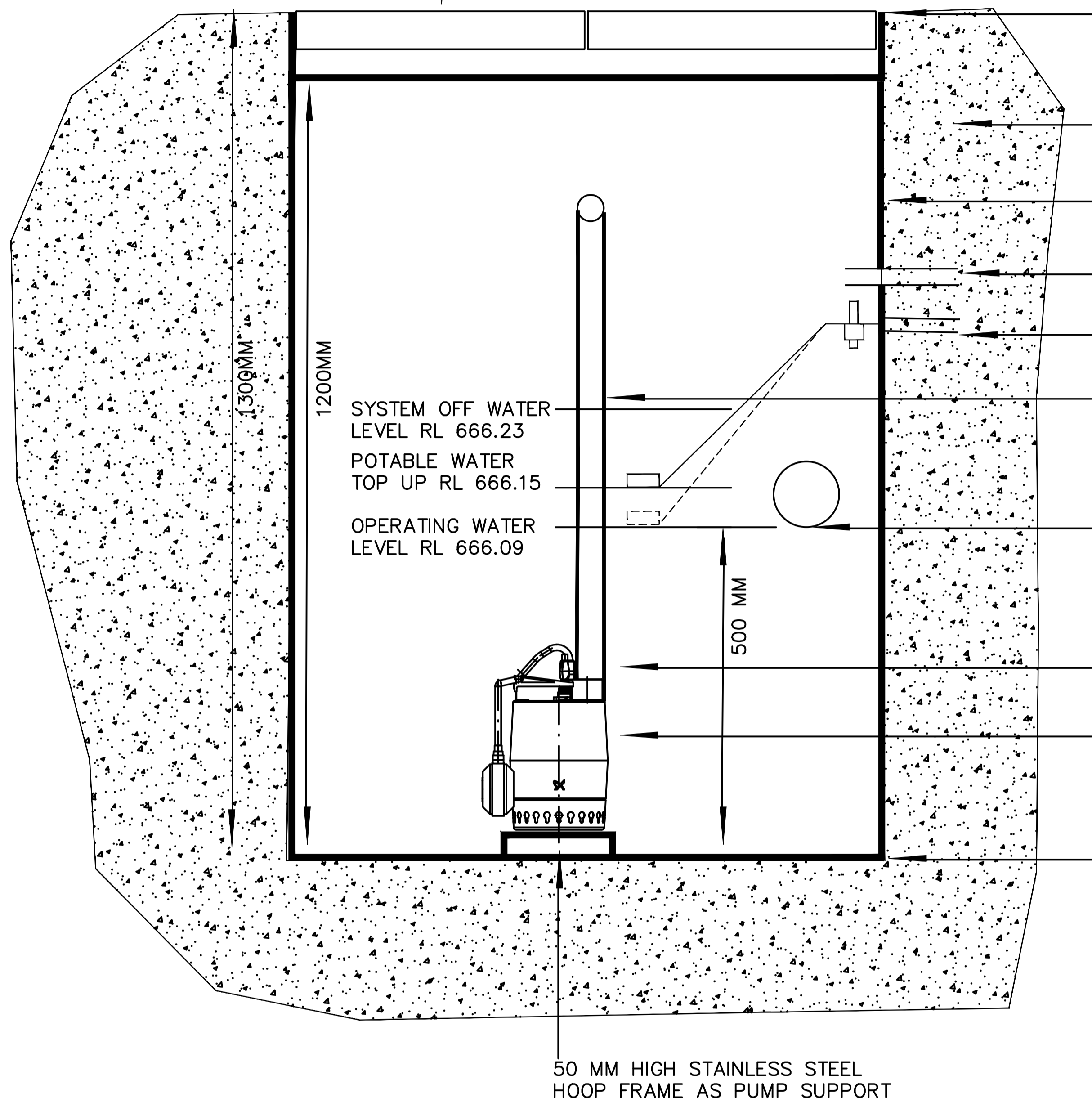


"BUFFER TANK DETAIL 1:5 @ A1

CLASS B GATIC PAVER INFILL COVER AND FRAME. IN-LL TO SUIT UPTO 75 MM THICK BLUESTONE PAVER.



FINISHED SURFACE LEVEL (BLUESTONE PAVING) RL 666.89

BACKFILL BUFFER TANK IN MAX 150 MM CLASS OF CLASS 2 CRUSHED ROCK TO 98% DD.

900*900*1200 (D) CONCRETE BUFFER TANK
25ø HD ORANGE ELECTRICAL CONDUIT AND CABLE AS POWER SUPPLY TO PUMP
25ø PE PW TO 20ø BALL FLOAT FIXED TO INTERNAL WALL SET TO MAINTAIN PW @ RL 666.15
40ø PE PN 12.5 AS RISING MAIN TO START OF "RILL"

