SA Water

Engineering

Technical Standard

TS 0104 - Design quality management

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Acknowledgements

The valuable input of the many reviewers who participated in the industry review of this document has been greatly appreciated in the development and finalisation of this document. Thank you for your time, effort and willingness to be a part of developing this standard.

Documents superseded by this standard

SAWG-ENG-0520 version 2.0 (Consultant accreditation information)

Significant/major changes incorporated in this edition

This is the first version of this technical standard.

Implementation of this standard

Full implementation of this Technical Standard will occur across a three month transitional period to:

a. Provide an opportunity for Design Consultants and other users of the document to become familiar with its requirements

b. Allow preliminary performance feedback to be provided to Accredited Consultants/Accredited Superintendents prior to formal implementation.

    i. A new Accredited Superintendent list will be published on the SA Water website, with all level 1 consultants (under the existing system) to be included at level 2 (per section 5.5.1.2)

c. Enable SA Water to fully deploy the systems required for the standard to achieve full functionality.

SA Water will host technical forums in within approximately 4 weeks of release of this standard, in support of these objectives.

The following sections of this Technical Standard will become fully operational from the **18th of November 2024**, noting the application of newly released technical governance per TG 0103:

a. Section 5.5

b. Section 6.3 (including Appendix D)

Document controls

Version history

Version	Date	Author	Comments
1.0	16-08-2024	Matthew Davis	First issue.

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Matthew Davis	Manager Engineering Quality and Innovation	17/08/2024 X Signed by: DA003681
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Role	Name	Revision	Review Date
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Principal Civil/Structural Engineer	Hany Habib	0.3	15-02-2024
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Various	Industry reviewers	0.4	29-04-2024
Manager Engineering Delivery	Raj Ramachandran	1.0	07-08-2024

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1 Introduction

SA Water is responsible for an extensive amount of engineering infrastructure and relies on professional engineering services to support the maintenance, upgrade and replacement of this infrastructure.

This Technical Standard has been developed to establish SA Water's requirements with respect to the quality of design activities, to ensure designs for infrastructure projects:

a. Are delivered by competent and experienced personnel,

b. Use suitably thorough and rigorous quality assurance, both in the development of design and during construction,

c. Achieve outcomes which are effective, functional, safe and in accordance with SA Water's Project Requirements.

1.1 Purpose

The purpose of this standard is to establish the requirements and expectations of design activities undertaken for all SA Water infrastructure (inclusive of infrastructure whose ownership is to be transferred to SA Water by agreement), and the role and accountabilities of those involved.

This document is structured as follows, to reflect the different mechanisms by which infrastructure is designed and delivered for SA Water:

a. Section 4: Design requirements - General

b. Section 5: Design requirements – Land development

c. Section 6: Design requirements – SA Water capital projects

The requirements of section 4 apply across all designs for SA Water infrastructure, while sections 5 and 6 provide specific requirements tailored to specific types of infrastructure projects.

1.2 Glossary

The following glossary items are used in this document:

Term	Description
ACR	Asset Criticality Rating (refer TS 0109)
AS	Australian Standard
BAL	Bushfire Attack Level
CAR	Corrective Action Report
CDR	Concept Design Report
CFD	Computational Fluid Dynamics
CHAZOP	Control System Hazard and Operability
CLoS	Customer Level of Service
CV	Curriculum Vitae
D&C	Design and Construct
DA	Development Application
DAFI	Developer Agreement Formal Instrument
DBR	Design Basis Report
DDR	Detailed Design Report
DMP	Design Management Plan

Term	Description
ECI	Early Contractor Involvement
EPA	Environment Protection Authority
ESCOSA	Essential Services Commission of South Australia
FEA	Finite Element Analysis
HAZOP	Hazard and Operability
IFC	Issued for Construction
ITP	Inspection and Test Plan
NCR	Non-conformance Report
OE	Owner's Engineer
QA	Quality Assurance
QMP	Quality Management Plan
QMS	Quality Management System
RFI	Request for Information
SA Water	South Australian Water Corporation
SiD	Safety in Design
TDRF	Technical Dispensation Request Form
TG	SA Water Technical Guideline
TLoS	Technical Level of Service
TS	SA Water Technical Standard
WHS	Work Health and Safety
WSAA	Water Services Association of Australia

1.3 References

1.3.1 Australian and International

The following table identifies Australian and International standards and other similar documents referenced in this document:

Reference	Title
	Work Health and Safety Act 2012 (SA)
	Work Health and Safety Regulations 2012 (SA)
AS/NZS ISO 19011	Guidelines for Auditing Management Systems
AS/NZS ISO 9001	Quality Management Systems

1.3.2 SA Water Documents

The following table identifies the SA Water standards and other similar documents referenced in this document:

Reference	Title
-	SA Water technical dispensation request procedure
SAWG-ENG-0521	Major land developments safety in design management plan
SAW-PR-0006	Procurement and contract management procedure *(internal SA Water use only)*
SCM	Sewer construction manual

Reference	Title
TG 0103	Approach to Technical Governance
TG 0530	Sewer network hydraulic design considerations to minimise network odour impact
TG 0531	Gravity network ventilation design
TS 0100	Requirements for technical drawings
TS 0101	Safety in design
TS 0106	Temporary works (when published)
TS 0109	Infrastructure design
TS 0110	Durability design
TS 0130	As constructed data requirements for linear assets
TS 0132	Operation and maintenance manuals
TS 0134	Requirements for automated assessment
TS 0523	Requirements for drawings in land development projects (when published)
TS 0700	Design, assessment and retrofitting of SA Water assets in bushfire-prone areas
TS 0910	Surge mitigating infrastructure
WSCM	Water services construction manual

1.4 Definitions

The following definitions are applicable to this document:

Term	Description
Accepted	Determined to be satisfactory by SA Water's Representative.
Accredited Consultant	Consultants whose design activities are typically undertaken for works delivered under a DAFI
Accredited Superintendent	Authorised under a DAFI agreement to support an effective quality assurance process during construction of infrastructure to be transferred to SA Water by proactively managing risk and working with Constructors to ensure delivery of infrastructure that satisfies SA Water's requirements.
Agent	Person or organisation that engages a Designer.
Authoriser	Ensures that the relevant review and verification activities/process of a given output have been completed.
Constructor	The organisation responsible for constructing and installing infrastructure for SA Water whether it be a third party under contract to SA Water or an in-house entity.
Contract	A set of documents supplied to the Constructor as the basis for construction; these documents contain contract forms, contract conditions, specifications, drawings, addenda, and contract changes.
Design Consultant	An organisation who employs Designers, Reviewers and Verifiers, and is responsible for designing infrastructure for SA Water. This may be as a third party under contract (for example, to SA Water or a Constructor), or internal to SA Water.
Design Deliverables	Documents intended to provide sufficient technical information in detail about the work to be constructed, and to provide a record of works undertaken.
Design Manager (Agent)	The person/s, nominated by the Constructor, who is responsible for co-ordinating site investigations, meetings, project interfaces/stakeholders (inclusive of the Designer) and commissioning activities.

Term	Description
Design Manager (Design Consultant)	The person, employed by the Design Consultant, who is responsible for oversight and coordination of design effort (inclusive of managing any sub-consultants directly engaged by the Design Consultant) to deliver a design which complies with SA Water's Project Requirements.
Designer	The organisation responsible for designing infrastructure for SA Water whether it be a third party under contract to SA Water or a Constructor, or an in-house entity. A Designer is a person who effects design, produces designs or undertakes design activities as defined in the *Work Health and Safety Act 2012 (SA)*.
Drawing	A document intended to provide sufficient technical information in detail about the work to be constructed, and to provide a record of works undertaken.
Inspection	Measuring, testing or examining of Works, materials or goods or services (includes raw materials, components and intermediate assemblies) for determining conformity with the Requirements.
Inspection and Test Plans	The planned inspections and tests for individual work processes or activities.
Manufacturer	A person, group, or company that owns and operates a manufacturing facility that provides materials for use in SA Water infrastructure.
Non-Conformance Report	Report provided to SA Water by the Constructor on non-conforming products indicating the proposed rectification method and supporting information.
Owner's Engineer	Engaged by SA Water to protect the SA Water's interests by ensuring the works progress project progresses in accordance with SA Water's Project Requirements.
Principal	As defined in SA Water's Developer Agreement Formal Instrument
Project Sponsor	Asset planner accountable for ensuring a project is governed effectively and delivers outcomes that achieve the required level of service.
Requirement	Need or expectation that is stated within the Contract.
Reviewer	A suitably qualified and experienced person, who: • Carries out design review activities to ensure technical requirements are satisfied. • Possesses water industry experience specifically related to the subject area for which the review is being undertaken.
Responsible Discipline Lead	The engineering discipline expert identified in the 'Approvers' table (via SA Water's Representative).
Representative	The Representative shall be either one of the following: • For Works delivered under a Developer Agreement Formal Instrument (DAFI), this shall be the Accredited Superintendent. • For works delivered directly for SA Water under a contract or other engagement, this shall be the SA Water Representative.
SA Water Project Requirements	Documentation (for example, Request for Quotation, Functional Specification etc.) specifying SA Water's requirements for a given project, and inclusive of SA Water's Technical Governance.
SA Water Representative	The SA Water representative with delegated authority under a Contract or engagement, including (as applicable): • Superintendent's Representative (for example, AS 4300 and AS 2124 etc.). • SA Water Project Manager. • SA Water nominated contact person.
Shall and should	In this Standard the word "shall" indicates a requirement that is to be adopted to comply with the Standard. The word "should" indicates practices which are

Term	Description
	advised or recommended.
Supplier	A person, group or company that provides goods for use in SA Water infrastructure.
Technical Dispensation Request Form	This form is part of SA Water's Technical Dispensation Request Procedure which details the process by which those required to comply, or ensure compliance, with SA Water's technical requirements may seek dispensation from those requirements.
Technical Governance	SA Water's primary method for articulating required technical outcomes to stakeholders, usually via Technical Standards, Standard Drawings etc.
Terminology	• Where an obligation is given and it is not stated who is to undertake these obligations, they are to be undertaken by the Constructor. • Directions, instructions and the like, whether or not they include the expression "the Constructor shall" or equivalent, shall be directions to the Constructor, unless otherwise specifically stated. • Where a submission, request, proposal is required and it is not stated who the recipient should be, it is to be provided to SA Water's Representative for review. • Each word imparting the plural shall be construed as if the said word were preceded by the word "all". • Each word implying persons shall, where appropriate, also be construed as including corporations. • "Authorised", "approval", "approved", "selected", "directed" and similar words shall be construed as referring to the authorisation, approval, selection or direction of SA Water's Representative in writing. • "Allow" shall mean that the cost of the item referred to is the responsibility of the Constructor. • "Provide" shall mean "supply and install". • "Submit" shall mean "submit to the SA Water Representative or their nominated delegate". • Submissions, requests, and proposals are to be provided at least 10 business days before work commencing or material ordering (unless noted otherwise). • "Informative" shall mean "provided for information and guidance".
Verifier	A suitably qualified and experienced person, who: • Carries out design verification to ensure technical requirements are satisfied. • Possesses water industry experience specifically related to the subject area for which the verification is being undertaken.
Work	Elements of a project which require design and/or construction.

2 Scope

The scope of this Technical Standard is to establish SA Water's minimum requirements for how design activities are to be managed, to ensure that SA Water infrastructure is designed such that it:

a. Is safe, and satisfies SA Water's obligations under the *Work Health and Safety Act* 2012 (SA)

b. Complies with applicable legislation, regulations, standards and state government policy

c. Satisfies the performance requirements and outcomes stipulated in SA Water's Project Requirements and

d. Achieves the outcomes (e.g., CLoS, TLoS etc.) expected by SA Water's customers, regulators and key stakeholders.

This Technical Standard defines:

a. Design management requirements.

b. The roles, responsibilities and accountabilities of Designers, Reviewers, Verifiers and Agents.

c. Competencies of personnel engaged for design, review and verification activities.

d. The design process to be followed

e. An escalation process for disputes and review comment resolution.

f. How non-conformances are raised and managed.

Unless noted otherwise (or approved via a TDRF), this Technical Standard is applicable for all design activities undertaken for SA Water infrastructure.

2.1 Exclusions

The following are excluded from the scope of this Technical Standard:

a. Designs undertaken by SA Water employees for network alterations delivered **strictly** in accordance with SA Water's WSCM and SCM drawing sets (namely minor third party works or extension and connection designs)

b. Legislative/Statutory/Planning approvals

c. Cultural/Environmental assessments or investigations

d. Project risk assessments (aside from project risks pertinent to design activities)

e. Evaluation of sustainability, environmental and circular economy parameters.

f. Commissioning requirements or procedures (excepting the role of the Designer).

g. Systems engineering deliverables

h. Design of temporary works

i. Levels of detail for the technical content of design documentation.

2.2 Technical dispensation

Departure from any requirement of this Technical Standard requires the submission of a Technical Dispensation Request Form (TDRF) for review and approval/rejection, in accordance with SA Water's Technical Dispensation Procedure. These are submitted and evaluated on a case-by-case basis, noting that:

a. The Agent shall not proceed to engage a Design Consultant who is not an SA Water panel member (Engineering or Automation) until the respective Panel Manager has provided approval via the Technical Dispensation Request Form (TDRF).

b. The Designer shall not proceed to document/incorporate any non-conforming work before an approved TDRF has been issued.

c. The use of companies other than SA Water's Accredited Consultants or Accredited Superintendents for works delivered via a DAFI is not permitted

    i. Dispensation requests to use companies not listed as an SA Water Accredited Consultant or Accredited Superintendent will not be accepted.

SA Water requires sufficient information to assess dispensation requests and their potential impact. The onus is therefore on the proponent to justify dispensation request submissions and provide suitable evidence to support them.

Design works that are carried out without being appropriately sanctioned by SA Water shall be liable to rejection by SA Water and retrospective rectification by the Design Consultant/Constructor.

3 Use of design consultants at SA Water

Design Consultants play an essential role in the development of engineering designs and provision of technical services in support of delivering works on SA Water infrastructure. Such works are broadly grouped into three project types, with design capability which shall be as described in Table 1Table 1.

Table 1 - Engineering design matrix

Project type	Engineering design by
SA Water capital	SA Water panel/s
SA Water operational	SA Water panel/s
Land development	Refer Table 2

Table 2 – Land development design matrix

Infrastructure Type(1)	Accredited Consultant(2)	SA Water Panel Member(3)
Standard infrastructure(4)	Permitted	Permitted
Non-standard infrastructure(5)	Not permitted	Permitted
Non-standard connection/augmentation(6)	Not permitted	Permitted

Notes:

1) Including single or multi-stage developments
2) Refer section 5.2
3) SA Water Engineering or Automation Panel (as appropriate), refer section 3.1
4) Standard infrastructure includes:
   a. Drinking and non-drinking water networks to ≤ DN375 (inc. highway, creek, and rail crossings)
   b. Gravity sewer networks to ≤ DN300 (inc. highway, creek, and rail crossings)
   c. Sewer rising mains to ≤ DN200 (inc. highway, creek, and rail crossings)
   d. Wastewater pumping stations with a design flow rate of ≤ 30L/s which includes:
      i. Siting of the wastewater pumping station and
      ii. Determination of design flows originating within a development
   e. Connections to gravity sewer pipelines mains ≤ DN300 (unless excluded by note 6)
   f. Connections to drinking and non-drinking water mains ≤ DN375 (unless excluded by note 6)
   g. Tankering sites
5) Non-standard infrastructure includes:
   a. Pressure reducing valve stations.
   b. Booster pump stations
   c. Pipe diameters or flow rates greater than those prescribed in note 4.
   d. Vacuum or Pressure sewer systems.
6) Non-standard connection/augmentation includes:
   a. Connection to critical facilities or trunk mains
   b. Augmentation or modification of critical infrastructure

3.1 SA Water panels

SA Water maintains two panels (an Engineering Panel and an Automation Panel), in which companies have been evaluated via a formal procurement process to confirm their capability to deliver designs of a high standard to SA Water.

