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1. Purpose

This addendum sets out those requirements that are specific to United Utilities (United Utilities) where a developer wishes to design and construct a pumping station for inclusion within an adoption agreement. The clauses within this document are referenced to Sewers for Adoption 7th Edition and follow on from the clauses detailed within the main document.

It is intended that this addendum, in conjunction with Sewers for Adoption 7th Edition, will provide specific guidance for the design and specification of sewerage elements involved when making an application to United Utilities.

This addendum does not remove the need for early engagement and constructive discussions between United Utilities and developers at appropriate stages or where site specific factors need to be addressed in advance of making an application.

For discussions where a pumping station is to form part of an adoption agreement, developers should contact the Developer Services Team at the following address:

United Utilities Water PLC
Warrington North Wastewater Treatment Works
Gatewarth Industrial Estate
Off Liverpool Road
Sankey Bridges
Warrington
WA5 1DS

Email address: wastewaterdeveloperservices@UnitedUtilitiesplc.co.uk

The clause numbers below refer to those in Sewers for Adoption 7th Edition (SfA7). These clauses are supplementary and follow on from the clauses listed in the main document except where the sub clause number is prefixed by:

- an (A), in which case it is an Additional clause,
- or (D), in which case it is a Deletion of that clause,
- or (R), in which case it is a Replacement clause.

2. Procurement

The equipment may be selected from United Utilities’ Framework Suppliers (for details of Suppliers contact United Utilities) and associated standard drawings in accordance with the relevant United Utilities Framework Agreements. Where the design solution requires the procurement of equipment that can only be obtained from a non-framework supplier, the developer shall specify the requirements as part of the particular design specification for the scheme or contract.

The applicable product areas detailed within this addendum and associated standard drawings are:

- Pumps
- Low voltage switchgear and control gear assembly (electrical control panels)
- Instrumentation
- Telemetry

Where a product is available from more than one Framework Supplier, or there are no relevant Framework Agreements, the final selection for technically compliant submissions shall be made with reference to United Utilities Procurement Guidelines (available on request from the United Utilities Supply Chain Department) and shall be based on lowest whole life cost and sustainability analyses.
3. Hazardous Area Rating

All equipment installed in wet, or dry wells, shall be rated according to the hazardous area classification of the area in which they are to be installed.

Guidance on how to comply with the United Utilities’ hazardous area classification can be found in the current versions of specific United Utilities documents which are available on request from the United Utilities Engineering team.

All hazardous areas shall comply with DSEAR and United Utilities H&S Procedure “Dangerous Substances and Explosive Atmosphere Regulations”

The selection, installation and maintenance of mechanical and electrical apparatus for use in potentially explosive atmospheres shall be in accordance with United Utilities Code of Practice “Installations in Potentially Explosive Atmospheres Associated with Water and Wastewater”.

4. Designer’s Responsibilities

The design aspects of the mechanical and electrical design of the station take into account the requirements, stipulations and recommendations contained in current UK safety legislation, including, but not limited to, the following:

a) The Health and Safety at Work Act 1974
b) The Electricity at Work Regulations 1989
c) The Electricity Safety, Quality and Continuity Regulations 2009
d) Construction Design & Management Regulations (CDM)
e) Reporting of Injuries, Diseases & Dangerous Occurrences Regulations 1995 (RIDDOR)
f) Provision & Use of Work Equipment Regulations 1998
g) Dangerous Substances & Explosive Atmosphere Regulations 2002 (DSEAR)
h) Approved Codes of Practice (ACOPS)
i) Lifting Operations and Lifting Equipment Regulations
j) Working at Height
5. Part D - Pumping Stations

D1 SCOPE
Clause 3 (A) - Compliance with the features and guidance set out in SfA7, as modified by United Utilities’ Addendum, will be deemed to provide an efficient and cost effective design.

D4.3 SITE LAYOUT
Clause 5 (A) (a) Where security fencing is required to the pumping station compound, then fencing types Palisade or Paladin would be considered acceptable.