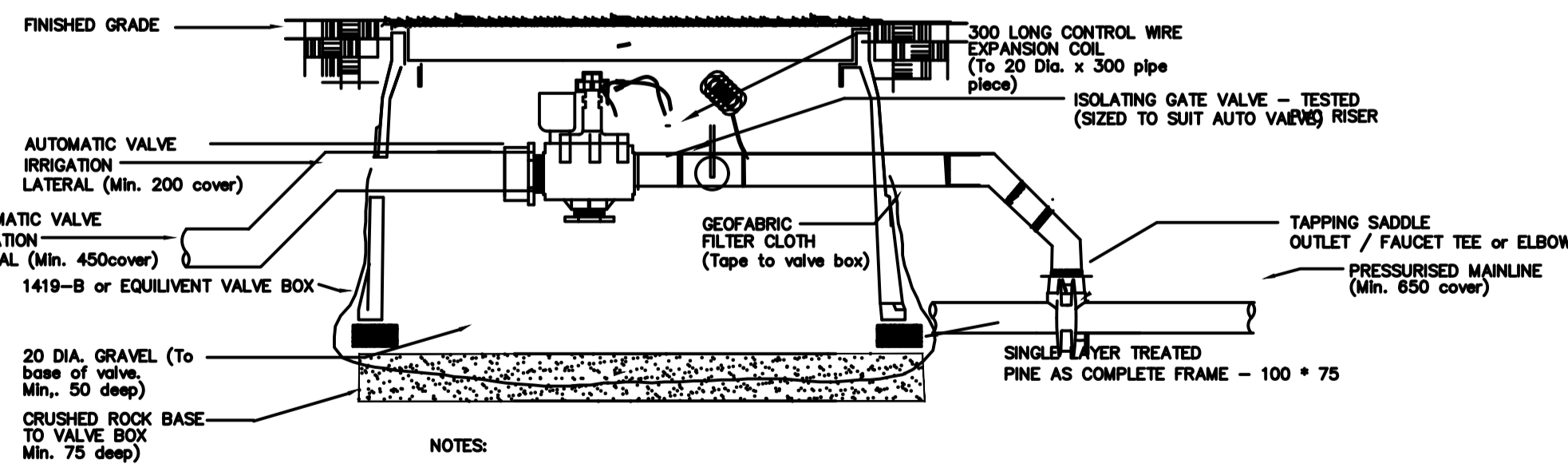
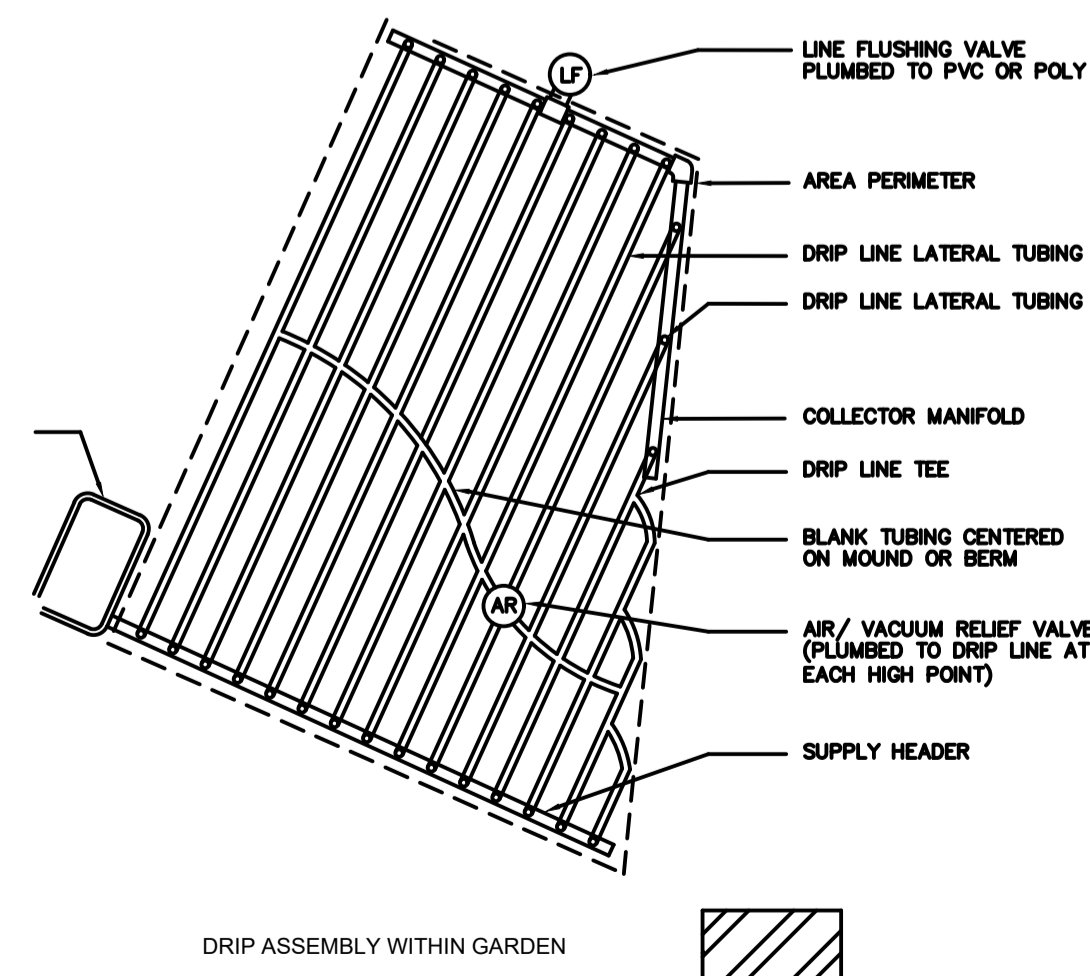
RL (INVERT OF 100ø PVC DWV) RL 666.09

