*Document Guidelines (delete these prior to finalising document)*

*Blue Text*

*The blue text provides guidelines on how to complete this document.*

*All blue text to be deleted when no longer needed, prior to finalising the project-specific document.*

Yellow Highlighted Text

The yellow highlighted areas are where project-specific information shall be added/deleted or where information should be checked for relevance and/or currency by the template user.

Black Text

Black (no highlight) text should not be altered without consultation with Urban Utilties. This text serves to provide both standard information and design and technical specifications. Approval in writing must be obtained from Urban Utilities for any changes or variations from requirements that are indicated in black text. Any such variations, reasons for variations and written approvals must be recorded in Appendix 4 of this document.

*Notes*

*The “Template Revision Table” must appear on the bottom of the cover page.*

*Do not leave table cells blank. If there is no relevant information, add “-“ or “Not Applicable” (NA). Where data is not available at the time of drafting the project specific BoD, Indicate “To be confirmed” (TBC).*

*Do not leave any sections blank. Write a statement indicating that there is no relevant information for this project, or similar statement. Do not delete any whole sections.*

*Abbreviation and document reference tables to be in alphbetical order (abbreviation or doc#).*

*Adjust formatting so tables are generally on 1 page (extra long tables are the exception).*

*Check revisions / titles / doc numbers for all documents referenced.*



 Water Booster Pumping Station

[Insert WB site identifier number and street Name designation]

Basis of design

(BoD Template for Water Booster Pumping Stations)

DOCUMENT no: [insert doc #]

PROJECT NO: [insert Urban Utilities Project #, or Water Approval Number #]

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Template Revision Table

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| --- | --- | --- | --- | --- |
| **Rev** | **Date** | **Document Status** | **Author** | **Approved by** |
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| **4** | 11/01/2023 |  Updated |  Harald Kemmetmuller |  Joe Otter |
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**Document Change History**

Revisions:

Pre IFC-Revisions are alpha (A, B, etc).

IFC and post IFC are numeric (1, 2, etc)

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| **Rev** | **Date** | **Document Status** | **Author** | **Check by** | **Review by** |
| **A** |  | Issued for Review |  |  |  |
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Review By

Name & Position in Urban Utilities to whom document was issued for review.

Add Date of any received feedback. Enter “No Comments” if no feedback received.

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| **Rev** | **Name** | **Position** | **Date** |
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Urban Utilities Approved By

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| --- | --- |
| **Name** | [name] |
| **Position** | [Technical Assurance Lead] |
| **Date**  | DD/MM/YYYY y |

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# Introduction

## Purpose

*The Basis of Design Document (BoD) for a project, is a record of all design criteria, performance requirements, system parameters, design methodologies, decision processes and considerations, as well as reference documents that will be relied upon in the design process.*

*This document is intended to assist with the process of completing an Urban Utilities water booster pumping station basis of design document by highlighting all design requirements that are specific to Urban Utilities’ Water Booster Pumping Stations, from the various SEQ WS&S D&C Code documents and other applicable civil, mechanical, electrical and SCADA standards, specifications and reference drawings, into a single, generic, template document.*

This Basis of Design [Document Identification Number] provides a single reference to guide the design of the water booster pumping station WBXXX, by Identifying performance requirements standards, design criteria, typical drawings and other relevant, project specific details for the proposed new water booster pumping station within the Urban Utilities Service Area.

## Background

*This section is to be completed with sufficient information provided from the Urban Utilities Master Plan and Feasibility Report; or the Project Planning Report and the Water Approval Notice to provide a basic understanding of the project including the upstream water supply area, and the boosted level zone that is served by the new water booster that is to be built.*

## Operational Issues/Constraints

*Provide information on known operational matters that may need to be addressed in the design. Also provide details of operational matters that affect construction sequence, timing, methods, additional work or other measures. Particular consideration should be given to the upstream and downstream water supply zones.*

## Schedule Considerations

*Provide information about the proposed pumping station construction completion as well as details and timing of interdependent upstream and downstream systems, that are likely to be affected or be dependent on this pumping station project.*

The following ongoing projects shall be considered during the design of this project:

* [project #1/Water Approval Number]
* [project #2/Water Approval Number]
* etc

## Definitions

Table 1‑1 Definitions

| **Word/ Phrase** | **Meaning** |
| --- | --- |
| Project | *[Enter the Water Booster site ID], [Locality Name] – [URBAN UTILITIES project# or Water Approval Number].* |
| Works | Design and Construct Scope of Works |
| Designer | Person or group responsible for the preparation of the design. |
| RPEQ | Registered Professional Engineer Queensland |
| Constructor | The entity contracted by the developer to carry out construction of the works. |
| Network Access Permit | The permit that the constructor must obtain from Urban Utilities to carry out works on or near Urban utilities’ assets |
| Applicant | The applicant for a development proposal |
| Consultant | The consultant engaged by developer to carry out the design and documentation of the proposed works. |
| Certified Design Package | Drawings, reports, specifications and the like to completely describe the intended works, certified by one or more RPEQ  |
| IFA package | Certified Design Package issued for approval |
| IFC package | Certified Design Package issued for construction |
| Developer | The owner of the proposed development |
| Design RPEQ | The RPEQ engaged by the developer to carry out or supervise the design of the works and certify that the design documentation is accurate and complete and meets the standards agreed by Urban Utilities. |
| Construction RPEQ | The RPEQ engaged by the developer to oversee construction of the works to the approved design. |
| Urban Utilities | The company and/or its representatives |
| Q100 Level | The level derived from the relevant local government or state government (or from another agreed entity) flood study for the project site for a 1% AEP flood event. |

## Abbreviations

The use of abbreviations in this document should align with abbreviations used in the SEQ Code as well as other reference documents. A comprehensive list of abbreviations is found in WSA 03-2011-3.2 (SEQ WS&S D&C Code V1.4-2024). A supplementary list of abbreviations is listed in Table 1‑2 Abbreviations in this document.

Table 1‑2 Abbreviations

| **Abbreviation** | **Description** |
| --- | --- |
| AEP | Annual Exceedance Probability |
| BOD | Basis of Design |
| BWL | Bottom Water Level |
| DTMR | Department of Transport and Main Roads |
| EA | Environmental Authority |
| EI&C | Electrical, Instrumentation and Control |
| EP | Equivalent Person |
| LCP | Local Control Panel |
| MCPS | Minor Capital Project Submission |
| P&ID | Piping & Instrumentation Diagram |
| PFD | Process Flow Diagram |
| PLC | Programmable Logic Controller |
| PQA | Power Quality Analysis |
| PSA | Power Systems Analysis |
| RPEQ | Registered Professional Engineer of Queensland |
| SEQ | South East Queensland |
| SSFS | Site-specific functional specification |
| STEP | Site Access, Tenure, Environmental and Planning  |
| TWL | Top Water Level |
| TPZ | Tree Protection Zone |
| WS&S D&C Code | Water Supply and Sewerage Design and Construction Code |

# Documentation

## Project References

The following listed project-specific documents and drawings will be referred to throughout the design process. Design and functional requirement information provided in these documents takes precedence over other standards and codes referred to in this Basis of Design. The project reference documents applicable to this design are provided in Table 2‑1.