Clause 8 (A) The tanker hardstanding area should drain into the foul system.

D4.4 KIOSK POSITIONING
Clause 1 (A) (i) Vehicle protection bollards should be provided if the site arrangement presents a risk.

D4.6 HYDRAULIC DESIGN OF PUMPING STATIONS
Clause 3 (A) – ‘Snore’ operation requires that the pump unit must be able to tolerate normal, fully primed running, loss of prime and running in the condition where the impeller is neither completely in air or primed sufficiently to pump as normal, as well as any transitions between these operating conditions. Where pump units cannot comply with this requirement, the developer shall inform United Utilities accordingly, including a proposed solution to this non-compliance.

Clause 3 g) (A) – When in back up control, the pump shall operate on reaching the high level and run for a pre-set period to reduce the well level to empty.

D4.7 PUMPING STATION DESIGN
Clause 1a) (R) – Pumping stations designed to WIS 4-04-01 and WIS 4-04-02 are not acceptable. Pumping stations shall be designed to D4.7 clause 1b).

D5.2 RELIABILITY
Clause 1 (R) – The minimum size for a rising main shall be 80 mm nominal bore providing that the nominal bore is always greater than the solids passing capacity of the associated pump units.

D5.3 HYDRAULIC DESIGN
Clause 2 (R) – The pipework roughness value (ks) used for the design shall be shown in the calculations submitted and shall be determined as follows:

• Where the rising main already exists, tests shall be conducted to establish the actual ks and this shall be the value used.
• Where the rising main is to be a plastic material (such as HDPE) then the ks value to be used shall be 0.6 mm.
• Where the rising main is to be a ductile, cast iron or cement mortar finished material then the ks value to be used shall be 1.5 mm.

Conservative values are used to allow for the 40 year specified life assuming minimal maintenance of the rising main pipes.

Clause 3 d) - refer to comments above (ref 4.6 clause 3) on ‘snore’ operation.

D6 DESIGN OF PUMPING STATIONS
D6.1 GENERAL
Clause 3 - Refer to comments above (ref 4.6 clause 3) on snore operation.

Clause 3 g) (A) – When in back up control, the pump shall operate on reaching the high level and run for a pre-set period to reduce the well level to empty.

Clause 3 (A) – The control unit provided can be a proprietary controller with built in logic provided it is WITS compatible and United Utilities has agreed to its use.
Clause 4 (A) – Compliance with the features and guidance set-out in SfA7, as modified by United Utilities’ Addendum, will be deemed to provide a reliable and efficient design.

D6.2 HAZARDOUS AREAS

Clause 3 (R) – Every pumping station installation, including its wet well and valve chamber, shall be assessed and classified in accordance with United Utilities’ model risk assessment technique contained in United Utilities’ Code of Practice “Installations in Potentially Explosive Atmospheres associated with Water & Wastewater (Document ref 60024)”

Where a well is classified as Zone 2, any electrical equipment installed shall be suitable for a Zone 1 environment.

D6.3 WET WELL - GENERAL

Clause 1 (A) - The hydraulic design of the wet well shall be based upon previously used successful designs and recognised guidance such as that available from BHRG or the Hydraulic Institute. Unconventional layouts shall not be proposed unless they include wet well modelling as a part of the proposal. Wet wells shall include flow control baffles, plates and benching, as necessary, to achieve the requirements set out in the following clauses.

Clause 5.b (A) - The maximum acceptable pre-swirl angle is 5 degrees.

Clause 5.c (D) Clause to be deleted.

Note: Reason for deletion: provided that the wet well has been designed as detailed in the preceding clauses and the pump unit is capable of running in 'snore' mode, then the requirements of 5c are already satisfied.

D6.4 WET WELL – STRUCTURAL DESIGN

Clause 2 (R) Design to counter flotation should be carried out using the method in BS EN 1997-1.

Clause 3 (R) Precast concrete units should conform to BS EN 1917 and BS 5911-3. Joints between precast units shall be watertight as defined in Clause E7.8. The wet well should be surrounded with not less than 150 mm thickness of GEN3 concrete.

