			
4.7.2	8.3.2(b)	Breaking of rock	m ³	5.0			
Total Carried Forward							0 00

Contract 1
Schedule 1

Section 5

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
5	1200GA PSGA	CONCRETE & REINFORCEMENT					
5.1		Strength concrete (Preparation, formwork, chamfering, placing, all surfaces finishing, box-outs, testing etc included, complete):					
5.1.1	8.4.2 PSGA-5	Grade15/19 blinding and dental concrete to receive structures cast in the form of slabs less than 50mm thick.	m ²	140.0			
5.2	8.4.1 PSGA-5	Grade25/19 reinforced concrete to all structures (foundations, thrust blocks, pedestals, chambers, etc)					
5.2.1		Air-Valve & Scour Chamber Bases	m ³	8.0			
5.2.2		Air-Valve & Scour Chamber Decks	m ³	8.0			
5.2.3		Type C (800x800x400mm Cradle)	m ³	5.0			
5.2.4		Type E (800x1500x400mm Base)	m ³	1.0			
5.2.5		Type D (800x1500x400mm Base)	m ³	8.0			
5.2.6		Type D (2000x1000x350mm Pedestal)	m ³	15.0			
5.2.7		Thrust blocks	m ³	42.0			
5.2		Steel Reinforcement to Concrete(All diameters, bending profiles and installation included, complete)					
5.2.1	8.3.1 PSGA-2	High tensile reinforcement bars ≤Y12 to all small structures, fixed and cast in, complete, provisionally at 50kg/m ³ .	t	4.5			
5.2.2	8.3.2 PSGA-2	High tensile welded mesh Ref 395 to bases and decks of chambers	m ²	120.0			
Total Carried Forward To Summary							0 00

Contract 1
Schedule 1

Section 6

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
6	1200L&LB PSL / PSLB	MEDIUM PRESSURE PIPELINES & BEDDING					
6.1		Supply, lay, bed, test & backfill complete with couplings & bends (Note Class C bedding):					
6.1.1	8.2.1PSLB-2	Type A : Lay and bed Ø350mm HDPE pipe underground with ≥200mm cover over pipe including couplings etc installation by machinery, complete	m	770.0			
6.1.2	8.2.1PSLB-2	Type B : Lay, bed & backfill Ø350mm Ductile Iron / Class K9 pipe underground with ≥200mm cover over pipe including couplings etc installation by hand, complete	m	1,550.0			
6.1.3	8.2.1PSLB-2	Type C : Lay and bed Ø350mm Ductile Iron / Class K9 pipe above ground including couplings etc installation by hand, complete	m	170.0			
6.1.4	8.2.1PSLB-2	Type D : Lay and install Ø350mm Ductile Iron / Class K9 pipe on concrete pedestals including couplings etc installation by hand, complete	m	70.0			
6.2		Provision of bedding from trench excavation:					
6.2.1	8.2.1.a	Selected granular material	m ³	310.0			
6.2.2	8.2.1.b	Selected fill material	m ³	700.0			
6.3		Supply bedding by importation:					
6.3.1	8.2.2.1.a	Import granular or sandy material as bedding for Class C bedding	m ³				Rate Only
6.3.2	8.2.2.1.b	Import granular or sandy material as fill for Class C bedding	m ³				Rate Only
Total Carried Forward To Summary							0 00

Contract 1
Schedule 1

Section 7

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
7	1200LP SL/PA/PB	"HYDRAULIC EQUIPMENT & ACCESSORIES(Supply & install complete)"					
		Supply and Install all Hydraulic Equipment, Accessories & Fittings, Complete					
7.1		Air-valve chamber:					
7.1.1	8.2.5	Flange Adaptor PN16 (Ø350mm) between flanged T-piece and Ductile Iron pipe	No	28.0			
7.1.2	8.2.5	Galvanised Air-valve T-piece (Ø350mm x Ø150mm) flanged all ends	No	14.0			
7.1.3	PA3	Air-Valves (Ø100mm), type anti-surge anti-shock double-action, flanged, Vent-O-Mat series RBX" or similar	No	14.0			
7.1.4	PA1	Isolating gate valve Ø100mm Flanged	No	14.0			
7.2		Scour chamber:					
7.2.1	8.2.5	Scour T-piece: Ø350mm x Ø100mm, Galvanised, PN16, flanged all ends	No	8.0			
7.2.2	PA1	Scour Gate Valve: Ø100mm, PN16	No	8.0			
7.2.3	8.2.5	Flange Adaptor: Ø100mm, PN 16	No	8.0			
7.2.4	8.2.5	Flange Adaptor (Ø350mm) between flanged T-piece and Ductile Iron pipe	No	16.0			
7.3		Outlet Works:					
7.3.1	8.2.5	Ø350/250 Galvanised steel pipe reducer at outlet works	No	1.0			
7.3.2	8.2.5	Ø250 VJ Coupling PN16	No	1.0			
7.3.3	8.2.5	Ø350 VJ Coupling PN16	No	1.0			
7.4		Inlet Chamber:					
7.4.1	PSL-1	Ø350 Stainless steel pipe: 500mm long with puddle and flanged one end (Inlet chamber & pipeline connection)	No	1.0			
7.4.2	PB2	Ø350 Flange Adaptor PN16 (Inlet chamber & pipeline connection)	No	1.0			
7.4.3	PA1	Ø500 Knife Gate Valve	No	1.0		Rate Only	
7.4.4	PSL-1	Ø500 Stainless Steel pipe: ±500mm long with puddle and flanged one end	No	1.0		Rate Only	
7.4.5	PB2	Ø500 Flange Adaptor	No	1.0		Rate Only	
7.5		Bends:					
7.5.1	PB2	11,25 degree short radius Ductile Iron bend	No	30.0			
7.5.2	PB2	22,5 degree short radius Ductile Iron bend	No	11.0			
Total Carried Forward							0 00

Contract 1
Schedule 1

Section 7

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
Brought Forward						0	00
7.5.3	PB2	45 degree short radius Ductile Iron bend	No	2.0			
7.6		Other Fittings:					
7.6.1	PSL-1	Supply and Install Ø50mm PVC pipe to be bedded in scour chamber base	m	15.0			
7.6.2	8.2.5	Ø350mm VJ Couplings PN16 between HDPE pipe and Ductile Iron pipe	No	1.0			
7.6.3	8.2.5	Ø350 VJ Coupling PN16 at high concrete pedestals (Type D)	No	15.0			
Total Carried Forward To Summary						0	00

Contract 1
Schedule 1

Section 8

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
8	1200HA PC2	"MISCELLANEOUS"					
8.1		"All Structural Steel Work (Sundry Items)(supply, assemble, install, shop drawings, complete):"					
8.1.1	PC2	Supply & install Type C & D galvanised steel strap with M16 chemical anchors, complete	No	310.0			
8.1.2	PC2	Supply & install Type E galvanised pivoting pipe steel cradle with steel strap with M16 chemical anchors, complete	No			Rate Only	
8.1.3	PC2	Supply & install air-valve chamber lockable steel lid	No	14.0			
8.1.4	PC2	Supply & install scour chamber lockable steel lid	No	8.0			
8.2		"All Other Work, Components & Accessories(Supply and install, complete):"					
8.2.1		Supply and construct air-valve chamber brickwork of 230mm thickness with brick force etc. - Complete	m ²	160.0			
8.2.2		Supply and construct scour-valve chamber brickwork of 230mm thickness with brick force etc. - Complete	m ²	55.0			
8.2.3		Supply and construct air / scour –valve chamber 115mm brick cradle with brick force etc. - Complete	m ²	5.0			
8.2.4		Air / Scour –valve Chamber 230mm x 3mm thick rubber liner between wall and pipe	m	55.0			
8.2.5		Type C & D 400mm x 3mm thick rubber liner between concrete and pipe	m	340.0			
8.2.6		Type C & D 80mm x 3mm thick rubber liner between steel strap and pipe	m	170.0			
8.2.7		Type E 120mm x 3mm thick rubber liner between steel cradle and pipe	m			Rate Only	
8.2.8		Type B : Construct retaining wall with selected stone on site	m ²	940.0			
8.2.9		Type B : Supply and construct retaining wall with concrete blocks filled with soil.	m ²			Rate Only	
8.2.10		Gabions in river bed with selected material on site	m ³	5.0			
8.2.11		Ø350 pipe tie-in: Break wall, Sika Swell around pipe, non-cracking bars, concrete – Complete	No	1.0			
8.2.12		Ø500 pipe tie-in: Break wall, Sika Swell around pipe, non-cracking bars, concrete – Complete	No			Rate Only	
8.2.13		Ø500 slotted subsoil drainage pipe in the river bed with selected stone backfilling complete	m			Rate Only	
Total Carried Forward							0 00

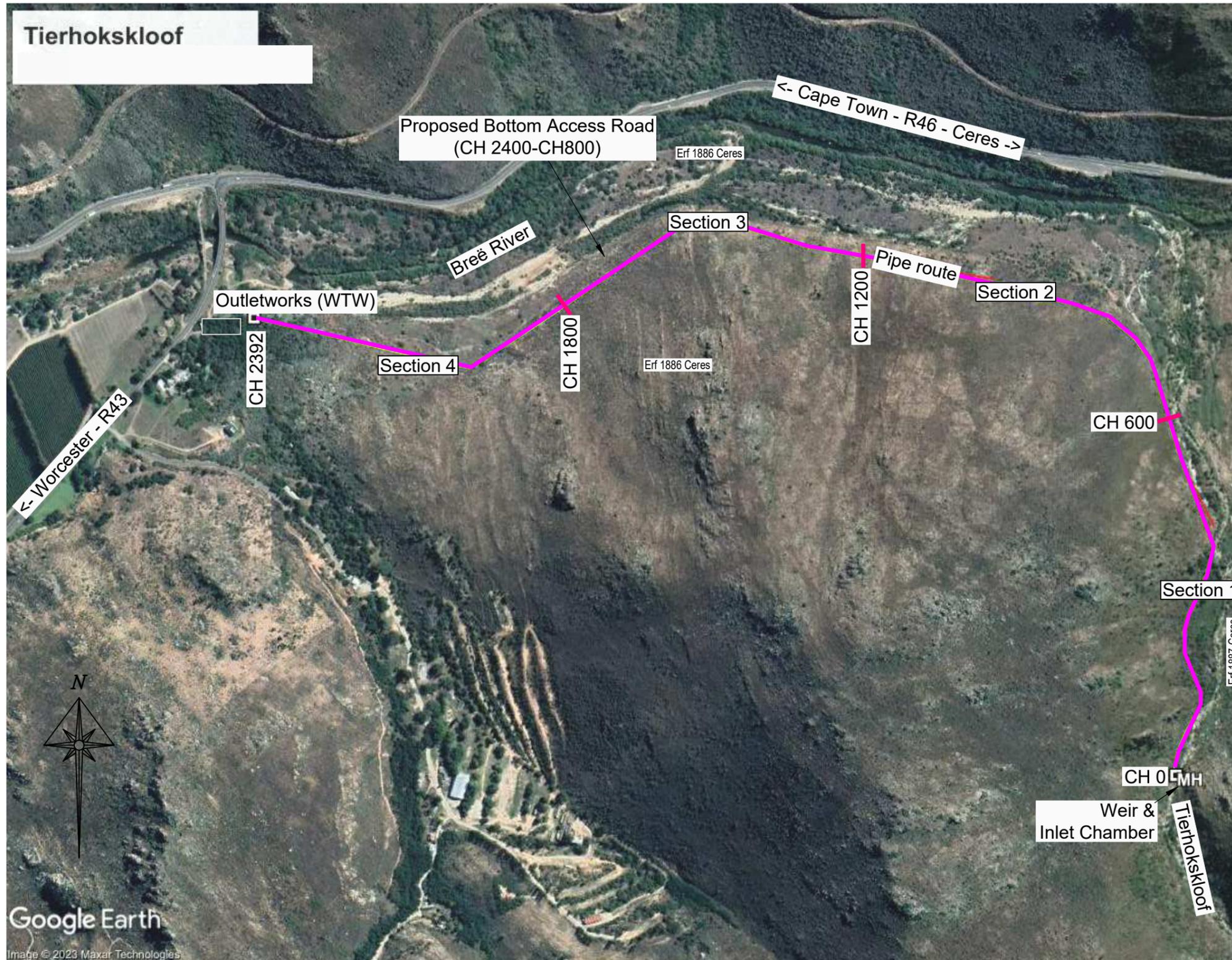
Contract 1
Schedule 1

SUMMARY OF SECTIONS

SECTION	DESCRIPTION	AMOUNT (RAND)
1	Section 1	10,000.00
2	Section 2	20,000.00
3	Section 3	0.00
4	Section 4	0.00
5	Section 5	0.00
6	Section 6	0.00
7	Section 7	0.00
8	Section 8	0.00
	SUBTOTAL	30,000.00
	Add 15% VAT	4,500.00
	Total Carried Forward To Summary Of Schedules	34,500.00