Panel members shall only be engaged to provide design capability within the scope for which the panel was established. Engagement of a panel member to undertake other design activities will require a TDRF to be submitted and approved before proceeding (refer section 3.1.3).

Compliance with the requirements of this Technical Standard is a crucial element of becoming (and remaining) a member of SA Water's panels. SA Water reserves the right to conduct audits of a Design Consultant at any time to monitor performance against the requirements of this Technical Standard.

3.1.1 Engineering panel

The companies that constitute SA Water's engineering panel are as follows:[1]

a. SMEC/Stantec
b. GHD
c. WSP/Entura
d. Tonkin

3.1.2 Automation panel

The companies that constitute SA Water's automation panel are as follows:

a. Alliance Automation
b. ATSYS
c. GPA Engineering
d. Verbrec
e. SAGE Automation

[1] The presence of a '/' indicates that the second company is a secondary partner, and engagements must go through the primary partner

3.1.3 Use of SA Water panels

Excluding designs delivered by SA Water personnel, the use of design capabilities that are not from an SA Water panel member requires an approved TDRF **before** any engagement is entered into. Approval of any such TDRF does not override any of SA Water's commercial requirements with respect to the engagement of design services, and these shall be followed by the Agent as applicable.

TDRF submissions requesting the use of non-panel design services must contain **all** of the following:[2]

a. Details of why design capability outside SA Water's panels is required

b. The quality systems the proposed design consultant currently maintains (ISO 9001 etc.)

c. The systems/procedures for design, review and verification (refer section 4.3)

d. Details of how technical capability is being matched to the requirements of section 4

e. A Curriculum Vitae of personnel to be used (demonstrating suitability and experience) and nominating their role in the design engagement (Reviewer, Verifier etc.)

f. Potential risks foreseen in engaging a non-panel Design Consultant.[3]

g. Cost implications, which **must be quantified** against a comparable scope of work.

3.1.3.1 Sub-consulting requirements

The use of sub-consultants by members of SA Water panels is only permissible without specific SA Water approval where either:

a. The sub-consultant is another SA Water panel member or

b. The sub-consultant is not an SA Water panel member and has been engaged to provide additional capacity in areas of technical capability the panel member already possesses.

Where the conditions above are not satisfied, a TDRF shall be prepared and submitted by the Design Consultant which provides details of:

a. Why the capability is being sought by the Design Consultant

b. How capability of the sub-consultant has been evaluated by the Design Consultant, per the requirements of this Technical Standard

c. How the Design Consultant will ensure review and verification requirements of this Technical Standard will be satisfied, and what corrective actions will be implemented should issues arise.

It shall be noted by both the Agent and Design Consultant that the use of sub-consultants does not absolve the Design Consultant of their design accountabilities under this Technical Standard, and they remain accountable for ensuring the quality management requirements of section 4.3 are satisfied.

[2] The TDRF shall be submitted by the Agent for the engagement, who is accountable for ensuring compliance with the requirements of this Technical Standard, and any other conditions listed in the TDRF.

[3] Management of these risks shall be nominated in a corresponding mitigation plan

4 Design requirements - general

This section outlines SA Water's general design requirements, which are applicable to all designs undertaken for SA Water infrastructure (unless noted otherwise).

4.1 Design development principles

In the development and delivery of design for SA Water infrastructure, SA Water requires Designers to develop designs such that each stage of design is consistent with, and a logical development of, the preceding version(s) of the design, and is not of a lesser standard (by ways of technical robustness, quality, maturity etc.) than any preceding version of the design.

In addition, SA Water requires that designs:

a. Comply with SA Water's Project Requirements, with any deviations to be authorized in accordance with section 2.2.

b. Consider temporary or enabling works that may be required to facilitate installation/construction/commissioning.

c. Are cost effective, as evaluated as total expenditure across the entire design life, inclusive of OPEX, major maintenance and CAPEX.

d. Maintain clear version control and document identification

   i. For drawings, this shall be consistent with TS 0100 and TS 0523 (as appropriate)

   ii. For Safety in Design outputs, this shall be consistent with TS 0101

   iii. For Operation and Maintenance Manuals, this shall be consistent with TS 0132

e. Comprise of equipment, materials, coatings and detailing which are appropriate for the operating environment.

f. Be cognisant of equipment/material availability, and not unduly increase SA Water's requirement to procure and hold additional spares.

g. Represent outcomes that are:

   i. Safe
   ii. Sustainable
   iii. Healthy
   iv. Functional
   v. Operable
   vi. Maintainable
   vii. Reliable
   viii. Durable
   ix. Resilient

h. Have been through a rigorous quality assurance process (including a technical evaluation via a documented review and verification process), which confirms that the design satisfies SA Water's project requirements (refer section 4.3).[4]

Where the Designer wishes to deviate from SA Water's Project Requirements, the process identified in section 2.2 shall be followed.

4.2 Design responsibilities and accountabilities

4.2.1 Agent

The Agent is the organisation or individual who engages a Designer to deliver a design in accordance with the project requirements.

[4] Designers who sub-contract work to other remain accountable for satisfying this requirement

The Agent is expected to work collaboratively with the Designer to co-create a suitable design engagement scope, noting that where an Agent makes decisions pertaining to technical deliverables to be produced by the Designer (and in particular, their omission), that the Agent assumes responsibility and liability of a Designer with respect to those matters, under the definition provided in this Technical Standard (which is also aligned with the *Work Health and Safety Act* 2012 (SA)).

Where the Agent engages multiple Designers, the Agent assumes accountability for items a) to c) of section 4.2.2. Failure of the Agent to comply with these requirements to deliver satisfactory outcomes constitutes a non-conformance under this Technical Standard.

a. For land development works, this will be addressed as provided in section 5.5.

b. For SA Water capital works, this will be actioned as provided in section 7.

4.2.2 Design consultant

The Design Consultant is an organisation who employs Designers, Reviewers and Verifiers, and is responsible for designing infrastructure for SA Water. This may be as a third party under contract (for example, to SA Water or a Constructor), or internal to SA Water.

The Design Consultant is wholly and fully accountable for design and design management activities necessary to satisfy project requirements. Where the Design Consultant engages sub-consultants or sub-contractors to undertake design and investigation activities, the Design Consultant is accountable for:

a. Managing the design interfaces across the Design Consultants engaged

b. Co-ordinating the outputs across the sub-consultants or sub-contractors, to ensure the outputs from each are compatible

c. Confirming that the final design satisfies both the project requirements and design quality expectations of SA Water (as articulated in this Technical Standard).

Activities pursuant to SA Water acceptance/sign-off of infrastructure upon completion of a project remains the responsibility of the SA Water Representative. However, this shall be supported by the activities of the Design Consultant, as described in this Technical Standard.

4.2.3 Designer

4.2.3.1 General

The Designer is employed by a Design Consultant and is the individual responsible for designing infrastructure for SA Water.

A Designer undertakes design activities to create deliverables for a given design output, as defined in the *Work Health and Safety Act* 2012 (SA), and shall be appropriately qualified, experienced and competent in the area for which they are undertaking design activities.

SA Water supports and encourages the development of junior and/or inexperienced personnel. However, where such personnel are used for SA Water projects, they are to be supervised and supported by a Senior Engineer who is appropriately qualified, competent and experienced in the area for which design activities are being undertaken. This shall be noted in both the DMP, and the review/verification outputs for a given design.

4.2.3.2 Role post design

At the conclusion of formal design activities, SA Water expects the Agent to work collaboratively with the Designer to identify the support required during the construction and commissioning phases of an infrastructure project, to ensure suitable quality assurance and design validation activities are undertaken. However, where the Agent does not engage the Designer to undertake the activities nominated in sections 4.2.3.2.1 and 4.2.3.2.2, **the Agent does so at their own risk, and assumes responsibility for these activities.**

The Owner's Engineer (and other SA Water employees) **shall not** be used to supplement any omission on the part of the Agent in accounting for such activities to be undertaken.

4.2.3.2.1 During construction

To ensure the construction of infrastructure designed for SA Water satisfies the original design intent, the Designer shall have an active role supporting the Constructor during the construction phase of a project, including, but not limited to the following activities:

a. Supporting quality assurance activities by undertaking inspections and validating constructed works against the design to facilitate certification of as constructed drawings etc. (refer section 4.3.4).

b. Reviewing vendor drawings/datasheets etc. to verify compliance with SA Water's Project Requirements, SA Water Technical Governance and the design intent.

c. Checking shop drawings created for fabrication activities, to ensure these are consistent with the design, and comply with SA Water technical standards.

d. Supporting the Constructor through the provision of technical advice and direction, to ensure works are constructed in accordance with the design, and relevant standards.

e. Reviewing, documenting and authorising any design changes made during construction, while ensuring SA Water requirements are satisfied.

4.2.3.2.2 During commissioning

To ensure new SA Water infrastructure is commissioned appropriately and shown to satisfy the original design intent, the Designer shall have an active role prior to and during commissioning. This includes, but is not limited to:

a. Ensuring the design makes suitable provision for commissioning to be conducted

b. Contributing to preparation of the commissioning plan by:

   i. Detailing the test procedure

   ii. Defining tests and pass/fail criteria.

   iii. Defining interfaces to be managed and/or checked.

c. Reviewing and approving the final commissioning plan

d. Attending site during commissioning to troubleshoot/support commissioning activities (as required)

4.2.4 Reviewer

The Reviewer is employed by a Design Consultant and is the individual responsible for the review of designs for SA Water infrastructure.

SA Water requires that all designs developed for its infrastructure shall be subject to a design review, which is to be undertaken by a Reviewer. The Reviewer shall:

a. Be at the level of a senior engineer (or higher),

b. Have suitable qualifications and industry experience specifically related to the subject area for which the review is being undertaken and

c. Satisfy the registration requirements of section 4.3.2.1.

In undertaking a design review, the Review shall undertake the following tasks for given design outputs (as a minimum):

a. Perform alternative calculations
    i. While the Reviewer is not expected to reproduce all calculations, it is expected that they perform alternative calculations or a detailed check of a representative sample.
b. Review any modelling inputs against real world conditions to validate their suitability/applicability
    i. This review shall also include a check of modelling parameters used to ensure that these are realistic and represent an appropriate level of design conservatism
c. Compare the design to the requirements provided in the contract specification
d. Compare the design to statutory requirements
e. Compare the design with the requirements of SA Water Technical Governance, and with the requirements of applicable national and international standards (as applicable)
f. Compare the design to similar proven designs and
g. Compare the design to industry recognised best practice

The design and associated documentation shall be promptly revised to resolve all issues raised by the Reviewer. It is the responsibility of the Designer to liaise with the Reviewer to ensure all comments and queries are adequately addressed and rectified, with actions to be documented.

Once all review comments and queries have been resolved, the Designer is to liaise with the Reviewer for final confirmation, certification and progression of the design to the Verifier.

4.2.5 Verifier

The Verifier is employed by a Design Consultant and is the individual responsible for design verification for the design of SA Water infrastructure.

SA Water requires that all designs developed for its infrastructure shall be subject to a design verification, which is to be undertaken by a Verifier. The Verifier shall:

a. Possess experience at least equal to the Reviewer (and preferably greater)
b. Have suitable qualifications and industry experience specifically related to the subject area for which the review is being undertaken and
c. Satisfy the registration requirements of section 4.3.2.1.

The Verifier shall verify that the design output/s are, as a minimum:

a. Completed to an appropriate level
b. In accordance with SA Water's Project Requirements, SA Water Technical Governance and with the requirements of applicable national and international standards (as applicable)
c. In accordance with statutory requirements, including safety in design requirements (per TS 0101) or design certification requirements (e.g. TS 0910)
d. Appropriate and adequate in meeting the functional, contractual, and other specified requirements of the brief and may address issues such as construction, operation, and decommissioning
e. Incorporate any previous lessons learned.
f. Complete (inclusive of comments being closed/resolved) and suitable for the next stage of the project for which the design output/s are being issued

The design and associated documentation shall be promptly revised to resolve all issues raised by the Verifier. It is the responsibility of the Designer to liaise with the Verifier to ensure all comments and queries are adequately addressed and rectified, with actions to be documented and resolved in accordance with section 6.2.3.1.[5]

Once all review comments and queries have been resolved, the Designer is to liaise with the Reviewer for final confirmation, certification and progression of the design to the Authoriser.

4.2.5.1 Verifier independence

SA Water does not require Verifiers to be completely independent and permits Designers to engage with Verifiers at a high level throughout the development of a design. This engagement is intended to be for support and/or guidance, to ensure delivery of design outputs that satisfy SA Water's Project Requirements, as well as those of this Technical Standard.

This engagement with the Verifier is subject to the following conditions:

a. The Verifier is not to be directly involved in the creation of design documentation, including, but not limited to, modelling, calculations, reports and drawings.

b. The Verifier is not to act as Reviewer on the same Design Deliverable.

4.2.6 Authoriser

The Authoriser ensures that the relevant review and verification activities/process of a given output have been carried out as per the requirements of this Technical Standard.

In authorising finalised documents (refer section 4.4), the Authoriser confirms that:

a. The appropriate checks, reviews and verifications have been undertaken and documented

b. Any design documentation prepared by sub-consultants has been suitably integrated by the Designer

c. Review comments have been actioned and closed

d. Statutory requirements (e.g. Safety in Design) have been documented, and actions closed.

e. All design deliverables have been completed, and that the design output is suitable for use by outside parties

SA Water permits the Reviewer or Verifier to perform the role of the Authoriser, subject to their satisfying all requirements of this Technical Standard in doing so.

4.2.7 Owner's Engineer

The Owner's Engineer is a role undertaken by SA Water Engineering (or a Design Consultant engaged by SA Water Engineering, to act on their behalf) to protect SA Water's interests, by ensuring works are delivered in accordance with SA Water' Project Requirements. In support of this objective, the Owner's Engineer may undertake monitoring and/or reviews of design/construction/commissioning activities and raise issues for the Designer and/or Constructor to address.[6]

The presence of an Owner's Engineer's role in a given project is determined by SA Water and will be communicated to the Agent and/or Designer developing the DMP by the SA Water Representative.

[5] For land development projects, this is managed via the audit process defined in section 5.5.1.3.

[6] In land development projects, this role is undertaken by the Accredited Superintendent.

