TWEED SHIRE COUNCIL

DEVELOPMENT DESIGN SPECIFICATION

D12

SEWERAGE SYSTEM

VERSION 1.11

SPECIFICATION D12 - SEWERAGE SYSTEM

CLAUSE CONTENTS PAGE

CITATION

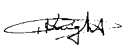
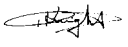
This document is named "Tweed Shire Council, Development Design Specification D12 - Sewerage System".

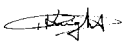
ORIGIN OF DOCUMENT, COPYRIGHT

This document was originally based on AUS-SPEC-1\NSW-D11 Sep 2000 (Copyright), AUS-SPEC appreciates the role of the NSW Water Directorate in comprehensively updating the design and construction specifications for water and sewer works. Substantial parts of the original AUS-SPEC document have been deleted and replaced in the production of this Tweed Shire Council Development Specification. The parts of the AUS-SPEC document that remain are still subject to the original copyright.

VERSIONS - TWEED SHIRE COUNCIL DEVELOPMENT SPECIFICATION D12 SEWERAGE SYSTEM

VERSION	AMENDMENT DETAILS	CLAUSES AMENDED	DATE ISSUED (The new version takes effect from this date)	Authorised by the Director
1.1	Original Version		1 July 2003	
1.2	Amendments to referenced standard drawings Review of Pump Station standard drawings and associated specification Gravity discharge for scour valves	D12.03; D12.20-3; D12.22-1 D12.20-D12.26 D12.27.1	1 June 2004	
1.3	Amendments to referenced standard drawings Update WSA references Review design requirements for access structures Clarify road crossing clause for pressure and gravity pipes Review of Sewage Pump Station design requirements Add pressure sewerage systems to scope Update references to Council specifications and Australian Standards Delete references to superseded Public Works Department Manual of Practice (PWD-SD & PWD-PSD) Colour coding of pipes specified ADWF for design loading defined OPVC pipe deleted	D12.03 and all references D12.03 and all references D12.01; D12.08; D12.09 (Deleted) D12.10 D12.20-D12.26 D12.01 D12.03 D12.03 & all occurances D12.10-7 D12.06-2 D12.10; D12.14	23 June 2006	
1.4	Pipe classes for road crossings Delete VC pipe requirement for industrial subdivisions	D12.10.2 D12.10.4	12 January 2007	

VERSION	AMENDMENT DETAILS	CLAUSES AMENDED	DATE ISSUED (The new version takes effect from this date)	Authorised by the Director
1.5	Update Standard Drawing List	D12.03	11 April 2007	
	Delete requirement for step irons in maintenance structures.	D12.08.3		
	Clarify manhole sizing and clear openings	D12.08.7		
1.6	Updated references to Standard Drawings and WSAA Water Supply Code. Reference new Mechanical and Electrical Specifications to replace MEW E101	Various	18 August 2010	
	Sewer Overflow Risk Analysis additional requirement.	D12/04, D12.05, D12.20		
	Sewer depth to meet minimum height standards between soffit and house overflow in AS/NZS 3500	D12.05.2		
	Sewer Alignment: update DCNR approval to reflect TSC structure, reference WSAA separation requirements for sewers, renumber subclauses 5 and 6.	D12.07		
	Maintenance Structures - significant amendments	D12.08		
	Preformed Components for Pumpstations require approval from Manager of Water	D12.20.07		
	Delete multi-trode requirement	D12.21		
	Control building required for electrical switchboards if CT metering required	D12.22		
	Telemetry compatible with Clear SCADA	D12.25		

VERSION	AMENDMENT DETAILS	CLAUSES AMENDED	DATE ISSUED (The new version takes effect from this date)	Authorised by the Director
1.7	Addition to scope Amend/Addition to reference documents Amend/Addition to General Approval requirement updated Design Loading - significant amendments Amend sewer alignment requirements to include Plumbing and Drainage Act 2011 and Easement Policy. Update Council Directorates Maintenance Structures - significant amendments Pipeline - significant amendments Changes to minimum vent pipe height, buffer, flow meters, private sewer ejection pump stations Delete 'and the collector manhole' Amend rising main scour valve design requirements	D12.01 D12.03 D12.04 D12.05 D12.06 D12.07 D12.05, D12.07 D12.08 D12.10 D12.20 D12.24 D12.27	20 January 2014	
1.8	Definition regarding reference to Manager or Director within document Change from Director of Community and Natural Resources to Director	D12.03 D12.05, D12.07, D12.20, D12.27	13 May 2014 13 May 2014	
1.9	Addition of revised/new standard drawings	D12.03(d)	28 August 2014	

VERSION	AMENDMENT DETAILS	CLAUSES AMENDED	DATE ISSUED (The new version takes effect from this date)	Authorised by the Director
1.10	Amend reference documents	D12.03	21 August 2015	
	Change from DECCW to OEH	D12.04 & D12.20		
	Amend Design Information	D12.04 & D12.05		
	Inclusion of Trenchless Technology	D12.07 & D12.10		
	Inclusion of Trunk Sewer	D12.07		
	Change to Easements	D12.07		
	Deletion of Maintenance Shafts	D12.08		
	Update to Venting	D12.08		
	Inclusion of Covers & MH's	D12.08		
	Inclusion of Serviceability	D12.10		
	Inclusion of PVC requirements.	D12.14		
	Change to SPS site access	D12.20		
	Inclusion of well size	D12.20		
	Update to Site Layout	D12.20		
	Inclusion of diesel pumps	D12.20		
	Inclusion of Fall Prevention system	D12.20		
	Inclusion of energy efficiency	D12.21		
	Update to switchboards	D12.22		
	Update to rising mains	D12.27		
	Inclusion of documentation requirements	D12.31 & D12.32		
1.11	Replace all references to SWAC with "Certifying Engineer"	Various	15 September 2017	
	Inclusion of WWTP Buffer Zone requirements	D12.04		
	Deletion of TMS	Various		
	Change to Works in Proximity name	D12.07		
	Access ladders not required	D12.08 & D12.24		
	Update to Venting	D12.08		
	Update to precast manholes	D12.08		
	Update to Access Covers	D12.08		
	Inclusion of Smartpit Maintenance Holes	D12.08		
	Inclusion of Minimum Cover over sewers	D12.09		
	Inclusion of OPVC pipes	D12.10 & D12.14		
	Update of colour coding	D12.10		
	Inclusion of Exposed Pipelines	D12.15		

VERSION	AMENDMENT DETAILS	CLAUSES AMENDED	DATE ISSUED (The new version takes effect from this date)	Authorised by the Director
	Removal of Lift Station detail	D12.20		
	Update of Fall Protection	D12.20		
	Inclusion of System Curve Requirements	D12.23		
	Update of Rising Main Material	D12.27		
	Inclusion of Pressure Sewer Systems	D12.27		
	Inclusion of Trunk Sewer Material	D12.30		

DEVELOPMENT DESIGN SPECIFICATION D12

SEWERAGE SYSTEM

GENERAL

D12.01 SCOPE

1. This Specification is for the design of sewerage systems for subdivisions and other development projects including (but not limited to) residential, rural, commercial and government development. ***Design***

2. The Specification contains procedures for the design of the following elements of the sewerage system: ***Elements***

   (a) Gravity sewers including junctions, property connection sewers, maintenance holes and other associated sewerage structures.