*Complete Table 2.1. Insert the Document Identification Code, Title and revision information.*

Table 2‑1 Project References

| **Doc Number** | **Title** | **Revision** |
| --- | --- | --- |
| [doc #] | [Water Approval Decision Notice] | [rev #] |
| [doc #] | [URBAN UTILITIES IZP / Planning Report / Feasibility Report] | [rev #] |
| [doc #] | [MCPS for Water Booster Pump Station] | [rev #] |
| [doc #] | [Development Planning Report] | [rev #] |

## Design Standards

The design of the proposed water booster pumping station shall be in accordance with:

* Project references (Table 2‑1);
* Urban Utilities’ Technical Specifications;
* Urban Utilities’ standard and typical drawings;
* SEQ Code;
* WSAA Standards

Referenced technical documents, drawings and specifications shall be the most current at the time of the design. This Basis of Design document lists the revision and date of all technical documents, drawings and specifications adopted for the design.

Refer to Appendix 4 for the list of proposed variations from Urban Utilities’ technical standards and specifications. All variations from Urban Utilities’ technical standards and specifications must be agreed by Urban Utilities in writing prior to construction**.**

Urban Utilities’ Technical Standards reference the following general codes (current published versions) to be complied with:

* *Water Supply Code of Australia South East Queensland Service Providers Edition ((version x.x date)*;
* *SEQ Design Criteria (version x.x date)*;
* *SEQ Asset Information Specification(version x.x date) ;*
* *SEQ Accepted Civil Infrastructure Products and Material List (version x.x date) ;*
* *SEQ Accepted Mechanical Products and Material List (version x.x date) ;*

The above referenced codes are collectively referred to as the **SEQ WS&S D&C Code,** or **SEQ Code** found online at <http://www.seqcode.com.au>.

## Urban Utilities’ Technical Standards

Technical specifications, procedures and templates relevant to the water booster pumping stations are listed in Table 2‑2 General Standards, Table 2‑3 Civil Standards, Table 2‑4 Mechanical Standards,

Table 2‑5 Electrical and Instrumentation Standards, Table 2‑6 Control Systems Standards, and Table 2‑7 Environmental Standards. This is not a complete list of all Urban Utilities documents.

*It is the author’s responsibility to check revisions and titles against the* [*Urban Utilities “Development Standards and Guidelines” web page*,](https://urbanutilities.com.au/development/help-and-advice/standards-and-guidelines) *to ensure currency in referencing.*

*Any project-based variations from Urban Utilities’ technical and design standards that are accepted by Urban Utilities, or additional technical standards directed to be used by Urban Utilities must be captured in Appendix 4*

Table 2‑2 General Standards

| **Doc Number** | **Title** | **Rev #** |
| --- | --- | --- |
| PRO662 | Safety in Design Procedure | [Rev #] |
| PRO307 | Engineering Drawing and Document Management Requirements For Capital Project Delivery | [Rev #] |
| TMS1647 | Plant and Equipment Tag Numbering  | [Rev #] |
| TEM618 | Asset Management Equipment Register | [Rev #] |
| TMS76 | Supplement to the WSA 201 Manual for Selection and Application of Protective Coatings | [Rev #] |
| TMS176 | Security Design Guidelines | [Rev #] |
| PRO395 | Urban Utilities Addendum to: SEQ Water Supply and Sewerage Design & Construction Code   | [Rev #] |

Table 2‑3 Civil Standards

| **Doc Number** | **Title** | **Rev #** |
| --- | --- | --- |
| TMS1435 | Technical Specification for Design and Construction of Water and Sewerage Main Systems | [Rev #] |
| STD117 | Fall Protection and Safety Requirements for Liquid Retaining Structures - Design Standard Note | [Rev #] |
| STD146 | Air, Dust and Odour Environmental Standard | [Rev #] |
| TMS1581 | Drinking Water Reservoirs and Tanks Specification | [Rev #] |
| TMS1582 | Specification for Horizontal Directional Drilling (for rising mains only). | [Rev #] |
| TMS1583 | Micro-tunnelling and Pipejacking Specification | [Rev #] |
| TMS1731 | Civil and Structural General Specification | [Rev #] |
| TEM715 | Template for Geotechnical Investigation Report | [Rev #] |

Table 2‑4 Mechanical Standards

| **Doc Number** | **Title** | **Rev #** |
| --- | --- | --- |
| TMS1639 | Mechanical General Specification | [Rev #] |
| TMS1636 | Asset Specification for Hypochlorite and Monochloramine Chemical Dosing Units  | [Rev #] |

Table 2‑5 Electrical and Instrumentation Standards

| **Doc Number** | **Title** | **Rev #** |
| --- | --- | --- |
| TMS60 | Low Voltage Switchboard and Enclosures | [Rev #] |
| TEM336 | Power System Analysis Guidelines | [Rev #] |
| TMS62 | Preferred Equipment List Electrical and Instrumentation and Control. | [Rev #] |
| TMS1732 | Electrical and Instrumentation General Specification | [Rev #] |

Table 2‑6 Control Systems Standards

| **Doc Number** | **Title** | **Rev #** |
| --- | --- | --- |
| PRO396 | Control Systems Change Management Procedure | [Rev #] |
| TMS1649 | Standard MPC Water Booster Functional Specification | [Rev #] |
| TEM587 | Standard MPC Water Booster Site Specific Functional Specification Template | [Rev #] |
| TMS1733 | Control Systems General Specification | [Rev #] |
| TMS1151 | Preferred Equipment List Control Systems | [Rev #] |

Table 2‑7 Environmental Standards

| **Doc Number** | **Title** | **Rev #** |
| --- | --- | --- |
| [FOR325](https://tap.urbanutilities.com.au/qpulsedownloads/BCB1048B1FCC45E79B5AD265E6A9DF50) | Preliminary STEP Assessment | [Rev #] |
| [FOR608](https://tap.urbanutilities.com.au/qpulsedownloads/E622B4F658664EEBAA5527DB4FC44434) | STEP Assessment Spreadsheet | [Rev #] |

## Urban Utilities’ Standard Drawings

The standard drawings listed in Table 2‑8 are to be utilised in the design documentation. Where relevant, these drawings are to be referenced in the IFA package and included with the IFC package.