Appendix B - Design Drawings

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Municipality • Munisipaliteit • U Mungqala Wase

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ENGINEER



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Epsom Downs,
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PROJECT

TIERHOKSKLOOF BULK WATER

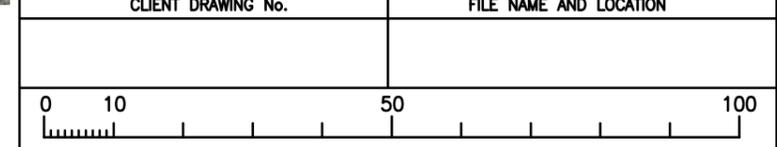
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**CONSTRUCTION OF NEW
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LAYOUT**

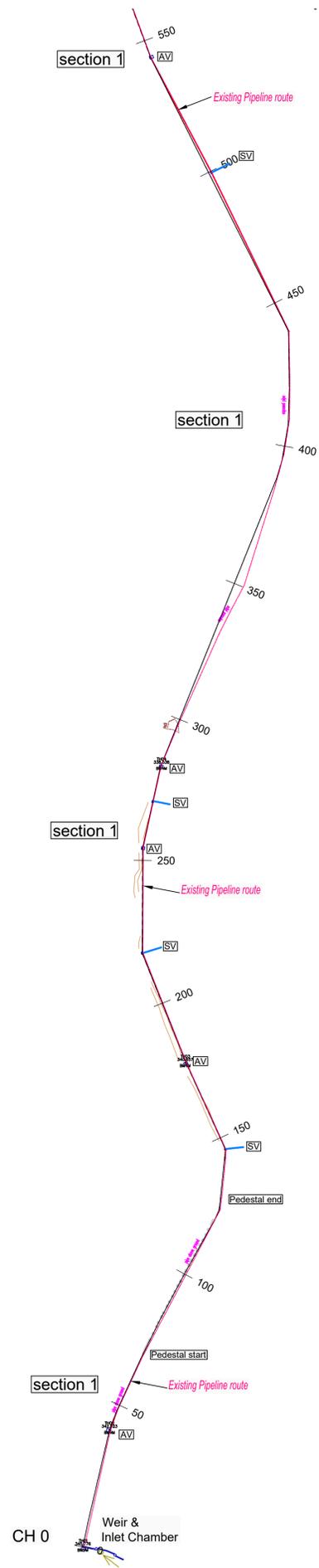
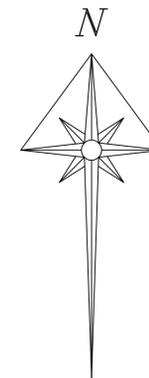
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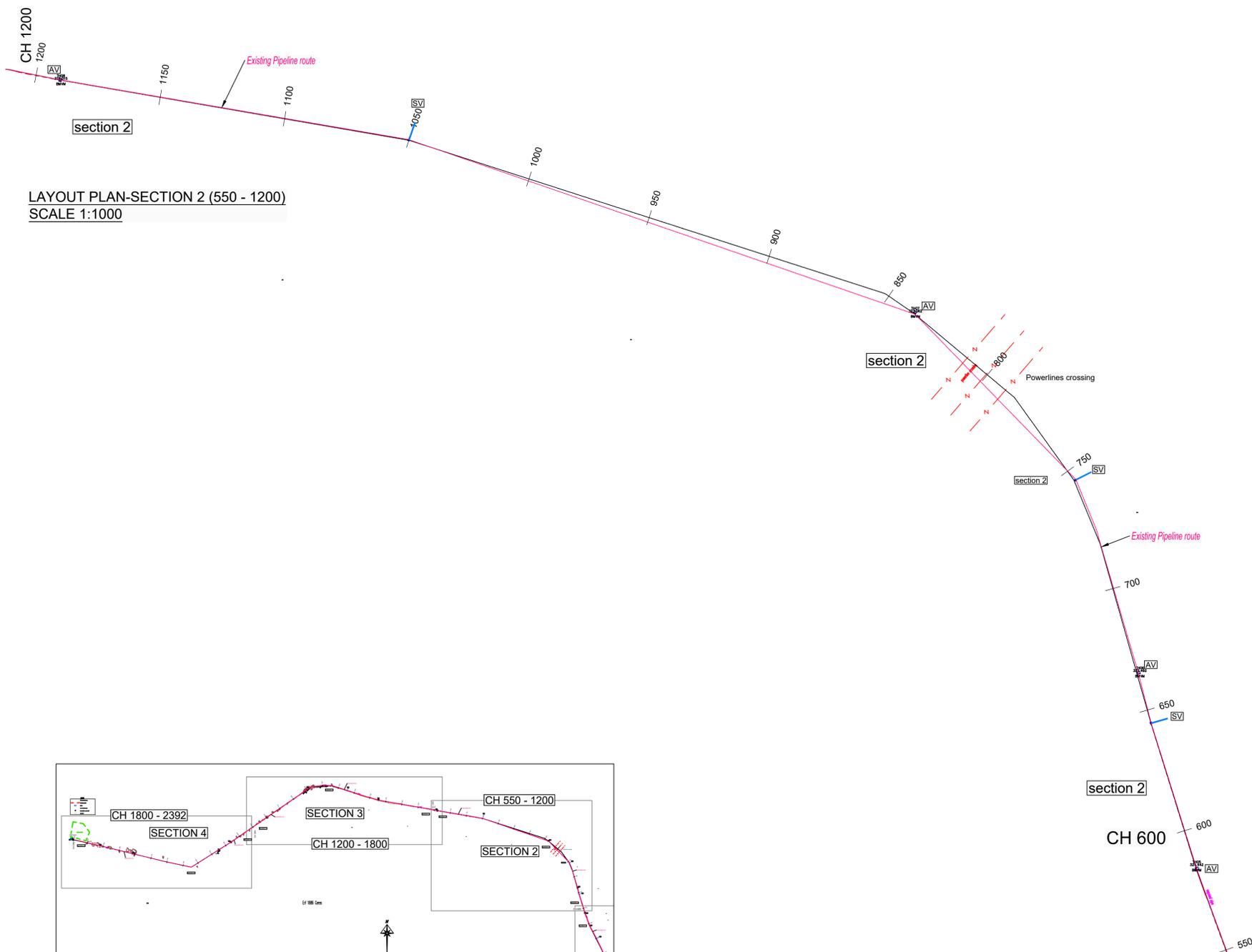
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CLIENT DRAWING No.		FILE NAME AND LOCATION			



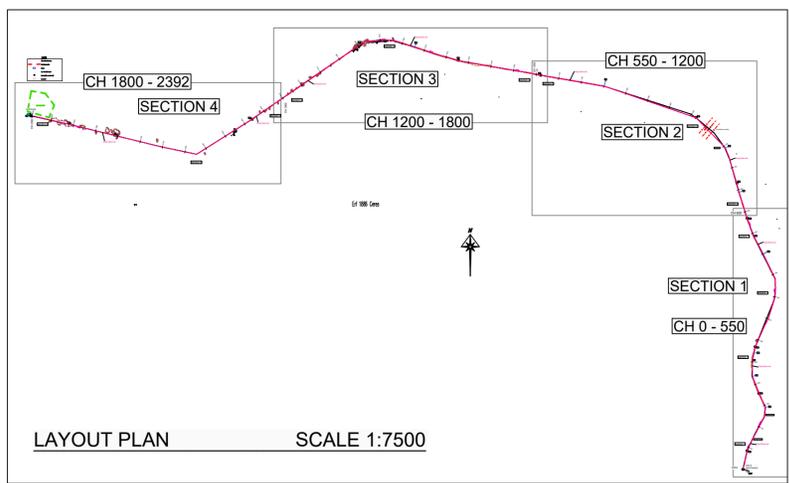
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LAYOUT PLAN-SECTION 1 (0 - 550)
SCALE 1:1000



LAYOUT PLAN-SECTION 2 (550 - 1200)
SCALE 1:1000



LAYOUT PLAN SCALE 1:7500

LEGEND	
AV	Air Valves
SV	Scour Valves

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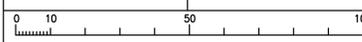
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 LAYOUT