Issue of documents for Owner's Engineer review shall occur in accordance with section 6.2.2, noting that the Owner's Engineer:

a. Is **not** accountable for delivering activities nominated in sections 4.3 and 4.4.

b. Shall not be considered by the Design Consultant or Constructor as being part of their quality management processes.

c. Shall be considered as part of the stakeholder engagement process required during design development, which is to be guided by project requirements an impacted stakeholders (whether SA Water staff or otherwise)

d. **Does not** relieve the Designer or Constructor of their responsibilities and obligations under the Contract for the suitability and performance of their design against project requirements (including SA Water's Technical Governance).

e. Is **not** liable or responsible, **even after completing reviews**, for errors, deficiencies, defects or omissions in the Designer or Constructor's documentation.

f. Is **not** obliged to accommodate accelerated review times to relieve schedule pressures resulting from variables within either the Designer or Constructor's control (for example, late submissions of design deliverables, quality management issues, scheduling etc.).

    i. Acceptance of an accelerated review shall only be with agreement of the Owner's Engineer, per section 6.2.2.

Failure of the Designer or Agent to engage with the SA Water Owner's Engineer (where this role is present on a given project) prior to the 30% stakeholder review gate will be considered a non-conformance to this Technical Standard.

4.3 Quality management requirements

4.3.1 General

Management of design quality is essential to ensuring safe, functional and value for money outcomes are achieved in the design of SA Water infrastructure. To ensure this, Design Consultants designing SA Water infrastructure shall:

a. Maintain a Quality Management System (QMS), certified to ISO 9001 and audited in accordance with AS/NZS ISO 19011.

b. Ensure the capability and experience of Designers assigned to design engagements is proportional to the technical risk and complexity of the design being undertaken.

    i. Design Consultants shall utilise a technical risk classification system (specific to their organisation), to manage the experience, capability and competence of design personnel.

    ii. SA Water requires that projects which are of a high technical risk or complexity to have more experienced people deployed for design, review and verification activities, compared to projects with lower technical risk or complexity.

c. Have a design and verification procedure which achieves the purpose and outcomes described in section 4.3.2.

d. Implement system/s (e.g., training and development, skills matrices, succession planning etc.) to ensure the capability and experience of staff used for SA Water projects continues to be maintained in accordance with this Technical Standard

e. Have a procedure to ensure that all comments/actions from design reviews (including design verification) and SiD workshops (including other safety in design activities such as HAZOPs, CHAZOPs etc.) are closed appropriately (refer section 6.2.3.1, which shall also apply to land development projects).

f. Provide appropriate and traceable document version control (refer section 4.4)

SA Water reserves the right to right to audit and/or request evidence of the application of a Design Consultant's quality systems (including an Agent who is acting as a Designer) at any time, to ensure that all requirements of this Technical Standard are being satisfied.

4.3.2 Design review and verification

Design review and verification is a critical activity that provides safeguards against technical errors, omissions or inconsistencies that may result in design/project/safety/performance outcomes not being achieved.

4.3.2.1 General

SA Water considers a robust design review and verification process to be the cornerstone of a Design Consultant's QMS, to ensure appropriate quality assurance and technical peer review is undertaken and can be demonstrated in the design of infrastructure.

Documented evidence of design review and verification having been completed shall accompany all design documentation issued by the Design Consultant. As a minimum, this shall consist of:

a. A record of changes, including highlights/revision clouds of all changes in the document since the last issue
    i. This excludes minor changes to correct spelling/grammatical errors etc.
b. Document version control which nominates who has undertaken the individual roles within the design and verification process.
c. The submission of other documentation required by a Design Consultant's QMS (for example, checklists, reports, forms, registers etc.) is also encouraged

This evidence constitutes a **WITNESS POINT** under this Technical Standard, and is to be provided as follows:

a. For Land Development projects, evidence to be provided at each instance of submitting a design for audit
b. For SA Water capital projects, evidence to be provided at each stakeholder review gate and when designs are issued for acceptance (refer section 6.2)

Where it is evident that the quality of the review and verification process for submitted documentation does not satisfy this Technical Standard (or is absent), a non-conformance shall be raised.

As of the **1st of July 2026**, Reviewers and Verifiers of SA Water infrastructure designs shall be Chartered Professional Engineers (CPEng), or equivalent (e.g. RPEng) who are registered with a recognised professional engineering body in Australia. Reviewers and Verifiers shall also:

a. Only undertake review/verification activities in their area/s of competence, in accordance with their professional engineering body's code of ethics. For example, an electrical engineer shall not review or verify structural drawings and so on.
b. Provide their name (not initials), post nominals (e.g. CPEng, RPEng etc.) and membership/registration number on all documentation submitted to SA Water (per SA Water's Project Requirements) that they have reviewed/verified.

4.3.2.2 Design review

The design review is a quality process used to confirm that specified requirements, standards and criteria of the reviewed design element, product or associated output have been met.

A design review of all design deliverables (including drafting) is to be undertaken by the Reviewer to ensure the suitability and completeness of the output. Reviews shall include, as a minimum, confirmation that the design:

a. Represents a robust, safe, functional and durable infrastructure which achieves the objectives of SA Water's Project Requirements.
    i. This requirement applies to the design as a whole, as well as for each contributing engineering discipline
b. Is technically sound, constructable, commissionable and operable, to satisfy SA Water's Project Requirements.
c. Demonstrates that appropriate coordination of design interfaces (particularly for multidisciplinary projects) has occurred
d. Has used appropriate/current design methods, references, systems, and equipment
e. Is based on appropriate and acceptable design inputs (e.g. modelling parameters/boundary conditions, geotechnical investigations, site surveys, product datasheets, stakeholder feedback, environmental/cultural heritage assessments, land use planning etc.)
    i. That is, the output complies with, and is traceable to, the inputs.
f. Is consistent with other design and construction activities on the project.
g. Is free of errors, omissions, conflicting/contradictory information and non-conformances
h. Contains correct and current references to other documentation (internal and external to the design output)
i. Satisfies the requirements of SA Water Technical Standards, Australian and International Standards (as appropriate to the project) or has been granted formal approval to deviate from these requirements in accordance with Section 2.2.
j. Complies with legal and statutory requirements
k. Conveys information such that the intent of the Designer is understood by the Constructor and
l. Complies with SA Water's standard formatting requirements/style guide.

Design reviews may be undertaken at any time during the development of a design. However, prior to issuance of any design documentation to SA Water for review/audit, evidence of the design review having been undertaken shall be provided in accordance with section 4.3.2.1.

4.3.2.3 Design verification

Design Verification is a risk mitigation process used to confirm that the reviewed design outputs satisfy SA Water's Project Requirements and shall be conducted by the Verifier.

The scope of the verification is to perform a wholistic assessment of the design documentation against the project design criteria including. Design Consultants are expected to implement systems to ensure design outputs consistently satisfy SA Water's Project Requirements.

This may include, but not limited to:

a. Confirming the design review has been completed correctly
b. Confirming that design outputs satisfy SA Water's Project Requirements
c. Comparison with proven designs
d. Checking of data, calculations, etc., including independent spot calculations
e. Readability, accuracy, and completeness of reports.

Projects with low technical complexity may seek approval to reduce or omit design verification via a TDRF. Such submissions, along with requiring endorsement of the Project Sponsor, shall reference how technical risk is to be managed if verification is not to occur.

4.3.3 Design authorisation

Authorisation of a design output represents the final stage before issuing design documentation for acceptance to the SA Water Representative (per section 6.2.3)[7]. Prior to transmitting any issued for acceptance drawings and other finalised design outputs (for example, calculations, documents, reports and other design related documentation), documents must be signed by the Authoriser to warrant that necessary checks have been undertaken (refer section 4.2.6).

Intermediate documents moving through design development and stakeholder review gates, are not required to be formally authorised, although version control shall be provided (per section 4.4).

4.3.4 Design validation

The purpose of design validation is to confirm that SA Water's Project Requirements will be satisfied by the design. This process differs from design verification in that it occurs over multiple phases of an infrastructure project, starting with design and progressing through commissioning to:

a. Validate that what is being built during construction matches the design, which may include (but is not limited to)
    i. On site activities undertaken by the Designer (e.g. pre-pour inspections, ITP sign off etc.)
    ii. Providing technical support to the Constructor during construction (e.g. RFI responses).
b. Validate, via commissioning and as constructed drawings (refer section 4.2.3.2), that infrastructure:
    i. Has been built in accordance with the design.[8]
    ii. Functions in accordance with the design intent and
    iii. Satisfies SA Water's Project Requirements.

Responsibility for the forgoing activities is vested with the Design Consultant and shall only be carried out by competent personnel operating within their area/s of expertise. The Agent may assume these responsibilities, subject to the conditions of section 4.2.3.2.

[7] For land development projects, this is managed via the audit process defined in section 5.5.1.3.

[8] This is intended to function as a Designer's review of as constructed drawings, and certification that they represent construction of infrastructure as designed. The Designer is not responsible for the accuracy of the as constructed drawings, unless engaged accordingly. Any lack of detail in as constructed drawings that impacts certification shall be raised with the Constructor for resolution. Where a non-conformance with the original design is identified (whether by construction defect or design changes not authorised by the Designer), the Constructor shall raise a non-conformance, which shall be addressed in accordance with TS 0105.

4.4 Document management

SA Water requires all design documents prepared for its infrastructure to incorporate document control principles across their development, publication and subsequent revision. This section provides minimum requirements for document control across design report outputs (including design reports, calculations etc.) and design drawings.

4.4.1 Document revision

The revisions of design documentation shall follow the following convention:

a. Minor revisions are to be used during the review/verification process or stakeholder engagement etc., and shall increase in 0.1 increments

b. Major revisions are to be used at design milestones (e.g. issued for acceptance) and shall increase in 1.0 increments.

For example, a drawing at the 30% stakeholder review gate that has been revised twice to that point (during the review and verification process) would be revision 0.3.

4.4.2 Design reports

All design reports shall be provided with document control as shown in Figure 1 (details of inputs required are provide in italics). For large, multi-discipline engagements, there may be multiple lines within one revision to reflect the various engineering disciplines involved. However, only one individual may act as the document authoriser.

Definitions of the roles and responsibilities of those contributing to the document are defined in section 4.2.

Figure 1 - Document Control (Reports)

Revision	Date	Designer	Reviewer	Verifier	Status
0.1	*dd/mm/yy*	*Given Name, Surname* *Title* *Organisation*	*Given Name, Surname, Post nominals* *Title* *Registration no.* *Organisation*	*Given Name, Surname, Post nominals* *Title* *Registration no.* *Organisation*	*Draft*
0.2	*dd/mm/yy*	*Given Name, Surname* *Title* *Organisation*	*Given Name, Surname, Post nominals* *Title* *Registration no.* *Organisation*	*Given Name, Surname, Post nominals* *Title* *Registration no.* *Organisation*	
Authorised by:					
Accepted by SA Water Representative#:					

Applies only when documentation is issued for acceptance, refer section 6.2.3

4.4.3 Design drawings

Design drawings shall comply with the requirements below and for the Design Panel, adopt the naming convention of 'first name initial', 'full stop', 'full surname'. For example, 'John Drafter' would be written as 'J. DRAFTER'.

In design drawings, document revision information shall be recorded in the revision panel as the design progresses, in accordance with TS 0100.

4.4.3.1 Land development projects

Design drawings for land development projects shall be prepared and submitted in accordance with TS 0523, with definitions of roles and accountabilities as defined in this Technical Standard.

4.4.3.2 SA Water capital projects

SA Water uses an automated drawing management system (Meridian/Lunr) to ensure consistency and traceability of design drawings delivered as part of SA Water infrastructure projects. The specific requirements of drawings being entered into Meridian/Lunr is defined in TS 0100, with definitions of roles and accountabilities to be as defined in this Technical Standard.

4.4.4 As constructed drawings

Creation and submission of as-constructed drawings serves an essential quality assurance activity that validates that the design has been constructed in accordance with the IFC documentation (refer section 4.4.4). In addition, it provides SA Water with crucial information to identify the location and orientation of constructed infrastructure for future reference.

Preparation of as constructed drawings by the Designer is not a mandatory requirement. However, as constructed drawings shall be:

a. Developed in accordance with the quality requirements of this Technical Standard
b. Developed and submitted in accordance with TS 0100, TS 0130, TS 0134 and TS 0523 (as appropriate)
c. Checked and certified by the Designer that infrastructure has been constructed in accordance with the issued for construction drawings (refer section 4.3.4).
    i. Where this is not the case, a non-conformance process shall be initiated by the Constructor in accordance with their QMS.

4.4.5 Changes to final/IFC documentation

After being Issued For Construction, design documentation may not be altered or deviated from without a written **HOLD POINT** release from both the SA Water Representative and the Designer. This approval shall be sought using a change management process, which includes (as a minimum):

a. Documented engagement with impacted project stakeholders (per the change management process provided in the DMP)
b. Confirmation from the Designer of the suitability of the change, relative to satisfying SA Water's Project Requirements
c. Systematic identification and documentation of the impact of the change, per TS 0101
d. Version control of impacted documents which complies with this Technical Standard.

4.4.6 Digital signatures

Digital signatures shall be used for all design documentation where signatures are required (typically it is the Authoriser and the SA Water Representative who will sign documents). As a minimum, the details within the digital signature shall be presented in the following order:

a. Full Name
b. Signature
c. Title
d. Organization[9]
e. Date

An important distinction between digital signatures and electronic signatures is that the latter are not validated for authenticity. An electronic signature is simply an electronic representation of a person's signature, whereas a digital signature contains a unique digital identifier to verify its authenticity.

4.5 Environmental and sustainability considerations

Along with complying with all relevant legislative and regulatory requirements, the Designer shall consider the following (where applicable) during the development of a design:

a. Accounting for impacts of climate change and flooding, per TS 0109.
b. Minimising noise and vibration impacts, particularly during operation and construction
c. Minimising impact to native vegetation.[10]
d. Prioritising the preservation of cultural heritage and areas of cultural significance
e. The South Australian Planning and Design Code (refer https://code.plan.sa.gov.au)
f. Adopting principles of sustainable design provided in TS 0109
g. Reducing waste by using/reusing/incorporating existing infrastructure into the new design, where technically and economically appropriate.
h. Utilising design features (where technically appropriate) that can be constructed using less invasive construction techniques (for example, hydro excavation or trenchless techniques) to minimise disturbance of nearby trees and sensitive buried assets.
i. Adopting water sensitive urban design principles to manage site stormwater runoff.
j. Managing the BAL in accordance with TS 0700.
k. Using design features and principles that minimise odour generation in wastewater infrastructure, per TG 0530 and TG 0531.

[9] Typically, the Designer's direct employer, unless otherwise agreed in a secondment arrangement

[10] Any removal of native vegetation may require a native vegetation impact assessment.

5 Design requirements – land development

This section outlines SA Water's specific requirements for designs prepared for land development projects, which are delivered via a DAFI.

5.1 Review and issue of designs

For Land Development infrastructure delivered via a DAFI, in addition to the requirements of TS 0101 and TS 0523, interface and engagement with key project stakeholders shall be undertaken in accordance with SA Water's "*Major Land Developments Safety in Design Management Plan*", which is available on the SA Water website.

5.2 Accreditations

Land developers shall only engage:

- SA Water Accredited Consultants to prepare designs for new water/sewer infrastructure (in accordance with Table 3) and
- SA Water Accredited Superintendents to oversee construction activities.

The requirements and application process for these consultants is presented in sections 5.3 and 5.4 respectively, along with the criteria against which their performance is evaluated and managed.

5.2.1 Sub-consulting requirements

An Accredited Consultant may only engage sub-consultants for land development projects where these are:

a. Another accredited consultant, with a performance rating level of 1 or 2 at the time of engagement or

b. A member of SA Water's panels (refer section 3.1)

The use of sub-consultants does not absolve the Accredited Consultant of their design accountabilities under this Technical Standard, and they remain accountable for ensuring the quality management requirements of section 4.3 are satisfied.