Table 2‑8 Standard Drawings

| **Drawing Number** | **Title** | **Revision** |
| --- | --- | --- |
| 486/1/25-0004-001 | Chain Wire Security Fencing and Signage Notes | [Rev #] |
| 486/1/25-0004-002 | Typical Fence and Single Person Access Gate Details | [Rev #] |
| 486/1/25-0004-003 | Vehicle Access Gate and Corner Post Detail | [Rev #] |
| 486/4/25-0005-002 | GENERAL ARRANGEMENT FLOWMETER FACILITY | [Rev #] |

## Urban Utilities Typical Drawings

Urban Utilities typical drawings for water booster pumping station electrical, instrumentation and controls are attached at Appendix 2. These drawings are provided for design guidance and are suitable as a template. These drawings must be developed into project-specific drawings with associated project-specific drawing numbers.

## Preferred Equipment

*Any project-based variations from preferred equipment that are accepted by Urban Utilities or additional product direction by Urban Utilities must be captured in Appendix 4*

Preferred electrical, instrumentation and control system equipment lists are provided in Table 2‑9. Proposed variations to these lists are listed in Appendix 4.

Also refer to <http://www.seqcode.com.au/products/> for preferred Mechanical and Civil Products (IPAM lists).

Table 2‑9 Preferred Equipment Lists

| **Doc Number** | **Title** | **Revision** |
| --- | --- | --- |
| TMS62 | Preferred Equipment List Electrical and Instrumentation | [Rev #] |
| TMS1151 | Preferred Equipment List – Control Systems | [Rev #] |

## Project Drawing List

The project drawing list for the proposed water booster pumping station is attached at Appendix 1 – Project Drawing List.

*Applicant to complete the drawing list Appendix 1 including references for drawings as applicable.*

*Numbering in accordance with* *TMS1654* [*Project Document Numbering and Naming Requirements*](http://tap.urbanutilities.com.au/qpulsedownloads/579064693A554078988715310798065D)*.*

*Document request through FOR1063* [*Project Document Number Request Form*](http://tap.urbanutilities.com.au/qpulsedownloads/DAE9A40D684049CB9CA137FE0897E1C7)*.*

## Variations

All project-based variations from Urban Utilities’ Design Standards that are accepted by Urban Utilities, or additional technical standards directed to be used by Urban Utilities are captured in Appendix 4

# Site Conditions

## Site Location

The [Site name (Site ID)] is located in [insert details of where the Water Booster is located.]

*Insert an aerial photo of the locality map to scale per the* SEQ Code Asset Information Specification *showing existing RP boundaries with a point marked to indicate location options for the water booster pumping station and lines showing the proposed connecting pipes to the water supply reticulation pipe networks. To provide sufficient clarity, it may be necessary to create a section break in this document and insert the Figure on an A3 page .*

*The geometry of the property allocated for the water booster pumping station must be adequate to contain the infrastructure while achieving the access and manoeuvring requirements detailed in section 4.10.3 .*

Figure 3‑1: Site Locality

## Climatic Conditions

The climatic conditions for the site are provided in Table 3‑1.

Table 3‑1 Site Climatic Conditions

| **Parameter** | **Value** |
| --- | --- |
| Site Exterior Environment | Select one of Coastal/Non-Coastal/Rural |
| Ambient Temperature Range (for Design): | -5oC to 45 °C |
| Rainfall for drainage design (5% AEP storm flows (Level IV QUDM\*)): | 324 mm/day |
| Average ambient Relative humidity: | 65% @ 28oC |
| Ambient Relative Humidity Range (for Design): | 10% at 35oC to 100% (Condensing) |
| Solar Radiation Black Bulb Temp | 85°C |

\*Queensland Urban Drainage Manual

## Solar Radiation

Above-ground equipment and pipework exposed to the sun and that contains stagnant (non-flowing) fluids shall be designed to accommodate heating of exposed surfaces.

Where surface temperatures may exceed 60 °C, the Designer shall include for thermal insulation to limit temperature rise to below 60oC or guarding to prevent personnel from being able to touch hot surfaces.

# Basis of Design

This section describes site-specific design and layout requirements of site areas associated with the ***[Site Name (Site ID) Project Title], [Project Number (URBAN UTILITIES Capital Project), or Water Approval Number #]***.

## Design Considerations

It is proposed to design and construct:

* a new water booster pumping station [WB###} at, [Street Address], [Locality] in accordance with Water Approval Notice number ##; and

### Design for Workplace Health and Safety

The safety of the public and everyone who may interact or be impacted during construction, operation, maintenance or future foreseeable modification or demolition of the works shall be a fundamental consideration in the facility layout and design. Installations shall be designed such that all operation and maintenance can be carried out safely.

It shall be the responsibility of all parties to fully comply with all related legislative requirements including the Queensland *Work Health and Safety Act 2011*, *Work Health and Safety Regulation* 2011 and associated Codes of Practice.

The design shall be subject to Safety in Design reviews (SID) during detailed design phase with participation by Urban Utilities and related parties.

The Safety in Design process shall be in accordance with Urban Utilities specification PRO662 *Safety in Design Procedure*.

### Design Life

The equipment shall be designed for minimum design life durations as stated in Table 4‑1. The equipment shall also be suitable for normal continuous operation with only minimal routine maintenance as specified by the component manufacturer.

Table 4‑1 Design Life

| **Component** | **Min. Design Life (Yr)** | **Reference** |
| --- | --- | --- |
| Buildings | 50 | TMS1731 |
| Structural Steel | 50 | TMS1731 |
| Civil Structures and pipe work | 100 | SEQ Code / TMS1731 |
| Electrical Equipment and Related Assets | 25-50 | TMS1732 |
| Instrumentation and Control Equipment Including Software | 15 |  |
| Mechanical Equipment and Related Assets | Varies | SEQ Code / TMS1639 |
| FRP/GRP/PE/PVC Process Pipe, Process Tanks | 25 | TMS1639 |
| Vehicular and pedestrian access pavements (Reinforced Concrete) | 40 | TMS1731 |
| Protective coating on metalwork | 25 | WSA 201 |

### Staging of Construction Works

The design shall incorporate all necessary features and provisions for the staging of the Works, including temporary works.

The design is undertaken on the basis that:

* The upstream and downstream water supply systems that the new water booster pumping station is connecting into may be in service during the construction and commissioning of the new works; and
* Necessary works on or near existing Urban Utilities’ assets (including cut-ins) will be achieved with minimal interruption of the water supply to existing consumers.

Works on or near Urban Utilities’ sewerage and water supply assets require a Network Access Permit, issued by Urban Utilities. The Construction RPEQ must make the Constructor aware of the requirement to obtain a Network Access Permit, by written instructions issued to the Constructor. The Design RPEQ must provide notes on the IFA drawings to address this requirement.