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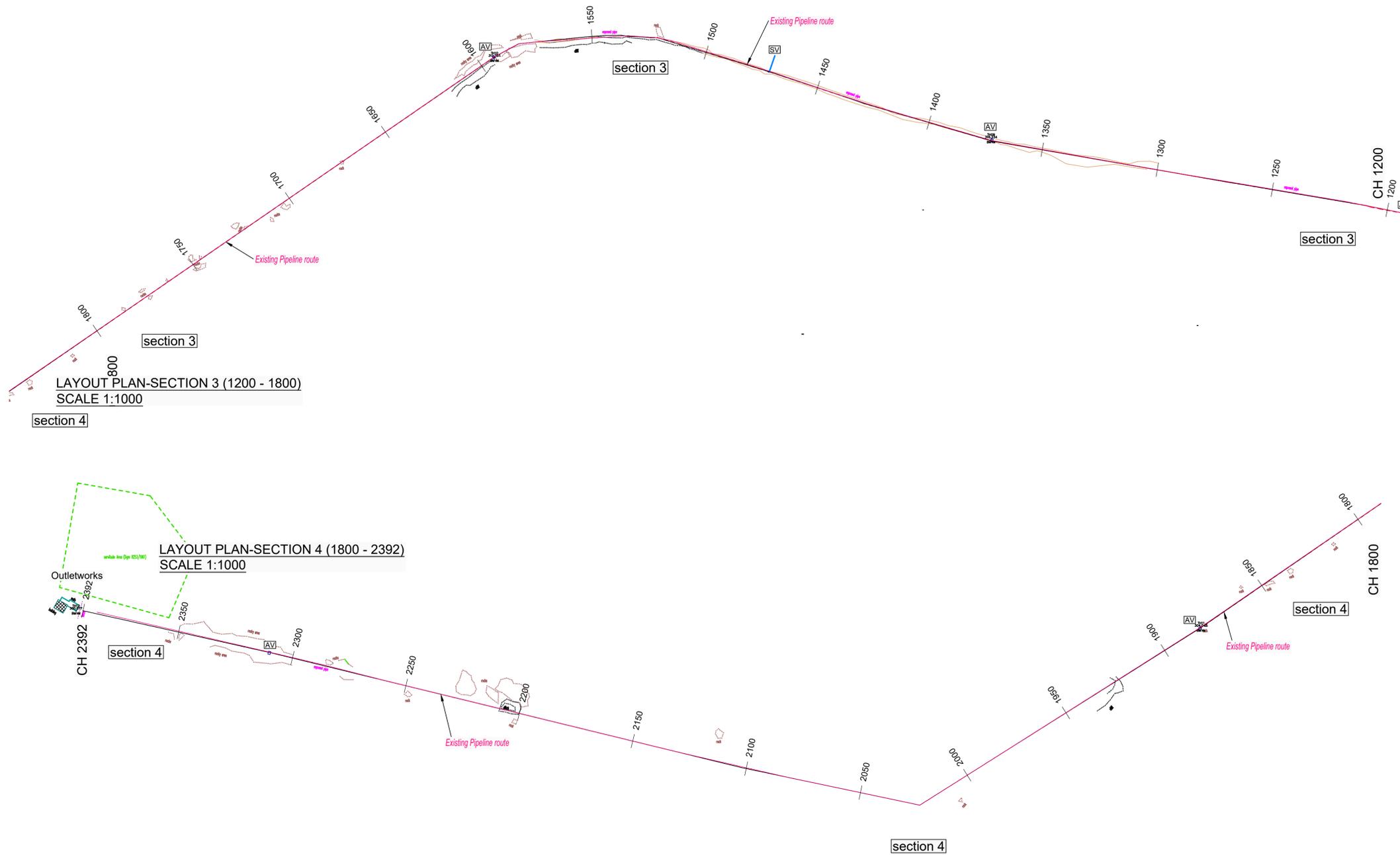
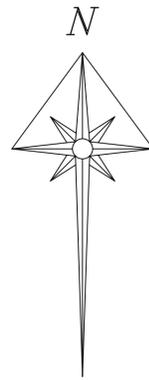
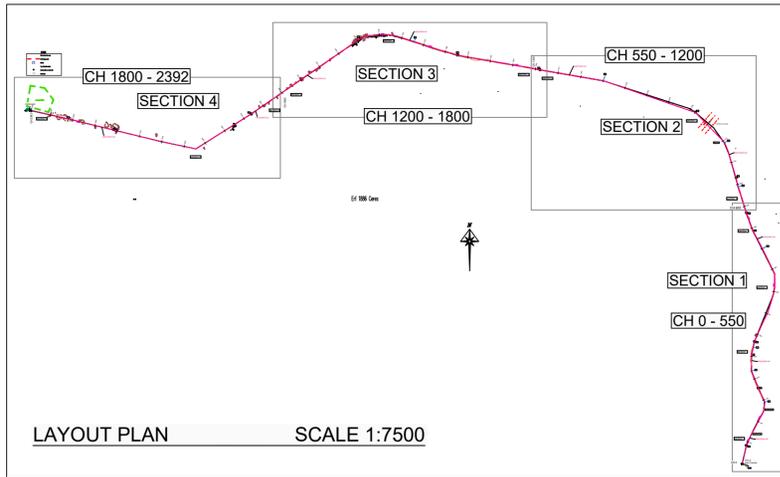
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2252-S3-02		2		A1	

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LEGEND	
AV	Air Valves
SV	Scour Valves

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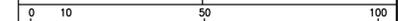
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 TIERHOKSKLOOF BULK WATER

DRAWING
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 BULK WATER PIPELINE:
 LAYOUT

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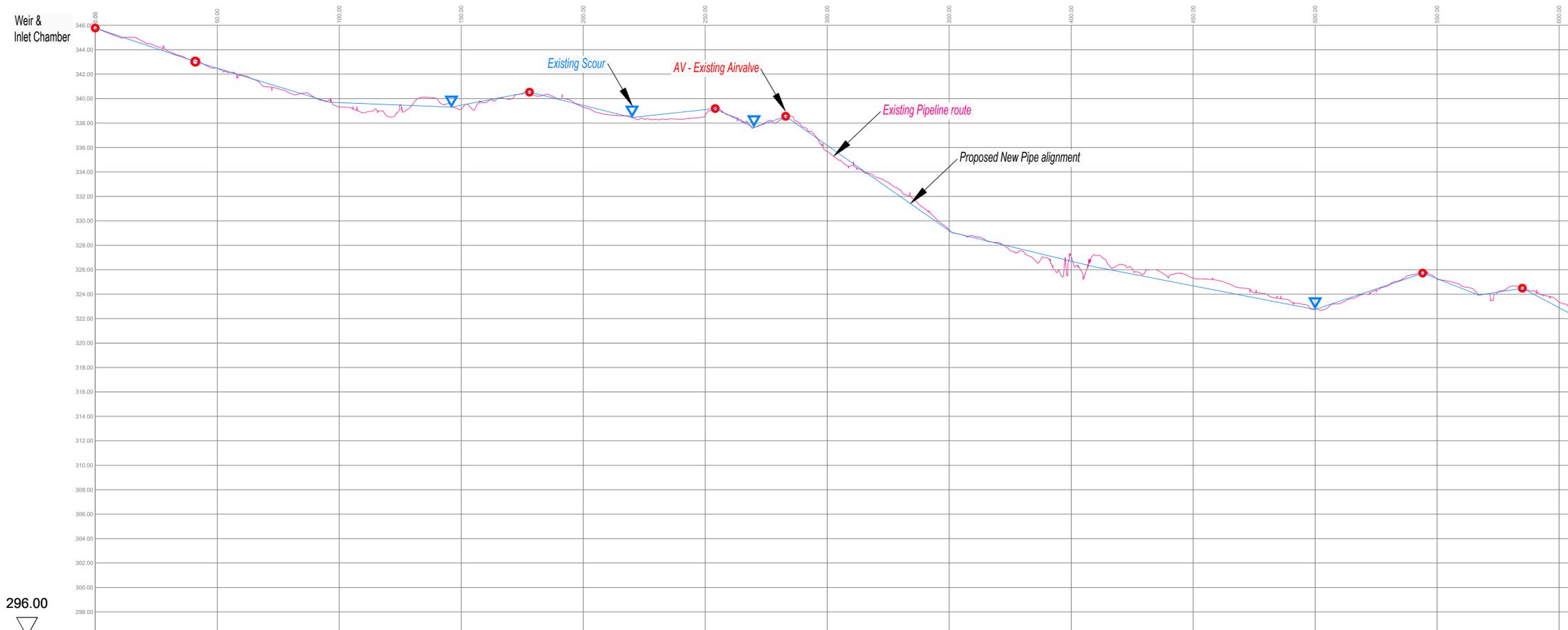
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SCALE AS SHOWN	

PROJECT No.	DISCIPL.	DRG. NUMBER	STAGE	SHEET SIZE	REVISION
2252-S3-03		3		A1	
CLIENT DRAWING No.	FILE NAME AND LOCATION				



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LONGITUDINAL SECTION - SECTION 1 (0 - 600) SCALE Hor. 1:1000 Vert. 1:200



Chainage	0.00	50.00	100.00	150.00	200.00	250.00	300.00	350.00	400.00	450.00	500.00	550.00	600.00	
Groundlevel pipe route	345.78	342.48	339.32	338.13	339.29	338.62	335.70	329.26	327.08	325.32	322.80	325.23	323.35	
Structures (Existing)	AV	AV		SV	AV		SV	AV	SV	AV		SV	AV	AV
Cross Falls	Flat		Steep				Steep			Steep		Steep		Ste
Type A	70m													
Type B & C												1570m		
Type D			60m											

LEGEND	
AV	Air Valves
SV	Scour Valves

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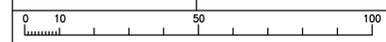
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 BULK WATER PIPELINE:
 LAYOUT

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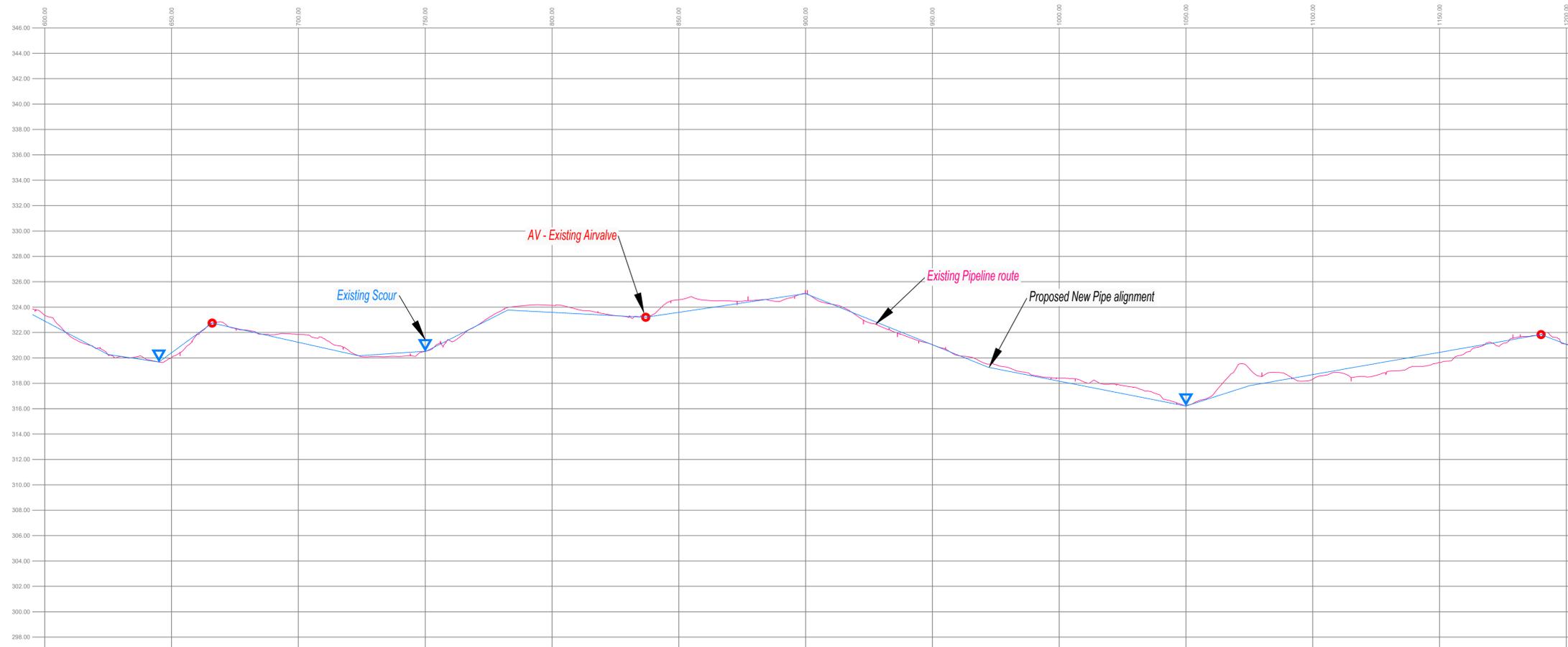
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APPROVED		