   (b) Common effluent sewers both gravity and pressurised.

   (c) Vacuum sewer system.

   (d) Pressure sewer systems.

   (e) Rising mains.

   (f) Pump stations.

3. The design of gravity sewer systems, pressure sewer systems, and their components shall comply with the Water Services Association of Australia's publication SEWERAGE CODE OF AUSTRALIA, SEWERAGE PUMPING STATION CODE OF AUSTRALIA and PRESSURE SEWERAGE CODE OF AUSTRALIA unless specified otherwise herein and should be constructed in accordance with the DEVELOPMENT CONSTRUCTION SPECIFICATION C402 - SEWERAGE SYSTEM. ***Compliance***

4. A sewerage system designed in accordance with this specification is to provide sewerage connections for:

   (a) All urban subdivision allotments and rural living (<1ha) subdivision allotments.

   (b) Urban parks, reserves, public open spaces

   (c) Public buildings, toilets and change rooms

   (d) Commercial development allotments

   The system shall include all connections, links to and upgrading capacity of the existing sewerage system and provide for extension for future upstream or adjacent development in the catchment.

D12.02 OBJECTIVE

1. The objective of the sewerage system is to transport sewage or effluent from domestic, commercial and industrial properties to the treatment plant in accordance with all current relevant legislation. Consumer requirements shall be met by providing a sewer main and allowing an appropriate point of connection for each individual property.

Sewerage System

D12.03 REFERENCE AND SOURCE DOCUMENTS

The Manager or Director

In cases of conflict or contradiction within this or other Council Specifications, the Manager or Director is defined as "the Manager or Director responsible for water supply and wastewater services or appointed delegate at Tweed Shire Council".

In cases of conflict or contradiction, unless otherwise specified, the provisions of this Specification will prevail over all reference documents and prevail over all Tweed Shire Council (TSC) Standard Drawings. TSC Standard Drawings shall prevail over any other standard drawings.

Documents

1. Documents referenced in this Specification are listed below whilst being cited in the text in the abbreviated form or code indicated. The Designer shall possess, or have access to, the documents required to comply with this Specification.

Sewerage Code

2. References to the SEWERAGE CODE OF AUSTRALIA are made where there are parallel sections or equivalent clauses to those in this Specification. Where not called up as part of this Specification, these references are identified by part and section numbers and enclosed in brackets thus (WSA Edition, Part, Section).

(a) Council Specifications

C242 – Development Construction Specification Flexible Pavements

C244 – Development Construction Specification Sprayed Bituminous Surfacing

C402 - Development Construction Specification Sewerage System.

D1 – Development Design Specification – Road Design

D5 - Development Design Specification – Stormwater Drainage Design

D13 – Development Design Specification – Engineering Plans (Subdivisions)

EL01-EL19 - Electrical Specifications

ME01-ME04 - Mechanical Specifications

Driveway Access to Property Part 1 – Design Specification

Driveway Access to Property Part 2 – Construction Specification

Australian Standards

(b) Australian Standards

References in this Specification or the Drawings to Australian Standards are noted by their prefix AS or AS/NZS. (WSA 02-2002, 0, III)

The Designer shall use the latest edition of the Australian Standards including amendments and supplements, unless specified otherwise in this Specification.

AS 1102	-	Graphical symbols for electrotechnical documentation (various)
AS 1214	-	Hot dipped galvanised coatings on threaded fasteners (ISO metric coarse thread series)
AS/NZS 1260	-	PVC pipes and fittings for drain, waste and vent applications
AS 1281	-	Cement mortar lining of steel pipes and fittings.
AS 1444	-	Wrought alloy steels – Standard, hardenability (H) series and hardened and tempered to designated mechanical properties
AS/NZS 1477	-	PVC pipes and fittings for pressure applications
AS 1579	-	Arc welded steel pipes and fittings for water and wastewater.
AS/NZS 1594	-	Hot rolled steel flat products
AS 1631	-	Cast grey and ductile iron non-pressure pipe and fittings
AS 1646	-	Elastomeric seals for waterworks purposes
AS 1657	-	Fixed Platforms, walkways, stairways and ladders – Design, construction and installation
AS 1741	-	Vitrified clay pipes and fittings with flexible joints - Sewer quality.
AS 2129	-	Flanges for pipes, valves and fittings
AS 2200	-	Design charts for water supply and sewerage
AS/NZS 2280	-	Ductile iron pressure pipes and fittings
AS/NZS 2566.1	-	Buried flexible pipelines – Structural design
AS 2634	-	Chemical plant equipment made from glass-fibre reinforced plastics (GRP) based on thermosetting resins
AS 2837	-	Wrought alloy steels – Stainless steel bars and semi-finished products
AS 3500	-	National Plumbing and Drainage Code
AS 3518.1	-	Acrylonitrile Butadienne Styrene (ABS) pipes and fittings for pressure applications – Pipes
AS 3518.2	-	Acrylonitrile Butadienne Styrene (ABS) pipes and fittings for pressure applications – Solvent cement fittings
AS 3571	-	Glass filament reinforced thermosetting plastics (GRP) pipes - Polyester based - Water supply, sewerage and drainage applications
AS 3680	-	Polyethylene sleevings for ductile iron pipelines.
AS 3735	-	Concrete structures for retaining liquid
AS 3862	-	External fusion-bonded epoxy coating for steel pipes
AS 3996	-	Access covers, road grates and frames.
AS 4058	-	Precast concrete pipes (pressure and non pressure)
AS 4060	-	Loads on buried vitrified clay pipes.
AS 4087	-	Metallic flanges for waterworks purposes
AS 4100	-	Steel structures
AS/NZS 4129	-	Fittings for polyethylene (PE) pipes for pressure applications.
AS/NZS 4130	-	Polyethylene (PE) pipes for pressure applications.
AS/NZS 4131	-	Polyethylene (PE) compounds for pressure pipes and fittings.
AS/NZS 4158	-	Thermal-bonded polymeric coatings on valves and fittings for water industry purposes
AS 4198	-	Precast concrete access chambers for sewerage applications
AS/NZS 4321	-	Fusion-bonded medium-density polyethylene coating and lining for pipes and fittings
AS/NZS 4765 (Int)		Modified PVC (PVC–M) pipes for pressure applications
HB48	-	Steel structures design handbook.

Where not otherwise specified in this document, the Contractor shall use the latest Australian Standard available within two weeks of close of tenders.

(c) Other

Institute of Public Works Engineering Australia (IPWEA)
- Streets Opening Conference Information Bulletin on Codes and Practices (Sections 3 and 4 detailing locations and depths of other services).

PWD - Safety Guidelines for fixed ladders, stairways, platforms and walkways for use in sewage treatment Works, pumping stations and maintenance holes.

Building Codes Board of Australia
- Building Code of Australia - PART E1, Fire Fighting Equipment.