## Site Details

*Provide description of the proposes site, including but not limited to, relevant grade, existing vegetation and access. Also provide details of proposed siteworks, drainage, aesthetic and landscaping treatment for the water booster site.*

Details for the site are provided in Table 4‑2.

Table 4‑2 Site Design Details

| **Item Description**  | **Value**  |
| --- | --- |
| Site Street Name | [Enter Access Street Name] |
| Lot / Plan Number | [Enter Lot and Plan number of water booster site] |
| UTM Coordinate Reference | [Enter building UTM coordinate] |
| Nearest noise sensitive receptor details | [Enter Lot, description and distance of relevant noise sensitive receptors] |
| Site Grade Level | R.L. [Value] |
| Site Q100 Level / 1% A.E.P Level | R.L. [Value] |
| FSL of Building Slab | Q100 + 300mm (minimum) |
| FSL of Access Road Pavement | Q100 (minimum) |
| FSL of Valve Surrounds | Q100 (minimum) |
| FSL of other Appurtenances | Q100 (minimum) |

## System Design

The water booster pumping system design shall be carried out in accordance with the SEQ WS&S D&C Code (*insert current version)*. Alsorefer toTable 4‑3 *System Design Criteria.*

*Make reference to information provided in the project reference documents listed in Section 2.1* Project References*, Table 2‑1* Project References*, of this document.*

Table 4‑3 System Design Criteria

| **Design Consideration** | **Criteria/Requirement** | **Reference/Advice** |
| --- | --- | --- |
| Average Day Demand(AD) | 230 L/EP/d | SEQ Design Criteria, Part A, Table 4.1 – Water Network. Or Water Approval Conditions. |
| Estimated Non-Revenue Water (NRW) | 30 L/EP/d | SEQ Design Criteria, Part A, Table 4.1 – Water Network. Or Water Approval Conditions. |
| Peaking Factors |  | SEQ Design Criteria, Part A, Table 4.1 – Water Network. Or Water Approval Conditions. |
| MDMM/AD | 1.5 |
| PD/AD | 2 |
| PH/PD | 2 - Low to Medium Density Residential1.75 – High Density Residential1.4 – Commercial and Industrial |
| Fire Flow | 7.5L/s for up to 2 hours from 1 hydrant in single story residential.15L/s from 2 hydrants for 2 hours, for lots >1000m. 25L/s from 2 hydrants for 2 hours, for low density residential.45L/s from 4 hydrants for 4 hours for medium density residential (4-6 storey buildings), as well as Commercial and Industrial areas.60L/s from 5 hydrants for 4 hours for High Density Residential (>6 storey buildings). | SEQ Design Criteria, Part A, Table 4.1 – Water Network. Or Water Approval Conditions. |
| Minimum Service Pressure | 22m at the property boundary | SEQ Design Criteria, Part A, Table 4.1 – Water Network.  |
| Minimum Residual Water Mains Pressure for Fire Flow Conditions | 12m at the hydrant from where fire flows are drawn. 6m elsewhere in mains that have consumer connections. Positive gauge pressure throughout. | SEQ Design Criteria, Part A, Table 4.1 – Water Network.  |
| Maximum Service Pressure | 55m  | SEQ Design Criteria, Part A, Table 4.1 – Water Network. |
| Background Demand | (2/3 x PH demand for residential lots) + (1 x PH demand for Non-residential lots) Convert to instantaneous flow rate, divide by 86400 (L/s). | SEQ Design Criteria, Part A, Table 4.1 – Water Network. |
| Maximum Design Flow (L/s) | Background demand (L/s) + Fire demand (L/s) |  |
| Minimum Design Flow (L/s)  | 0.3 x AD/ 86400 (L/s) |  |
| Pump System Redundancy (PH) | N+1 for PH instantaneous flow rate.*Where N is the number of pumps needed to achieve the design flow rate.* | Section 6.2.9.4 of WSA 03-2011-3.2 (SEQ WS&S D&C Code V1.4-2024). |
| Pump System redundancy (Maximum Design Flow) | N, one of the largest pumps can be unavailable for lot intensities up to low density residential.For medium density and greater, N+1 is required. |
| Pump Duty head for:PH demand flow:Maximum Design Flow:Minimum Design Flow: | [Values] Based on Hydraulic Modelling for Steady state PH demand and (Background Demand + Fire Flow) | Section 5.6 of SEQ Design CriteriaSection 6.2.4 of WSA 03-2011-3.2 (SEQ WS&S D&C Code V1.4-2024). |
| Flowmeter | Required | Urban Utilities requirement |
| Maximum Allowable Velocity | 2.5m/s | SEQ Design Criteria, Part A, Table 4.1 – Water Network. |
| Pump Selection | Refer to Section 4.3.2 Pump Selection | Section 6.2.5.9 of WSA 03-2011-3.2 (SEQ WS&S D&C Code V1.4-2024). |
| Water Booster Site  | Water booster pumping stations shall be on separate Urban Utilities owned land. | Sections 6.2.2.8 and 6.2.2.9 of WSA 03-2011-3.2 (SEQ WS&S D&C Code V1.4-2024). |
| Permanent Installed Emergency Generator with ATS | Required/Not required | Section 6.2.8 of WSA 03-2011-3.2 (SEQ WS&S D&C Code V1.4-2024).  |
| Facility to connect an emergency generator | Required at all sites where a permanent generator with ATS is not installed. |
| Pressure Accumulator Tank | Required to limit pump start/stop cycles with a single pump operating at minimum speed under minimum demand conditions.A jockey pump may also be used to provide stable pump operation for minimum flow conditions for the supply zone. | Section 6.2.7 of WSA 03-2011-3.2 (SEQ WS&S D&C Code V1.4-2024). |
| Hydraulic surge affects | Hydraulic modelling required for loss of power during high flow and low flow scenarios  | Section 7.3 of WSA 03-2011-3.2(SEQ WS&S D&C Code V1.4-2024). |

### Water Booster Zone Details

*Provide available water booster pumping station details including calculated values in Table 4‑4 Water Booster Zone Details below.*

Water booster pumping station zone details are provided in Table 4‑4.