PROJECT No.	DISCIPL.	DRG. NUMBER	STAGE	SHEET SIZE	REVISION
2252-S3-04		4		A1	

CLIENT DRAWING No.	FILE NAME AND LOCATION



LONGITUDINAL SECTION - SECTION 2 (600 - 1200) SCALE Hor. 1:1000 Vert. 1:200



Chainage	600.00	650.00	700.00	750.00	800.00	850.00	900.00	950.00	1000.00	1050.00	1100.00	1150.00	1200.00
Groundlevel pipe route	323.35	320.02	321.84	320.98	324.14	324.98	325.95	327.04	318.41	318.22	318.37	318.64	321.98
Structures (Existing)		SV	AV		SV		AV				SV		AV
Cross Falls	Steep		Steep			Steep				Steep			
Type A													
Type B & C	1570m												
Type D													

LEGEND	
AV	Air Valves
SV	Scour Valves

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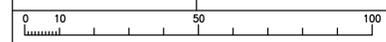
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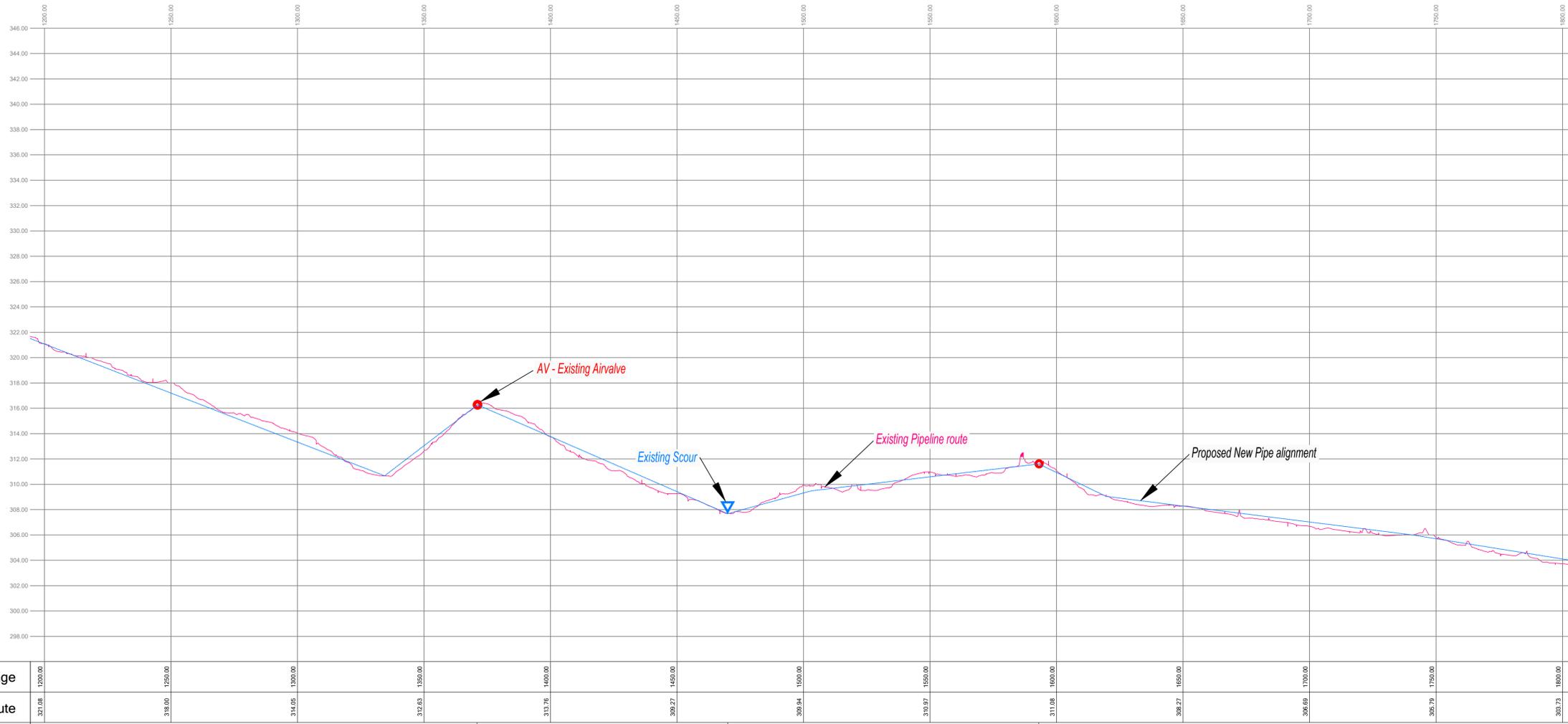
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SCALE	AS SHOWN	

PROJECT No.	DISCIPL.	DRG. NUMBER	STAGE	SHEET SIZE	REVISION
2252-S3-05		5		A1	

CLIENT DRAWING No.	FILE NAME AND LOCATION



LONGITUDINAL SECTION - SECTION 3 (1200 - 1800) SCALE Hor. 1:1000 Vert. 1:200



Chainage	1200.00	1250.00	1300.00	1350.00	1400.00	1450.00	1500.00	1550.00	1600.00	1650.00	1700.00	1750.00	1800.00
Groundlevel pipe route	321.08	318.00	314.05	312.63	313.76	309.27	309.94	310.97	311.08	308.27	306.69	305.79	303.73
Structures (Existing)					AV		SV		AV				
Cross Falls	Steep		Steep			Steep					Flat / Moderate		
Type A													
Type B & C	1570m												
Type D													

LEGEND	
AV	Air Valves
SV	Scour Valves

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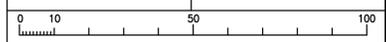
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 BULK WATER PIPELINE:
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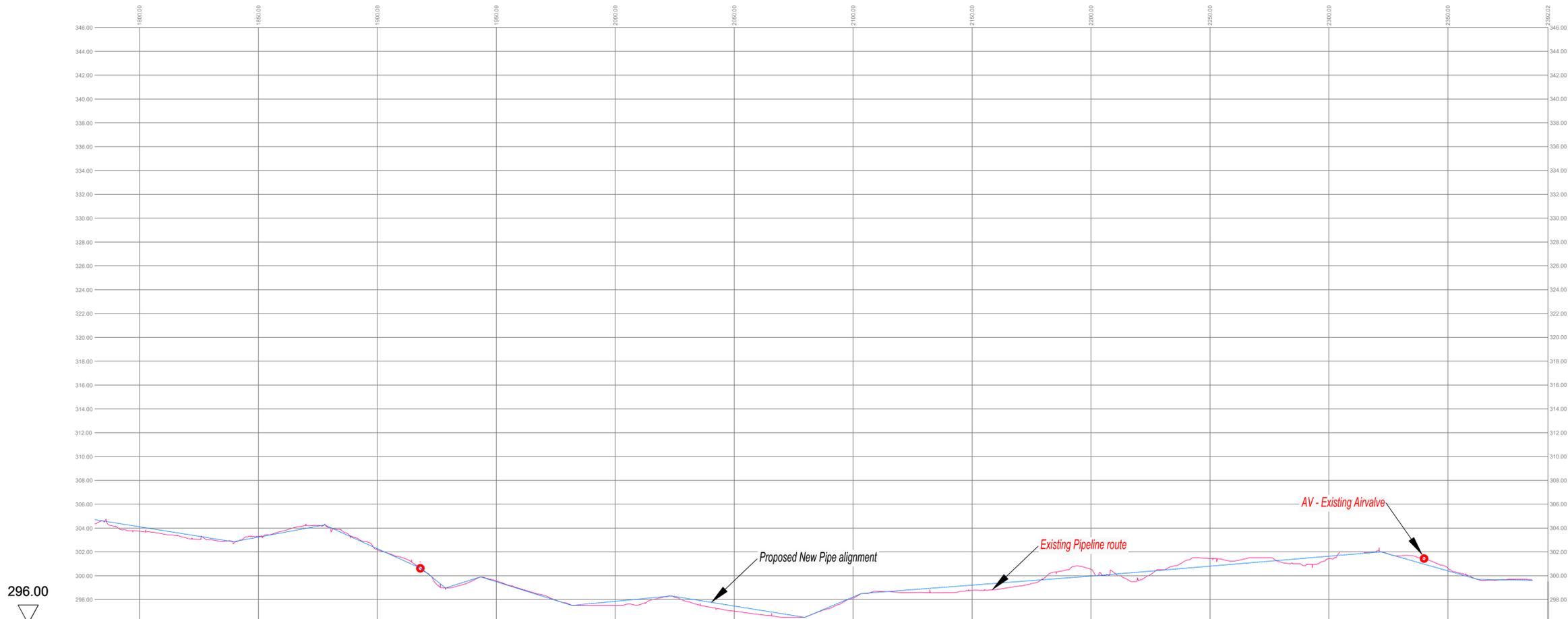
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SCALE	AS SHOWN	

PROJECT No.	DISPL	DRG. NUMBER	STAGE	SHEET SIZE	REVISION
2252-S3-06		6		A1	

CLIENT DRAWING No.	FILE NAME AND LOCATION



LONGITUDINAL SECTION - SECTION 4 (1800 - 2392) SCALE Hor. 1:1000 Vert. 1:200



Chainage	1800.00	1850.00	1900.00	1950.00	2000.00	2050.00	2100.00	2150.00	2200.00	2250.00	2300.00	2350.00	2392.02
Groundlevel pipe route	303.73	303.29	302.17	299.57	297.50	297.03	298.11	298.77	300.51	301.46	301.44	300.83	299.61
Structures (Existing)			AV										AV
Cross Falls	Flat / Moderate												
Type A	1570m												
Type B & C													
Type D													

LEGEND	
AV	Air Valves
SV	Scour Valves

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PROJECT
 TIERHOKSKLOOF BULK WATER

DRAWING
 CONSTRUCTION OF NEW
 BULK WATER PIPELINE:
 LAYOUT

ISSUED FOR INFORMATION

	SIGNATURE	DATE
DESIGNED	H.H	JAN/23
DRAWN	DL	
CHECKED		
APPROVED		

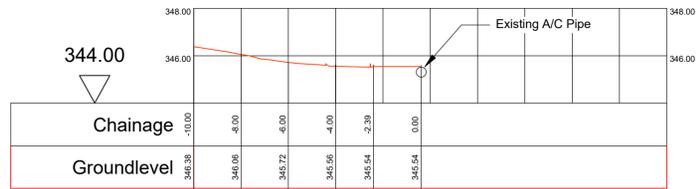
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PROJECT No.	DISCIPL	DRG. NUMBER	STAGE	SHEET SIZE	REVISION
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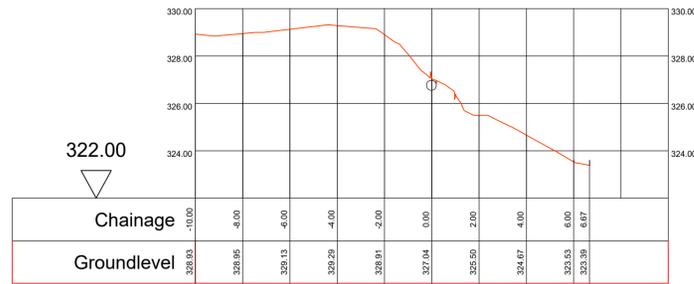
CLIENT DRAWING No.	FILE NAME AND LOCATION