Plumbing Code of Australia (PCA)

European Standard.
BS EN 1091 - Vacuum Sewerage Systems

Water Services Association of Australia (WSAA)

WSA 02–2014 - GRAVITY SEWERAGE CODE OF AUSTRALIA,
WSA 04–2005 - SEWERAGE PUMPING STATION CODE OF AUSTRALIA,
WSA 06-2008 - VACUUM SEWERAGE CODE OF AUSTRALIA
WSA 07-2007 - PRESSURE SEWERAGE CODE OF AUSTRALIA ,
WSA 2007- Product and Material Information and Guidance
WSA 02-2002 - SEWERAGE CODE OF AUSTRALIA (STANDARD DRAWINGS)
WSA PRODUCT SPECIFICATIONS FOR PRODUCTS AND MATERIALS - WSA PS 200 TO 404 (Where Relevant)

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(d) Standard Drawings that apply to this section: ***Drawings***

The following Tweed Shire Council standard drawings shall be used:

S.D.110	Interallotment Drainage/ Sewerage Location Diagram
S.D.220/01	2.0m diameter Pump Station - Site Layout
S.D.220/02	2.0m diameter Pump Station - Standard Notes
S.D.220/03	2.0m diameter Pump Station - General Arrangement
S.D.220/04	2.0m diameter Pump Station - Sectional Plan and Section 'A'
S.D.220/05	2.0m diameter Pump Station - Concrete Reinforcing
S.D.220/06	2.0m diameter Pump Station - Details
S.D.240	Sluice Valve Installation Details
S.D.242	Automatic Air Valve Installation Details
S.D.243	Manual Air Valve Installation Details
S.D.244	Sewerage Rising Main Discharge Chamber
S.D.250	Property Connection Details - Type A and Type B
S.D.251	Property Connection Details - Type C1 and Type C2
S.D.252	Property Drain Connection to Council Sewer
S.D.260	Pressure Sewerage Systems Property Service Layout
S.D.261	Pressure Sewerage Systems Typical Details

S.D.262	Pressure Sewerage Systems House Drain Connection Details
S.D.263	Pressure Sewer Rising Main Connection of Single Household Pump to Council Gravity Sewer
S.D.272 Panel	Control Building for Sewage Pumps Up To 80kW - Tilt-Up Construction (Sheets 01-09)
S.D.273	Control Building for Sewage Pumps Up To 80kW - Blockwork Construction (Sheets 01-09)
S.D.276	Trench Drainage Bulk Heads and Trench Stops
S.D.277	10m Vent Stack
S.D.278	Maintenance Holes for Sewers ≤ 300 mm Diameter
S.D.820	Sewage Pump Stations 0.1-22.5kW Electrical Standard Drawings SCADA Pack 350 Controller (Sheets 00-17)

SEWERAGE CODE OF AUSTRALIA drawings are to be used in preference to DPWS Standard Drawings (WSA 02-2002, 4, Standard Drawings SEW-1100 to 1500 series).

DESIGN CRITERIA

D12.04 GENERAL

1. Sewerage systems design criteria shall be in accordance with the SEWERAGE CODE OF AUSTRALIA (WSA 02–2014, 1; WSA 04-2005; WSA 07-2007) unless specified otherwise herein. ***Standard***

2. Council will provide: ***Design Responsibility***

   (a) Details of the existing sewerage system in the area and any significant proposed alterations

   (b) Preferred connection point(s)

   (c) Council's *Sewerage Strategy Study* for the appropriate catchment (where available)

   (d) Requirements for additional sewerage system capacity in the subdivision or development for future expansion

   The Subdivider's/Developer's Designers shall:

   (a) From information provided by Council and the designer's own investigations, evaluate the availability and capacity of the existing sewerage system to accept design flows from the development (and any required upstream areas)

   (b) Determine if system upgrading downstream of the proposed development is required

   (c) Design the subdivision/development sewerage system including the connections and links to the existing system; include provisions or extensions required to provide for future upstream or adjoining development in accordance with this specification; include necessary capacity upgrading of the existing downstream system.

   (d) The design is to be consistent with the optimum design for the whole catchment including accommodation for any future extension of the system.

   (e) Perform sewer overflow risk analysis to comply with the licensing guidelines for sewerage treatment systems available on the NSW Office of Environment and Heritage (OEH) website http://www.environment.nsw.gov.au/water/sewagetreatment.htm

3. The Designer shall confirm the design criteria with TSC and shall design a gravity pipeline distribution system with pump stations and rising mains, where necessary to comply with the requirements of this Specification, to transport fresh sewage, or common effluent, for treatment. ***Conventional Gravity System, Pump Stations and Rising Mains***

4. Alternative sewerage systems will only be considered after consultation with and approval from TSC. ***Alternative Sewerage Systems***

5. The Designer shall not provide for discharges from alternative sewerage systems to gravity sewers or conventional wastewater treatment plants without the concurrence of TSC. ***Discharges to Gravity Sewers***

6. At Development Application Stage a Sewerage Management concept report including assumptions, calculations used in determining design flows and layout plans shall be provided. Other pertinent considerations including pipeline self cleansing, detention time in rising mains, septicity and odour control and staging of capacity information shall be submitted to TSC for approval. (see Development Design Specification D13 - Engineering Drawings (Subdivisions)). For large developments including subdivisions, the report shall include (where applicable) how capacity for future stages is incorporated and any upgrade works to either the existing or future system to enable the servicing of the development. (Refer to Clause D12.05.4). For smaller developments, Clauses D12.05.4 (a), (b) and (i) shall be submitted for approval provided as a minimum,

Design Information

7. At Construction Certificate Application Stage or Section 68 Application, Detail Design Engineering plans shall be submitted to TSC for approval. Design shall be as outlined in Development Design Specification D13, (Groups D24 to D29) and C402 - Development Construction Specification Sewerage System.

Detail Design Information

8. Best practise is for development to be separated from Wastewater Treatment Plants (WWTP's) by a distance that minimises the odour or other air pollutant impacts on the amenity of the development. Wastewater Treatment Plants are "Industrial" by nature and have potential for unacceptable odour and amenity impacts. It is therefore recommended that only Industrial zones around Wastewater Treatment Plants are permitted, otherwise Rural or Special Infrastructure.

WWTP Buffer Zones

The NSW Department of Urban Affairs and Planning and more recently the NSW Department of Planning suggest preferred buffer areas around Wastewater Treatment Plants based on the best engineering practise and design. A two level buffer standard is required with the primary and secondary buffer for operational, decommissioned and proposed future WWTP locations.

Description	Primary Buffer	Secondary Buffer
WWTP (current or proposed)	200 metres	400 metres

The Primary buffer restricts development between any current or proposed process units and ponds of any Wastewater Treatment Plant and the nearest boundary of any allotment except for uses of an open air nature (e.g. car parking) or those uses not requiring permanent or prolonged work station occupation.

The Secondary buffer may include only Industrial zones around Wastewater Treatment Plants, otherwise Rural or Special Infrastructure. Buildings associated with industrial or trade must be designed with ventilation emanating from the side facing away from the Wastewater Treatment Plant, and any office/retail components of the industrial building are to be air conditioned. A suitable vegetated area of 10 metres within the buffer is recommended to screen the Wastewater Treatment Plant from public view.