Table 4‑4 Water Booster Zone Details

| **Parameter**  | **Value** | **Reference/Advice** |
| --- | --- | --- |
| **Water Booster Design Capacities** |
| Average Day Demand (L/day) |  | [Planning Report/ MCPS/Water Approval] |
| Fire Flow + (Factor x PH) (L/s) |  |  |
| Fire Flow + (Factor x PH) Duty Lift (m) |  |  |
| Peak Hour Demand (L/s) |  |  |
| Peak Hour Duty Lift (m) |  |  |
| Minimum Flow (L/s) |  |  |
| Minimum Flow Duty Lift (m) |  |  |
| **Upstream Supply Zone Details** | **Value** |
| Supply Zone Name |  |
| Supply Zone Reservoir Name  |  |
| Supply Zone Reservoir TWL (mAHD) |  |
| Supply Zone Reservoir BWL (mAHD) |  |
| **Booster Zone Details** | **Value** |
| Booster Zone Name |  |
| Number of Residential Properties  |  |
| Number of Commercial Properties |  |
| Number of Properties Totally without water if booster does not operate |  |

### Pump Selection

*The designer shall obtain a number of pump selections from reputable pump suppliers to cover the above specified duty range. The pump set as a whole, is required to be able to operate efficiently and reliably over a typical water booster flow and duty-lift range. An NPV calculation should be carried out, based on a typical diurnal flow pattern for the water booster zone assuming that this flow pattern will exist immediately, at year 1.*

*A selection table shall be completed and supplied in Appendix 3 for the project specific derivative of this report. The selection table shall show and discuss, but may not be limited to the following criteria:*

* *Purchase and supply cost of pumps and any propriety multi-pump controller.*
* *Pump efficiency*
* *Energy cost NPV calculated monthly over a 15 year period by taking the integrand of instantaneous P1 Power (wire Power) of the pump, motor and VSD as a combined unit, for a whole average day, and multiply this value x 365/12. Provide details of assumed discount factor and electricity tariff.*
* *Any relevant build material differentiator that would affect the life of the pump or its parts. Refer to Table 4‑5 Water Booster Pump Skid Requirements.*
* *Any relevant performance differentiator.*
* *Stock location and supply line information as well as lead times for the supply of spare parts.*
* *Availability of a local servicing organisation for the selected pumps.*

*Include a summary of the selected pump units in this part of the report. Provide copies of the completed selection criteria evaluation table and the manufacturer’s product information indicating specific material build and feature options for the proposed pumps that are considered as part of the pump selection process in Appendix. 3*

Pump selection details and curves are attached at Appendix 3.

*Provide a figure showing the plot of the required pump duty design points from Table 4‑4 Water Booster Zone Details overlayed on the pump characteristic curve for the composite curve for the proposed pump skid performance envelope.*

*Also provide information from the pump supplier showing pumping efficiency, NPSHr and absorbed power for the pump over the full range of operation that is warranted by the pump supplier. The pump selection shall be conforming to guidance provided by the pump supplier with respect to the Allowable Operating Region (AOR, ANSI 9.6.3.2) across the full speed range of the pump.*

## Booster Pump Skid Requirements

Water booster pump skid requirements are provided in Section 7.9 of TMS1639 Mechanical General Specification.

## Mechanical Design

### Applicable Codes and Standards

The Urban Utilities specifications listed in Section 2.3 will be observed with respect to the mechanical design works.

The mechanical equipment and materials shall comply with the relevant Urban Utilities Technical Standards and relevant Australian Standards.

### Noise

All items that can potentially generate noise above allowable limits shall be attenuated as necessary to maintain plant noise levels to comply with TMS1639 and *Environmental Protection (Noise) Policy 2019*.

### Maintenance Access

Urban Utilities’ pumping station maintainers must be able to position their service vehicles so that they can use the hydraulic jib crane that is mounted on the service vehicle to access mechanical equipment. So far as is reasonably practicable and safe, the pumping station design must minimise the distance between the closest approach of the service vehicle to the centre of gravity of the furthest pump. This consideration must also be given to any other heavy machinery item within the total design of the pumping station complex.

Requirements for the design and construction of the water booster pumping station access pavement is detailed in Section *4.10.3 Access Roads* of this document. Also refer to section 4.1.2.

### Flowmeter

Flowmeters may be installed on either the suction or the discharge side of the water booster pump station either in a pit as indicated in drawing 486/4/25-002, or above ground, within the pump station building as shown indicated in template drawing 413000003 provided in Appendix 2. Refer to Table 4‑6 Flowmeter Requirements.

Table 4‑6 Flowmeter Requirements

| **Parameter** | **Value** |
| --- | --- |
| Flowmeter Type | Electro-magnetic |
| Maximum measurement error | +/- 0.5% , Operating range cut-off at 2mm/s |
| Enclosure Rating of Flow Tube | AS1939 – IP68 |
| Measuring tube material | SS 304L |
| Measuring tube flange material | Carbon Steel, Flanges ASTM A105 |
| Measuring tube liner | Natural Rubber. |
| Sensor Housing  | Carbon steel, fully welded housing. |
| Sensor Electrode Material | C22 Hastelloy |
| Ground Disks | C22 Hastelloy |
| External Coating Flow Tube | AS2312.1 - EVH2 or ISO12944-5 A1.26 Very high build Epoxy.  |
| Product Selection and Installation references | 486/4/25-0005-002, TMS60 and TMS62. |
| Size  | To match rising main nominal bore diameter. |
| Voltage | 24V DC |
| Physical installation option (Remote) | Transmitter/controller within switchboard cables shall be connected, tested and potted at the flow tube by the manufacturer, prior to shipping. Flow tube sensor may be on suction or discharge pipe. |
| Connection | Flange AS4087 PN16 |

## Facility Piping and Jointing Requirements

List any specific project requirements.

Buried piping shall comply with SEQ Code and TMS1435.

Generally, flanges shall comply with AS4087, using grade 316 stainless steel bolts and nuts with washers. Studs bolts and tapped flanges shall not be permitted. Flanges for any PE Piping shall be 316SS, full Face with SS backing rings. Any buried flanges must be fully protected using a conforming, barrier system such as Denso Petrolatum System or similar. Above ground pipe within the water booster facility area shall be FBE or equivalent thermally bonded polymeric coated ductile iron pipe. Pipe that passes under structures and pavements shall be MSCL joint-free, reinforced concrete-encased pipe.

## Building Design

Update section as required. If not applicable, remove wording and indicate not applicable, or change wording to describe the alternate design that meets the project requirements.