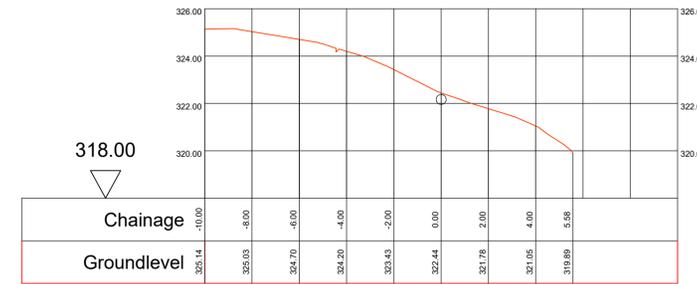
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0.00
Horiz. 1:150 Vert. 1:150



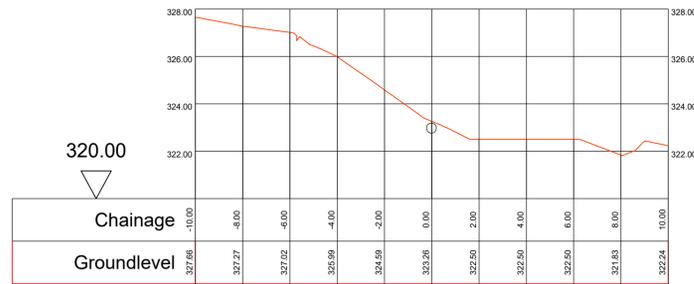
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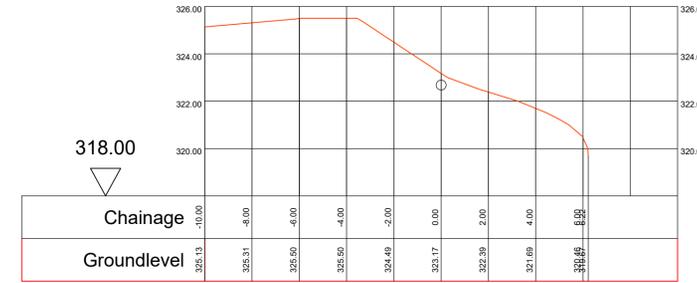
800.00
Horiz. 1:150 Vert. 1:150



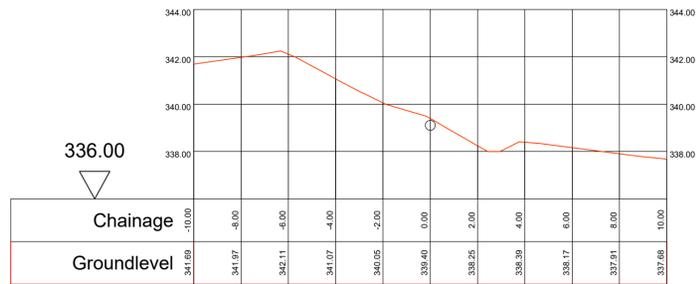
100.00
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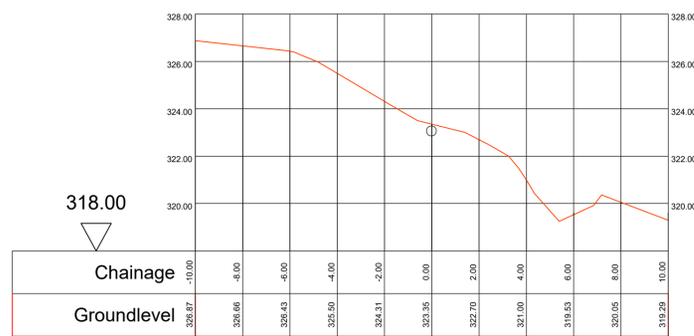
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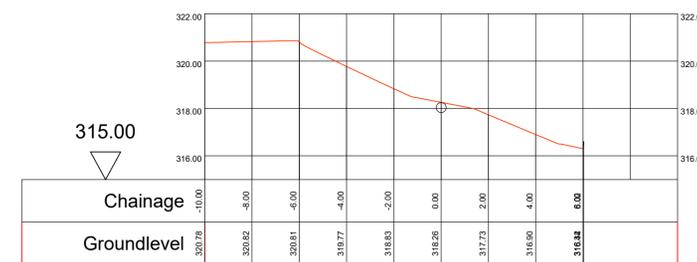
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200.00
Horiz. 1:150 Vert. 1:150



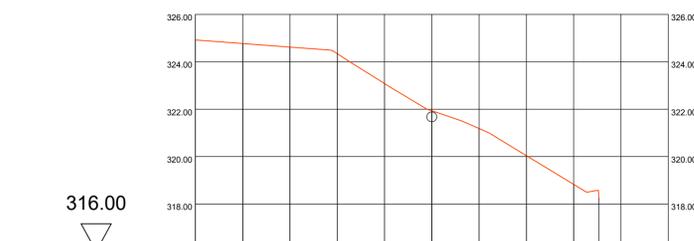
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Horiz. 1:150 Vert. 1:150



1000.00
Horiz. 1:150 Vert. 1:150



300.00
Horiz. 1:150 Vert. 1:150

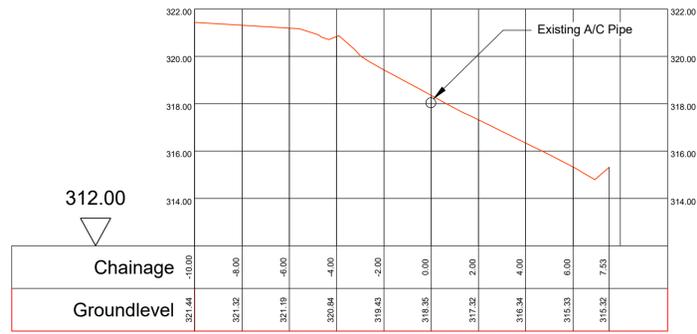


700.00
Horiz. 1:150 Vert. 1:150

TENDER
Note: See attached Site Topography Sheet.

LEGEND	
AV	Air Valves
SV	Scour Valves

CLIENT WITZENBERG Witzenberg Local Municipality Cnr Voortrekker & Lyell Streets, Ceres, 6835	
ENGINEER ETL Consulting (Pty) Ltd The Oval Office Park 1 Meadowbrook Lane Epsom Downs, Bryanston, 2152	
PROJECT TIERHOKSKLOOF BULK WATER	
DRAWING CONSTRUCTION OF NEW BULK WATER PIPELINE: LAYOUT	
ISSUED FOR INFORMATION	
SIGNATURE	DATE
DESIGNED H.H	JAN/23
DRAWN DL	
CHECKED	
APPROVED	
SCALE AS SHOWN	
PROJECT No. 2252-S3-08	DISCIPL. 8
CLIENT DRAWING No.	STAGE SHEET SIZE A1
FILE NAME AND LOCATION	
0 10 50 100	
COPYRIGHT RESERVED	



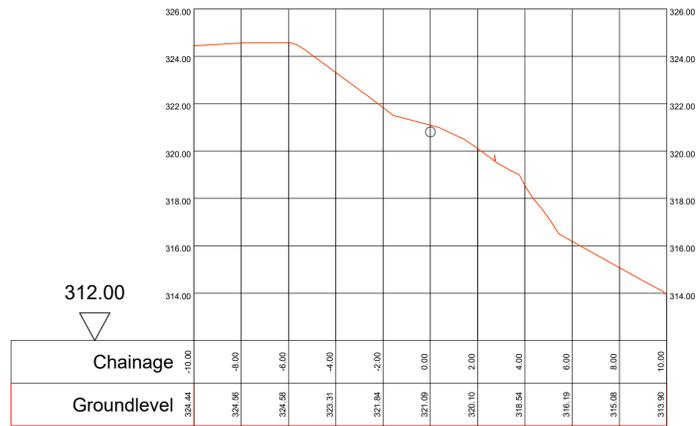
1100.00
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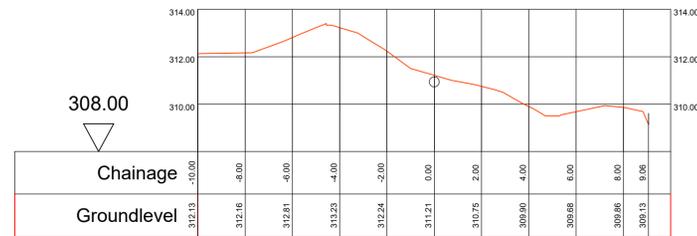
1500.00
Horiz. 1:150 Vert. 1:150



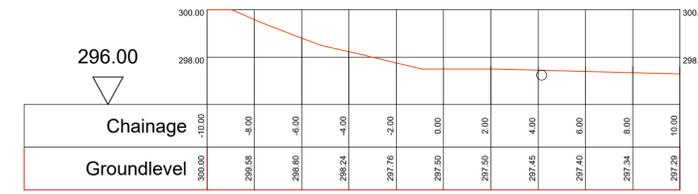
1900.00
Horiz. 1:150 Vert. 1:150



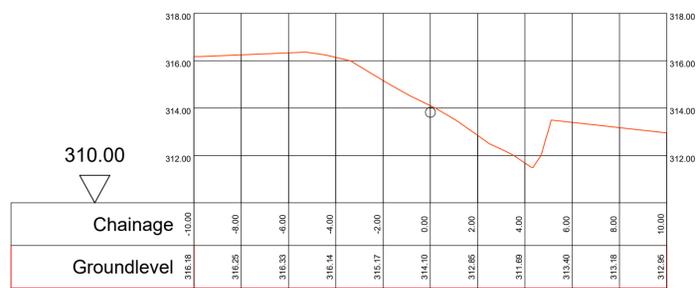
1200.00
Horiz. 1:150 Vert. 1:150



1600.00
Horiz. 1:150 Vert. 1:150



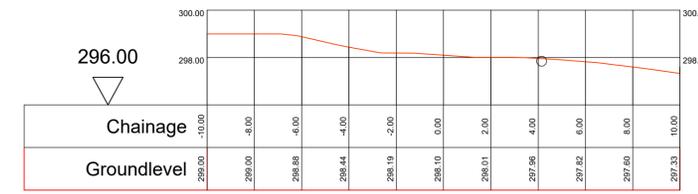
2000.00
Horiz. 1:150 Vert. 1:150



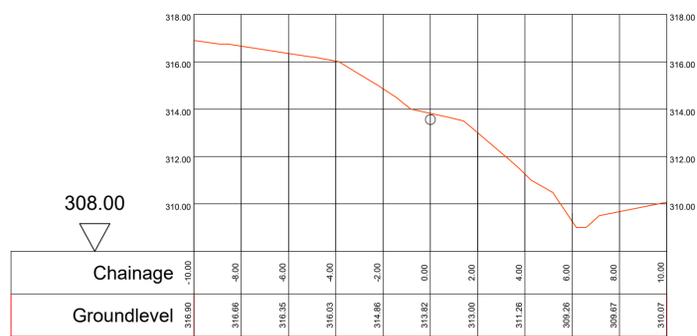
1300.00
Horiz. 1:150 Vert. 1:150



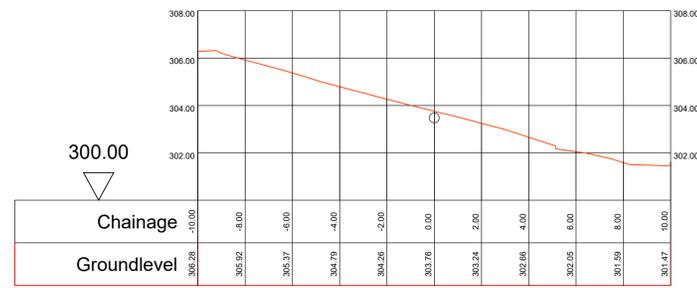
1700.00
Horiz. 1:150 Vert. 1:150



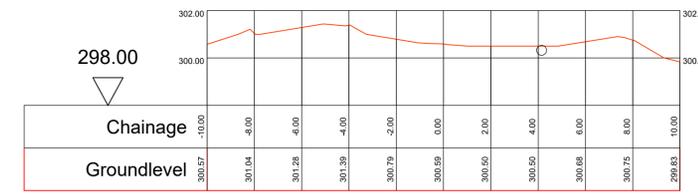
2100.00
Horiz. 1:150 Vert. 1:150



1400.00



1800.00
Horiz. 1:150 Vert. 1:150



2200.00
Horiz. 1:150 Vert. 1:150

TENDER

Note: See attached Site Topography Sheet.