5.3 Accredited Consultants for land development

Accredited Consultants for land development are consultants whose design activities are typically undertaken for works delivered under a DAFI.

SA Water maintains an Accredited Consultants rating list, which can be found on the SA Water website.

For continued inclusion on the list of Accredited Consultants, a consultant is required to:

a. Consistently perform at a rating level of 1 or 2 (refer section 5.5)

b. Be actively participating in design for water and sewer infrastructure, over a 24-month period **and**

c. Satisfy Quality Management System certification and insurance requirements

SA Water Accredited Consultants are only authorised to prepare and submit designs as permitted in Table 2. The design of this infrastructure must comply with the requirements of SA Water's Technical Governance, relevant national standards and WSAA codes (including SA Water supplements to these).

5.3.1 Application process

Applications to become an Accredited Consultant will only be accepted when applications are listed as being open on the SA Water website. Applicants shall be familiar with SA Water's technical requirements **prior** to making an application.

To be considered for accreditation, applicants must:

a. Provide details and evidence of appropriate qualifications and experience for all key personnel undertaking the applicable functions nominated in section 4.2.

b. Provide a copy of the company's Quality Management System certification

c. Provide Public Liability and Professional Indemnity insurance certificates of currency

d. Demonstrate experience in design projects of various levels of complexity

e. Provide copies of designs **and** safety in design hazard registers for three projects of similar complexity to the design of SA Water infrastructure

f. Not have been removed from SA Water's Accredited Consultant's rating list within the last 18 months.

SA Water will interview the applicant and may request further information to determine capability to perform at the required standard.

5.3.2 Application outcome

SA Water will provide a written response regarding the outcome of an application to become an Accredited Consultant based on the evaluation criteria in Table 3.

Table 3 - Accredited Consultant Evaluation Criteria

Criteria	Requirement
Personnel	Suitably qualified and experienced key personnel, per section 4.2 inclusive
Quality Systems	Provided, and are certified to ISO 9001 or equivalent
Insurance	Sums insured consistent with the requirements of Annexure A of SA Water's Land Development Agreement
Experience	Proof of extensive involvement in at least 3 relevant design projects, with all supporting documentation provided
Quality of design documents	**No** Major non-conformances and **two or less** minor non-conformances in submitted design documentation (refer Table 7).
Client References	Positive notes about the applicant/applicant's agency and the work carried out

Where applications are successful:

- SA Water will update the Accredited Consultant Rating List to include the successful company.
- A newly listed Accredited Consultant will initially be rated at level 2.

Where information submitted in the application does not satisfy SA Water's requirements, applications will be rejected, and applicants will be ineligible to make another application for a period of not less than 12 months. This decision is final and is not subject to appeal.

5.4 Accredited Superintendents for land development

Accredited Superintendents for Land Development are consultants who support works in accordance with Annexure D of SA Water's DAFI and this Technical Standard.

The Superintendent must be qualified, competent and experienced in undertaking the role in water and sewer infrastructure. Only SA Water Accredited Superintendents may undertake this role and must be listed as an Accredited Superintendent on the date on which the Developer signs the DAFI.

The role of the Accredited Superintendent is to:

a. assess and approve the construction programme proposed by the Constructor(s)

b. assess the Constructor's quality assurance processes and quality assurance documentation records, to ensure compliance with project and SA Water requirements.

c. report at least monthly to the Principal, and SA Water, of:

    i. progress against the contract programme(s), and

    ii. quality performance against SA Water's requirements

d. conduct surveillance activities in the field (in addition to site meetings) to verify SA Water requirements are being satisfied

e. ensure proposed and actual construction practices/procedures are consistent with SA Water requirements

f. assess the quality of materials and workmanship in accordance with the contract documents and SA Water requirements

g. provide technical direction to the constructor relating to design, standards and construction methodology

h. assess progress claims and issue progress certificates

i. direct variations to the work under the contract

j. assess claims for extra payments for variations to the contract

k. assess claims for extra payment such as claims relating to latent conditions

l. assess claims for extension of time

m. foster sufficient and appropriate interface between the Designer and Constructor, to ensure accountabilities and responsibilities in designing and constructing infrastructure are correctly managed

n. support the successful delivery of infrastructure to SA Water by **proactively**:

    i. managing risk

    ii. addressing issues (whether quality, safety or otherwise) before and as they arise

    iii. supporting an effective quality assurance process (inclusive of raising/closing non-conformances identified during construction)

    iv. reviewing the practices used by Constructors to identify and address any shortcomings before infrastructure is built and

    v. supporting any defect rectification works that may be required.

5.4.1 Application process

Applications to become an Accredited Superintendent will only be accepted when applications are listed as being open on the SA Water website. Applicants shall be familiar with SA Water's technical requirements **prior** to making an application.

To be considered for accreditation, applicants must:

a. Provide details and evidence of appropriate qualifications (e.g. degrees/certificates in civil engineering and/or construction etc.) and experience for all key personnel.

b. Provide details of Public Liability and Professional Indemnity insurances held

c. Demonstrate experience in water/sewer infrastructure projects of various levels of complexity

d. Provide client references for previous Superintendent engagements

e. Not have been removed from SA Water's Accredited Superintendent's rating list within the last 18 months.

SA Water will interview the applicant and may request further information to ascertain the applicant's capabilities to perform at the required standard.

5.4.2 Application outcome

SA Water will provide a written response regarding the outcome of an application to become an Accredited Superintended based on the following evaluation criteria shown in Table 4:

Table 4 - Accredited Superintendent Evaluation Criteria

Criteria	Requirement
Personnel	Suitably qualified and experienced key personnel
Insurance	Sums insured consistent with the requirements of Annexure A of SA Water's Land Development Agreement
Experience	Proof of extensive involvement in at least 3 relevant infrastructure projects
Client References	Positive notes about the applicant/applicant's agency and the work carried out

Where applications are successful:

a. SA Water will update the Accredited Superintendent rating list to include the successful company.

b. A newly listed Accredited Superintendent will initially be rated at level 2.

Where information submitted in the application does not satisfy SA Water's requirements, applications will be rejected, and applicants will be ineligible to make another application for a period of not less than 12 months. This decision is final and is not subject to appeal.

5.5 Performance management

5.5.1 Accredited Consultants and Accredited Superintendents

SA Water manages the performance of Accredited Consultants and Accredited Superintendents for land development via classification ratings, which are released bi-annually. Details of how this process functions for each are described below and **apply only for these consultants**.

5.5.1.1 Classification structure

SA Water has a three-level structure for rating its Accredited Consultants and Accredited Superintendents, which is based on audits and performance criteria shown in Table 7 and Table 9. Based on performance, a rating level of 1, 2 or 3 will be allocated, which will last for the following 6 months.

The rating levels are as follows, with the performance thresholds required to achieve each rating provided in section 5.5.2.2.

Level 1 - Outstanding

- Accredited Consultant/Superintendent has performed at a high standard against the requirements of this Technical Standard.

Level 2 - Acceptable

- Accredited Consultant/Superintendent has not achieved the standard to be rated Level 1 but have still performed to a level which justifies their continued accreditation.

Level 3 - Unacceptable

- Accredited Consultant/Superintendent have not fulfilled the requirements of this Technical Standard. The consultants will be permitted to complete development works for which they have already been formally engaged as a final opportunity to demonstrate improved performance, prior to accreditation being revoked.

Asterisk (*)

- Where an Accredited Consultant/Superintendent has not been active in land development infrastructure projects during the previous 12-month period, they will be assigned an asterisk in place of a level rating.

Hash (#)

- Where an Accredited Consultant/Superintendent has not been active in land development infrastructure projects during the previous 18-month period, they will be assigned a hash in place of a level rating.

5.5.1.2 Movement between rating levels

Movement between levels will be based on the outcome of the bi-annual performance reviews as follows:

a. Where a consultancy has achieved the standard to be rated level 1:
   i. A level 1 consultant will remain at level 1
   ii. A level 2 consultant will be elevated to level 1

b. Where a consultancy has not achieved the standard to be rated level 1, but satisfied the requirements of level 2:
   i. A level 1 consultant will be adjusted to level 2
   ii. A level 2 consultant will remain at level 2

c. Where a consultancy has performed below an acceptable level:
   i. A level 1 **or** level 2 consultant[11] will be adjusted to level 3.
   ii. SA Water will contact the consultant to provide an opportunity to discuss improvement plans.

Where poor performance continues, the consultant's accreditation will be revoked. From this point the consultant is only permitted to complete development works for which they have already been formally engaged at the time of their accreditation revocation.

[11] Unacceptable levels of performance will result in a level 3 classification, regardless of original classification.

5.5.1.3 Audits

SA Water collects performance data on its Accredited Consultants and Accredited Superintendents via audits, conducted on designs and site performance respectively, as described below.

5.5.1.3.1 Accredited Consultants

Accredited Consultants are required to submit designs for technical audit by SA Water for performance to be evaluated.

Upon submission for audit, designs and supporting information will be assessed for conformance with SA Water's Technical Governance, and against the performance criteria shown in Table 7. The resulting scoring will then be used to inform consultant ratings at the end of the performance review period (refer section 5.5.2.2). Some examples of how this scoring is applied provided in Table 5 and Table 6.

Table 5 - Audit outcome - example 1

Audit Number	First submission	Second submission	Level Rating Calculation(2)
Description of Audit Outcome	No major technical non-conformances. One minor technical non-conformance and minor deficiencies in SiD documentation noted. Design will require resubmission.	Submission complete, with no technical non-conformances. SiD documentation satisfies requirements. Design accepted.	A = 1.80 (Lvl 2) B = 1.88 (Lvl 2) C = 2.50 (Lvl 1) D = 1.90 (Lvl 1) **Rating: Level 2**
Scoring(1)	A = 1.80 B = 1.25 C = 2.50 D = 1.80	A = 1.80 B = 2.50 C = 2.50 D = 2.00	
Scoring Notes	Scoring for metric A reduced as design will be returned.	Scoring for metric A retained previous audit, as submission now satisfies SA Water requirements without further returns being necessary.	

Notes:

1) Scoring per Table 7
2) Rating per Table 8

Table 6 - Audit outcome - example 2

Audit Number	First submission	Second submission	Third submission	Fourth submission	Level Rating Calculation[2]
Description of Audit Outcome	One major and three minor technical non-conformances present. Audit on these items ceased. Minor deficiencies in SiD documentation noted. Design will require resubmission (first return).	One major and two minor technical non-conformances present. Audit on major non-conformances ceased. SiD documentation satisfactory Design will require resubmission (second return).	One major technical non-conformance. Audit on this item ceased No minor technical non-conformances. SiD documentation satisfactory Design will require resubmission (third return).	Submission complete, with no technical non-conformances. SiD documentation satisfies requirements. Design accepted.	**Design Consultant** A = 0.68 (Lvl 3) B = 2.19 (Lvl 2) C = 0.63 (Lvl 3) D = 1.45 (Lvl 3) **Rating: Level 3**
Scoring[1] ***Design consultant***	A = 1.80 B = 1.25 C = 0 D = 0	A = 0.90 B = 2.50 C = 0 D = 1.80	A = 0 B = 2.50 C = 0 D = 2.00	A = 0 B = 2.50 C = 2.50 D = 2.00	
Scoring[1] ***Certifying consultant[3]***	N/A	N/A	A = 1.80 B = 2.50 C = 0 D = 2.00	A = 1.80 B = 2.50 C = 2.50 D = 2.00	**Certifying Consultant** A = 1.80 (Lvl 2) B = 2.50 (Lvl 1) C = 1.25 (Lvl 3) D = 2.00 (Lvl 1) **Rating: Level 3**
Scoring Notes	Scoring for metric A reduced as design will be returned.	QA process has not detected all non-conformances present in first submission Scoring for metric A reduced as design will be returned. Further submissions require certification	QA process has not detected all non-conformances present in first submission Scoring for metric A reduced as design will be returned. Next submission requires re-certification	Scoring for metric A retained from previous audit, as submission now satisfies SA Water requirements without further returns being necessary.	

Notes:

1) Scoring per Table 7
2) Rating per Table 8, noting limited dataset used for this example
3) Refer Table 7, note 3

In undertaking a design audit, SA Water's role is **not** to function as an element of a consultant's QA process by providing design review. It is SA Water's expectation that as quality assured companies (certified to ISO 9001), Accredited Consultants ensure their technical capability is managed to achieve the required quality of design output.

As such, once the lowest score for a given performance metric is reached, SA Water's auditors will no longer examine the drawings against that metric.

- For example, when one major non-conformance is found during an audit, the SA Water auditor will not identify any further major technical non-conformances that may be present (this remains the responsibility of the Accredited Consultant).

5.5.1.3.2 Accredited Superintendents

SA Water will conduct audits of project quality documentation at the commencement and conclusion of projects, to evaluate Accredited Superintendent performance coupled with other performance metrics as shown in Table 9. The resulting scoring will then be used to inform consultant ratings at the end of the performance review period (refer section 5.5.2.2).

5.5.2 Performance management

SA Water's performance review process for Accredited Consultants and Accredited Superintendents is undertaken bi-annually, to ensure changes in performance and/or activity levels are identified and reflected in SA Water's published documents as early as possible.

In the event of decreased performance or activity, this process aims to provide an opportunity to improve performance and/or activity levels over the following six months, and for ratings to be updated promptly based on the outcome of these efforts.

It shall be noted that the complexity of jobs is not considered as a factor during the performance review process, as SA Water's expectation is that consultants will allocate the appropriate resources and expertise required.

5.5.2.1 Performance review criteria – Accredited Consultants

Performance reviews will occur on 6 monthly bases, using the metrics shown in Table 7 below.

Table 7 - Performance metrics (Accredited Consultants)

Metric	Description	Weighting	Scoring key	Score
A	Audit Cycles *(no. returns before a satisfactory result, per design)*	30%	10: Design accepted on first submission	3.0
			6: Design returned once	1.8
			3: Design returned twice	0.9
			0: More than twice[3]	0
B	Quality of SiD documents	25%	10: SiD Process has been applied and is supported by detailed and accurate information	2.5
			5: SiD Process has been applied, however there are minor deficiencies in the supporting information	1.25
			0: SID process has been superficially applied or there is incomplete or undeveloped information submitted	0
C	Major technical non-conformances[1] *(per design)*	25%	10: No major non-conformances	2.5
			0: One or more major non-conformances	0
D	Minor technical non-conformances[2] *(per design)*	20%	10: No minor non-conformances	2.0
			9: One minor non-conformance	1.8
			8: Two minor non-conformances	1.6
			0: More than two minor non-conformances	0

Notes:

1) A Major technical non-conformance is where the design:
   a) Does not meet network design or SA Water requirements
   b) Lacks appropriate calculations (e.g. for hydraulic design)
   c) Is a risk to safety and environment
   d) Does not suitably allow for construction, commissioning, maintenance and operation.
   e) Critical design values/data incorrect or missing
2) A Minor technical non-conformance is where the design:
   a) Contains drafting errors (such as leaders split across two sheets etc.)
   b) Contains drawings that are not compliant with TS 0523
   c) Has incorrect/incomplete construction notes
   d) Has incorrect title block content
3) Where designs have not achieved SA Water acceptance within two audit cycles (due to the presence of non-conformances etc.), designs shall be certified by another Accredited Consultant prior to re-submission to SA Water for audit.
   a) Under these circumstances, performance of **both** consultants will be evaluated.