Residential development is not located within the primary or secondary buffers surrounding Wastewater Treatment Plants. Development including Residential and Business zones, Village, Tourist, Large Lot Residential, Community facilities (eg, halls, schools etc) and other habitable buildings are excluded.

Applications for development on land within the Wastewater Treatment Plant buffer should be accompanied by an air quality assessment report including odour modelling to simulate the dispersion if odour emissions and predict downwind concentrations. This application is to be approved by the General Manager or his delegate prior to any development on the land.

To ensure compliance with the Wastewater Treatment Plant buffers, any subdivision development will contain a condition requiring registration of a

restriction as to use under Section 88B of the Conveyancing Act stipulating the above requirements if not already implemented as part of land use zoning provisions.

D12.05 DETERMINATION OF AREA TO BE SERVED

1. The area to be served shall be determined in accordance with WSA 02–2014, Part 1 except that TSC may require provision for an upstream sewer. In the design brief TSC will indicate the level and size of existing or proposed pipe(s) as well as anticipated flows to be allowed for in the design. ***Upstream Sewer***

2. The depth of sewer shall be sufficient to allow a minimum of 90 per cent of each lot to be serviced. The minimum depth of a soffit of the sewer connection point shall be 1.2m or in accordance with WSA02-2014 S5.6.5 subject to approval of the Director. ***Soffit Depth***

3. All lots shall be able to be served by gravity sewers wherever possible. ***Provision of Sewerage***

4. A Sewerage Management concept report is to be submitted for approval with the development application. This concept report should address the planning and design principles outlined in WSA 02-2014 Part 1, including (but not limited to) the following: ***Sewerage Management Concept Report***

   (a) Design flows based on estimated population

   (b) Staging of the development and assessment of the downstream and existing system to receive additional flows,

   (c) Septicity and odour control management of each stage

   (d) Pump lot layout and pump design including efficiency and costs of operation at each respective stage

   (e) Minimum velocities in gravity pipelines and SRMs at each stage

   (f) Overall operation costs at each stage (including servicing replacements)

   (g) Comparative report on at least two total system options (if alternative to conventional gravity is proposed), with operational and maintenance costing for each stage for the consideration of the Director

   (h) Sewer overflow risk analysis including controlled overflow locations

   (i) Assumptions, calculations and plans for the concept design.

D12.06 DESIGN LOADING

1. Design shall be based upon the WSA 02-2014, 1, 3 design flow estimation methodology (also see Appendix C Flow Estimation for Undeveloped Areas) but with the following qualifications and parameter selection guidelines: ***Storm Allowance***

   (a) One Equivalent Tenement (ET) shall be 2.8 Equivalent Persons (EP)

   (b) Average Dry Weather Flow (ADWF) shall be 180 L/EP/day

   (c) Groundwater Infiltration (GWI) for new developments using conventional sewerage systems shall be 0.01425 L/s/Ha. Where the development is using older sewerage systems (pre July 2003 construction) GWI shall be taken to be

0.02125L/s/Ha.

(d) Soil Aspect (Sa) shall be taken as 0.5 unless otherwise approved by TSC.

(e) Network Defects and Inflow Aspect (Na) shall be taken to be 0.5 unless otherwise approved by TSC

(f) Rainfall Intensity for 1 hour 2 year storm event (I(1,2)) shall be 52mm/hr

(g) New gravity sewers shall be sized to permit 5 year ARI storm event inflow and infiltration, however where downstream conveyancing systems cannot cope with that flow, pumps will be sized to deliver a 2 year ARI storm flow. The pump duty shall be submitted to TSC for approval before adoption.

2. Design flow for sewers servicing industrial and commercial areas shall take into consideration the type of development envisaged or existing, the guidance provided by WSA 02-2014 (Appendix B) and other pertinent information. The Designer shall obtain approval from TSC prior to completion of the design. ***Flows***

3. Where other than conventional gravity sewerage systems have been approved for use, the designer shall submit all design criteria proposed to be adopted, any limitations of the system and justification for the adoption of the criteria to TSC for approval prior to proceeding to design.

4. The design shall take account of AS 2200, AS/NZS 2566.1, AS 3500, AS 3735, and WSA 02-2014. ***Design Codes***

5. A copy of the design loading calculations and assumptions shall be submitted to Council for approval. ***Design Loading Calculations***

D12.07 SEWER ALIGNMENT

1. Sewer design shall take account of WSA 02-2014, 1, 5 ***Extent of Location***

Sewer mains are to be laid to each allotment. One junction is required per allotment. Exceptions will not be made for sewers passing through town houses or mobile home style developments.

Proponents should familiarise themselves with the distinction between sewerage works and sanitary drainage system works, the latter being defined and regulated under the Plumbing and Drainage Act 2011. Sanitary drainage including house drainage to serve strata titled developments requires approval under the provisions of the Plumbing and Drainage Act 2011 and associated regulations. Irrespective of it being shown on subdivisional drawings, no sanitary drainage will be approved under this specification.

The guidelines of plan location of gravity sewer lines are offered below:

(a) On street frontages of allotments, sewer lines shall be located 1 to 2 m within the property boundary, if driveway access cuttings are not required. . Some flexibility can be applied for sewer alignments along curved property frontages, subject to approval of the Director. An easement over the sewer line of not less than 3.0 m is to be provided.

(b) On side boundaries of allotments, sewer lines shall be located 1 to 2 m from the side boundary, with a minimum easement width of 1.5 times the sewer depth plus 0.5 m, but not less than 3.0 m or more than 3.5 m provided.

(c) On side boundaries of allotments, sewer lines shall be located 1 to 2 m from

the side boundary, with a minimum easement width of 1.5 times the sewer depth plus 0.5 m, but not less than 3.0 m or more than 3.5 m provided.

(d) On rear boundaries, sewer lines shall be located 1.5 m from the boundary, with an easement over the sewer line of not less than 3.0 m provided.

Sewerage rising mains shall be located in road reserves where possible. For permissible locations in the road reserve see TSC D1 – Road Design, Section 15.

Sewer Trenches

The impact of sewer trenches acting as subsoil drainage or reducing the bearing capacity of adjacent building wall or embankment foundations should be borne in mind by designers. Sewers shall not be laid in the bed or banks of unlined watercourses where the grade exceeds 1%.

Commercial & Industrial areas

All sewers in commercial and industrial areas shall be laid in publicly owned land, or contained in easements.

Environment

The consequences on the environment of any system component failure must be addressed.

2. ***Consent of Owner***

Where it is necessary for sewers to be located outside the development, the Designer shall obtain written approval from the affected property owner

3. ***Road Reserve***

Where sewers are proposed to be located within existing road reserves, the Designer shall check that the sewers do not conflict with other utility services. Locate the sewers in accordance with established protocols. (WSA 02-2014, 1, 5.4). See TSC D1.15 for road verge utility allocations.

4. ***Separation***

Sewers shall be located in accordance with WSA 02-2014, Part 1, Section 5.4, obeying all separation requirements, unless otherwise directed by TSC.