LEGEND	
AV	Air Valves
SV	Scour Valves

CLIENT
 WITZENBERG
 Witzenberg Local Municipality
 Cnr Voortrekker & Lyell Streets,
 Ceres,
 6835

ENGINEER
 ETL
 ETL Consulting (Pty) Ltd
 The Oval Office Park
 1 Meadowbrook Lane
 Epsom Downs,
 Bryanston,
 2152

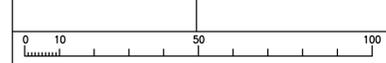
PROJECT
 TIERHOKSKLOOF BULK WATER

DRAWING
 CONSTRUCTION OF NEW
 BULK WATER PIPELINE:
 LAYOUT

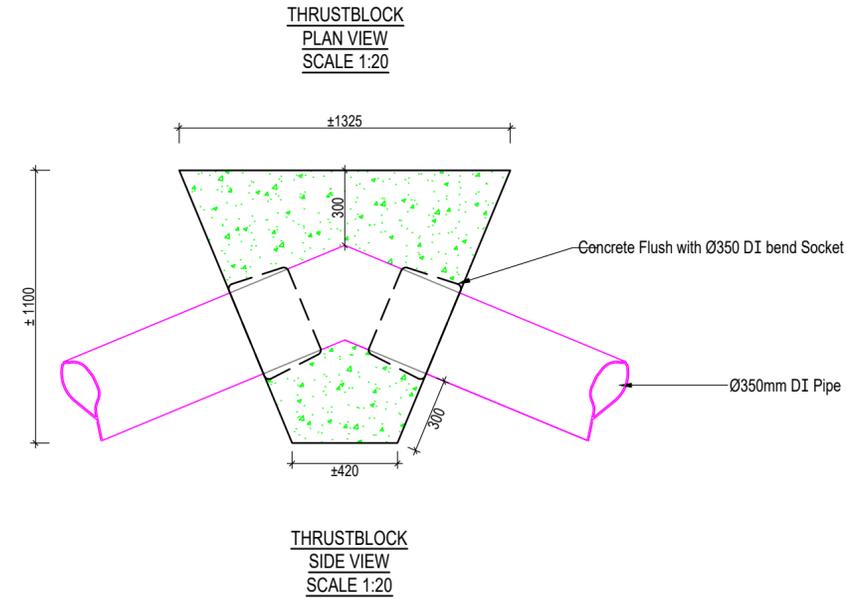
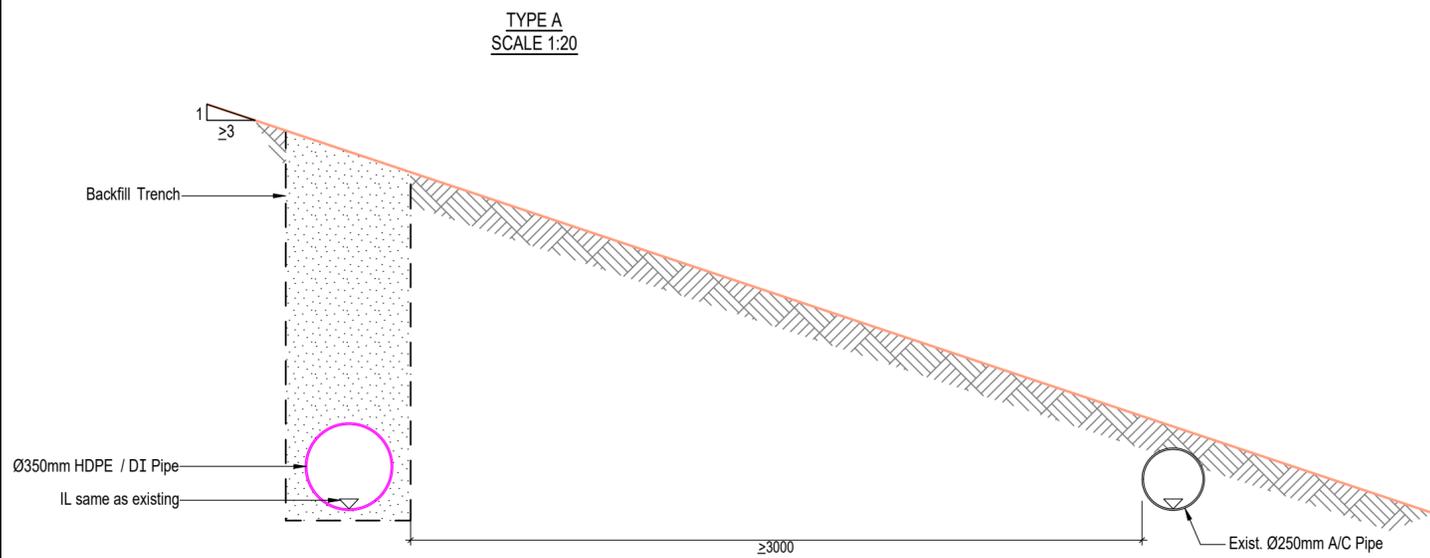
ISSUED FOR INFORMATION

SIGNATURE		DATE
DESIGNED	H.H	JAN/23
DRAWN	DL	
CHECKED		
APPROVED		
SCALE	AS SHOWN	

PROJECT No.	DISCIPL.	DRG. NUMBER	STAGE	SHEET SIZE	REVISION
2252-S3-09		9		A1	
CLIENT DRAWING No.		FILE NAME AND LOCATION			



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LEGEND

- New Ø350 Ductile Iron Pipe
- Existing Ø250 A/C Pipe
- New Concrete
- Existing Concrete
- Cut
- Fill
- Steel
- Existing Retaining Wall
- Rebar

TENDER

CLIENT

Witzenberg Local Municipality
Cnr Voortrekker & Lyell Streets,
Ceres,
6835

ENGINEER

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The Oval Office Park
1 Meadowbrook Lane Epsom Downs,
Bryanston,
2152