Water booster building requirements are provided in Table 4‑7 Building Design Requirements

| Table 4‑7 Building Design Requirements |
| --- |
| **Item**  | **Requirement** |
|  |  |
| Building Importance Level | 3 – Public Utilities (National Construction Code - Table B1.2) |
| Building Classification | 10a – non-habitable  |
| Fire Resistance | Refer NCC clauses:* A5.6 Resistance to the incipient spread of fire
* C2.13 Electricity supply system
 |
| Flood Resistance | Building work in designated flood hazard areas is regulated by the Queensland Building Act 1975. and the Queensland Development Code 3.5 - Construction of buildings in flood hazard areas. |
| Earthquake | * Refer to NCC, *Section B – Structural, Part B1 Structural Provision – Performance Requirements and Verification Methods*. Noting *BP1.1(b)* and *BV1 and BV 2 Reliability and Robustness* respectively.
* Refer AS/NZS 1170 Part 2 - Structural design actions — Wind actions
 |
| Wind Resistance | * Refer to NCC, *Section B – Structural, Part B1 Structural Provision – Performance Requirements and Verification Methods*. Noting *BP1.1(b)* and *BV1 and BV 2 Reliability and Robustness* respectively.
* Refer AS/NZS 1170 Part 2 - Structural design actions — Wind actions
 |
| Building Construction | FloorWallsRoof StructureRoofing MaterialRoof Insulation | Reinforced Concrete, slab on groundArchitectural Face Block (Structural, reinforced masonry).Steel TrussSteel roll form sheet (standard orb corrugated profile)70mm Anti-con blanket (glass wool with reinforced foil backing), supported on battens, under the roof sheet.Expanded Polystyrene cladding shall not be used |
| Internal Wall Ceiling | [If applicable][If applicable] |
|  | Building design and materials may be varied according to architectural preference in providing a visually pleasant building that is in keeping with the building function and the locality in which the water booster pumping station is situated |
| External Lighting |   |
| Internal Lighting  |   |
| Ventilation | Non-habitable building, Ventilation may be required to manage heat loads from electrical switchboard and pump motors. Sound attenuating, weather, vermin and wasp proof induct and educt louvres. Thermostat controlled low noise fan on the educt, set to start 40oC. And stop at 30oC.Vents and fan locations must ensure adequate ventilation/cooling is achieved past the heat sources in the room, i.e. achieve cross flow past pumps and the switchboard.  |
| Floor Drain | 25mm fall across the floor towards the main door. No floor sump. |
| Entry and Exit Doors | 2 alternate safe paths for egress from the pump station building shall be provided. If an electrically operated panel lift door is for the main door opening, then 2 hinged emergency exit doors are required. Doors must have a sound attenuation rating. Also refer to TMS176 Security Design Guidelines. |
| Main Door Opening Size (minimum) | Width 3.5m, Height 3.2m. To allow the rear of the fitter’s service vehicle to enter and for the hydraulic jib crane to be used to lift and load pumps. Also refer to TMS176 Security Design Guidelines. |
| Main Door | Sound attenuating, hinged double, or electrically operated panel lift door. The main door must have a sound attenuation rating.  |
| Access Space Around Pumps | Conformance with AS3000 and AS1657. Walk through path minimum width is 1100mm. Minimum clearance on non-walk through side of pumps is 600mm. |
| Ceiling Height (minimum) | 3.5m to provide lifting head room over pumps for hydraulic jib crane. |
| Cable Management | Under slab to adjacent each plant and instrument item. Pump control signal may not be co-located in pump power conduit. Out of ground cable and supports must not obstruct access to plant and instruments. A separate Electrical Conduit Layout Plan with schedule shall be provided. |

## Electrical and Instrumentation Design

### Applicable Codes and Standards

The Urban Utilities specifications listed in Section 2.3 will be observed with respect to the electrical and instrumentation design works.

The electrical and instrumentation equipment and materials shall comply with the relevant Urban Utilities Technical Standards and relevant Australian Standards.

### Electrical Specific Design Deliverables

Water booster pumping stations shall be designed in accordance with requirements detailed and referenced in Table 4‑8 Electrical Design Deliverables. The electrical switchboard design for the proposed new water booster pumping station shall generally follow this design and include necessary changes to match the specific supply, load and site requirements for this project.

Table 4‑8 Electrical Design Deliverables

| **Doc Number** | **Title** | **Revision** |
| --- | --- | --- |
| [doc #] | Power Systems Analysis Report | [rev #] |
| [doc #] | Lightning Protection Design Report | [rev #] |
|  |  |  |

### Power System Analysis (PSA)

*A PSA shall be undertaken for the proposed new water booster pumping station in accordance with TEM336. The PSA shall be delivered as a single consolidated report. The PSA shall include the following elements: Load flow, pump starting analysis, fault current calculation, protection coordination, arc flash analysis, LV cable calculations and harmonic analysis.*

 *Include summary of key details and requirements.*

### Electrical Equipment

*Update section as required. If not applicable, remove wording and indicate not applicable.*

*New electrical equipment shall be preferentially selected from TMS62. Datasheets for new electrical equipment to be developed during detailed design.*

*The installation of equipment and cabling shall comply with the requirements of TMS1732.*

### Lightning Protection

*Complete section as required. If not applicable, remove wording and indicate not applicable.*

*All platform structures and equipment installed shall be protected against damage from lightning strikes. The design shall minimise the risk to personnel and the electrical system, under lightning strike conditions. Lightning protection for the platforms shall designed and installed in full compliance with TMS1732.*

### Uninterruptable Power Supply (UPS)

*Add details as required. If not applicable, remove wording and indicate not applicable.*

## Control Systems

### Applicable Codes and Standards

The Urban Utilities specifications listed in Section 2.3 will be observed with respect to the control system design works.

The control system equipment and materials shall comply with the relevant Urban Utilities Technical Standards and relevant Australian Standards.

### Control System Design

*Update section as required. Reference site-specific functional specification (SSFS).*

*SSFS shall comply with TEM587 and TMS1733.*

*New control system hardware shall be selected from* TMS62 Preferred Equipment List Electricaland Instrumentation *and* TMS1151 Preferred Equipment List Control Systems*.*

## Civil Design

### Applicable Codes and Standards

The Urban Utilities specifications listed in Section 2.3 will be observed with respect to the civil design works.

### Survey Data

All levels used on the project shall be to the Australian Height Datum (AHD) and the project documents must reference the adopted PSMs.

### Access Roads

All water booster pump stations must have all weather paved surfaces to support maintenance vehicle access, including provision for safe manoeuvring of the vehicle to get on and off the public road in accordance with the requirements of the Local Authority or DTMR as applicable.

The vehicular entry gate to the fenced site must be recessed and configured to allow the design maintenance vehicle to be located completely within the front property boundary of the site. The water booster pumping station access road shall conform to Section 15 of *TMS 1731 Civil & Structural General Specification* except as follows:

* *Always adopt a turn-out pavement*
* *Vehicle pavement width 4 metres minimum.*
* *Growth is not assumed for the design life.*
* *Pavement to be reinforced concrete.*
* *The design vehicle is as per* Table 4‑9 Design Vehicle Details (Fitter’s Service Vehicle)
* *The design vehicle must be able to:*
	+ *always enter and leave the site in a forward direction while being located on the reinforced concrete pavement at all times; and*
	+ *manoeuvre within the site to access the water booster pumping station building as specified while located on the reinforced concrete pavement at all times*
* *Access from the public road must also meet requirements of the road authority*

| Table 4‑9 Design Vehicle Details (Fitter’s Service Vehicle) |
| --- |
| **Units** | **(mm)** |
| Vehicle model | Wheel base | Overall length | Rear Overhang | Rear track | Front track | Height | Cab height | Body width | Turn radius |
| NPR400 Medium | 3,365 | 5,985 | 1,510 | 2,115 | 2,115 | 2,500 | 2,270 | 2,250 | 6,300 |

Design Drawings shall include a general layout drawing with vehicle turning paths showing the vehicle entering the site and reversing into the building as well as leaving the site and turning onto the roadway.