40ø SPRING LOADED CHECK VALVE

GRUNDFOS UNILIFT PUMP AND FLOAT

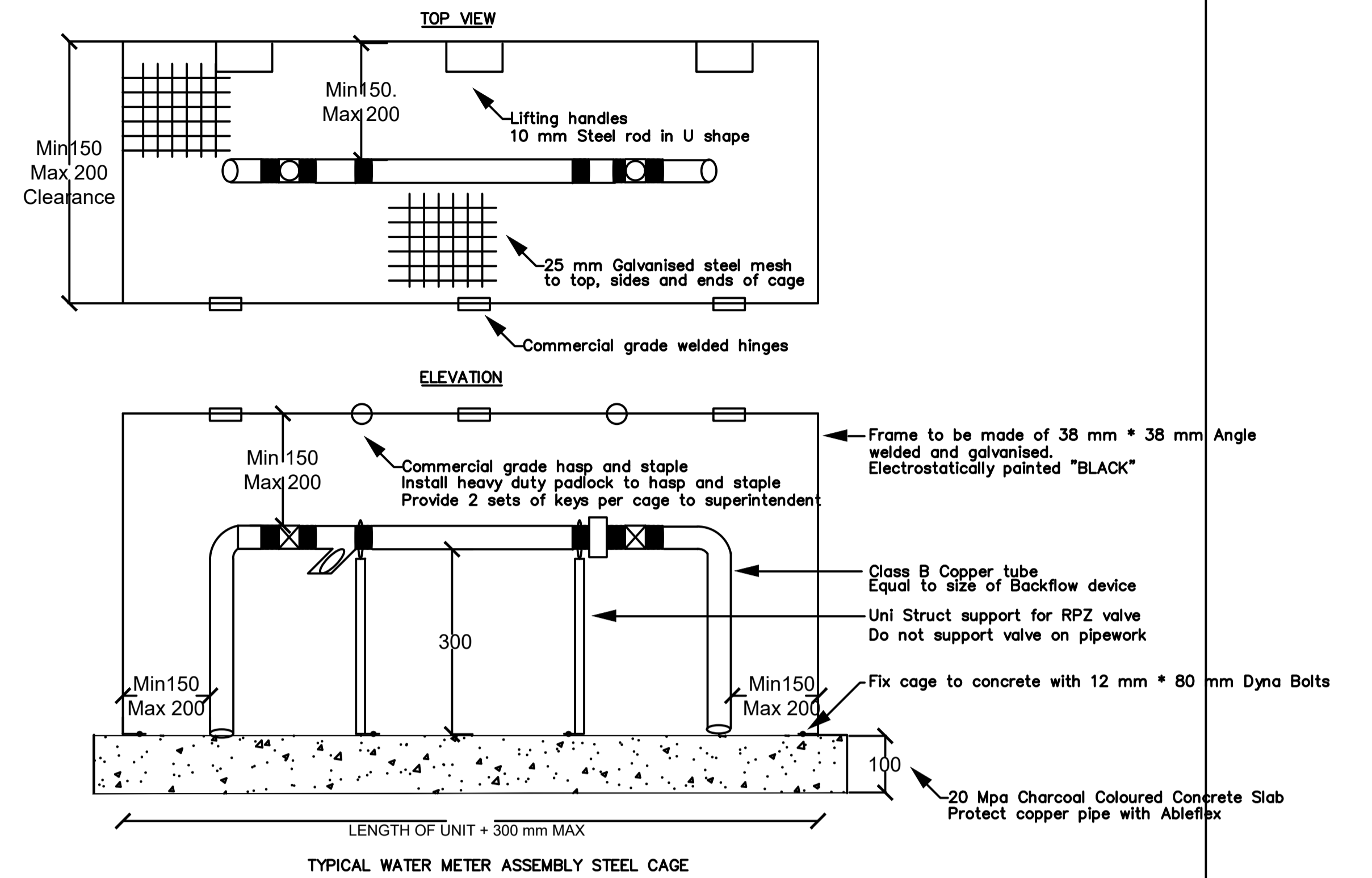
BASE OF PIT (INTERNAL) RL 665.59

50 MM HIGH STAINLESS STEEL HOOP FRAME AS PUMP SUPPORT



- NOTES:
1. ATTACH VALVE IDENTIFICATION TAG TO VALVE HANDLE
 2. TAPE CONTROL WIRES TO MAINLINE IMMEDIATELY AFTER INSTALLATION.
 3. DO NOT SUPPORT VALVE BOX ON PIPEWORK OR VALVE.
 4. INSTALL VALVE BOX FLUSH WITH TURF.
 5. MIN. 50 CLEARANCE BETWEEN TOP OF VALVE AND VALVE BOX LID.
 6. INSTALL VALVE BOX LONG SIDE PARALLEL TO PAVEMENT AT MAX 300 MM OFFSET.
 7. INSTALL VALVE BOX CRUSHED ROCK BASE AND COMPLETE (4) SIDED TREATED TIMBER FRAME 100*100 AND NOTCH OUT 60 MM DEPTH FOR PIPEWORK. ENSURE PIPEWORK DOES NOT COME INTO CONTACT WITH THE VALVE BOX.

TYPICAL SOLENOID VALVE ASSEMBLY



| ISSUE | DATE | SUBJECT | DWT |
|-------|----------|------------------|-----|
| A | 17.08.22 | DRAFT | SD |
| B | 06.09.22 | ISSUED TO CLIENT | SD |
| C | 12.09.22 | FOR TENDER | SD |
| D | 19.09.22 | T1 | SD |
| E | 11.10.22 | T2 | SD |
| F | 27.09.23 | REVISED LAYOUT | SD |
| G | 03.10.23 | ISSUED TO CLIENT | SD |

CLIENT
GbLA
PROJECT
WOMBAT HILL BOTANIC GARDENS - DAY BASIN
DRAWING
PUMPSETS AND PIPEWORK

make it wet!
make it wet!

| | |
|--------------------|------------------------------|
| PHONE 0468 210 748 | EMAIL design@waterwet.com.au |
| DRAWN | HW |
| CHECKED | SD |
| DATE | 3RD OCTOBER 2023 |
| SCALE | AS SHOWN |
| ISSUE | G |
| DWG NO. | 1016-00-02 |

“RILL”