5. ***Easements***

Easements in favour of Council shall be provided by the Developer as follows

(e) Over all sewers (gravity or pressure) located on private property including (but not limited to) residential lots, parks and reserves, industrial and commercial sites.

(f) Easements shall be:

(i) 3.0m wide minimum for single reticulation mains up to and including 300mm diameter (with no other services installed);

(iii) 5.0m wide minimum for an existing single reticulation main greater than 300mm diameter (with no other Council service installed)

(iii) for each additional trunk main co-located within the easement an additional 3.0m minimum shall be provided;

(g) Shared easements (containing two different services where approved by Council e.g. sewer and interallotment stormwater) shall be:,

(i) 4.0m wide minimum for services up to and including 300mm diameter each. Refer to S.D.110 for details of service allocation and separation distances within this minimum shared easement width.

(ii) If either service exceeds 300mm diameter, the width of the easement may be required to exceed the minimum 4.0m width, subject to considerations including (but not limited to): pipe depth and diameter, zone of influence, minimum pipe separation requirements in accordance with WSA 02-2014, Part 1, Section 5.4, and/or geotechnical and groundwater conditions.

(h) Easements shall be protected with a Section 88B restriction as to user,

(i) The sewer shall be located in the centre of the easement unless otherwise approved by TSC. A Registered Surveyor shall survey easements and pipelines. (WSA 02-2014, 1, 5.2.8).

6. Where easements are located through private property no structures or part thereof may encroach into the easement, as per TSC Easement Policy. ***Easement Policy***

7. Construction over or near existing sewers must conform to the TSC Council Utilities - Works in Proximity Policy. ***Works in Proximity Policy***

8. Where control of the trench width is practical or effective, the design may be based on wide trench condition. The Designer shall call up the need, in the Construction Specification, for the Contractor to supply special construction control with a method statement when there is economic justification to design to narrow trench condition. ***Trench Width***

9. Trenchless techniques may be acceptable subject to TSC approval where the location is not suitable for trenching such as roads, built up areas and where environmental conditions make trenching difficult). Unless approved, all pipes shall be encased. Design shall be in accordance with WSA 02-2014 and C402 - Development Construction Specification Sewerage System. ***Trenchless Techniques***

10 Sewer pipelines greater than 3m depth or greater than 300 mm in diameter shall be designated as "trunk" sewers and located outside of allotments. (refer to Clauses D12.30.1 to D12.30.5 inclusive.) ***Trunk sewers***

D12.08 MAINTENANCE STRUCTURES

1. Design shall take into account WSA 02-2014, 1, 7 and SD278. ***General***

(a) Maintenance structures comprise Maintenance Holes (also known as manholes) (MH's) and Terminal Maintenance Shafts (TMS's). MH's are Councils preferred maintenance structure. TMS's may be adopted subject to TSC approval.

(b) Provision of MH's and TMS's shall be in accordance with WSA 02–2014, 1, Table 7.1. TMS's shall not be used as permanent ends to property connection sewers. ***Application***

(c) A MH is required at the end of dead end lines greater than 10 m long.

(d) Maintenance structures shall generally be placed on gravity sewers as specified in WSA 02–2014, 1, 7.3. The maximum distance between any two consecutive maintenance structures is to be 90 m except where; ***Spacing***

(i) The dead end line is less than or equal to 10 m in length, then an end cap is required.

(ii) The dead end line is greater than 10 m but less than or equal to 30m in length, then a manhole is required.

(iii) The dead end line is greater than 30m but less than or equal to 90m in length, then a manhole is required.

(e) Where curved property frontages exist, sewer alignment shall be designed to reduce the number of MH's. Unless approved by TSC, manholes should not be less than 10m apart.

2. All upstream ends of sewers shall terminate in a MH if the upstream end is more than 10m from the downstream maintenance hole. The designer should limit maximum MH depths to 5.0m. ***Maintenance Structures***

3. Access ladders and step irons are not required ***Step Irons***

4. The Designer shall provide for the venting of MH's which accept pumped discharges, where odour control may be required and at Sewer Pumping Stations. Vent stack (shaft) shall be higher than the maximum building height where possible. 10m vent stacks shall be provided unless otherwise approved by TSC. (refer to WSA02-2014, 1, 8.4 and S.D 277) ***Venting***

5. Connections to existing sewerage infrastructure shall be made using a MH. Connection positions shall be in accordance with TSC's Sewerage Master Plan and require TSC approval. ***Connections to Existing Systems***

6. On reticulation sewers where the internal fall across the base of the manhole is not achievable due to a large difference between the levels of incoming and outgoing sewers, then external drops shall be provided in accordance with WSA 02-2014. Internal drops are unacceptable unless specific TSC approval is obtained. ***External Drop***

7. Precast manhole systems using reinforced or unreinforced concrete rubber ring jointed segments in accordance with AS 4198 (Humes, Amatec, EJ or equivalent accepted) may be used. The standard manhole diameter shall be 1050mm with a standard clear opening diameter of 600mm minimum. For manholes deeper than 4m, the standard diameter shall be 1200mm, standard clear opening 600mm x 900mm minimum. ***Manhole Standard Diameter***

8. Access covers shall be ductile iron hinged with watertight seal manufactured in accordance with AS 3996. MH access openings shall have a minimum clear opening diameter of 600mm. Where approved, concrete access covers shall comply with AS 4198 and shall have a minimum clear opening diameter of 600mm ***Access Covers***

   All manhole access covers and surrounds must be lightweight ductile iron hinged with rubber water tight seal, be marked "San Sewer" and be the appropriate class for the traffic loading. (EJ Maestro Access Covers or similar).

   In coastal towns, villages (Tweed Heads east of Razorback, Fingal, Kingscliff, South Kingscliff, Casuarina, Cabarita Beach, Bogangar, Hastings Point, and Pottsville) and other areas within one kilometre of the coast, concrete manhole covers may be used only if approved by TSC.

9. Access covers shall be water tight and gas tight and finished horizontally flush with the finished surface level; not buried or on an angle. Covers should not be located in overland flow paths or stormwater drainage channels. Covers should not be located within one meter of a stormwater or roof water inlet pit/grate. ***Access Cover locations***

10. Heavy Duty (Class D) manhole covers to be provided in areas accessible to vehicles. Light Duty (Class B) manhole covers to be provided in pedestrian areas. (AS3996-2006, S3.1) ***Access cover load ratings***

11. Minimum concrete strength for all cast insitu components of maintenance structures shall be 50MPa. ***Concrete Strength***

12. TMS's having uPVC chambers shall be provided with 20MPa mass concrete encasing 150mm thick around the chamber. Concrete surfaces shall finish 100mm short of the connection pipe and riser shaft ends. ***Concrete Encasement***

13. House connections shall not be made to manholes. ***House connections***

14. Maintenance hole units can be either pre-cast or cast-in-situ. Benching and invert levels shall be designed to suit the inflow conditions and shall be designed in accordance with WSA 02-2014, 1, 7.6. (also refer to S.D.278 for standard manholes) ***Standard MH***

15. Maintenance holes and covers shall not be located on a property boundary. The centre of the access cover shall be a minimum of 1.5 m from the property boundary. ***Property boundary***

16. Smartpit PE maintenance holes may be used at sewerage rising main discharge maintenance structures that accept pumped flows ***Discharge Manhole***

D12.09 MINIMUM COVER OVER SEWERS

1. Minimum cover to top of reticulation sewers shall be: ***Minimum cover***

- 600mm for public and private lots not subject to vehicular loading,
- 750mm for private lots subject to vehicular loading,
- 900mm for footways, nature strips, industrial or commercial lots and sealed road pavements, other than major roads, subject to vehicular loading,
- 1200mm for major road carriageways.