Clause 4 (R) If constructed of in situ concrete the wet well shall be designed to BS EN 1992-3 tightness class 1. Cover slabs shall either be precast units conforming to BS EN 1917 and BS 5911-3 or in situ concrete designed in accordance with BS EN 1992-1 with an applied loading of accidental wheel load. The concrete mix and cover to reinforcement should be determined from BS 8500. These parameters will depend on the aggressiveness of the ground which should be determined using BRE Special Digest 1.

Clause 6 (A) - If the use of polyethylene and glass reinforced plastics (GRP) mouldings for package pumping stations applications is proposed, prior approval must be obtained from United Utilities. Mouldings shall incorporate all necessary inlet and outlet connections and preformed benching of the bottom section to prevent debris accumulating in dead zones. In addition, for increased depths or non-standard site conditions, increased wall thicknesses shall be used in conjunction with the inclusion of external reinforcing ribs around the circumference of the moulding.

Clause 7 (A) - The base of the tank shall be flat or incorporate either stabilising feet or a circular base ring to enable the tank to be positioned on a RC slab at the bottom of the excavation. The pumping station shell moulding should incorporate an anti-flotation skirt to enable wet concrete, when poured around the task, to flow into the skirt as a mechanical key to offset the effects of buoyancy.

• The requirements for the foundation slab and backfilling shall be as directed in the manufacturer's technical guidance literature. In locations subject to high water tables, the designer shall ensure that all necessary measures have been implemented to prevent flotation of the tank under all operating conditions.
The uplift force can be considerable particularly if the water table reaches up to ground level. Anti-flotation requirements and minimum GRP thickness should be calculated to ensure the pumping station can resist these forces.

**D6.5 VALVE CHAMBER**

Clause 1 (A) - The structural design of the valve chamber shall be as the wet well.

Clause 4 (R) – The valve chamber shall be provided with gravity drain pipework to return leakage, rainwater etc. into the wet well. The inlet end of the drain pipe, in the valve chamber, shall be fitted with a non-return valve to limit the possibility of crude sewage passing directly from the wet well into the valve chamber. This arrangement shall be considered as an integral part of the DSEAR risk assessment as required by D6.2 Clause 3.

**D6.6 FLOW METERING**

Clause 2 c) (A) - Where it is not practicable to drain back into the wet well the flow meter chamber shall have a water tight cover.

**D6.7 ACCESS INTO WET WELL, VALVE CHAMBERS AND FLOW METER CHAMBERS**

Clause 7 (A) – Access to electrical equipment in the wet well shall be by means of local isolation points at the surface to the well and be designed such that an operator does not have to enter the well to pull cables for pumps or instrumentation.

**D6.8 CABLE DUCTS**

Clause 2 (A) All cable ducts passing between the valve chamber and the kiosk (or other control panel building) shall be sealed using a gas-tight sealing technique (not foam).

**D6.10 KIOSK**

Clause 1 (R) - The kiosk should, as a minimum, enclose the following equipment:

a) The electrical assembly.

b) The telemetry outstation (normally United Utilities installations to have an outstation as part of the ICA Section).

c) A kiosk heating and lighting system.

d) A RCD switched 230 V socket.

e) Cable support details and containment trunking.

Clause 2 (A) - The kiosk layout shall be set out as detailed in United Utilities Standard Details – Drawing No. STND/00/016 Issue A – General Arrangement of Control Kiosk.

**D6.11 KIOSK CONSTRUCTION**

Clause 2 (A) – Where steel kiosks are provided, the kiosk shall be fitted with internal insulation to limit the effects of external temperatures during the seasons and prevent the build-up of condensation which would affect the controls.

Clause 12 (R) - The kiosk shall be arranged for either a separate compartment to the main kiosk or be of sufficient size to allow the DNO’s supply and meter to be installed. The latter should be used where there is a problem with cross ventilation in the kiosk.

Clause 14 (R) - The kiosk doors should be fitted with an Abloy manufactured key-barrelled lock.