**PUMPING
SPECIFICATION**

**WOMBAT HILL
BOTANIC GARDENS
DAYLESFORD**



| | |
|--|----|
| General..... | 3 |
| Competence..... | 3 |
| Standards..... | 3 |
| Delivery, Handling & Storage | 3 |
| Changes to Equipment Schedule | 4 |
| Changes to design | 4 |
| Scope of Works..... | 4 |
| Document Schedule | 5 |
| Construction Inspections..... | 5 |
| Notices | 6 |
| Defects | 6 |
| As Constructed Drawings | 6 |
| Warranty | 7 |
| Practical Completion..... | 7 |
| Maintenance..... | 8 |
| Materials & Installation | 8 |
| Set out | 8 |
| Tree Protection..... | 8 |
| Hydro Vac (Non Mechanical Excavation)..... | 9 |
| Pipework | 10 |
| Pipe fittings | 10 |
| Trenching (Areas outside tree protection zone)..... | 10 |
| Marker Tape..... | 11 |
| Instrument Control..... | 11 |
| Control cable – Solenoid Valve (SV1) and PW valve..... | 16 |
| Irrigation / Buffer Tank works..... | 17 |
| Appendix 1 | 19 |
| Appendix 2..... | 20 |

General

This specification shall be read in conjunction with the schedule of rates and the design drawings. All documents are equally binding. If there is a discrepancy between any of the documents, clarification must be sought in writing from the principal or their nominated representative. Failure to seek clarification during the tendering process shall not be considered grounds for variations during the construction process.

This specification shall be read in conjunction with the requirements of the GBLA landscape drawings works contract documents including all conditions of tender and contract therein.

Competence

The successful contractor shall have an experienced supervisor on site at all times during the construction period. Evidence of this experience shall be a minimum of a Restricted Water License (Irrigation) issued by the Victorian Plumbers and Drainers Licensing Board. An “Open Water License” issued by the Victorian Plumbers and Drainers Licensing Board or equivalent licenses / certificates are acceptable.

Standards

The following standards apply to this contract

| | |
|-----------|---|
| AS 1432 | Copper tubes for water, gas and sanitation |
| AS 1159 | Polyethylene Pipe for pressure applications |
| AS 1460.1 | Fittings for use with polyethylene pipes: Mechanical jointing |
| AS 3500 | National Plumbing and drainage – Water Supply |
| AS 1462 | Methods for testing uPVC pipes and fittings |
| AS 1477 | uPVC pipes and fittings for pressure applications |
| AS 2032 | Code of practices for installation of uPVC pipe systems |
| AS 2033 | Installation of polyethylene pipe systems |
| AS 3000 | SAA wiring rules and amendments |
| AS 2053 | uPVC wire conduits |

If there is a conflict between this specification, the site specific specification and the Australian Standards, the Australian Standards shall be adopted.

Delivery, Handling & Storage

The irrigation contractor shall ensure materials are delivered to the project site in the original containers with the manufacturer’s identification on each package. It is the responsibility of the contractor to protect all materials on site from damage by weather, accidents and theft up to the date of practical completion. A copy of the relevant insurance documents shall be made available for inspection by the superintendent.

Changes to Equipment Schedule

Changes to the specified equipment will only be considered for items with ‘or approved equivalent’. For alternative equipment to be approved it must be proven that the performance, durability and quality are not less than the original product specified. If the contractor wishes to offer an alternative product, the following must be supplied to the superintendent for approval prior to construction commencement.

- A working sample
- Technical data
- Cost comparisons

If the alternative product is approved, then the contractor shall be notified in writing. Failure to comply with above requirements will result in the alternative product being removed from site at the contractor’s expense.

Changes to design

Any proposed change to the design will require an accurate drawing showing the intended modification submitted to the superintendent. Any modifications made to the design drawings shall be at the contractor’s expense and shall the contractor shall not be entitled to a variation for these works. Any modification to the design drawings shall be approved in writing by the superintendent prior to implementation. Any modifications not approved in writing shall be rectified by the contractor at their sole expense.

Scope of Works

The work to be performed under this contract shall comprise the provision of all plant, equipment, materials, labor and the performance of all operations of whatever kind needed for the complete and proper construction and testing of the stormwater harvesting system as specified herein, and as detailed on the design drawings, site specific specification and to the satisfaction of the superintendent. The superintendent or their representative’s decision is final.

The work site is located at Wombat Hill Botanic Gardens, Daylesford

The works include the supply and installation of, but are not limited to

- **All pipework and electrical conduits with tree protection zones shall be excavated by Non Destructive digging (low pressure water jet and vacuum)**
- Supply and installation of 1 No. Swallow engineering model 1200 galvanized steel control cabinets, being electrical circuit breakers and 1 for pump control panel and irrigation controller
- Supply and installation of Grundfos Unilift 1.0 l/sec sump pump, check valve and 40 dia HDPE Pn 12.5 discharge pipework to buffer tank

- Supply and installation of new 900*900*1200 deep concrete pit complete with Gatic Class B paver infill cover as buffer tank
- Supply and installation of 450*450*450 (D) mm plastic pit with grated galvanized steel cover directly below “Rill” outlet.
- Supply and installation of 100 dia PVC DVW drainage pipework as “Rill” water return under gravity to buffer tank
- Connection to existing potable water supply, supply and installation of new 25 mm double check valve (testable) above ground in new galvanized steel mesh cage on concrete base behind existing hedge
- Supply and installation of pump control panel with timer for submersible pump
- Supply and installation of 25 mm HDPE Pn 12.5 as potable water top up to buffer tank complete with 20 mm isolation valve and 20 mm float within buffer tank.
- Supply and installation of irrigation controller, solenoid valve and dripline to “rill” garden surrounding day basin.
- Supply and installation of electrical conduits and junction pits
- Maintenance manuals and end operator training
- As Constructed drawings in Autocad and PDF formats
- Testing and Commissioning
- Site Clean and removal of all spoil

Document Schedule

| | | |
|--------------------------|---------|-----------------------------|
| 1016-DD-01 As Shown @ A1 | Issue F | Pipework layout and details |
| 1016-DD-02 As Shown @ A1 | Issue F | Pipework layout and details |

Pumping specification

These drawings shall be read in conjunction with GBLA landscape drawings and specification at all times. If there is a discrepancy between the irrigation drawings and the landscape drawings bring it immediately to the attention of the superintendent.