D12.10 PIPELINE

1. Design shall take into account WSA02-2014, 2. ***Type***

   Pipes and fittings for sewerage systems shall be of unplasticised PVC, modified PVC, Oriented PVC, ductile iron, vitrified clay, steel, polyethylene, glass reinforced plastic or reinforced concrete with type CASL (calcareous aggregate with additional sacrificial cover). The material specifications for each pipe type are provided in Clauses D12.13 to D12.19 inclusive.

   UPVC pipes for gravity sewers shall be RRJ class SN8 in 3m length.

2. (a) Gravity pipelines for road crossings or where located under road pavements shall be series 1 white uPVC pressure pipe min class 12, or DI Epoxy Lined internally. House connections to these pipelines are not permitted ***Road Crossings***

   (b) Pressure pipelines for road crossings or where located under road pavements shall be DICL or uPVC class 16.

   (c) Changes in pipe material shall only occur at MH's.

   (d) Where trenchless techniques are used the carrier pipe must have white internal pipe wall surface.

3. Asbestos cement pipe and fittings shall not be used. ***Asbestos Cement***

4. The physical and chemical nature of the soil and the nature of the likely trade wastes, e.g. industrial solvents, should be taken into consideration when selecting the type of piping.

5. Pipelines shall be buried. Above ground sewers may be designed in a gravity system only where other options are less practical and unless specific TSC approval is obtained. (WSA 02-2014, 1, 5.6.3) ***Buried Pipes***

6. The Designer shall show on the Drawings the extent of external protection required to be undertaken by the Contractor. External protection shall be shown to comply with C402 – Sewerage System. ***External Protection***

7. For pipeline sizing and grading, WSA 02-2014 Section 5.5 shall be used. ***Sizing & Gradients***

8. For pipeline sizing and minimum gradients for upstream sewers in residential areas, refer WSA 02-20142 Tables 5.9 and 5.10 for property connection sewers and upstream ends of sewers in residential areas with EP ≤ 20. ***Minimum Gradients***

9. For further pipeline sizing and minimum gradients, refer WSA 02-2014 Table 5.8 regarding absolute minimum grades for construction. When read in conjunction with WSA02-2014 Part 2 Table 22.1, the absolute minimum grade for design should take into account construction tolerances of 10% for flat pipes. Table 1 below highlights the absolute minimum design grade. ***Minimum Gradients***

Table 1 - Minimum Sewer Grades

Pipe Size (mm)	Absolute Minimum Grade	
	(As-Constructed Grade)	Design Grade
	(Table 5.8)	(Table 5.8 and Table 23.1)
150	1:180	1:165
225	1:300	1:275
300	1:400	1:365

10. WSA 02-2014 Section 5.5.7.2 states that self-cleansing flow required for removal of grit and debris shall be based on achieving a wetted cross section average velocity of 0.7m/s at PDWF+GWI. Where sewer grades based on Table 1 cannot achieve a wetted cross section average velocity of 0.7 m/s at PDWF+GWI, Table 2 should be used for minimum sewer grade design. ***Minimum Gradients***

Table 2 - Minimum Sewer Grading Table

Pipe Size(mm)	150	225	300
Grade	Tenements	Tenements	Tenements
k (in mm)	1.5	1.5	1.5
80	1		
90	4		
100	9	16	
110	13	21	
120	19	29	40
130	26	36	47
140	33	44	54
150	43	51	61
160	50	59	70
180	69	74	87
200		94	109
220		119	131
250		161	171
300		266	263
350			384
400			556

11. For grading through manholes, refer WSA 02-2014 Section 5.6.6. Minimum fall through manholes as per Table 5.12 and review of hydraulic performance of the sewer entering a manhole is required to reduce the effect of non laminar flows and hydraulic jumps occurring. This is further outlined in Section 5.6.6.6. ***Minimum Internal fall***

12. Where sewer pipes or rising mains are to be located in close proximity to other services pipes or where there is the likelihood of the pipes not being recognised as sewerage pipes, the Designer shall provide for the pipes to be colour coded and shown on the Drawings accordingly. Water pipe colours shall **NOT** be used for sewers. ***Colour Coding***

    The following colour coding shall be used:
    Sewerage rising mains - cream or grey
    Effluent mains - purple

    Pipe colours shall be displayed as follows:
    PVC pipe - pipe material to be coloured
    DICL pipes - polyethylene sleeving to be coloured
    PE pipes - pipe stripes to be coloured
    Other materials where the pipe or coating material cannot be coloured - coloured polyethylene sleeving to be installed

13. To enable internal and CCTV inspections, all gravity pipes must have white or other light shaded internal wall surfaces (WSA 02-2014, 1, 4.4) ***Serviceability***

14. Piers for any above ground sewer pipeline shall be in accordance with WSA 02-2014. ***Piers***

15. The pipeline alignment shall be such that no property connection sewer is to be more than 10m in length. ***Property Connection***

16. The Designer shall ensure that connections to the pipeline shall be not more than 1500mm in depth below the finished surface. ***Connection Depth***

17. The Designer shall allow for adequate working area, waste removal and transport arrangements where scouring points or inspection pipe locations are nominated. ***Special Allowances***

18. The Designer shall design thrust blocks to resist maximum pressure of the pipe, not the estimated surge pressure. ***Thrust Blocks***

19. The Designer shall provide for surge control by specifying an appropriate rising main material and class selection. Minimum Class 12 pipes shall be used for sewage rising mains. ***Surge Control Method***

20. Structural protection from external forces consisting of concrete or steel encasement shall be provided where pipelines are constructed under load. (WSA02-2014 9.4) ***Structural Protection***

D12.11 JOINTS

1. Gravity sewers and rising mains shall generally be spigot and socket joints with rubber rings (elastomeric) complying with AS 1646, or butt welded in the case of polyethylene pipe. ***Rubber Ring or Butt Welded***

2. Flanged joints connecting pipes, fittings, valves and pumps shall comply with AS 4087. The concurrence of TSC shall be obtained for the type of joint to be used. ***Flanges***

D12.12 UNSTABLE AREAS

1. The pipe jointing system selected shall be capable of accepting ground movements, without impairing the water tightness of the joint. For areas with high ground strains a pipe jointing system using shorter effective length pipes and/or ***Geotechnical Issues, Pipe Jointing System***

deep socket fittings shall be used.

In areas of known or suspected mass movement, subsidence or land slip, a geotechnical engineer's investigation and report is required recommending design/construction techniques required to ensure that the expected working life of the system will not be compromised by geotechnical risks.