The size of the site provided for the water booster pumping station must be adequate to achieve the access road criteria herein. Vertical grades within the site must be suitable for all operational requirements including design vehicle manoeuvring.

### Stormwater Drainage

*Complete section as required.*

*Appropriate levels shall be designed to ensure no backflows to the new infrastructure.*

*Design floods shall be estimated using the methodologies described in the Queensland Urban Drainage Manual 2017 (QUDM). An Average Exceedance Probability (AEP) of 5% shall be applied for general site drainage and access roads.*

*Building downpipes shall be directed to ground at an appropriate location such as the road kerb or alternatively shall be discharged to the existing or proposed piped stormwater network.*

*Where stormwater flows are concentrated, the design should provide for these to be directed through natural flow paths towards, and able to connect to existing stormwater drainage systems.*

*Adopt recommendations in QUDM for the design of stormwater systems.*

### Fencing & Guarding

Update section as required. If not applicable, remove wording and indicate not applicable.

Site fencing where required shall be to the following minimum standard:

* 1.8m high chain link fence;
* three strands of barbed wire;
* fence post extension cranked 45O outwards from secure area, except gate posts.

Adopt standard Urban Utilities drawings for fencing as detailed in Section 2.4.

Refer to TMS176 Security Design Guidelines.

# APPENDICES

## Appendix 1 – Project Drawing List

Table 5‑1 Project Drawing List

| **Drawing Number** | **Title** | **Reference/ Guidance** |
| --- | --- | --- |
| [value] | COVER SHEET AND LOCALITY PLAN | 413000001 |
| [value] | GENERAL LAYOUT AND DRAINAGE PLAN | 413000002 |
| [value] | BUILDING PLAN PIPE LAYOUT AND MATERIALS LIST | 413000003 |
| [value] | PUMP STATION BUILDING SECTION VIEWS | 413000004 |
| [value] | VEHICLE ENTRY AND EXIT LAYOUT | 413000005 |
| [value] | WATER BOOSTER STANDARD DRAWING INDEX | WB???-1000\_EE-DRG-0001 |
| [value] | SINGLE LINE DIAGRAM – 400VAC & 230VAC | WB???-1000\_EE-DRG-0002 |
| [value] | POWER DISTRIBUTION SCHEMATIC DIAGRAM - 400VAC & 230VAC | WB???-1000\_EE-DRG-0003 |
| [value] | SCHEMATIC DIAGRAM – WATER BOOSTER PUMPS 1 & 2 | WB???-1000\_EE-DRG-0004 |
| [value] | SCHEMATIC DIAGRAM – WATER BOOSTER PUMPS 3 & 4 | WB???-1000\_EE-DRG-0005 |
| [value] | SCHEMATIC DIAGRAM – WATER BOOSTER PUMPS 5 & 6 | WB???-1000\_EE-DRG-0006 |
| [value] | SCHEMATIC DIAGRAM MANUAL TRANSFER SWITCH CONTROL | WB???-1000\_EE-DRG-0007 |
| [value] | (*RESERVED GENERATOR CONTROL)* | WB???-1000\_EE-DRG-0008 |
| [value] | SCHEMATIC DIAGRAM – 24VDC DISTRIBUTION & RTU LAYOUT | WB???-1000\_EE-DRG-0009 |
| [value] | SCHEMATIC DIAGRAM – COMMON CONTROLS | WB???-1000\_EE-DRG-0010 |
| [value] | SCHEMATIC DIAGRAM – COMMON RTU I/O | WB???-1000\_EE-DRG-0011 |
| [value] | TERMINATION DIAGRAM – RTU DIGITAL INPUTS - SHEET 1 OF 2 | WB???-1000\_EE-DRG-0012 |
| [value] | TERMINATION DIAGRAM – RTU DIGITAL INPUTS - SHEET 2 OF 2 | WB???-1000\_EE-DRG-0013 |
| [value] | TERMINATION DIAGRAM – RTU DIGITAL OUTPUTS | WB???-1000\_EE-DRG-0014 |
| [value] | TERMINATION DIAGRAM – RTU ANALOG INPUTS | WB???-1000\_EE-DRG-0015 |
| [value] | TERMINATION DIAGRAM – COMMON CONTROL & GENERATOR | WB???-1000\_EE-DRG-0016 |
| [value] | TERMINATION DIAGRAM – PUMP ENCLOSURE | WB???-1000\_EE-DRG-0017 |
| [value] | SWITCHBOARD EQUIPMENT SCHEDULE | WB???-1000\_EE-DRG-0018 |
| [value] | SWITCHBOARD CABLE SCHEDULE | WB???-1000\_EE-DRG-0019 |
| [value] | SWITCHBOARD LABEL SCHEDULE | WB???-1000\_EE-DRG-0020 |
| [value] | SWITCHBOARD CONSTRUCTION DETAILS – Sheet 1 of 3 | WB???-1000\_EE-DRG-0021 |
| [value] | SWITCHBOARD CONSTRUCTION DETAILS – Sheet 2 of 3 | WB???-1000\_EE-DRG-0022 |
| [value] | SWITCHBOARD CONSTRUCTION DETAILS – Sheet 3 of 3 | WB???-1000\_EE-DRG-0023 |
| [value] | GENERAL ARRANGEMENT – PUMP SWITCHBOARD - ELEVEATIONS | WB???-1000\_EE-DRG-0024 |
| [value] | GENERAL ARRANGEMENT – PUMP SWITCHBOARD - SECTIONS | WB???-1000\_EE-DRG-0025 |
| [value] | CLEARANCE REQUIREMENTS – PUMP SWITCHBOARD | WB???-1000\_EE-DRG-0026 |
| [value] | (*RESERVED GENARATOR EXTERNAL CONNECTION BOX)* | WB???-1000\_EE-DRG-0027 |