Construction Inspections

The contractor shall attend joint field inspections/meetings with the superintendent or his representative at each of the following HOLD points during the construction process. The contractor shall give 72 hours notice in writing to the superintendent that they are approaching a HOLD point and request an inspection of the works to date. Failure to have these HOLD point inspections carried out will result in defect notices being issued against those points. A HOLD point is a milestone in which no installation works are permitted to be carried out until satisfactory completion of the said tasks.

The superintendent or his representative may conduct works inspections at any time during the construction process. As a minimum, the following tasks during the construction process shall be inspected

- to witness trenching, installation of pipework, bedding & backfilling, compaction (**HOLD Point**)
- to witness the correct operation of the Pumpset and level sensing devices (**HOLD Point**)
- to witness the correct operation of all valves
- to witness removal of spoil and construction materials from site

The contractor shall co-ordinate their works program to ensure grouping of required HOLD points to the least number of inspections possible.

Notices

At the completion of each construction inspection the superintendent shall issue a construction report in writing to the irrigation contractor. All items listed for repair, removal or defective workmanship shall be rectified by the irrigation contractor prior to further works progressing at the sole expense of the irrigation contractor.

Defects

At the point when the contractor believes the project is complete they shall request in writing to the superintendent with 14 days notice an inspection of the works for practical completion. The contractor shall reconfirm this date with the superintendent 72 hours prior to the due date.

At this point the superintendent shall carry out an inspection of the works with the irrigation contractor's site representative to witness the following

- to witness the correct operation of the pumps and control panels and level sensing devices
- to witness the correct operation of all valves
- to witness removal of spoil and construction materials from site
- To witness valve and gate valve location and correct operation.

Upon completion of this inspection a report shall be issued by the superintendent to the irrigation contractor of items requiring rectification or replacement. The irrigation contractor shall have 14 days to rectify the defects and shall then request in writing a further inspection of the works by the superintendent or his representative.

As Constructed Drawings

Two copies of all drawings (full size) and one reduced (A3) size copy (to be installed in irrigation controller cabinet) and a CD with the AutoCAD files (2022 or later) and PDF version 13.0 or later of all drawings shall be provided to the superintendent for approval. Drawings submitted larger than A1 size will not be accepted.

The drawings at a minimum shall include all

- All valve locations by triangulation from 3 fixed points

- Mainline locations by triangulation from 3 fixed points
- Controller and sensor locations
- Points of connection and associated items
- All wiring and wire joints by triangulation from 3 fixed points
- Tapping / meter location/s
- Other details where necessary

Warranty

The contractor responsible for the supply and installation of the system shall supply the superintendent with a written guarantee that they will without charge repair, replace or re-instate any part of the system that has failed due to defective equipment, unspecified equipment or poor workmanship within 12 months of the date of practical completion.

The guarantee shall include details of any extended warranties offered by manufacturers on any of the system components.

Practical Completion

The irrigation system shall be deemed to have achieved practical completion upon the following conditions be achieved

- the complete pumping & irrigation system has been operating successfully for 8 cycles over a minimum of a 14 day period
- commissioning of the system in the presence of the superintendent or their representative comprising of the field testing of all individual pumpsets, valves, sprinklers from the PLC and Irrigation controller for successful operation
- repair of damages or vandalism caused during construction
- submission of 'As Constructed' drawings and maintenance manuals
- successful completion of all notices and defects
- submission of warranty, trouble-shooting and materials information
- submission of typical summer/winter irrigation programs for Oval
- education of end users
- correct programming of the PLC and sensing devices
- all site sheds, materials, debris have been removed from the site

A practical completion certificate shall be issued when ALL of the above requirements and the defects list have been successfully completed. From the time of site possession until practical completion is achieved the contractor shall maintain the risk of all materials, plant and equipment. Damage, theft or vandalism shall be the sole responsibility of the contractor until practical completion is achieved.

From the date of practical completion, the contractor shall be responsible for rectification of defects in the system for the period stated in the annexure. During the defects liability period the contractor shall attend to all emergency calls as quickly as possible. If during the defects liability period the contractor does not promptly attend to the emergency, the

proprietor will have the right to engage others to rectify the problem and recover costs from the contractor.

Maintenance

The contractor shall visit the site on a fortnightly basis once practical completion has been achieved and shall maintain a log book which must be signed off by either the superintendent or their representative upon arrival and upon completion of works on site. The specific maintenance period shall be 13 weeks. During this period the following items shall be tested at each site visit

- Pumpset operated from the Pump Control Panel and manually and checked for operation / stopping and automatic operation
- Hydraise controller shall be checked for correct date, time, and re-programmed according to season

At the completion of the maintenance period the contractor shall request in writing an inspection of the site and their log book. It shall not be until this inspection and all defect items are complete that it shall be deemed the end of the maintenance period.

Materials & Installation

All the materials supplied shall be new and shall conform to the relevant Australian Standards. Installation of irrigation systems shall conform to AS 3500.1 “National Plumbing and Drainage Code”. Installation of valve wiring shall conform to AS 3000 1991 “SAA Wiring Rules”

Set out

An electronic copy of the design drawings in Autocad 2022 format shall be provided to the contractor for this purpose.

All pipework shown on the design drawings shall be installed in the location shown. Before trenching commences each main, sub main or lateral shall be marked out with white marker paint (do not use lime) for approval by the superintendent prior to trenching. **No trenching is permitted without this approval being given.** The superintendent or their representative shall make themselves available during the construction phase to complete this requirement.