MATERIALS

D12.13 UNPLASTICISED PVC (uPVC) GRAVITY PIPE

1. Unplasticised PVC (uPVC) pipe shall be specified to be manufactured in accordance with AS/NZS 1260, designed in accordance with AS/NZS 2566.1 and with rubber ring (elastomeric) spigot and socket joints. (WSA 02-2014, 2, 13). The pipe shall be not less than Class SN8. ***Standard***

2. The Designer shall ensure that PVC pipe is compatible with ductile iron (DI) pipe where necessary. ***DI Compatible***

3. Fittings for use with PVC pipe shall be elastomeric seal jointed. ***Fittings***

D12.14 UNPLASTICISED, ORIENTED PVC & MODIFIED PVC (uPVC, OPVC, PVC-M) PRESSURE PIPE

1. PVC Pressure Pipe shall be specified as below: ***Standard***

   (a) Unplasticised PVC (uPVC) pressure pipe shall be specified to be manufactured in accordance with AS/NZS 1477 Series 2 and AS/NZS 4765, designed in accordance with AS/NZS 2566.1, and with rubber ring (elastomeric) spigot and socket joints.

   (b) Oriented PVC (OPVC) pressure pipe may be used, except for 500 MRS 50 MPa. Wherever OPVC is proposed in designs, the Minimum Required Strength (MRS) shall be specified.

2. The Designer shall ensure that PVC pressure pipe is compatible with ductile iron pipe where necessary. ***DI Compatible***

3. Fittings for use with PVC pressure pipe shall be DICL elastomeric seal jointed. ***Fittings***

4. PVC-M shall not be used on rising mains or pipes under pressure. . ***Rising Mains***

D12.15 DUCTILE IRON (DI) PIPE AND FITTINGS

1. Ductile iron pipes and fittings shall be specified to be manufactured and cement mortar lined in accordance with AS/NZS 2280 minimum Class PN20 for rubber ring (elastomeric) joints. Where pipes are flanged, Flanged Class shall be specified. ***Standard***

2. The Designer shall specify cement mortar lining in accordance with AS 1281, or fusion-bonded medium density polyethylene to AS/NZS 4321 (for gravity mains). ***Corrosion Protection***

   External protection shall be epoxy coating to AS 3862 where not otherwise specified as sleeved or wrapped, taking into account the type of corrosion protection required.

3. Generally, pipe and fitting joints shall be specified to be spigot and socket type using a rubber ring (elastomeric) push in seal made of natural rubber, or ethylene ***Joints***

propylene rubber with compounds complying with AS 1646. The seal shall be a single jointing component shaped to provide both groove lock and seal mechanisms.

4. Flanges shall be specified to be manufactured in accordance with AS 4087 Figure B5. Bolts, nuts and washers for flanged joints shall be stainless steel in accordance with AS 4087. ***Flanges***

5. Where sewer pipelines may be temporarily or permanently exposed (ie: over stormwater drainage channels or within buildings), Ductile Iron Pipe and Fittings shall be used. ***Exposed pipelines***

D12.16 VITRIFIED CLAY (VC) PIPES AND FITTINGS

1. Vitrified Clay pipes and fittings shall be specified to be manufactured in accordance with AS 1741 and designed in accordance with AS 4060. ***Standard***

2. Pipe and fitting shall be spigot and socket type using roll on rubber ring (elastomeric) joints. Natural rubber shall not be used. ***Joints***

D12.17 STEEL PIPE AND FITTINGS

1. Steel pipes and fittings shall be specified to be manufactured in accordance with AS 1579 and AS/NZS 1594 and designed to AS/NZS 2566.1. ***Standard***

2. The Designer shall specify the jointing system where long-term corrosion resistance, ease of construction or special circumstances dictate the need. The pipe jointing shall be either: ***Joints***

   (a) Rubber ring (elastomeric) jointed to conform to AS 1646, or

   (b) Welded with butt welding or by using a welding collar with the application of a polyethylene heat shrunk sleeve over the weld, or wrapped, or

   (c) Flanged to comply with AS 4087 table C. Bolts and nuts for flanged joints shall be stainless steel in accordance with AS 4087 and C402 – Sewerage System.

3. Steel pipes and fittings shall be cement mortar lined in accordance with AS 1281 and coated externally with FBPE in accordance with AS 4321. ***Corrosion protection***

D12.18 POLYETHYLENE PIPE AND FITTINGS

1. Polyethylene pressure pipe shall be specified to be manufactured in accordance with AS/NZS 4130 and designed to AS/NZS 2566.1. ***Standard***

2. Fittings shall comply with AS/NZS 4129 with compounds to AS/NZS 4131. ***Fittings***

D12.19 GLASS REINFORCED PLASTIC (GRP) PIPE AND FITTINGS

1. Glass filament reinforced thermosetting plastics (GRP) pipes shall be specified to be manufactured to AS 3571 and designed to AS/NZS 2566.1. ***Standard***

2. Fittings shall comply with AS 2634.

SEWAGE PUMP STATIONS (SPS)

D12.20 GENERAL

1. TSC standard pump station and associated standard drawings show typical layouts and details only. These drawings are provided to establish TSC typical design requirements only and shall not be used by Designers as detailed design drawings. The Designer shall be wholly responsible for the design of the pump station and shall prepare a set of project specific detailed design drawings complete in all respects to allow construction and commissioning of the pump station. ***Standard Drawings***

2. The detailed design drawings shall be in accordance with the requirements of the TSC Standard Drawings, the TSC Development Design Specification D12 – Sewerage System, the TSC Development Construction Specification C402 – Sewerage System, applicable Codes of Practice, Australian Standards as well as the requirements of Statutory Authorities. The designer shall submit the complete set of detailed design drawings to TSC for approval. TSC will provide an SPS name and number to be displayed on the drawing title blocks. The construction certificate will only be released by TSC on approval of the design submission. ***Design Drawings***

   The design drawings shall clearly detail the following information (as a minimum requirement):

General

a. Reference to applicable TSC standard drawings, specifications and Australian Standards.

Siteworks

a. Landscaping details, reinstatement and surface finishing;
b. Security fencing and gate (where required – Designer to check with TSC);
c. Pump station, collector manhole and pipework setout details;
d. Access driveway layout;
e. Site drainage details;
f. Water and power supply positions;
g. Vent pipe and odour control equipment positions;
h. Co-ordinate system and bench mark(s);
i. Layout of overflow mitigation provisions.

Access driveway

a. Horizontal and vertical alignment of access driveway;
b. Pavement design details.

Pump well and valve pit general arrangement

a. Pump, pipework and associated equipment details;
b. Pump well and pump control levels;
c. Access cover manufacturer, individual lid sizes and weights, cover positions and lid configurations, opening directions and support beam positions;
d. Ladder position and details;
e. Conduit, cable and cable support details;
f. Ventilation and odour control details.

Concrete and reinforcing details

a. Concrete layouts, levels and dimensions;
b. Reinforcing steel details;

c. Concrete grades and cover to reinforcing;
d. Benching details;
e. Corrosion protection coating details.