**FIGURE D.4**

Section A-A

Replace the note “Benching 60º minimum slope” by “Benching preferred to be 60º, but to be a minimum 45º slope”.

**Plan View**

In the Plan View, the valve chamber drainage pipework shall extend, including a rocker pipe and couplings, into the wet well to enable positive drainage i.e. the sketch shall not be interpreted as a ‘soak-away’ system.

Location of the cable entry into the wet well to be modified in line with standard United Utilities requirements to incorporate a junction box just outside of the wet well (the current design would need operators to enter the well to pull cables). The design shall minimize H&S issues for the operations team.
Part F – Mechanical and Electrical Specification for Small Pumping Stations

F1.1 HAZARDOUS AREA APPLIANCES
Clause 1 (R) - United Utilities Guidance - The risk assessment shall be carried out referencing the guidelines included in the Code of Practice “Installations in Potential Explosive Atmospheres Associated with Water and Wastewater” and shall comply with DSEAR and United Utilities H&S Procedure “Dangerous Substances and Explosive Atmosphere Regulations”.

F1.2 OPERATION AND MAINTENANCE DOCUMENTATION
Clause 1 (R) - Two hard copies and three electronic copies are required.

F2 PUMP UNIT SPECIFICATION
F2.2 PERFORMANCE REQUIREMENTS AND INFORMATION
Clause 3 (The second sentence shall not apply). - Reason: practically speaking, vibration will always be present when the pump unit is running and cavitation will often be present, especially when the NPSH margin is low. What is vital is that neither the vibration, nor the cavitation, will reach levels that will cause damage that will shorten the pump unit’s design life when operated in the proposed design configuration. Other clauses within the specification address these issues.

Clause 4 (R) – Deterioration of all elements of the pumping system is to be expected with time. This shall be catered for by using a conservative ks factor for the rising main roughness (refer to D5.3 Clause 2) and to include a +10% power margin in the pump unit motor power available.

Clause 5 (D) – The following wording in this clause shall not apply: “to keep the wet well free from silt”. Reason: the wet well is unlikely to ever be completely free from silt and it is the hydraulic & benching design that will minimise the amount of residual silt, which is specified in D6.3.

Clause 8 (R) - Only where specified in the project specification or brief, the pump units shall be capable of discharging into an empty rising main. Reason: for low specific speed pumps, which naturally have an overloading power curve, the requirement to be able to discharge into an empty main is an onerous duty that could lead to an unnecessarily high powered motor being fitted. For a true rising main, it is never necessary in normal operation (only during commissioning under hand control via the isolating valve). This requirement should therefore only be invoked when it is actually necessary.

Clause 9 (A) – Where this would lead to overheating of the pump contents or if this operating condition would lead to the pump separating from the auto-coupling system due to the pump closed valve discharge head, the developer shall inform United Utilities of this non-compliance along with a proposed solution to allow safe operation of each pump unit in accordance with the pump manufacturer’s recommendations.

Clause 10 (Delete wording) - The wording in parentheses, within the ‘Note’ section of this clause, shall not apply.

Clause 11 (Delete sentence) - The first sentence of this clause shall not apply.

F2.3.3 NOISE
Clause 1 (R) - The developers shall make themselves aware of any Planning Authority restriction on noise levels from the site and shall ensure that any contributory noise emanating from the pump units is taken into account in satisfying the planning constraints.
F2.3.5 PUMP CASING
Clause 3 (A) - Where pumps are not available that include renewable casing wear plates, the developer shall inform United Utilities of this non-compliance along with a proposed solution for agreement.

F2.3.6 IMPELLERS
Clause 6 (A) – Where pumps are not available that include renewable impeller wear rings, the developer shall inform United Utilities of this non-compliance along with a proposed solution for agreement.

F2.3.9 BEARINGS AND BEARING LUBRICATION
Clause 2 (R) – Pump unit bearings shall be designed for a six year life, taking into account the actual utilisation factor or expected running hours of the pump unit being proposed. Where pump units are not available that include compliant bearings, the developer shall inform United Utilities of this non-compliance along with a proposed solution for agreement.