Tree Protection

A Tree Protection Zone (TPZ) shall be established for the duration of works adjoining each tree to ensure that no damage is caused to tree trunks, roots, canopy or branches during works.

The tree protection distance method outlined in the current Australian Standard will be used to determine the tree protection zone of each tree. The TPZ for an individual tree is calculated on trunk (stem) diameter (DBH), measured at 1.4 meters up from ground level.

The radius of the TPZ is calculated by multiplying the tree's DBH by 12. For example; a tree with 40cm DBH requires a TPZ of 4.8 meters.

TPZ distances are measured as a radius from the center of the trunk at ground level.

The following are not permitted within a tree protection zone:

1. Mechanical excavation
2. Stockpiling of building materials, debris or soil
3. Vehicular traffic except on existing paved surfaces
4. Installation of service pits or hatches
5. Vehicular crossing
6. Severing of tree roots with a diameter greater than **30mm**
7. Alteration of soil levels and structure

Tree protection zone

| Trunk Diameter (DBH) | Tree Protection Zone (TPZ) |
|-----------------------------|-----------------------------------|
| 10cm | 1.2m |
| 20cm | 2.4m |
| 40cm | 4.8m |
| 75cm | 9m |
| 100cm | 12m |
| 125cm and greater | 15m* |

* The maximum tree protection zone is 15 meters

Hydro Vac (Non Mechanical Excavation)

The contractor shall use a non-mechanical excavation method to install pipework and conduits, solenoid valves, potable water connection, double check valve in areas within tree protection zones throughout the site.

Tree protection zones are identified according to the table above.

Low pressure water with a vacuum suction pump and slurry pit is the preferred method of excavation in these areas.

Pipework

Pipe work shall be HDPE Pn 12.5 BLACK (provided in straight lengths within the day basin) to Australian standard. Pipework to water fountains within the day basin shall be secured to the structural steel by stainless steel worm drive clamps complete with 5.0 mm able flex installed between the pipe and the clamp.

Pipework within natural ground areas shall be installed to AS 3500.1.2 – 2015. Particular attention shall be paid to AS 3500.1.2 – 2003 section 5.1 (Depth of cover in public areas) and section 5.12 (Bedding and Backfill).

The shall at his own risk and expense shall carry out tests, and shall provide all labor together with pumps, engines and temporary valves, plug, flanges and all other equipment as may be necessary. Such plant shall remain the property of the contractor and shall make no charge for the use, installation and dismantling thereof.

Pipe fittings

Fitting selection and use shall be according to the below

| | |
|--|---|
| HDPE to HDPE 75 and above – tees, elbows Joiners, reducers and end connectors | Electrofusion or Butt Welded |
| HDPE to HDPE 75 and below – tees, elbows Joiners, reducers and end connectors | Compression type |
| Flanged connections | Galvanized bolt, washers & nuts with rubber insertion gaskets |

Ensure pipe cutting and fittings are performed in a workman like manner. The cuts shall be square, the burrs removed, and the inside of the pipe left as free of debris as possible.

Trenching (Areas outside tree protection zone)

All mainline and sub main trenches shall be excavated to a depth of 300 mm plus the diameter of the pipe. The offsets are indicated on the design drawings and **shall be strictly adhered to during construction.** The trench shall be free from hard edged objects, rocks, stones or similar material which would be retained in a 25 mm sieve. The trench shall be 3 times the diameter of the pipe which is to be installed in it. See trench details.

All trenches shall be backfilled in 150 mm layers and compacted to achieve 90 % compaction.

Trenches shall be finished flush with the surrounding levels. For re-instatement of turf or re-seeding of trenches refer to GBLA landscape design drawings.

Excess trench spoil shall be removed from site at the contractor expense and disposed of at a legal dumping facility.

Marker Tape

PVC marker tape shall be installed on all mainline pipework. The marker shall be installed 150 mm below finished level of the soil in continuous lengths directly on top of the pipework it relates to.

Nominated Item: Tapex (Non detectable) or approved equivalent

Instrument Control

Control Philosophy

The following section of the specification provides a process control philosophy for the function of the “Rill” and “Day Basin water fountains”. The system comprises the following infrastructure:

- Rill submersible pumpset – Grundfos Unilift 350
- Connecting pipework – HDPE
- Buffer Tank potable water top up

Automatic operation

Rill reticulation system

- Normal operation mode is ‘Automatic’ and reticulation pump re-circulates water from buffer tank to rill, then via gravity through rill to capture pit, then via 100 mm PVC DWV to buffer tank
- Flow rate is from 40 – 60 l/min total
- Low level water in pump well – pump float stops operation
- Low level water in buffer tank – potable water top up

Irrigation Cycle (Rill Garden) – Automatic Operation

- The irrigation cycle is supplied with potable water via solenoid valve – V1

- HDPE lateral pipework to the march garden and 16 dia in-line drip at 0.3 m inter emitter with 3 No equally spaced rows in the 1.0 m wide garden

Manual operation

- Pump shall have a manual override for the purposes of commissioning and maintenance. The scheme is otherwise not intended to be run in a manual mode.
- Switching to manual operation will be provided locally at the pump control panel.

Fault mode

When a fault occurs, the system will enter a ‘fault mode’ and will not operate until reset by an operator.

Controls

A phase failure/symmetry relay shall be supplied to protect the system in case of phase imbalance and phase reversal. This unit shall be wired to switch the power supply to the controller in case of phase reversal symmetry failure and reapply power when the fault is cleared. The system must re-energize on power resumption and reset the previous settings. Default settings on power up will not be acceptable.

After restoration of power following a power failure the system shall power up to normal operation except in the situation of the operator disabling the system prior to the power failure. In this situation each pump station shall revert to a disabled configuration until the operator re-enables the system.