5.5.2.2 Rating level calculation – Accredited Consultants

Consultant ratings for the period under review are calculated as an average score per performance metric, which is compared to the thresholds in Table 8 to determine rating level. The rating level will be assigned based on the metric for which the lowest score is achieved (that is, to achieve a level 1 rating, **all** metrics must achieve a score at that level).

Table 8 - Rating score thresholds (Accredited Consultants)

Metric	Description	Required Score		
		Level 1	**Level 2**	**Level 3**
A	Audit Cycles	A ≥ 2.40	1.80 ≥ A < 2.40	A < 1.80
B	Quality of SiD documents	B ≥ 2.20	1.25 ≥ B < 2.20	B < 1.25
C	Major technical non-conformances	C ≥ 2.50	1.60 ≥ C < 2.50	C < 1.60
D	Minor technical non-conformances	D ≥ 1.90	1.60 ≥ D < 1.90	D < 1.60

5.5.2.3 Performance review criteria – Accredited Superintendents

Performance reviews will occur on 6 monthly bases, using the metrics shown in Table 9.

Table 9 - Performance metrics (Accredited Superintendents)

Metric	Description	Weighting	Scoring key	Score
A	Quality Assurance – Inception[1]	20%	10: QA documentation reviewed & free of errors/omissions.	2.0
			5: QA documentation reviewed & up to three errors/omissions still present.	1.0
			0: QA documentation not reviewed or more than three errors/omissions still present.	0
B	Quality Assurance – Completion[2]	25%	10: QA documentation collated and supplied to SA Water. Documentation is fully and correctly completed, inclusive of evidence that the Superintendent has released appropriate hold points.	2.5
			5: QA documentation collated and supplied to SA Water. Documentation contains up to five errors/omission[3]	1.25
			0: QA documentation is not collated and supplied to SA Water and/or documentation contains more than five errors/omissions[3]	0
C	Undetected non-conformances[44] *(per project)*	25%	10: All non-conformances raised and actioned by Superintendent	2.5
			0: One or more non-conformances not detected which are raised by SA Water	0
D	Technical Capability and Efficacy[5,6] *(per project)*	30%	10: All measures adequately satisfied	3.0
			5: Up to two instances of measures not being adequately satisfied	1.5
			0: More than two instances of measures not being adequately satisfied	0

Notes:

1) Superintendent has a key role in ensuring a Constructor's QA documentation (QMP, ITP's etc.) is adequate and correct at project outset. This metric reflects a review being undertaken by the Superintendent, ensuring corrections are made to any errors/omissions found, and final endorsement of the documentation for use in the project.
2) The Superintendent's role during construction is reflected in section 5.4, and at the conclusion of construction, evidence of the Superintendent's release of appropriate hold points shall be provided in the form of collated and finalised QA documentation.
3) Including any lack of evidence that the Superintendent has released appropriate hold points.
4) A measure of Superintendent efficacy on site during construction as evidenced by the proactive raising and resolution of non-conformances across their entire involvement with the project under the DAFI.
5) Factors contributing to the measurement of Superintendent Technical Capability and Efficacy include:
   a) Timely and appropriate response to RFI's
   b) Aptitude to provide technical input to the constructor to resolve construction defects/issues in accordance with SA Water requirements
   c) Demonstrated ability to proactively identify unsuitable construction techniques and ensure appropriate methods are adopted **before** infrastructure is constructed.
6) Performance criteria measured by substantiated instances of Constructors, SA Water or Developer indicating that their needs against the criteria in Note 5) not being adequately satisfied, per the requirements of section 5.4.

5.5.2.4 Rating Level Calculation – Accredited Superintendents

Superintendent ratings for the period under review are calculated as an average score per performance metric, which is compared to the thresholds in Table 10 to rating level. The rating level will be assigned based on the metric for which the lowest score is achieved (that is, to achieve a level 1 rating, **all** metrics must achieve a score at that level).

Table 10 - Rating Score Thresholds (Accredited Superintendents)

Metric	Description	Required Score		
		Level 1	Level 2	Level 3
A	Quality Assurance – Inception	A ≥ 1.7	0.80 ≥ A < 1.7	A < 0.80
B	Quality Assurance – Completion	B ≥ 2.1	0.80 ≥ B < 2.1	B < 0.80
C	Undetected non-conformances	C ≥ 1.6	0.80 ≥ C < 1.6	C < 0.80
D	Technical Capability and Efficacy	D ≥ 2.5	0.75 ≥ D < 2.5	D < 0.75

5.5.3 Activity Requirements

To maintain experience and knowledge of SA Water's technical requirements, SA Water expects its Accredited Consultants and Accredited Superintendents to continue to be active in land development infrastructure projects, as described in the following sections.

Prior to any accreditation removal due to inactivity, SA Water will engage with the Accredited Consultant/Superintendent (usually after an 18-month period of inactivity), to provide an opportunity to increase activity levels.

5.5.3.1 Accredited Consultants

Accredited Consultants who submit less than three designs (inclusive of SiD requirements) during the previous 12-month period will be considered inactive.

If this inactivity continues for a 24-month period, an Accredited Consultant's accreditation will be revoked, requiring an application in accordance with section 5.3.1 (when open) to be reinstated.

5.5.3.2 Accredited Superintendents

Accredited Superintendents who act in that role for less than three land development projects during the previous 12-month period will be considered inactive.

If this inactivity continues for a 24-month period, an Accredited Superintendent's accreditation will be revoked, requiring an application in accordance with section 5.4.1 (when open) to be reinstated.

5.5.4 Ongoing Requirements

In addition to satisfying the requirements above, Accredited Consultants/Superintendents shall supply the following information upon request from SA Water to remain accredited:

1) Documentation demonstrating continued Quality Management System certification (per sections 4.3.1, 5.3.1 and 5.4.1)
2) Certificates of Currency for Insurance (per sections 5.3.1 and 5.4.1).

Failure to supply this information may serve as grounds for revoking accreditation.

5.5.5 Appeals Process

SA Water is committed to engagement with its partners, and to providing ongoing feedback and discussion with its Accredited Consultants and Accredited Superintendents. Per section 5.5.1.2, SA Water will work with Accredited Consultants/Superintendents to provide opportunities to improve performance.

However, where affording these opportunities has not resulted in the necessary improvements, SA Water reserves the right to rate or remove an Accredited Consultant/Superintendent at its sole discretion.

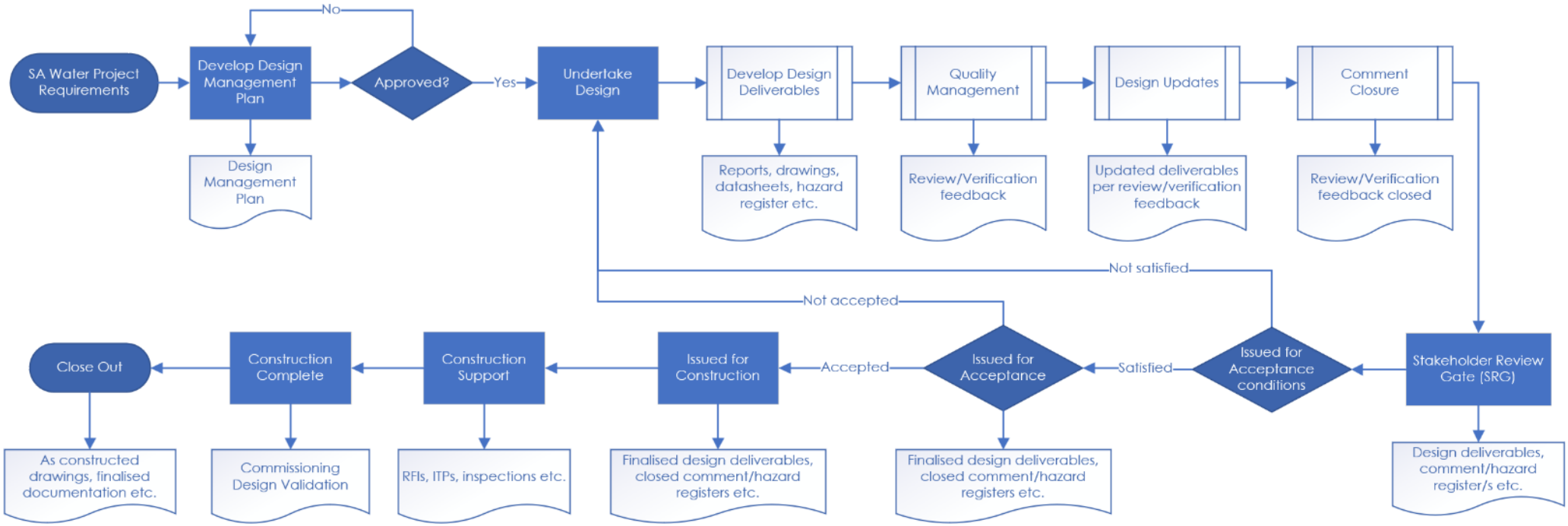
Such decisions are final and are not subject to appeal.

6 Design requirements – SA Water capital projects

This section outlines SA Water's specific requirements for designs prepared for SA Water capital works, regardless of the commercial mechanism by which they are delivered (D&C, ECI etc.).

A summary of the design process for SA Water capital works is shown in Figure 2.

Figure 2 - Design process summary (SA Water capital works)



6.1 Design Management

The Design Management Plan (DMP) is a key document of a design engagement that:

- Identifies the Agent who is responsible for the design engagement
- Establishes the required design scope and deliverables (including design sequence)
- Identifies key stakeholders whose inputs are required
- Establishes the design schedule
- Enables monitoring of scope, cost and schedule of a design engagement.

The Design Consultant shall develop a DMP and submit it to the SA Water Representative at least 10 business days before design activities are due to commence. This constitutes a **HOLD POINT** under this Technical Standard.

Where the Agent is a Constructor (for example, in an SA Water D&C contract), the Agent is to have been involved in developing and reviewing the DMP **before** submission to SA Water.

The Design Management Plan is to contain the items shown in Table 11 as a minimum.

Table 11 - Design Management Plan Requirements

Item	Description	Notes
1.0	Design Scope	Scope of design engagement, including reference to SA Water's Project Requirements, and any exclusions, limitations, pre-requisites etc. as required.
2.0	Roles and Responsibilities	Establishes roles and responsibilities of the design team. This shall also include detail of who is responsible for: • Design coordination between different Design Consultants and equipment vendors • Interface management activities • Review and verification activities • Undertaking design validation across the project lifecycle • Providing technical support during construction and commissioning
3.0	Investigations Required	Investigations and analysis required to complete design activities For example, geotechnical investigation, topographical survey, dilapidation and condition assessments, materials testing, any modelling (CFD, FEA, slope stability) etc.
4.0	Design Deliverables	List of design deliverables to be produced. Items are to be separated into elements as required by the Project/Program
5.0	Design Costs[1]	Design costs associated with design deliverables and other design activities Items are to be separated into elements as required by the Project/Program
6.0	Additional Information to be Supplied	Additional information to be provided by the Agent (for example, hydraulic models, development approvals, environmental approvals etc.)
7.0	Work breakdown structure	This shall be sufficiently detailed to allow monitoring of progress against deliverables, and is to include a resource plan showing hours to be worked per individual Appropriate allowance is to be made for review and SiD actions to be addressed and closed after designs have progressed through stakeholder review gates
8.0	Design Schedule[2]	Including identification of meetings, design activities, review stages, production of draft and final deliverables. Minimum review timeframes of stakeholder review gates shall also be included in the schedule.

Item	Description	Notes
9.0	Risks and Opportunities	Identification of project risks/opportunities and how these will be mitigated/realised This shall also include risks and mitigations associated legislative/external approvals per section 4.5.
10.0	Resourcing	This section of the DMP is to include the following: • Details of any subcontractors or subconsultants to be used (inclusive of prior approval from SA Water in accordance with this Standard) • Composition of the Design Team and how capability and experience aligns with the requirements of this Technical Standard. • An organisation chart, identifying roles and responsibilities
11.0	Key Stakeholders(3)	Key stakeholders for the development of the design May be for input into design requirements, undertaking stakeholder reviews, temporary works/bypassing inputs, constructability/commissioning assessments etc.
12.0	Interface Management	Description of who, how and when interfaces between the Designer, Agent, key stakeholders and SA Water will be engaged, and what outcomes are required from each (e.g. Constructor via a workshop at 30% design for constructability input, product vendor at 60% design for commissioning input etc.) • Emphasis and priority shall be made for early engagement with key stakeholders (especially Maintenance and Operations) before SiD workshops. • This section is expected to complement system engineering approaches being adopted across SA Water.
13.0	Quality Assurance	Design Quality Management and Quality Assurance activities being undertaken in accordance with this Technical Standard. This should also incorporate the change management process to be adopted during the design engagement
14.0	Project Controls	Project controls to be implemented (for example, checklists, transmittals, document collation etc.) and who is accountable for these activities.

Notes:

1) Design costs are not required in DMPs for works delivered via a Design and Construct or ECI contract, as these will be contained in other contract documentation.

2) Refer section 6.2.2.

3) Not applicable for D&C or ECI contracts (where stakeholders are nominated in SA Water's Project Requirements)

Reduction in the scope of a DMP as shown in Table 11 without an approved TDRF is only permitted when:

- SA Water is engaging the Design Consultant directly (i.e. an SA Water employee is the Agent) **and**
- The market approach does not require supply chain support, per the Market Approach Matrix in SAW-PR-0006

6.1.1 Program level design management plans

Recognising that SA Water delivers programs of works across certain infrastructure types, DMP's may be generated at a program level (as opposed to individual projects), subject to the following conditions being satisfied:

- The program is for a single infrastructure type (for example, water main relays)
- SA Water's Project Requirements have been prepared on the basis of delivering a program of works and nominate the infrastructure scope accordingly **and**
- For all infrastructure within the program, the ACR ≤ 3

6.1.2 Changes to design management plans

Changes to a DMP after the initial hold point is released are to be classified and actioned as shown in Table 12.

Table 12 - DMP change categories

Change category	Descriptor	Approval Requirements
Major	A fundamental change to original DMP resulting in: • ≥30% of the document content being altered (as judged by the SA Water Representative), OR • Changes to Reviewer or Verifier personnel (including addition of new engineering disciplines); OR • Reduction in design deliverables, interface management or quality assurance; OR • Increased design costs	Per section 6.1
Minor	Updates to the DMP made to reflect the evolution of design requirements, which are not considered to be major changes.	Change management process to be applied. SA Water Representative to be provided with 5 business days noticed before changes are implemented. This requirement is a **WITNESS POINT** under this Technical Standard.

Where any changes to a DMP are made after the initial hold point is released, the Design Consultant shall clearly identify in their revised DMP submission:

- What changes have been made?
- Why were changes required?
- How is technical risk managed to ensure design outputs satisfy SA Water's requirements?
- Which version of the document is current?[12]

[12] Previous versions shall be superseded.

6.2 Review and issue of designs

6.2.1 General

The progression of designs for SA Water infrastructure shall follow a logical and staged development, with opportunity provided for stakeholder review and inputs. This is to be articulated in the Design Management Plan, with the stakeholder review gates in section 6.2.2 stipulated as hold points.