F2.3.16 PUMP UNIT PROTECTION SENSORS
Clause 2 (Delete wording) - Delete the words “wear and seal”.

Clause 3 (Delete sentence) - The requirements of clause 3 shall not apply.

Clause 4 (Delete sentences) - The requirements of clause 4 shall not apply.

F2.4 TESTING
F2.4.1 GENERAL
Clause 1 (R) - Each pump unit shall be assembled and tested to comply with its design intentions and the project specific performance requirements. Vibration testing and acceptance shall be in accordance with BS ISO 10816-7. Hydraulic performance shall be tested to BS EN ISO 9906 Grade 2 Annex A as a minimum, or where a higher grade is required (e.g. minimum pass forward flow to be achieved under all circumstances), the hydraulic acceptance test code and tolerances shall be agreed with United Utilities. Type test certificates will be acceptable and shall be included in the pump unit Operating and Maintenance manuals. Acceptance of the pump units’ performance is also subject to acceptable Site Testing.

F2.4.2 TESTING ON SITE
Clause 1 (R) – Each pump unit shall be tested at site to ensure it is capable of transferring at least the specified flow rate, with the specified working level range in the wet well.

Clause 3 (R) – A visual inspection of the pumping station shall be made in the presence of United Utilities, as a part of the Site Tests, to ensure that the visible components, layout and hydraulic performance comply with the General Arrangement drawings and the design intentions. Functional checks shall be made of all installed instrumentation, level settings, control systems and equipment protection devices. Where any components or features are missing or malfunction, or the visible performance of the wet well is non-compliant (including dead zones, excessive vorticity or solids accumulations), the developer shall investigate the deficiency and rectify it to the satisfaction of United Utilities.

F3 ELECTRICAL
F3.2.1 GENERAL
Clause 5 (R) – The plant earth bar shall be installed in the kiosk complete with isolation link to allow the DNO’s earth to be isolated when a mobile generator is connected to the pumping station.

F3.3.4 EARTHING AND BONDING
F3.3.4.1 GENERAL
Clause 1 (A) – The earthing arrangement shall include an earth bar within the kiosk arranged for the DNO earth, equipment earth and facility for a generator earth with a disconnection link to ensure no feedback onto the DNO system in the event of a generator being connected.
F3.3.5.4 TERMINATION OF WIRING

F3.3.5.4.1 GENERAL

Clause 9 (A) – The design shall include for a means of local isolation for electrical cables without the need for operational personnel to enter the wet well by means of a harness or leaning into the wet well.

F3.3.8 ABNORMAL OPERATION

F3.3.8.3 INTERRUPTION/LOSS OF ULTRASONIC SIGNAL

Clause 3 (A) – The control system shall be arranged such that in the event of the high level instrument operating back up control shall be initiated, regardless if the ultrasonic has failed or not.

F3.3.8.5 (R) – WET WELL LEVEL MONITORING

Clause 1 (R) - Change from High-High to Persistent High Level.

Clause 2 (A) - Spill monitoring to be initiated if the Persistent High level is instigated for a set period of time as agreed with United Utilities.

F3.3.9 TELEMETRY SIGNALS

Table F.3 – Modify and Add signals

3rd row (R) change function from High-High to Persistent High Level

Add – Wet Well Spill.

F3.3.10 – ULTRASONIC LEVEL CONTROLLER (ULC) SPECIFICATION

General (A) – A proprietary controller can be provided for the control of the pumps utilising a separate ultrasonic level measurement and backup level device. The controller provided can incorporate a communications module (WITS compatibility) suitable for connecting to United Utilities’ Alarm and Monitoring Centre (AMC), which would reduce the need for telemetry terminations and a separate telemetry outstation.