Alarms / Operation

The status of the following information will be displayed:

- Rill pump activation status on/off/Fault

Primary pump controls

Primary pump controllers are required for the start and stop operation of the submersible pump on this site. The Contractor shall supply either proprietary pump controllers or electronics (motor starters, relays, switches etc.), capable of providing all the required manual and automatic functionality for the submersible re-circulation pumpset.

The primary pump controller will be installed within a control panel in above ground pump station control cabinet as per detail design drawings.

Input and output connections from the primary pump controller for control and monitoring of the pumps will be provided by the pump control supplier for connection by the

All pump controllers must provide power protection for all pump control circuitry and devices.

Primary pump control operation

Provision shall be made in each primary pump controller for the control of pump operation by auto-off-manual switches for each pump. These switches shall perform the following functions:

Auto - the pump shall respond to the controller

Off - the relevant pump shall not operate at all until this switch is reset to either manual or auto

Manual - the relevant pump shall run at full speed until this switch is reset.

Primary pump control faults and alarms

The primary pump controllers will provide the following local visual alarms

Pump motor overload

General fault

Any alarm within the primary pump controller will trigger a general pump fault in the control panel.

Control Cabinets

All internal electrical control cabinets shall be HD galvanized steel 1.8-2.0 mm thick painted internally “White” and externally equivalent to Colorbond® “Wilderness®” to accommodate all control and electrical components with 25% spare space for future additions.

Entry or exit of all cables shall be through the bottom of the electrical control cabinet.

The electrical control cabinet shall not be installed directly over the wet well.

The client will not allow power, control and communication cables to be run in the same conduit.

One conduit shall enter the buffer tank for pump power cables.

The minimum conduit size shall be 32 mm diameter for power.

Conduits shall be sealed to prevent gases from the wet well entering the control cabinet.

All components shall be fitted to din rail however where components are not din rail compatible the fixing shall be via tri-lobular stainless steel self tapping screws. Passivated self drilling drive screws will not be accepted.

All control cabinets shall be placed in a position to alleviate the possibility of direct sunlight to avoid radiant thermal temperature build-up within the control cabinet. The location of the control cabinet should ensure appropriate ventilation to allow cross flow of air and ensuring temperatures are maintained to less than 45°C. If it cannot be demonstrated that the

control cabinet will not be exposed to temperatures in excess of 45°C the control cabinet shall be forced cooled by external means.

If the control cabinet is not installed within a lockable housing, a 3 point padlockable cabinet door shall be used for latching slave doors with independent 90deg turn handles. The switchboard shall have ingress protection (IP) rating of no less than IP55 with all filters and louvers designed to suit this specification. IP compliance sheets will be required for inspection.

A power isolation switch is to be included in the electrical connection within the cabinets to allow for mains power to be isolated from the control panels during maintenance works.

Nominated Item : Swallow Engineering Model 1200

Pump station documentation

Each pump station shall be supplied with 3 copies of operation manuals which shall include descriptions of:

All components

Circuit diagrams

Electrical layout

Mechanical layout

Workshop fabrication drawings

Commissioning manual

Specific site variations to the standard documentation.

All documentation shall be supplied in hard copy and AutoCAD 2022 format.

Instrumentation

All instrumentation is shown on the detail drawings. The purpose and function of each is detailed in the following section of the specification.

The contractor is required to provide all field wiring of remote instrumentation back to the pump control panel.

Electrical connections and wiring

The Contractor is to determine, in conjunction with Hepburn Shire Council, existing single phase power supply capacity to toilet block. A permit is to be obtained from City Power for connection to the power supply (if required)

Unless otherwise specified, the Contractor will provide 0.6 kV -75 PVC insulated cables to AS/NZS 5000.1:2005 electric cables – polymeric insulated, for general internal wiring and heat resisting insulated cables for

connection to equipment capable of raising the insulation temperatures above 75°C.

The pumps shall be wired with red white and blue 3 phase multi strand cabling sized as per AS 3000.1 1976 electrical installations. The contractor will be responsible for sourcing and providing cabling/trenching to required locations on site.

All pump wiring shall be terminated at terminals within the switchboard suitable for wiring at least two sizes above the required switchboard wire size to accommodate long wire runs from the switchboard.

Pump power supply termination shall be made with crimp style motor terminals.

All motors shall be suitably earthed from the manufacturers nominated earth point within the terminal box to the earth point within the switchboard- not to a common bus.

All cables shall be sized to suit a current carrying capacity of not less than the maximum continuous rating of the equipment mounted within the control panel, or sized to withstand the "let through" energy of the circuit protective device, whichever is the greater. If the conductors are to be bunched or installed within wiring ducts, apply appropriate de-rating factor to as 3008 part 1 when determining conductor size. The minimum size power conductor shall be multi strand 2.5 mm².

The Contractor shall provide insulated conductors of not less than 1.5 mm² with 32/0.2 stranding and otherwise sized to suit the current carrying capacity of the particular circuit. PLC wiring min 0.75 mm² with 32/0.2 tinned flex stranding.

PVC insulated and PVC sheathed electronic instrument cables with stranded copper conductors with a cross sectional area of not less than 0.5 mm² for all 4-20 ma dc analogue circuits shall be provided. Conductor pairs to be twisted and shielded. Sheath colour to be black. Pairs to be individually and overall screened where more than one pair in any cable.

The following wiring code will be followed:

| | |
|-------------------|--------------|
| A phase: | Red |
| B phase: | White |
| C phase: | Blue |
| Neutral: | Black |
| Earthing: | Green/yellow |
| 240 v ac active | Pink |
| 240 v ac neutral: | Black |
| 24 v ac control: | Grey |
| 24 v ac common | Brown |

| | |
|-------------------|--|
| 24 v dc positive: | Orange |
| 24 v dc negative: | Purple |
| 4 to 20 ma loop: | White and black twisted shielded pairs |

Unless otherwise specified the Contractor will install wiring within PVC wiring ducts. The total cross section of the wiring within any one duct, including allowance for outgoing connections, shall not exceed 60% of the duct cross sectional area. If wiring is not installed in ducts, neatly bunch, support and lace it with PVC ties or strips. Provide protective insulation where bunched wiring or cables are in contact with metal, or pass through cut-outs in sheet metal.