## Appendix 2 – Typical Electrical Drawings (MPC Grundfos).

|  |  |
| --- | --- |
| **URBAN UTILITIES DWG No** | **Title** |
| WB???-1000\_EE-DRG-0001 | ELECTRICAL DRAWING INDEX |
| WB???-1000\_EE-DRG-0002 | SINGLE LINE DIAGRAM – 400VAC & 230VAC |
| WB???-1000\_EE-DRG-0003 | POWER DISTRIBUTION SCHEMATIC DIAGRAM - 400VAC & 230VAC |
| WB???-1000\_EE-DRG-0004 | SCHEMATIC DIAGRAM – WATER BOOSTER PUMPS 1 & 2 |
| WB???-1000\_EE-DRG-0005 | SCHEMATIC DIAGRAM – WATER BOOSTER PUMPS 3 & 4 |
| WB???-1000\_EE-DRG-0006 | SCHEMATIC DIAGRAM – WATER BOOSTER PUMPS 5  |
| WB???-1000\_EE-DRG-0007 | SCHEMATIC DIAGRAM MTS CONTROL |
| WB???-1000\_EE-DRG-0008 | (RESERVED GENERATOR CONTROL) |
| WB???-1000\_EE-DRG-0009 | SCHEMATIC DIAGRAM – 24VDC DISTRIBUTION & RTU LAYOUT |
| WB???-1000\_EE-DRG-0010 | SCHEMATIC DIAGRAM – COMMON CONTROLS |
| WB???-1000\_EE-DRG-0011 | SCHEMATIC DIAGRAM – COMMON RTU I/O |
| WB???-1000\_EE-DRG-0012 | TERMINATION DIAGRAM – RTU DIGITAL INPUTS - SHEET 1 OF 2 |
| WB???-1000\_EE-DRG-0013 | TERMINATION DIAGRAM – RTU DIGITAL INPUTS - SHEET 2 OF 2 |
| WB???-1000\_EE-DRG-0014 | TERMINATION DIAGRAM – RTU DIGITAL OUTPUTS |
| WB???-1000\_EE-DRG-0015 | TERMINATION DIAGRAM – RTU ANALOG INPUTS |
| WB???-1000\_EE-DRG-0016 | TERMINATION DIAGRAM – COMMON CONTROL & GENERATOR |
| WB???-1000\_EE-DRG-0017 | TERMINATION DIAGRAM – PUMP ENCLOSURE |
| WB???-1000\_EE-DRG-0018 | SWITCHBOARD EQUIPMENT SCHEDULE |
| WB???-1000\_EE-DRG-0019 | SWITCHBOARD CABLE SCHEDULE |
| WB???-1000\_EE-DRG-0020 | SWITCHBOARD LABEL SCHEDULE |
| WB???-1000\_EE-DRG-0021 | SWITCHBOARD CONSTRUCTION DETAILS – Sheet 1 of 3 |
| WB???-1000\_EE-DRG-0022 | SWITCHBOARD CONSTRUCTION DETAILS – Sheet 2 of 3 |
| WB???-1000\_EE-DRG-0023 | SWITCHBOARD CONSTRUCTION DETAILS – Sheet 3 of 3 |
| WB???-1000\_EE-DRG-0024 | GENERAL ARRANGEMENT – PUMP SWITCHBOARD - ELEVEATIONS |
| WB???-1000\_EE-DRG-0025 | GENERAL ARRANGEMENT – PUMP SWITCHBOARD - SECTIONS |
| WB???-1000\_EE-DRG-0026 | CLEARANCE REQUIREMENTS – PUMP SWITCHBOARD |
| WB???-1000\_EE-DRG-0027 | (RESERVED GENARATOR EXTERNAL CONNECTION BOX) |
| WB???-1000\_EE-DRG-0028 | GENERAL ARRANGEMENT – CONDUIT DETAILS |

## Appendix 2 – Example Electrical Drawings (Lowara/Hydrovar).

|  |  |
| --- | --- |
| **URBAN UTILITIES DWG No** | **Title** |
| 486/4/7-0046-000 | WATER BOOSTER DRAWING INDEX/COVER SHEET |
| 486/4/7-0046-001 | SINGLE LINE DIAGRAM – 400VAC & 230VAC |
| 486/4/7-0046-002 | POWER DISTRIBUTION SCHEMATIC DIAGRAM - 400VAC & 230VAC |
| 486/4/7-0046-003 | SCHEMATIC DIAGRAM – WATER BOOSTER PUMPS 1 & 2 |
| 486/4/7-0046-004 | SCHEMATIC DIAGRAM – WATER BOOSTER PUMPS 3 & 4 |
| 486/4/7-0046-005 | SCHEMATIC DIAGRAM – 24VDC POWER DISTRIBUTION & AUX CIRCUITS |
| 486/4/7-0046-006 | COMMUNICATIONS TOPOGRAPHY AND TERMINATION DIAGRAM |
| 486/4/7-0046-007 | SCHEMATIC DIAGRAM – RTU DIGITAL INPUTS SCHEMATIC DIAGRAM |
| 486/4/7-0046-008 | SCHEMATIC DIAGRAM – RTU DIGITAL INPUTS EXPANSION MODULE 1  |
| 486/4/7-0046-009 | SCHEMATIC DIAGRAM – RTU DIGITAL OUTPUTS |
| 486/4/7-0046-010 | SCHEMATIC DIAGRAM – RTU ANALOGUE INPUTS |
| 486/4/7-0046-011 | TERMINATION DIAGRAM – RTU DIGITAL INPUTS - SHEET 1 OF 2 |
| 486/4/7-0046-012 | TERMINATION DIAGRAM – RTU DIGITAL INPUTS - SHEET 2 OF 2 |
| 486/4/7-0046-013 | TERMINATION DIAGRAM – RTU DIGITAL OUTPUTS |
| 486/4/7-0046-014 | TERMINATION DIAGRAM – RTU ANALOG INPUTS |
| 486/4/7-0046-020 | SWITCHBOARD EQUIPMENT LIST |
| 486/4/7-0046-021 | SWITCHBOARD CABLE SCHEDULE |
| 486/4/7-0046-022 | SWITCHBOARD LABEL SCHEDULE |
| 486/4/7-0046-023 | SWITCHBOARD CONSTRUCTION NOTES – Sheet 1 |
| 486/4/7-0046-024 | GENERAL ARRANGEMENT – PUMP SWITCHBOARD - ELEVEATIONS |
| 486/4/7-0046-025 | GENERAL ARRANGEMENT – ESCUTCHEONS SHOWN |
| 486/4/7-0046-026 | GENERAL ARRANGEMENT – FRONT ELEVATIONS ALL COVERS OPEN |
| 486/4/7-0046-027 | GENERAL ARRANGEMENT – PLAN SECTIONS |
| 486/4/7-0046-028 | DETAILS SHEET 1 of 2 |
| 486/4/7-0046-029 | DETAILS SHEET 2 of 2 |

## Appendix 3 – Pump Selection Details

## Appendix 4 – Details of Proposed Variations

| **No.** | **REFERENCE*****(to standard document, including Clause No.)*** | **REASONS FOR PROPOSED VARIATION** | **DETAILS OF PROPOSED VARIATION** |
| --- | --- | --- | --- |
| 1 |  |  |  |
| 2 |  |  |  |
| 3 |  |  |  |
| 4 |  |  |  |
| 5 |  |  |  |