F3.3.10.3 FUNCTIONALITY

Clause 2 (A) – e) power monitoring

F3.3.11 FUNCTIONAL UNITS – FORM 4 ASSEMBLIES

F3.3.11.2 INCOMER COMPARTMENT

Clause 3 d) (A) – The arrangement of the distribution board installation shall ensure that kiosk services are available if the electrical assembly is isolated for any reasons. The design shall take into account the need of operations carrying out activities in the control panel and needing building services in the kiosk.

F3.3.11.4 MOTOR STARTER COMPARTMENTS

Clause 5 (A) – Details of individual alarms required for each starter shall be agreed with United Utilities.

F3.3.11.5 COMMON CONTROL COMPARTMENT

Clause 1 f) (A) - Separate indication is required for high level and persistent high level.

Clause 1 g) (A) - A separate spill monitoring alarm to be provided on the door and transmitted to telemetry.

F3.3.12 FUNCTIONAL UNITS – FORM 2 ASSEMBLIES

F3.3.12.3 INCOMER

Clause 3 d) (A) – The arrangement of the distribution board installation shall ensure that kiosk services are available if the electrical assembly is isolated for any reasons. The design shall take into account the need of operations carrying out activities in the control panel and needing building services in the kiosk.

F3.3.12.5 MOTOR STARTERS

Clause 8 (A) – Details of individual alarms required for each starter shall be agreed with United Utilities.
Clause 9 (A) – The panel shall be arranged such that each starter circuit can be locked off.

F3.3.12.6 COMMON CONTROL COMPARTMENT

Clause 1 e) (A) - Separate indication is required for high level and persistent high level.

Clause 1 g) (A) – Separate spill monitoring alarm to be provided on the door and transmitted to telemetry.

F3.4.1.5 JUNCTION BOXES

Clause 3 (A) – Local isolation point junction boxes (JB’s) shall be designed for ease of access by operations and cable entry suitable for the orientation of the JB.

Clause 6 (A) – Cable gland for JB’s shall be suitable for the environment and be fitted with IP washers.

Clause 7 (A) – JB’s installed in the installation shall be suitably rated to prevent ingress of moisture during normal operation and in the event of them being submersed.

F3.4.4 INSTALLATION OF CABLES

Clause 5 a) (A) – The DNO cable duct shall be coloured RED.

Clause 5 b) (R) – Pump unit cables – two 150 mm diameter ducts shall be provided and routed between the kiosk and the local isolation point.

Clause 5 c) (R) – the ultrasonic and digital level switch cables: – one 100 mm diameter duct shall be provided routed between the kiosk and local isolation point.

Clause 5 g) (A) - Earthing and bonding of electrical equipment shall be carried out using earthing cables routed through the appropriate cable duct.

Clause 8 (R) – The pump and instrument cables shall be routed from the local isolation JBs at high level in the wet well (see United Utilities standard arrangement) to allow for the isolation of cables without the need for entering the wet well on a harness or leaning into the wet well or having to pull cables through ducts to the local isolation JB.

F3.4.6.2.2 EARTH ELECTRODE

Clause 1 (R) – The earth electrode system shall be designed in line with the current British Standard and calculation of the earth electrode design provided as part of the review information.

F3.4.6.3.3 SUPPLEMENTARY EQUIPOTENTIAL BONDING

Figure F.3 (Modify and add wording) –

5) The earthing and bonding cables shall be connected to the earth bar in the kiosk and shall be routed to the relevant equipment or structures through cable ducts provided from the kiosk to the specific area of the installation.

F3.5 INSTRUMENTATION

(A) General installation of instruments shall be arranged to allow for good access for maintenance or removal without causing any operational or H&S issues for the operator.

F4.1 GATE (SLUICE) VALVES

Clause 2 (A) Between 2 and Valves insert the words “The valves shall be operable whilst standing at local ground level”.

F4.2 CHECK (REFLUX) VALVES

Clause 2 (R) All non-return valves shall be selected and installed to suit the operational environment including being matched to the calculated surge conditions.
One complete working set of operating instruction/maintenance manuals should be provided. These manuals should be in separate folders bound in loose-leaf volumes and be clearly indexed. A further four copies of the O&M manual are also required on four separate CD’s.