PROJECT

TIERHOKSKLOOF BULK WATER

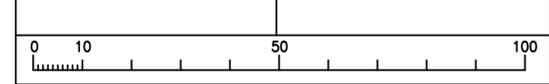
DRAWING

CONSTRUCTION OF NEW
BULK WATER PIPELINE:
LAYOUT

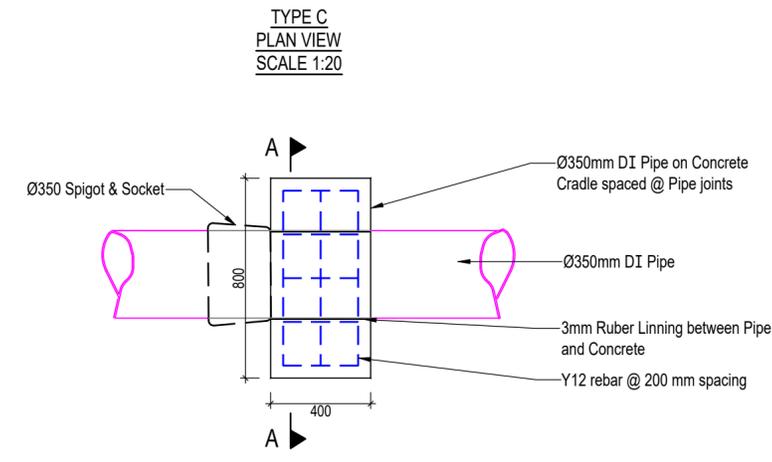
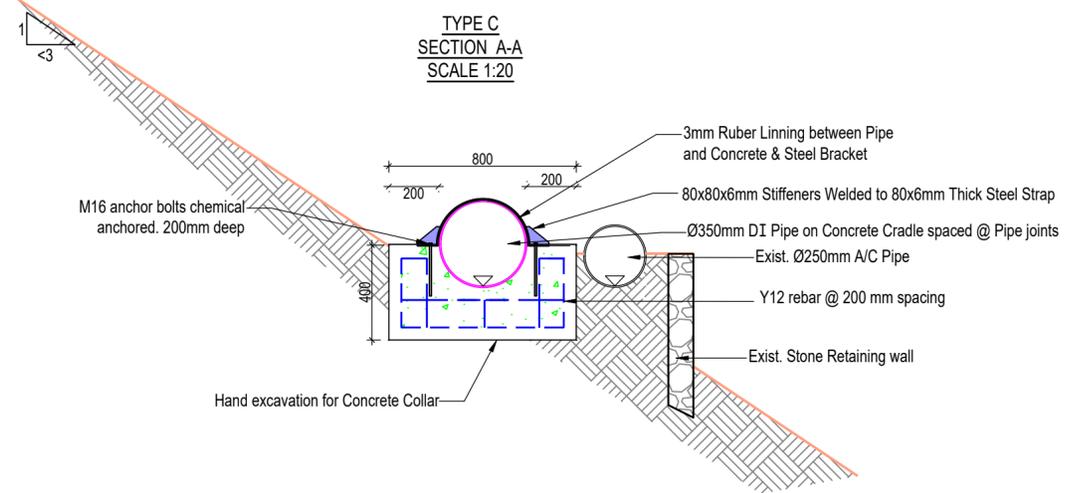
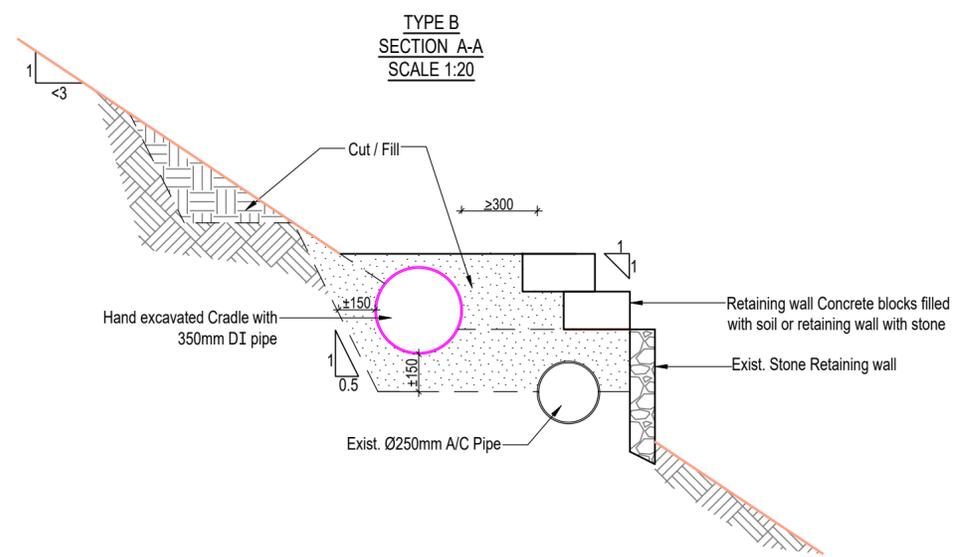
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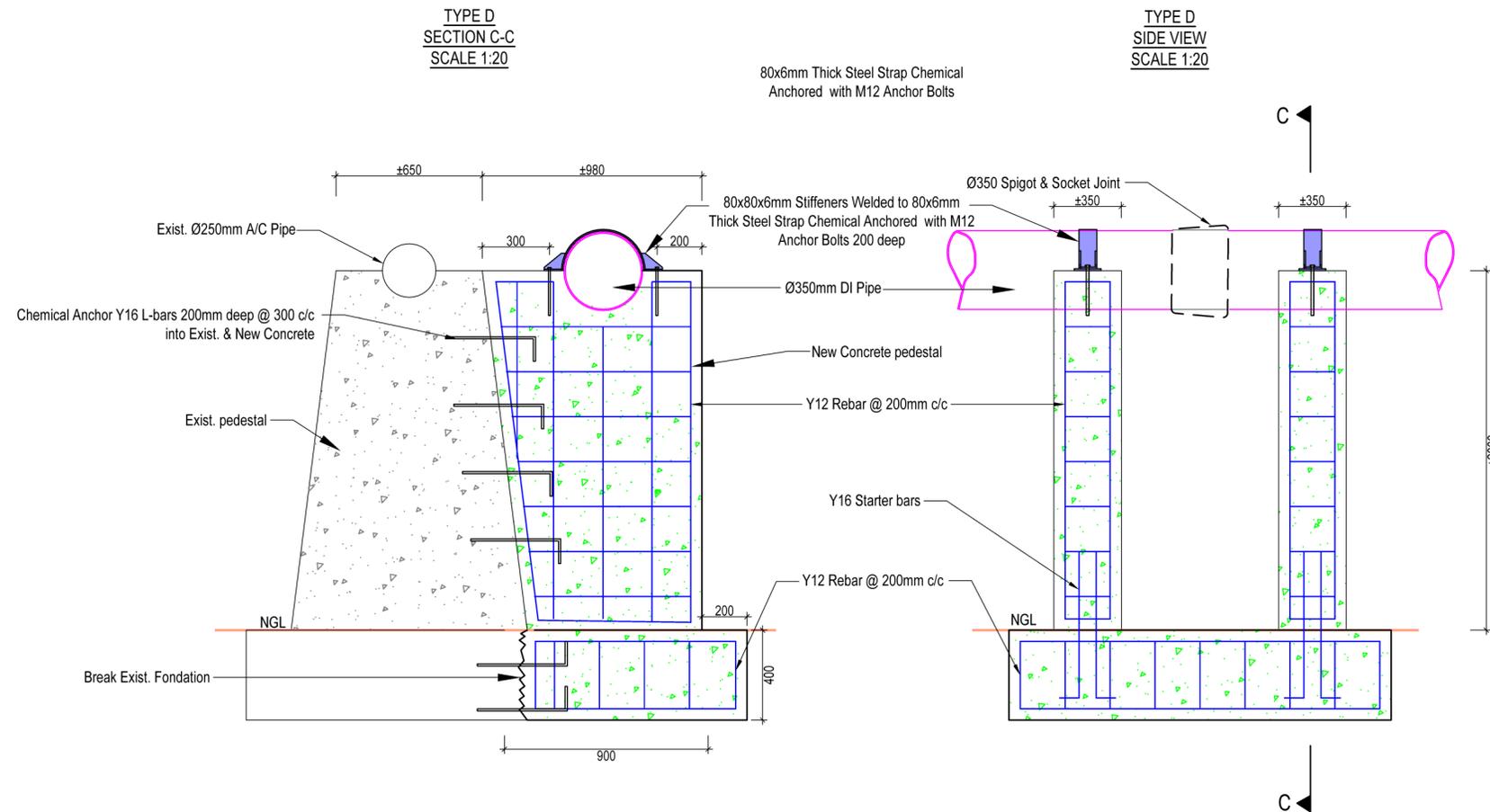
	SIGNATURE	DATE
DESIGNED	H.H	JAN/23
DRAWN	DL	
CHECKED		
APPROVED		
SCALE	AS SHOWN	

PROJECT No.	DISCPL	DRG. NUMBER	STAGE	SHEET SIZE	REVISION
2252-S3-10		10		A2	
CLIENT DRAWING No.			FILE NAME AND LOCATION		



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LEGEND	
	New Ø350 Ductile Iron Pipe
	Existing Ø250 A/C Pipe
	New Concrete
	Existing Concrete
	Cut
	Fill
	Steel
	Existing Retaining Wall
	Rebar

TENDER

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Ceres,
6835

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The Oval Office Park
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Bryanston,
2152

PROJECT

TIERHOKSKLOOF BULK WATER

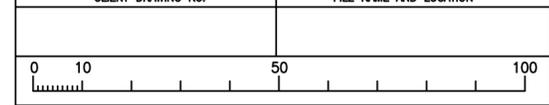
DRAWING

CONSTRUCTION OF NEW BULK WATER PIPELINE: LAYOUT

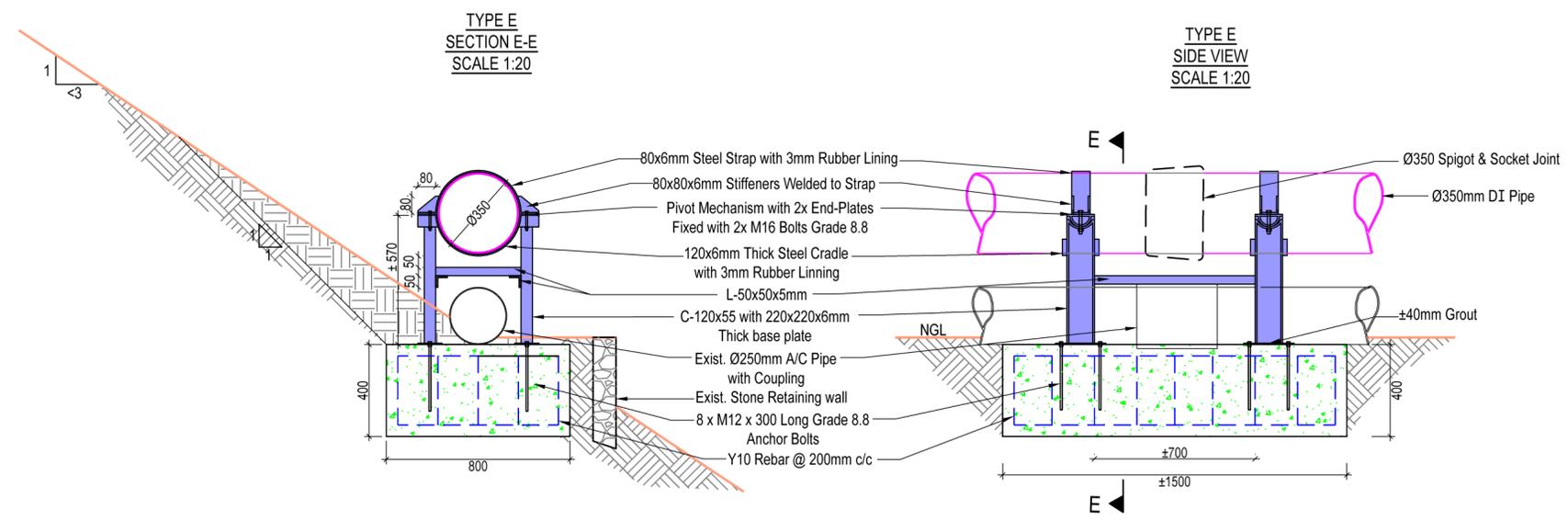
ISSUED FOR INFORMATION

	SIGNATURE	DATE
DESIGNED	H.H	JAN/23
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CHECKED		
APPROVED		
SCALE	AS SHOWN	

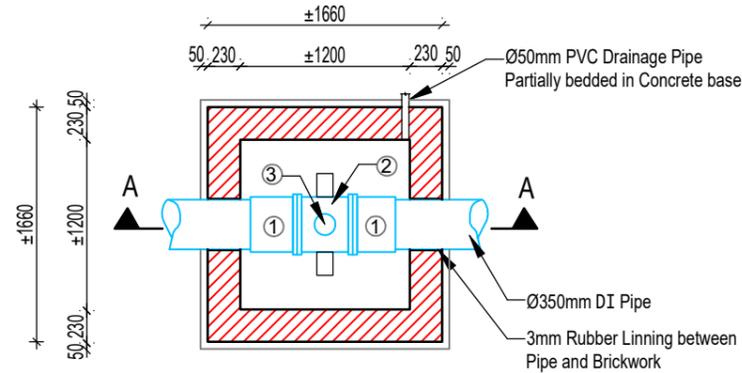
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CLIENT DRAWING No.			FILE NAME AND LOCATION		



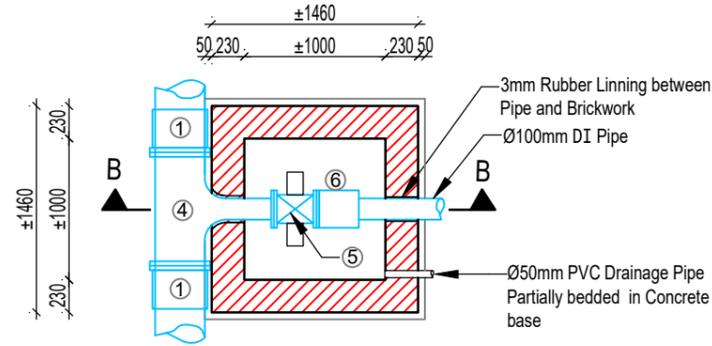
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AIR-VALVE CHAMBER
PLAN VIEW
SCALE 1:50

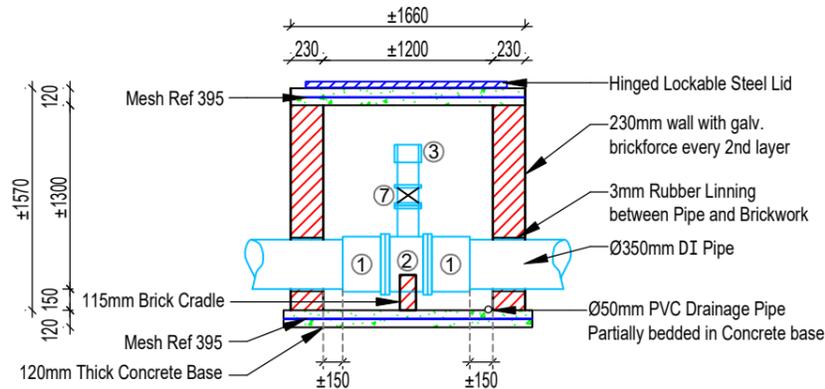


SCOUR-VALVE CHAMBER
PLAN VIEW
SCALE 1:50

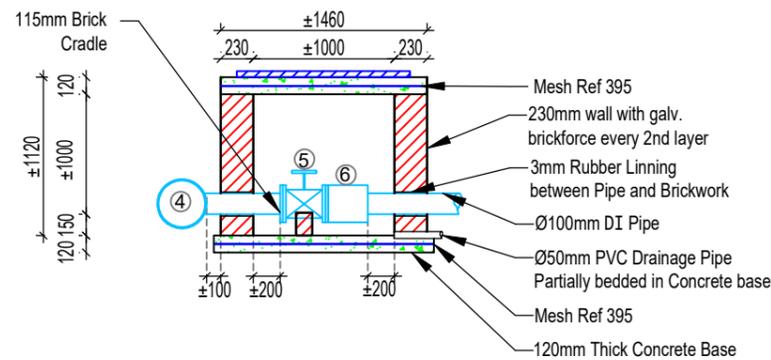


- LEGEND**
- ① Ø350mm Flanged Adaptor
 - ② Ø100mm T-Piece Flanged
 - ③ Ø100mm-Air Valve
 - ④ Ø350/100 Scour T-Piece Flanged
 - ⑤ Ø100mm Gate Valve
 - ⑥ Ø100mm Flanged Adaptor
 - ⑦ Ø100mm Gate Isolating Valve