Internal SA Water stakeholders to be engaged as part of this review include (subject to their confirmation, which shall be noted in the Design Management Plan), but are not limited to, the following:

a. Engineering (that is, the Owner's Engineer)

b. Capital Delivery

c. Operations

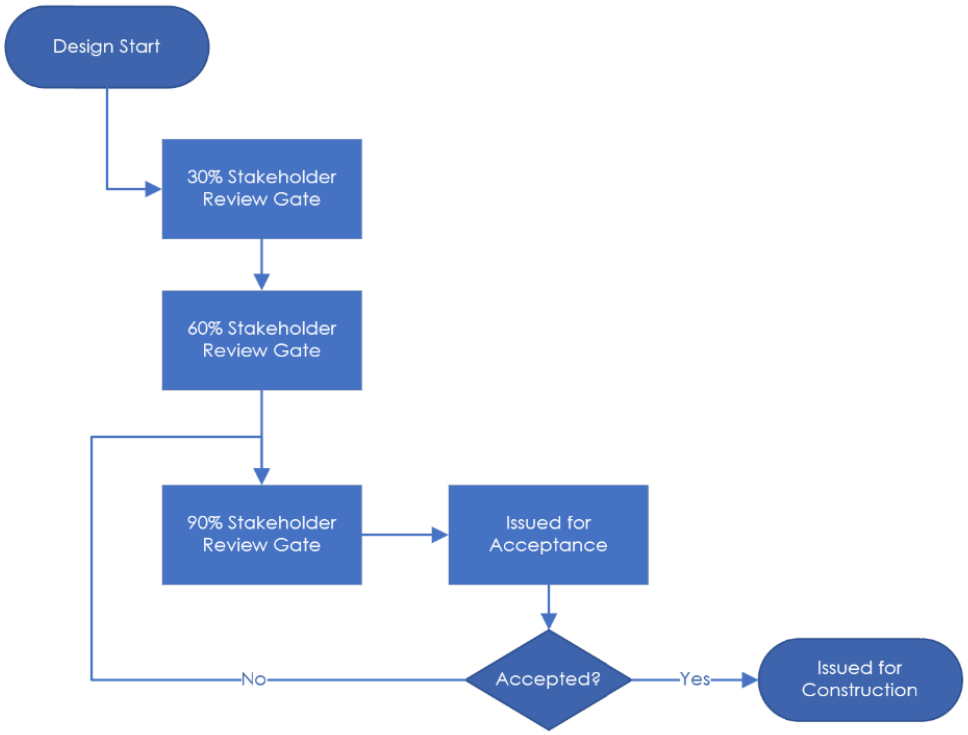
d. Maintenance

e. Environment and Heritage

Other SA Water stakeholders may be included (e.g. Treatment Expertise, Environment, Water Quality, Community Engagement etc.) based on specific project scope, per direction from the SA Water Representative.

Progression through the stakeholder review process is shown in Figure 3.

Figure 3 - Stakeholder review process



6.2.2 Stakeholder review gates

Eash stakeholder review gate below represents a **HOLD POINT** where the Designer shall submit deliverables (prepared per SA Water's Project Requirements) to the SA Water Representative for review. A minimum of 10 business days from SA Water's receipt of the **entire deliverable package for each review gate** shall also be allowed for this review to be undertaken.

This is considered a minimum timeframe to suit SA Water's wider infrastructure commitments and may fluctuate depending on technical demands/nuances across projects. Any variance to this timeframe is to be documented in the DMP with the endorsement of the SA Water Representative, who shall engage other business partners to confirm timeframes, noting that:

a. Review timeframes of five business days or less are not considered reasonable or acceptable, excepting situations under the control of an SA Water Incident Management Team

b. Per section 4.2.7, delays associated with variables within the Designer or Constructor's control will not be considered grounds for an accelerated review requirement being imposed on SA Water or the Owner's Engineer.

The stakeholder review gates below represent the completion of a design stage, with the percentage indicating the level of design development relative to the final (i.e. issued for construction) design documentation.

Where the Agent is a Constructor (for example, in a SA Water D&C contract), designs shall be reviewed by the Agent (and updated as required) **prior** to submission to the SA Water Representative.

Stakeholder review gates at SA Water are at:

a. 30% Design *(i.e. concept design)*

b. 60% Design

c. 90% Design

Per section 6.2.3.1, the stakeholder review process is expected to produce several artefacts for issue back to the Designer for resolution. These review artefacts shall be reviewed by the SA Water Representative (or their delegate, such as the Design Manager for the Owner's Engineer) before they are issued to the Designer, to ensure comments are concise, align with SA Water's Project Requirements, and are free of duplications/errors.

6.2.2.1 Design maturation

As the design progresses through the stakeholder review gates, it is expected that the design is maturing both in terms of completeness and level of detail provided (including equipment selections). This level of development shall be consistent with the requirements of TS 0101 to ensure that SiD workshops can be undertaken on suitably developed design documentation.

6.2.2.2 Reduced stakeholder review gates

Reflecting the differing project scales in which design activities may be undertaken, the stakeholder review gate at the 90% design hold point may be merged with the issued for acceptance hold point when all of the following requirements are satisfied:

a. Infrastructure has an ACR < 3

b. SA Water's Project Requirements document agreement for the reduction across the SA Water Representative **and** their SA Water business partners

c. All conditions required to issue a design for acceptance (refer section 6.2.3) are satisfied before documents are issued for acceptance.

The timeframe for review shall remain as nominated in section 6.2.2.

6.2.3 Issued for acceptance

Acceptance by the SA Water Representative is required for all design documentation prior to it being issued as final/for construction and represents a **HOLD POINT** under this Technical Standard.

Design documentation is not considered to be issued for construction unless it is digitally signed by the SA Water Representative as having been accepted.

The objective of this step is to ensure that all issues/comments/actions that have arisen during design development have been appropriately addressed (refer section 6.2.3.1) **before** construction commences, and that the SA Water Representative (and their business partners) agree that construction can proceed.

6.2.3.1 Review close out

The stakeholder review gates, as well as the review and verification process will typically produce one or more of the following:

a. Design comment register/s

b. Safety in Design (SiD) hazard registers (including other safety in design registers, such as those for HAZOPs, CHAZOPs etc.)

c. Drawing/Report markups

Comments/actions from the items above **must be closed prior to drawings being issued for acceptance.**

Resolution and closure of items identified in the documents above shall consist of (at a minimum):

a. The Designer updating design documentation or providing documented evidence, to respond and address the items raised (inclusive of updating registers as applicable) **and**

b. Acceptance of the Designer's action/response by the individual (or their delegate) who raised the original item, noting the requirement of section 6.2.3.2 b).

Failure to comply with this requirement will result in design documentation being returned to the Designer without SA Water review. Such occurrences also constitute a non-conformance with this Technical Standard, which will be raised in accordance with section 7 for resolution by the Designer and Agent (where the Agent is a Constructor).

6.2.3.2 Escalation pathways

Where agreement cannot be reached between the parties to resolve a technical misalignment/issue, the matter shall be escalated for resolution to the decision makers nominated in Table 13 noting that:

a. The form provided in Appendix D shall be used as the basis for summarising the matter to be escalated.

b. Design liability shall remain vested with the Designer.

    a. **No design liability shall be assumed by SA Water unless accompanied by an approved TDRF**.

c. Where decision makers nominated in Table 13 are not able to reach agreement, the matter is to be escalated by the SA Water Representative to the next level of SA Water's management structure.

Table 13 - Escalation Pathways

Issue type	Escalation	Notes
Project scope	To Project Sponsor	Further escalation may be required, subject to the impact of project scope changes relative to the delegation of the Project Sponsor (e.g. on budget, level of service etc.).
Technical	To SA Water Representative and Project Sponsor	Pathway applicable where: • There is a misalignment in technical opinion/interpretation between a stakeholder and the Designer • The technical matter is not impacted by a specific exclusion in the scope of SA Water's Project Requirements* In these situations, the Designer must provide appropriate and evidence based technical justification for their position before the matter is escalated.

* Where SA Water's Project Requirements have excluded an aspect of design scope that has impacted the design to create a technical misalignment/issue, the Designer shall provide details to inform further decision making.

6.2.4 Issued for construction documentation

Design documentation may only be revised to issued for construction when **both** of the following requirements (representing a single **HOLD POINT**), are satisfied:

1) Design outputs for all engineering disciplines have reached the 90% Design review gate **and**
2) Documents have progressed through the issued for acceptance process outlined in section 6.2.3.

6.3 Performance management

Performance management of SA Water's Engineering and Automation Panels will be undertaken by SA Water through a combination of:

- Informal and bi-annual formal review meetings
- Ad hoc audit of quality systems and/or design outputs
- Direct feedback from projects
- Outputs from SA Water's supplier performance management tool and project closeout reports
- Non-conformances raised under section 7 of this Technical Standard.
- Audits (per section 4.3.1)

In the case of any quality issues in the delivery of a design output, the Design Consultant concerned is to be contacted directly by the project team in the first instance to provide resolution. A non-conformance shall only be raised where:

a. An issue raised is substantiated and remains unresolved/requires escalation
b. Quality concerns arise more than twice on design work of the same type/scope.

7 Management of non-conformances

The identification of non-conformances represents a continuous improvement opportunity to address shortcoming in systems/processes/training (or a combination of all three) that have contributed to a failure in satisfying given requirements. The requirements of this section apply to all consultants undertaking designs for SA Water capital projects.

7.1 Application

The non-conformance process described below only applicable to issues arising from the work of Designers in SA Water capital works projects. Some typical examples are provided in Table 14 for guidance in the application of the non-conformance process of this Technical Standard.

Table 14 - Application of TS 0104 NCR Process*

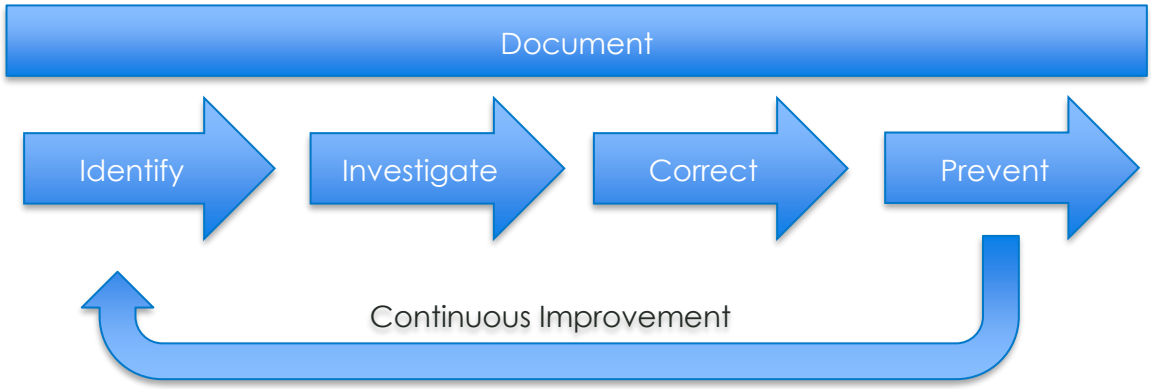
Scenario	Applicable NCR Process	Relevant TS 0104 Section	Notes
Design deliverables not in accordance with SA Water technical requirements	TS 0104	4.2 (Design responsibilities and accountabilities) 4.3 (Quality management requirements)	Refers to designs submitted to SA Water after having been reviewed and/or verified which are found to contain errors etc.
Designer seeks technical direction from SA Water	TS 0104	4.2.3 (Designer) 4.3.2 (Design review and verification)	Excludes clarifications sought from SA Water regarding scope, policy or application/interpretation of Technical Governance
Construction defect identified on site	Constructor QMS	N/A	
Design defect identified on site	TS 0104	4.2 (Design responsibilities and accountabilities) 4.3 (Quality management requirements)	
Construction/Commissioning support not provided	TS 0104	4.2.1 (Agent) 4.2.3.2 (Role post design) 4.3.4 (Design validation)	Excludes SA Water hold point releases etc. Examples may include SA Water being requested to prepare commissioning documentation or review of vendor datasheets to determine suitability.
Safety Incident	Constructor/SA Water WHS	To be confirmed at time of incident (as applicable)	TS 0104 applicability only where safety incident is the result of a failure of the design to address requirements of TS 0101

*Table is not intended to provide an exhaustive listing of non-conformance scenarios. Rather, it aims to provide a suite of examples to assist the application of the TS 0104 NCR process.

7.2 Non-conformance process

This Technical Standard adopts a structured non-conformance process as shown in Figure 4, to ensure adequate documentation of activities to identify, investigate, correct and prevent non-conformances.

Figure 4 - Non-conformance process



Steps of the process above are captured and documented through a non-conformance report (in some QMS' may also be known as a corrective action report).

7.2.1 Non-conformance form

Where instances of non-conformance to this Technical Standard occur, the SA Water Representative (or their delegate) will raise a non-conformance using the online form shown in Appendix C. This will create an entry on SA Water's non-conformance SharePoint site and a corresponding non-conformance reference number.

Upon submission, both the SA Water Representative submitting the form and the nominated Design Consultant contact will receive a copy. The Design Consultant shall use this form (along with the corresponding reference number) to work through the non-conformance process of their QMS, noting the SA Water form is intended to provide visibility to SA Water of non-conformances to TS 0104, and is not a replacement for a Design Consultant's non-conformance process.

7.2.2 Non-conformance report

The non-conformance report is a tool used to identify a non-conformance and document all investigations and actions taken with respect to that non-conformance, culminating in acceptance of the resolution by the originator (and other relevant parties).

The outcome of this process shall be a finalised non-conformance report issued to SA Water within 10 business days of the non-conformance form being issued which, as a minimum:

a. Identifies and confirms the non-conformance

b. Establishes the root cause of the non-conformance

c. Details actions taken to correct/resolve the identified non-conformance

    a. Acceptance of these actions represents a **HOLD POINT,** which must be accepted and released before implementation and continuation of design development.

d. Identifies actions to prevent a recurrence, along with assigning responsibility and a timeframe for their enactment.

Once the NCR is completed, actions agreed and fully implemented, the SA Water Representative is to upload the finalised NCR to SA Water's non-conformance SharePoint site and mark it as being closed.

Appendix A - Schedule of hold and witness points

Section	Type	Description
6.1	Hold	Approval of Design Management Plan
6.1.2	Hold	Approval of Design Management Plan changes
4.3.2.1	Witness	Review and verification documentation to accompany design deliverables
6.1.2	Witness	Changes to design management plans (minor)
6.2.2	Hold	Stakeholder review gates
6.2.3	Hold	Issued for acceptance
7.2.2	Hold	Approval of corrective actions (where NCR is raised)

Appendix B - Design deliverables list

The deliverables list below provides SA Water's general expectations with respect to design deliverables. However, given the breadth of infrastructure projects for which design is undertaken, design deliverables required are to be specified as part of SA Water's Project Requirements, with submission and approval of the DMP (refer section 6.1) to be used as the means by which these deliverables are formally established.

Requirements for operation and maintenance manuals and durability planning are provided in TS 0132 and TS 0110 respectively.