All items should be A4 or A3 size.

The manuals should include the following:

1. Index and references
2. Details of plant.
3. Schedule of drawings and wiring diagrams including general arrangement drawing.
4. Maintenance instructions for all items.
5. Fault finding and rectification instructions.
6. Operating instructions.
7. Spare parts list for all items.
8. Performance curves
10. ‘Ex’ Certificates and schedule – including hazardous area zoning report / drawing as required by DSEAR regulations.
11. Results of all on site tests.
12. Results of all off site tests.
13. Commissioning test results tabulated and certified.
14. PLC back-up disc, if applicable.

In addition to the above, the following items will be required at the time of adoption:

1. NICEIC completion and test certificates together with any subsequent inspection reports.
2. Maintenance records will be required at the time of adoption in particular for repairs and maintenance of certified equipment. Records must also contain a complete event log and meter readings. Failure to provide records may lead to additional costs for Developers.
3. H&S file – One complete hard copy shall be provided with five copies on CD.

It is important that all items of EX certified equipment are installed and maintained in accordance with BS EN60079. Only Contractors trained to maintain and install certified equipment should be permitted to do so.

Note: A collection of Manufacturer’s leaflets will not be accepted in place of a manual. ATEX is the name commonly given to the legal requirements for controlling explosive atmospheres and the suitability of equipment and protective systems used in them. DSEAR states the legal requirements for managing the risk of fire, explosion or similar events arising from dangerous substances at the workplace.
NOTE:- THIS DETAIL IS NOT APPROPRIATE IF THE CABLEING LEAVES THE ACCESS ON THE SAME SIDE AS THE GUIDERAILS, THE JUNCTION BOXES THEN BEING LOCATED WHERE OPERATIVES STAND TO RAISE THE PUMP.
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NOTES:-

230VacBLUE
PINK
BLACK
GREEN/YELLOW
POWER CIRCUITS

BROWN
BLACK
GREY
BLUE

PROTECTIVE CONDUCTOR

L1
L2
L3
N

PHASE 1
PHASE 2
PHASE 3
NEUTRAL

CONTROL CIRCUITS

230VacBROWN L
N

110VacBLUE
110VacRED L
N

24VacYELLOW

TELEMETRY
ANALOGUE
(WHITE +VE)
(BLUE -VE)

BLACK SCREENED

CURRENT TRANSFORMER

BLUE INTRINSICALLY SAFE
(TO BE SEGREGATED)
(FOR ENTIRE RUN)

24VdcYELLOW
0VdcBLUE

DIGITAL

GREY MULTICORE INPUTS
GREY MULTICORE OUTPUTS

PUMP No.2

SCHEMATIC DIAGRAM

UNITED UTILITIES WATER PLC
MANOR PARK WwPS

PUMPING STATION MCC

64329-066
NOTES:-

230Vac BLUE
PINK
BLACK
GREEN/YELLOW
POWER CIRCUITS
BROWN
BLACK
GREY
BLUE
PHASE 1
PHASE 2
PHASE 3
NEUTRAL
CONTROL CIRCUITS
BROWN
BLACK
GREY
BLUE
PHASE 1
PHASE 2
PHASE 3
NEUTRAL
PHASE 2
PHASE 3
PHASE 1
TELEMETRY
ANALOGUE
(WHITE +VE)
(BLUE -VE)
PHASE 1
PHASE 2
PHASE 3
PHASE 2
PHASE 3
PHASE 1
CURRENT TRANSFORMER
BLUE INTRINSICALLY SAFE
(TO BE SEGREGATED)
( TO BE SEGREGATED)
24Vdc
0Vdc
DIGITAL
GREY MULTICORE INPUTS
GREY MULTICORE OUTPUTS
ICA SECTION
TELEMETRY CONNECTIONS
SCHEMATIC DIAGRAM
UNITED UTILITIES WATER PLC
MANOR PARK WwPS
PUMPING STATION MCC
SCHEMATIC DIAGRAM
ICE SECTION
TELEMETRY CONNECTIONS

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