External circuit cables

If no provision is made in wiring ducts for external connecting cables, a galvanised perforated cable tray between terminal blocks and cable entries, of a size, and with available access space sufficient to permit ready installation of this external wiring will be installed.

Segregation

The contractor will segregate electric circuits subject to possible interference and terminate cable into groups according to voltage and function (controls; power; etc.). Instrumentation cables shall also cross power cables at 90°

All wiring shall be identified by engraved plastic ferrule markers, each core in accordance with the connection diagrams. Markers shall be Grafolplast or other approved equivalent that does not allow rotation out of alignment of any single marker within the group.

Performance guarantee

Upon completion of the instrumentation and control works, the installation of the works is to be guaranteed for a period of 12 months. Within this time any required repairs due to faults are to be completed at the contractor's expense.

Electrical

The contractor shall install all electrical connections from the isolator and meters provided by others (Refer Electrical engineers drawings) within the pump shed. Items include but not limited to Grundfos transfer pumps, Grundfos irrigation pressure pumpset, pressure transducers, display panel, 240V GPO's, UV treatment plant.

Control cable – Solenoid Valve (SV1) and PW valve

Installation of cables shall conform to AS 3000 1991 "SAA Wiring Rules" and shall be generally direct buried with the mainline.

The cable shall be installed in a 25 mm HD orange conduit as noted on drawing 1016-DD-01 installed with the electrical conduit to the control panel

A 500 mm loop of cable shall be left at each valve assembly and a 300 mm loop of cable at each change of direction. At each change of direction of cable a valve wiring pit (Carson 910-B or 1419-B) shall be installed. The loop shall be located within this pit. The pit shall be clearly labeled on the as constructed drawings.

Nominated Item: Tyflo or approved equal

Irrigation / Buffer Tank works

The contractor shall, prior to the commencement of the excavation works conduct and irrigation system audit to confirm the operational condition of the current system and a written report provided to the superintendent. At the completion of the project the contractor shall return the system to the pre-commencement of the works condition.

A new Rainbird PEB-100 series (V1) shall be installed for irrigation of the rill garden surrounding the day basin.

Solenoid valves shall be installed in Rainbird VB-STD rectangle valve boxes, on timber bearers, crushed rock base and geofabric lining. Refer detail on 1016-DD-02

Dripline shall be installed to the 1.0 m wide 'rill' garden. 3 No rows shall be installed at even distances and laid on the surface and pinned with galvanized steel hopes at max 2.0 m intervals. The dripline shall be covered with organic mulch by the landscape contractor.

A 900 (W) * 900 (L) * 1200 (D) pre cast concrete buffer tank shall be installed adjacent the day basin and within the new pavement works. The buffer tank shall be excavated by mechanical excavation and be set on a 150 mm compacted (95% DD) fine crushed rock Class 2. All excavated spoil shall be removed for the site and the excavation backfilled in 150 mm layers of FCR Class 2 and compacted to 95% DD. The backfilling FCR shall be moisture conditioned during the process.

The buffer tank pit cover shall by GATIC type Paver infill (upto 75 mm thickness pavers) with cast iron frame and shall be set to FSL 666.89.

The power conduit and cable shall enter the buffer tank above the top water level and shall be water tight sealed against the ingress of moisture from outside the buffer tank.

The potable water top up supply shall enter the buffer tank above the top water level and shall be water tight sealed against the ingress of moisture from outside the buffer tank.

A 20 mm brass float valve and plastic ball float (PW) shall be installed for potable water supply for top up of the buffer tank. The float shall be set to operate in a 100 mm ON / OFF range.

Within the buffer tank a Grundfos Unilift KP 350 submersible pump with automatic float shall be installed (low water level protection). The pump shall sit 50 mm off the bottom of the buffer tank and shall be supported by a stainless steel hoop frame.

At the discharge of the pump, a stainless steel check valve shall be installed with a 40 mm HDPE Pn 12.5 discharge pipework to the outlet of the rill (Northern side of day basin). The discharge pipework shall be installed with the rill garden and have a min pipework cover of 300 mm and be offset 100 mm to the outside edge of the paving.

A 40 mm stainless steel flow control valve shall be installed within a 910-VB within the rill garden for fine tuning of the flow to the rill.

Appendix 1

Materials Schedule

The materials schedule shall be returned with the tender. The tender may be deemed non conforming if this material schedule is not returned fully completed.

| Material | Intended Item |
|----------------------|---------------|
| Pumpset – Rill | _____ |
| Control Cabinet | _____ |
| Pipework (HDPE) | _____ |
| Automatic Valve | _____ |
| Isolating Valve | _____ |
| Isolating Gate Valve | _____ |
| Valve box | _____ |
| Control Wire | _____ |

Appendix 2.

Personal

Provide evidence of personal with relevant experience that will be installing the project. Include all licenses, certificates and time employed by the contractor.

Project Manager: _____

Supervisor: _____

Labourer: _____

Machinery

Provide maintenance logbooks and a description of all machinery to be used on site

Machine 1: _____

Machine 2: _____

Machine 3: _____

Contractor’s relevant experience

Provide a list of similar projects undertaken in the past 2 years along with contact details of the relevant clients.

Project 1: _____

Project 2: _____

Project 3: _____

Project 4: _____

Project 5: _____

Ensure all returnable schedules are completed in full and are attached to your tender.