List of Deliverables

Refresh Table

Deliverables	Planning & Scoping	Concept Design 30%	Detailed Design 60%	Detailed Design 90%	IFC 100%	Comments
GENERAL						
Deliverables List	x					
Options Report (Engineering Template)	x					
Options Endorsement Part A - Project Options	x*					*This is an IP&S deliverable that SA Water Engineering has input into during the Prefeasibility Study. Only required for Tier 1 and 2 projects.
Options Endorsement Part B - Technical Options	x*					*Only required for Pathway 3 projects.
Scoping Report	x					
Functional Specification	x					
Design Basis Report		x	x	x	x	
Concept Design Report		x				
Detailed Design Report			x*	x	x	* draft accepted at this stage To summarise the detailed design activities, assumptions, clarifications and outcomes of the design to demonstrate compliance with relevant SA Water and Australian Standards. This document details the design changes and decisions between the CDR and the IFC design.
Design Management Plan		x*	x*			*Only applicable to FEED for large project and to be completed prior to design commencing. Applicable to the Design Panel members and MFP Contractors for all Projects as per TS0104.
Technical Specification (AS4300 - ECI Contract)	x*					*Only applicable for major projects where a contractor is not already engaged under an existing agreement or sending out to multiple contractors for tender.
Technical Specification (AS4300 - D&C Contract)		x				
Engineering Specification (Regional Delivery Only)		x1, 2	x2	x2	x2	This document has two purposes: 1. It is used to convey scope, requirements and expectations to a Design Partner to undertake concept and detailed design. 2. It is used by the FEED team to capture DBR, CDR and DDR requirements for low complexity outputs, which do not require stand alone documents to be developed.
Value Management Register	x	x				
Needs Register	x	x*				* If delivered by SA Water Engineering
Interface Register	x	x				
Assumptions & Constraints Register	x	x	x	x	x	To be updated throughout the project lifecycle
Key Decisions Register	x	x	x	x	x	To be updated throughout the project lifecycle
Interoperability Assessment	x					
Constructability Assessment	x					
Reliability Availability & Maintainability Analysis	x					
Project Architecture	x					
Concept of Operations	x	x				
Human Factors Assessment	x					
INVESTIGATIONS						
Site visits to inspect existing installation, gather required information etc.	x	x	x	x		Site visits as required to gather relevant information to enable the design to be developed and finalised. Sufficient site visit allowances shall be made, and RFI's requesting site based information that should have been gathered by the Contractor during site investigations may be rejected.
Topographical Survey			x	x	x	
Service location		x				
Site Bushfire Risk Assessment	x	x	x			To be conducted by qualified and experienced consultant to inform on the material selections for significant assets (plants, water storages etc) where disruption of services is not acceptable and / or sset loss is not acceptable due to high cost of reinstatement
Geotechnical Investigation - Desktop Study	x	x**				To be done at (or even before) 30%.
Geotechnical Investigation & Report		x**	x**	x	x	To be done at (or even before) 30% for complex structures. For ordinary structures at 60%
Environmental Investigations & Report		x**	x**	x	x	To be done at (or even before) 30% for complex structures. For ordinary structures at 60%
Condition Assessment Report			x	x	x	Defect maps to be developed showing deteriorated areas
Technical Memo - Existing Process (Site Investigation)	x					
Technical Memo - Process Technology Selection	x					
Technical Memo - Other Investigation	x					
Technical Memo - Pilot Plant Assessment	x					
Desktop site assessment from SAPPA maps	x					
Radio Path Survey (Physical)			x*	x*		*Timing of when this occurs will depend on the complexity of the project and the design impact it may have i.e. civil / structural impacts for tower / pole.
As-building of existing site drawings / documentation	x*	x*	x**			To enable detailed design activities to be undertaken, when existing site documentation is limited or cannot be relied upon and such information is need prior to the progression of detailed design. *Typically done for process/mechanical related works, to enable concept design. **Typically completed by the Designer for electrical related works, to enable detailed design.
Power Authority Investigations with SA Power Networks	x*	x*	x	x	x	*SAPN liaison is preliminary only at these stages i.e. to commence high level feasibility discussions only.

List of Deliverables

Refresh Table

Deliverables	Planning & Scoping	Concept Design 30%	Detailed Design 60%	Detailed Design 90%	IFC 100%	Comments
SAFETY & RISK						
SID Assessment Plan	x	x*				*To be completed by SA Water where appropriate to allow for budgeting for Workshops etc
SID Short Form		x*				*For single discipline, low cost and low complexity projects. Not typically used for most capital projects executed through FEED. SID Specalist to approve the use of this Form.
HAZID Workshop & Minutes	x	x				
SID 1 Workshop & Register		x*	x*			*Timing will be dependent on the scope and complexity of the project i.e. SiD 1 & 2 may be combined.
HAZOP Workshop, Register & Report		x	x	x		Workshop quantities and timing will be dependent on scope and complexity of the project i.e. Top Down vs Bottom Up
CHAZOP Workshop, Register & Report		x	x	x		Requirement for this process is driven by project complexity and risk. A CHAZOP should be carried out for chemical plants, critical systems and multi loop systems.
SID 2 Workshop & Register			x*	x*		*Timing will be dependent on the scope and complexity of the project i.e. SiD 1 & 2 may be combined.
SiD Report				x	x	
Lessons Learned		x*	x*			*Known hazards and incidents to be identified and integrated into the SiD process. Usually included in the Insight ribbon.
AS4024 Risk Assessment Workshop, Register & Report		x	x	x		Required for machine guarding and emergency stop requirements
Pressure equipment hazard level classification				x	x	Required for pressure equipment such as surge vessels, accumulators, air compressor receivers etc
Functional Safety Lifecycle Process & Documentation (i.e. QRA, SRS etc.)		x	x	x		Requirement for this process is driven from the HAZOP / CHAZOP
Lifting Studies		x	x			
Shoring / Excavation Studies			x	x		
Ergonomic Studies			x	x		
Other Studies & Reports	x*	x*	x*	x*	x*	*As required by the specific project requirements.
Risk Register	x	x	x	x	x	
Multi-criteria Analysis	x	x				
General Risk Assessment Workshop & Report	x	x	x	x		Required where the above workshops are not suitable.
Hazardous Area Classification Report			x	x	x	Multidiscipline - Lead by Process. This includes any required dispersion modelling, ventilation calculations etc.
Hazardous Area Classification Drawings			x	x	x	
Hazardous Area Design Report			x	x	x	To summarise the basis of the hazardous area design, assumptions, criteria, inputs etc. including specific requirements required by the standards i.e. glanding methodologies etc.
IS Loop / Entity Calculations			x	x	x	
Increased Safety Calculations (i.e. Te time, heat loading etc.)			x	x	x	
Hazardous Area Inspection Sheet Templates				x	x	Templates provided for review prior to construction phase services. Forms to be completed during the construction phase.
Hazardous Area Verification Dossier				x	x	Collation of all design information into the verification dossier. Dossier to be finalised during the construction phase.
MULTI-DISCIPLINARY DOCUMENTATION						
Control Philosophy		x	x	x	x	Developed in conjunction with the P&ID Multidiscipline activity: Process, Mech, EIC
Demolition Plan		x*	x	x	x	* Dependant of assessed risk
Red-line Markups of Existing Drawings	x*	x*				*Preliminary Only - Provided at early stages to show potential tie-ins to existing infrastructure.
Update of Existing Site Drawings			x	x	x	To be updated by the Designer, including superseding or making existing drawings obsolete.
Site plan	x	x	x	x	x	to include all disciplines, as required
General Arrangement/s	x	x	x	x	x	
P&ID (s)	x	x	x	x	x	Multidiscipline activity: Process, Mech, EIC
Demolition Drawings		x*	x	x	x	*If it needs to be provided, will be preliminary only
Security drawings		x	x	x	x	To be developed in consultation with the SA Water Security Team.
Fire systems drawings		x*	x	x	x	*If provided, is preliminary only
Cutover / Staging Plan		x*	x	x	x	*If provided, it will be preliminary only to highlight constraints / issues that need to be considered as a part of the design process.
Performance Testing Method / Criteria		x*	x	x	x	*If provided, it will be preliminary only to highlight constraints / issues that need to be considered as a part of the design process.
Construction Scope of Works				x	x	Typically for regional projects
Building Datasheet/s or Technical Specification	x*	x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data. Multi-discipline Activity Includes new switchroom buildings

List of Deliverables

Refresh Table

Deliverables	Planning & Scoping	Concept Design 30%	Detailed Design 60%	Detailed Design 90%	IFC 100%	Comments
CIVIL & STRUCTURAL						
Civil Notes			x	x	x	
Site Plan		x	x	x	x	
Pavement Plan			x	x	x	
Pavement Details		x*	x	x	x	*Basic details, as required
Drainage Plan			x	x	x	
Drainage Details		x	x	x	x	
Bulk Earthworks Plan			x	x	x	
Long Sections - Roads and Pipe			x	x	x	
Cross Sections - Roads and Pipes			x	x	x	
Service Trench - Details			x	x	x	
Earth Retaining structure - Plan & Details			x	x	x	
Structural Notes			x	x	x	
Thrust Block			x	x	x	Only if not covered by WSCM
Trench Cross Sections Drawings				x	x	with input from relevant discipline - elec, eg
Concrete Plans with Members Schedule		x*	x	x	x	* Concept Design Plans can be provided without schedule
Reinforcement Plans with Reo Schedule			x	x	x	
Typical Footing Details		x*	x	x	x	*Basic details, as required
Ancillary Footing Sections and Details - for elec & mech equip.				x	x	which includes footing support and reinforcement support for other discipline related items such as switchboards, light poles, antenna, solar panel poles, pump,
Floor Plans with Members Schedule		x*	x	x	x	* Concept Design Plans can be provided without schedule
Reinforcement Plans with Reo Schedule			x	x	x	
Concrete Overall Elevations		x	x	x	x	
Concrete Overall Sections		x	x	x	x	
Typical Concrete Details		x*	x	x	x	*Basic details, as required
Project Specific Sections and Details				x	x	
Concrete Mix Design				x	x	
Defects Repair Methodology - Notes			x	x	x	
Defects Map		x	x	x	x	
Typical Concrete Repair Details			x	x	x	
Project Specific Repair Details				x	x	
Roof Framing Plans with Schedule		x*	x	x	x	* Concept Design Plans can be provided without schedule
Floor Framing Plans with Schedule		x*	x	x	x	* Concept Design Plans can be provided without schedule
Steel Framing Overall Elevations		x	x	x	x	
Steel Framing Overall Sections		x	x	x	x	
Typical Steelwork Details			x	x	x	
Project Specific Sections and Details				x	x	
Building Floor Plans		x	x	x	x	
Building Roof Plans		x	x	x	x	
Building Overall Elevations and Sections		x	x	x	x	
Building Typical details		x*	x	x	x	*Basic details, as required
Projects Specific Sections & Details		x*		x	x	*Basic details, as required
Demolition Methodology - Notes			x	x	x	
Demolition Plans			x	x	x	
Demolition Elevations and Sections			x	x	x	
Buried Pipe Structural Integrity Calcs			x*	x*	x	*Dependant on assessed level of risk and if not covered by SA Water Water Supply Construction Standards.
Pipe Penetration Details		x*	x	x	x	Detailed Designs must be fully dimensioned *Basic details, as required
Pipe Trench Details (if non-standard)		x*	x	x	x	* Dependant of assessed risk
MECHANICAL & HYDRAULICS						
Steady State Hydraulic Modelling Report	x	x	x	x	x	
Surge Modelling Report		x*	x	x	x	*Dependant on assessed level of risk. May be combined with steady state into overall hydraulics report
Water Balance		x*	x*	x*	x*	*Dependant on assessed level of risk and applicability.
Hydraulic calculations - Hydraulic Grade Lines		x	x	x	x	Input from Process team and Water Quality where required. May be included in hydraulic report.
Hydraulic calculations - System curves		x	x	x	x	Applicable to valves and pump selection. Pump/valve curves must be overlayed over System Curves. May be included in hydraulic report.
Hydraulic calculations - NPSHa		x*	x	x	x	Requirement at concept design stage dependent on assessment of risk.
Materials Selection Report			x	x	x	Can be part of DBR for simple projects
Pipe resonance calcs			x	x	x	
Plant/Machinery Vibration Calcs		x*	x	x	x	*Dependant on assessed level of risk
Hydraulic Residence Times Calcs (Sewer networks) Report		x	x	x	x	Can be part of CDR at Concept Stage
Air Conditioner Sizing Calculations		x	x	x	x	If required for a new buildings, switchrooms, control rooms or if typical ventilation fans cannot provide adequate cooling. Multidiscipline Activity.
Ventilation fan sizing calculations		x	x	x	x	Building ventilation
Piping stress analysis			x	x	x	
Anchor force calculations			x	x	x	To be used as an input to structural design of pipe anchors.
Flange gasket and bolt stress calculations				x	x	For bolted flange joints with flanges on pipes that are not standard sizes (ISO 559 for steel pipe) or for flange joints with flanges of differing dimensional standards.
Pipeline alignment plans		x	x	x	x	
Pipeline longitudinal sections		x	x	x	x	Long sections if the pipeline is >500m or if pipe profile is important in understanding hydraulics and/or pipeline operation
Hydraulic Grade Lines		x	x	x	x	
System curves		x	x	x	x	For network, distribution and transmission water pumping systems and for wastewater pumping systems.
Piping arrangement plan and sections		x	x	x	x	Piping arrangement drawings required if piping arrangement not covered adequately in the general arrangement drawings.
Piping details		x*	x	x	x	*Basic details
HVAC arrangement		x	x	x	x	Arrangement of key equipment (eg location of fans, air intakes, air exhausts, ducting, condenser units, fan coil units.
HVAC details				x	x	Refrigerant and condensate piping runs, ducting details, pipe/ducting supports, lagging, attennuation, insulation, louvres, motorised dampers, fans, filters, cowls, guards etc
Piping arrangement drawing		x	x	x	x	With input from Process if needed, with the ownership from the biggest input
Pump Datasheet/s		x	x	x	x	
Control Valve Datasheet/s		x	x	x	x	
Large/critical/non-standard isolating valve datasheet/s		x	x	x	x	As required by the specific project requirements.
Large/critical non-return valve datasheet/s		x	x	x	x	
Actuator datasheet		x	x	x	x	Incorporate with valve datasheet when specifying together with a valve.