AIR-VALVE CHAMBER
SECTION A-A
SCALE 1:50



SCOUR-VALVE CHAMBER
SECTION B-B
SCALE 1:50



LOCKABLE LID PHOTOS:



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PROJECT

TIERHOKSKLOOF BULK WATER

DRAWING

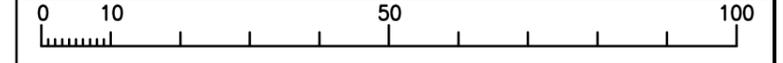
**CONSTRUCTION OF NEW
AIR-VALVE SCOUR
CHAMBER**

ISSUED FOR INFORMATION

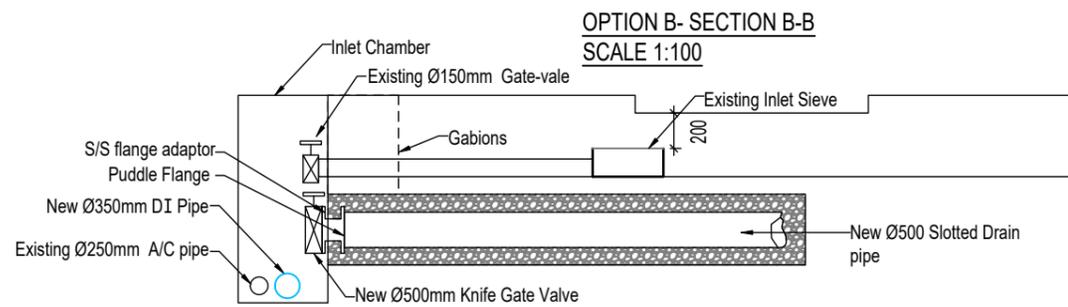
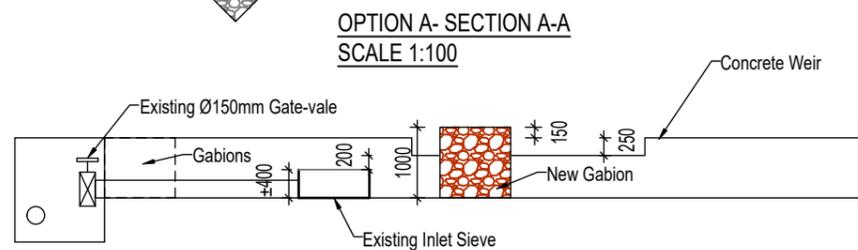
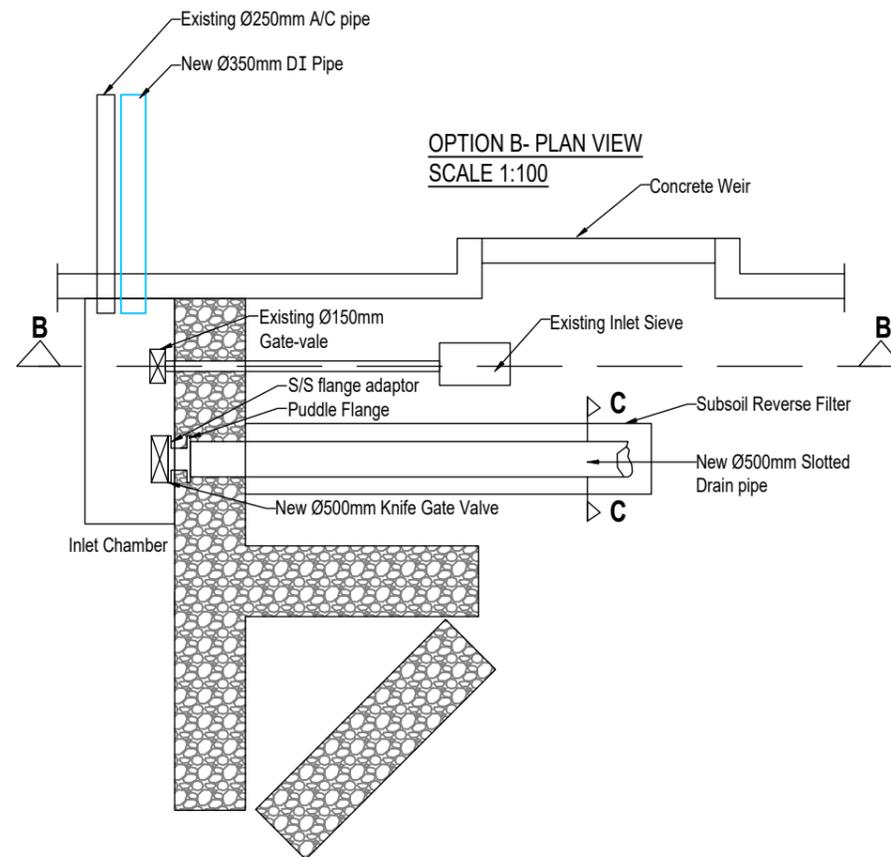
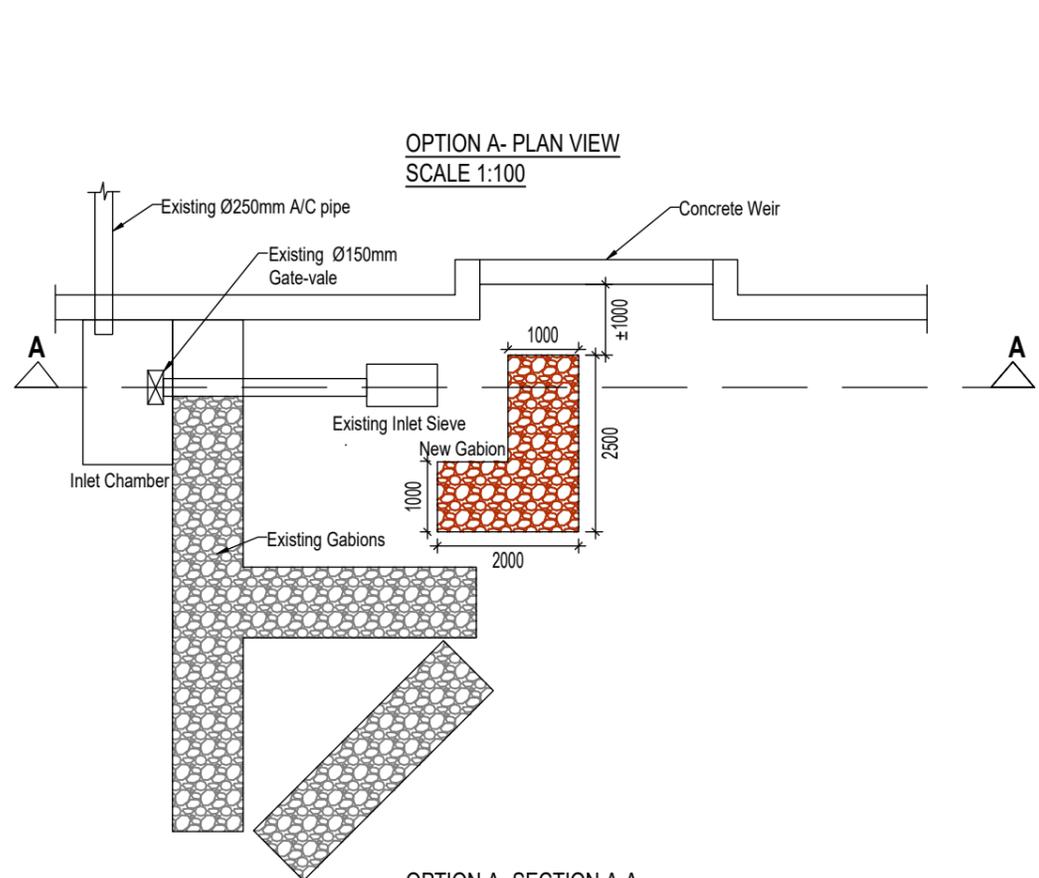
	SIGNATURE	DATE
DESIGNED	H.H	JAN/23
DRAWN	DL	
CHECKED		
APPROVED		
SCALE	AS SHOWN	

PROJECT No.	DISCPL	DRG. NUMBER	STAGE	SHEET SIZE	REVISION
2252-S3-12		12		A3	

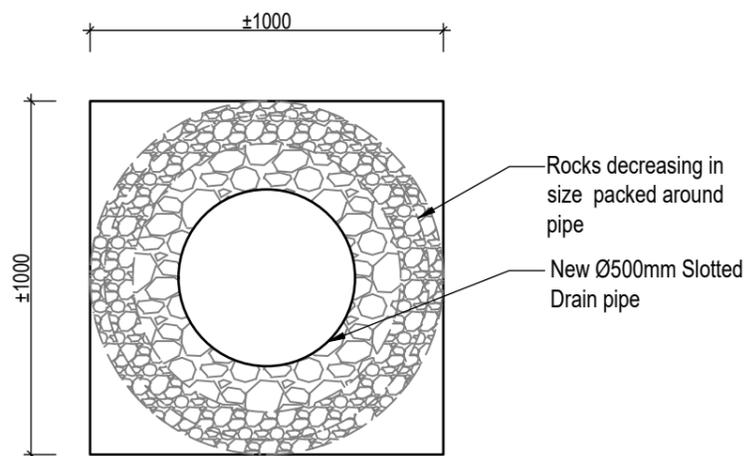
CLIENT DRAWING No.	FILE NAME AND LOCATION



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OPTION B- REVERSE FILTER SECTION C-C
SCALE 1:100



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ENGINEER



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The Oval Office Park
1 Meadowbrook Lane Epsom Downs,
Bryanston,
2152

PROJECT

TIERHOKSKLOOF BULK WATER

DRAWING

SILTING SOLUTIONS
OPTIONS A & B

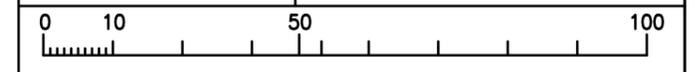
ISSUED FOR INFORMATION

	SIGNATURE	DATE
DESIGNED	H.H	JAN/23
DRAWN	DL	
CHECKED		
APPROVED		

SCALE AS SHOWN

PROJECT No.	DIBBL NUMBER	STAGE	SHEET SIZE	REVISION
2252-S3-13	13		A3	

CLIENT DRAWING No. FILE NAME AND LOCATION



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