List of Deliverables

Refresh Table

Deliverables	Planning & Scoping	Concept Design 30%	Detailed Design 60%	Detailed Design 90%	IFC 100%	Comments
ELECTRICAL & INSTRUMENT CONTROL						
Arc Flash Modelling and Report (as per TS0371)			x	x	x	For Switchboards with a rating > 250A. The native file of the model is to be provided as a deliverable. If this cannot be accommodated, subject to approval from the Principal Electrical Engineer, then all relevant raw data utilised in the development of the model shall be provided to SA Water in a suitable format (i.e. spreadsheet) for future model development.
Control Power Supply and Battery Sizing Calculations (12VDC)			x	x	x	For RTU Applications, where 24VDC is not being utilised.
Control Power Supply and Battery Sizing Calculations (24VDC)			x	x	x	
Earth Fault Loop Impedance Calculations			x	x	x	Can be provided as a part of the LV Power Systems Model analysis, but evidence and commentary needs to be provided within the Detailed Design Report to demonstrate compliance with the standards.
Fault Level Calculations			x	x	x	Can be provided as a part of the LV Power Systems Model analysis, but evidence and commentary needs to be provided within the Detailed Design Report to demonstrate compliance with the standards.
Heat Loading Calculations (Panel, Switchboard etc.)			x	x	x	Indoor and Outdoor Panel Calculations
Harmonic Analysis & Report			x	x	x	The Report can be combined as a part of the Detailed Design Report.
Lighting Study			x	x	x	
Lightning Protection Risk Assessment (AS1768)			x	x	x	
Lightning Protection Study & Report			x	x	x	The Report can be combined as a part of the Detailed Design Report.
LV Cable Sizing Calculations			x	x	x	Can be provided as a part of the LV Power Systems Model analysis, but evidence and commentary needs to be provided within the Detailed Design Report to demonstrate compliance with the standards.
LV Power Systems Model (PowerCAD)		x*	x	x	x	*Concept phase is Preliminary only Native File of the model to be provided as a deliverable.
Maximum Demand Calculation/s		x*	x	x	x	*Preliminary calculation only. This is generally developed to assist with early engagement with SAPN, determine the suitability of existing supply systems to support the proposed new load, determine preliminary tie-in locations and provide context of the size of the new switchboard/MCC/DB. The Designer shall take responsibility for this calculation.
Protection, Coordination and Grading Study/s			x	x	x	Can be provided as a part of the LV Power Systems Model analysis, but evidence and commentary needs to be provided within the Detailed Design Report to demonstrate compliance with the standards.
Solar Panel and Battery Sizing Calculations		x*	x	x	x	*Preliminary only, if provided. The Designer shall be responsible for this calculation. Typically provided for RTU applications.
Surge Divertor Sizing Calculation/s			x	x	x	
UPS and Battery Sizing Calculations		x*	x	x	x	*Preliminary only, if provided. The Designer shall be responsible for this calculation.
HV Power Systems Modelling and Report			x	x	x	Coordination with the relevant Supply Authority will be required to source relevant design inputs i.e. fault levels, impedance values etc. The native files of all model shall be provided as a deliverable. If this cannot be accommodated, subject to approval from the Principal Electrical Engineer, then all relevant raw data utilised in the development of the model shall be provided to SA Water in a suitable format (i.e. spreadsheet) for future model development. All reports shall summarise the scope, assumptions, options considered, issues encountered, findings, recommendations and confirmation that the design documented complies with relevant standard requirements.
HV Fault Analysis and Low Flow Study and Report			x	x	x	Refer comment above.
HV Protection Study and Report			x	x	x	Refer comment above.
HV Earthing Study and Report			x	x	x	Refer comment above.
Arc Flash Modelling and Report (as per TS0371)			x	x	x	Refer comment above.
HV Cable Sizing Calculations			x	x	x	Refer comment above.
LFI/ERP Investigation and Report			x	x	x	Multi-discipline Activity with inputs required from the Mechanical Designer
Single Line Diagram/s		x*	x	x	x	*Preliminary Only For HV, this includes protection single line diagrams as well.
Power Distribution Diagrams			x	x	x	
Electrical Schematic Diagrams			x	x	x	To include main incomer(s), generator incomer, motor, fan, heater, lighting, valving, etc.
Control Power Distribution Diagram/s			x	x	x	
Control Power Single Line Diagram/s			x	x	x	
Control Schematic Diagrams			x	x	x	To include power supply, battery, UPS etc.
Distribution Board Control Schematics			x	x	x	For external lighting control for instances.
PLC I/O Diagrams			x	x	x	To include AI, AO, DI, DO, Communications and any other required drawings
RTU I/O Diagrams			x	x	x	To include AI, AO, DI, DO, Communications and any other required drawings
RTU Power Distribution Diagram/s			x	x	x	
Network Architecture / Topology Diagram		x*	x	x	x	*Preliminary Only
Junction Box / Marshalling Panel / Remote Switching Panel Termination Diagrams				x	x	
Instrumentation Loop Diagram/s				x	x	
Instrumentation Mounting Diagram/s				x	x	
Equipment Layout Diagram/s		x	x	x	x	This is to include site layouts, switchroom and/or building layout drawings, lighting and power layouts etc. in order to highlight the location and size of new equipment items
Equipment Mounting Details		x		x	x	To provide context of where / how new equipment items are to be mounted.
General Arrangement Diagrams			x	x	x	This is to include Switchboard, MCC, DB, Control Panel, PLC Panel, Radio Panel, RTU Panel, Junction Box, Marshalling Panel etc. This includes Plan, Elevation, Section, Doors On / Off, Escutcheon View (Infront / Behind) etc.
Cable Routing Diagram/s			x	x	x	
Earthing Details				x	x	Typical earthing connection details
Earthing Layout Diagram/s			x	x	x	To define earth grid / stake details
Earthing Schematic/s, block diagram/s				x	x	To detail earthing field connections
Lightning Protection System Details				x	x	Typical earthing connection details
Lightning Protection System Layout Diagram/s			x	x	x	To define earth grid / stake details
Package Drawing List Coversheet			x	x	x	
Drawing Convention & Wiring Standards Sheet				x	x	
Bill of Materials List/s				x	x	
Cable Schedule/s			x	x	x	SA Water Cable Schedule Template to be utilised
Distribution Board Circuit Schedule/s			x	x	x	
Equipment Schedule/s				x	x	Summarises equipment supplier, make, model and key rating data for all equipment items
Instrumentation Schedule/s				x	x	Summarises equipment supplier, make, model and key rating data for all instrumentation

List of Deliverables

Refresh Table

Deliverables	Planning & Scoping	Concept Design 30%	Detailed Design 60%	Detailed Design 90%	IFC 100%	Comments
Label Schedule				x	x	
SCADA Impact Assessment	x	x*				*Typically to be completed by SA Water
Functional Design Specification				x	x	
PLC I/O Schedule		x*	x	x	x	*Preliminary Only
RTU I/O Schedule		x*	x	x	x	*Preliminary Only
SCADA Screens/Tags Markups				x	x	
HV Switchboard Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data.
Ring Main Unit Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data.
Kiosk Substation Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data. This is a combined RMU, Transformer, LV Distribution and Enclosure Datasheet
Transformer Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data.
Generator Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data. Multi-discipline Activity
AS61439 LV Switchboard Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data. User requirements datasheet. Datasheet to be completed by the Designer in consultation with the board manufacturer.
AS61439 MCC Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data. User requirements datasheet. Datasheet to be completed by the Designer in consultation with the board manufacturer.
AS61439 DB Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data. User requirements datasheet. Datasheet to be completed by the Designer in consultation with the board manufacturer.
AS61439 Control Panel Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data. User requirements datasheet. Datasheet to be completed by the Designer in consultation with the board manufacturer.
UPS Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data.
Variable Speed Drive Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data.
Harmonic Mitigation Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data.
Soft Starter Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data.
Motor Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data. Multi-discipline Activity
Solar Panel and Inverter Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data.
Battery Charger and Battery Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data.
Other Datasheet/s		x	x	x	x	As required by the specific project requirements.
PLC Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data.
HMI Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data. Includes eHMI
RTU Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data.
Radio / 4G Modem Datasheet/s		x*	x	x	x	*If provided will be preliminary only and will not be populated with vendor data.
Other Datasheet/s		x	x	x	x	As required by the specific project requirements.
Analyser Datasheet/s		x	x	x	x	Multi-discipline Activity
Flowmeter / Flow Switch Datasheet/s		x	x	x	x	Multi-discipline Activity
Gas Detector Datasheet/s		x	x	x	x	Multi-discipline Activity
Level Transmitter / Level Switch Datasheet/s		x	x	x	x	Multi-discipline Activity
Pressure Transmitter / Pressure Switch Datasheet/s		x	x	x	x	Multi-discipline Activity
Limit Switch Datasheet/s		x	x	x	x	Multi-discipline Activity
Other Datasheet/s		x	x	x	x	As required by the specific project requirements.
PROCESS						
Process Calculations	x	x	x	x	x	
Process OPEX Estimation	x	x	x	x	x	
Mass Balance/Load	x	x	x	x	x	
Filter Bed Sizing Calculations	x*	x	x	x	x	*Preliminary Only
Filter Media Hydraulic Calculations	x*	x	x	x	x	*Preliminary Only
Sedimentation Sizing Calculations	x*	x	x	x	x	*Preliminary Only
Reverse Osmosis Projections	x*	x	x	x	x	*Preliminary Only
Contact Tank Sizing	x	x	x	x	x	
Chemical Dosing Calculations	x	x	x	x	x	
Chemical Dosing Sizing	x	x	x	x	x	
Chemical Storage Sizing	x	x	x	x	x	
Chlorine Gas System Calculations	x	x	x	x	x	
Hypochlorite Dosing Calculations	x	x	x	x	x	
OCU specification	x	x	x	x	x	
Extraction air volume required (extraction fan sizing)	x	x	x	x	x	
Media Volume and specification (organic v inorganic)	x	x	x	x	x	
Air Curtain v water seal requirement	x	x	x	x	x	
Water Modelling Calculations	x*	x	x	x	x	*Preliminary Only
Wastewater Treatment Modelling (BioWin etc)	x*	x	x	x	x	*Preliminary Only
Odour or Ventilation Modelling	x*	x	x	x	x	*Preliminary Only
Odour Control Units (ACF, BF, BTF) sizing	x*	x	x	x	x	Odour Tech Spec, *preliminary unit sizing only
Technical Data Sheets		x	x	x	x	
Process Flow Diagram	x	x	x	x	x	
Chemical Dosing Plant/Panel GA		x	x	x	x	

List of Deliverables

Refresh Table

Deliverables	Planning & Scoping	Concept Design 30%	Detailed Design 60%	Detailed Design 90%	IFC 100%	Comments
MATERIALS						
Welding requirements			x	x	x	Deliverable in construction Phase. Welding requirement needs to have at least 60% design to make sure about materials and construction process.
Cathodic protection, review of exisiting CP	x		x	x	x	
Cathodic protection design site investigations including soil resisitvity testing	x	x	x	x	x	Note that these investigations require time, and need to be followed by a desing process. Start as early as possible once it has been confirmed that MSCL pipe will be used and that CP will be provided.
Cathodic protection, design (new, retrofit)			x	x	x	
Cathodic protection, electrolysis and stray current mitigation considerations	x		x	x	x	Consider as early as possible. Can be delted from subsequent stages, once completed.
LFI/EPR studies on pipelines	x	x	x	x	x	Consider that these studies take several weeks to months to completed depending on how quickly inputs are obtained from relevant authorities/utilities.
Durability planning, report/assessment		x	x	x	x	Mandatory for more complex projects proposed is Risk levels 1 and 2
Corrosivity assessment, macro and micro environments		x	x	x	x	
For material selection refer to items below		x	x	x	x	
Corrosion condition Assessment of metallic structures - site visit and inspection	x*	x*				x*: This activity to be done (if required) in one of the stages, ideally during investigation stage, Planning & Scoping or 30% Concept.
Concrete deterioration/corrosion sssessment of concrete structures - site visit and inspection	x*	x*				x*: This activity to be done (if required) in one of the stages, ideally during investigation stage, Planning & Scoping or 30% Concept.
Materials sampling and testing - concrete, steel, polymers	x*	x*				x*: This activity to be done (if required) in one of the stages, ideally during investigation stage, Planning & Scoping or 30% Concept.
Condition Assessment - report	x*	x*				x*: This activity to be done (if required) in one of the stages, ideally during investigation stage, Planning & Scoping or 30% Concept.
Remaining life assessment, structural assets	x*	x*				x*: This activity to be done (if required) in one of the stages, ideally during investigation stage, Planning & Scoping or 30% Concept.
Remaining life modelling (Chloride, carbonation)	x*	x*				x*: This activity to be done (if required) in one of the stages, ideally during investigation stage, Planning & Scoping or 30% Concept.
Material selection - repair and rehabilitation (concrete, metallic, polymers and coating)	x*	x	x	x	x	x*: Should be included here if there are fixed predetermined requirements, which are impacting cost
Material selection - new construction (coatings)	x*	x	x	x	x	x*: Should be included here if there are fixed predetermined requirements, which are impacting cost
Concrete	x*	x	x	x	x	x*: Should be included here if there are fixed predetermined requirements, which are impacting cost
Metals and alloys	x*	x	x	x	x	x*: Should be included here if there are fixed predetermined requirements, which are impacting cost
Polymers	x*	x	x	x	x	x*: Should be included here if there are fixed predetermined requirements, which are impacting cost
Material Notes on drawings (material properties and durability notes)		x	x	x	x	
Coatings			x	x	x	
Linings			x	x	x	
Hot dip galvanised coatings			x	x	x	
Coating specification for organic coatings			x	x	x	
Coating specification for thermal spray coatings			x	x	x	
Materials for corrosion resistance			x	x	x	
Materials failure analysis	x*	x*				x*: This activity to be done (if required) in one of these stages, ideally during investigation stage

Appendix C - Non-conformance form

The non-conformance form below is to be completed via the form on the SA Water Engineering RIVER site by the SA Water Representative (or their delegate).

Non-Conformance Form *(for use with TS 0104 only)*			
Project Type *(select one)*	**SA Water Capital Works**		
Non-conformance number *(provided by SA Water)*	To be autogenerated		
Date		**Form submitted by**	
Email		**Phone**	
Technical standard	TS 0104	**Section**	*A drop down list of sections to be provided (along with titles)*
Design consultant		**Consultant contact** *(for the non-conformance being raised)*	
Consultant email	*Email with copy of non-conformance to be issued to this email.*	**Consultant phone**	

SA Water Capital Works Details	
Project Name	
SA Water Project Manager	
Output Number *(e.g., A000-0000)*	
SA Water Framework *(e.g., Wastewater, Regional etc.)*	

Details of Non-Conformance	
Background *(brief details on the non-conformance, and actions leading up to it)*	
Design Consultant aware?	Yes/No (selecting no will not allow form to progress)
Design Consultant correspondence *(with respect to this non-conformance)*	
SA Water reference *(if available)*	

Closure of Non-Conformance	
Non-conformance report *(please attach non-conformance report from Design Consultant)*	
Root cause *(what was the root cause of the non-conformance?)*	
All actions agreed and complete?	Yes/No (selecting no will not allow form to progress)
Is evidence attached? *(please attach evidence)*	Yes/No (selecting no will not allow form to progress)
Non-conformance to be closed?	Yes/No (selecting no will not allow form to progress)
Date closed	To be autogenerated when yes is selected in field above.

Appendix D - Issue escalation form

The form below shall be used as the basis for information to be escalated in the event of this being necessary to resolve a technical misalignment/issue (refer section 6.2.3.2).

Issue Escalation Form *(for use with TS 0104 only)*			
Project ID:	*(project identifier)*	**Date opened:**	*(date form is completed)*
Title:	*(unique issue identifier or title)*	**Date identified:**	*(date issue first identified)*
SA Water Representative:	*(SA Water Representative under the contract/engagement)*	**Form completed by:**	*(person completing this form)*
Parties involved			
(names, roles and organisations of those involved)			
Issue description			
(one or two sentences that clearly define the issue)			
Background			
(a brief paragraph providing the issue's context and criticality of infrastructure involved (refer TS 0109))			
Options			
(available options to resolve issue)			
Implications			
(implications of each option above to SA Water (e.g. TOTEX considerations, safety, corporate risk, operational/maintenance, customer/community, corporate sustainability objectives etc.))			
Activities to date			
(describe activities project has undertaken to date, with chronology of events leading to escalation)			
Decision			
(outcome from decision makers to whom issue is escalated, inclusive of any actions/conditions for the project team to action)			
Approved: *(decision maker/s approving final decision)*	X Name Title	X Name Title	