Pumps and switchboards

a. Pump manufacturer, model, setout dimensions, clearances and pump numbering;
b. Pump performance details and curve;
c. Guide rail details;
d. Switchboard location and door opening orientation;
e. Switchgear cabinet details;
f. Pump schematics;
g. Power circuit schematics;
h. Telemetry control wiring details;
i. Solid state starter layout;
j. Electrical supply authority details.

Vent pipes and odour control system

a. Position, details and dimensions of vent system;
b. Manufacturer, model and complete details of odour control system.

3. (a) The Designer shall take into account access, site maintenance and restoration, easements, location of residential areas, power supply and working area when locating pump stations. ***Location***

(b) All pump stations are to be constructed within a separate Lot to be created in the plan of subdivision. The separate Lot is to be transferred to TSC following registration of the plan of subdivision at no cost to TSC.

(c) The distance to any residential or commercial lot boundary is to be maximised to prevent odour, noise and nuisance issues. Unless specific TSC approval is obtained, pump stations shall be located in public open space with at least a 50m buffer between the pump station, collector manhole or vent and adjacent property boundary. If the buffer is less than 50m, the designer must provide justification of the adequacy of the final buffer width with respect to the size of the pumping station, septic conditions of received flows, odour control measures and locality for approval by the Director. ***Buffers***

(d) The pump station site shall be a minimum of 225 square metres in area (excluding access). Refer to S.D.220/1 for pump station site layout. ***Area***

4. The Designer shall provide for all pump stations to be of the single wet well submersible pump style with a minimum of two pumps in a duty/standby arrangement and with self contained freestanding switchboards suitable for external use, in accordance with TSC standard drawings. ***Pump Station Type***

5. (a) The pump well shall be designed to accommodate peak wet weather flow from the ultimate catchment. The volume contained between the pump cut-in and cut-out levels shall be equivalent to 90 seconds pumping with the duty pump operating (WSA 04-2005, Cl.5.4.3). ***Well Capacity***

(b) Pump wells shall be maximum depth of 6.0 m (top of slab to pump well floor). In special circumstances deeper pump wells may be approved by TSC. ***Well Depth***

(c) Pump wells shall be sized to a maximum of 8 to 10 starts per hour depending on the pump size. Motors ≤ 15 kW shall have a maximum of 10 starts per hour during the peak times and motors >15 kW shall have a maximum of 10 starts per hour during the peak times. ***Well Size***

6. The Designer shall provide for the construction of the pump station and pump well after taking into consideration the ground and site conditions. TSC S.D.220/01-220/04 for Pumping Stations shall be followed in principle but separate detailed drawings are required. ***Site Conditions***

7. Pump stations shall be of cast in-situ reinforced concrete construction. Minimum concrete strength shall be in accordance with TSC S.D. 220/02. ***Pump Station Construction***

   Preformed components or systems, complying with TSC S.D.220/01-220/04 for Pumping Stations may be used in lieu of in-situ construction, subject to approval of the Director and provided:

   (a) The natural groundwater table is below the pump stop level (The Designer shall ensure selected components make a watertight system and have a satisfactory surface finish).

   (b) Precast concrete wall units are to be manufactured to AS4058. The Designer shall take into account the cover requirements for reinforcing steel and cement types.

   (c) Joints are flush with the internal concrete surfaces and joint restraint is in accordance with the manufacturer's requirements.

8. The standard drawings show the preferred pump station site layout, however if necessary due to site constraints, the orientation of the pump station components may be varied to suit (subject to approval by TSC). The site layout shall generally satisfy the following requirements: ***Site Layout***

   (a) The pump station shall be oriented to discharge generally in the direction of the outgoing rising main. The maximum allowable change in rising main direction at the pump station site is 90 degrees.

   (b) One collector manhole shall be provided between the incoming sewer(s) and the pump well. Only one inlet pipe into the pump well shall be provided. The minimum internal diameter of the collector manhole shall be 1500mm.

9. Pump stations shall be provided with an access driveway to satisfy the following requirements: ***Access Driveways***

   (a) Driveways shall be geometrically designed to cater for the turning movements of a 10 tonne single rear axle truck. A three-point turning head shall be provided on all driveways. The turning head shall be located immediately adjacent to the pump station and be wholly contained within the pump station lot. Site layout must comply with TSC S.D.220/01.

   (b) Driveways less than 25m in length (measured from the kerb line/edge of seal of the public road to the start of the turning head) shall be constructed of reinforced concrete. Driveways longer than 25m may be constructed of reinforced concrete or bituminous spray seal.

   (c) Concrete driveways shall be designed in accordance with the TSC Driveway Access to Property Part 1 – Design Specification and constructed in accordance with TSC Driveway Access to Property Part 2 - Construction Specification.

   (d) Bituminous spray seal pavement construction shall consist of 100mm gravel NGB20-2d to TSC Construction Specification C242 or approved equivalent overlayed by a spray seal comprising one coat of binder and one coat of 10mm aggregate to TSC Construction Specification C244.

(e) The longitudinal grade of the access road shall not be steeper than 10%.

10. The Designer shall prepare a landscaping plan as part of the detailed design drawing set (submitted to TSC for approval). The pump station site shall be landscaped by the Developer on completion of construction works in accordance with the approved landscaping plan. ***Landscaping***

11. Unless approved otherwise, access covers shall be of Havestock or Gatic (Iron) manufacture and shall satisfy the following requirements: ***Pumping Station Access Covers***

(a) Access covers shall be gas tight and finished flush with the concrete slab surface. Access covers shall be cast insitu with the concrete slab, recesses in the slab for grouting in frames are not permitted.

(b) Maximum mass of individual lids to be 56kg.

(c) Pump well access openings shall be sized to allow easy removal of the pumps and shall provide a minimum clear distance of 150mm between the outside of the pump and fixed surfaces during removal of pumps. If this requirement cannot be met, a larger pump well shall be provided. Valve pit access openings shall extend the full width of the valve pit and shall be sufficiently long to allow vertical removal of all valves.

(d) Two part or multi part access cover shall have lids of equal size.

(e) Multi part access cover support beams shall be removable and shall be provided with approved lifting lugs to allow easy removal when necessary.

(f) Cover removal directions shall be as shown by the arrows on the standard drawings.

(g) The valve pit access covers and beam support shall be positioned to ensure that isolating valves can be operated with the support beam in place and the bypass pumping pipework can be easily connected to the bypass valve.

12. Sewerage pumping stations, collection manhole and rising main discharge manholes shall have ventilation and odour control and shall satisfy the following requirements: ***Ventilation and Odour Control***

(a) Where a sewage pump station, collection manhole or rising main discharge manhole receives flows from a rising main having a detention time greater the four hours from the source (based on ADWF), then an odour management plan is to be submitted as part of the development approval process. An objective of this management plan should be to provide odour control facilities which have minimised ongoing operational costs, as opposed to minimised upfront capital costs.

(b) Vent pipes and odour control systems shall be specifically designed to suit the location of the pump station and the anticipated sewage septicity. Where necessary, specialist designed odour control systems shall be provided.

(c) Minimum odour control shall consist of a replaceable TSC approved odour filter connected to a vent pipe as detailed in WSA04-2005, complete with a non-metallic ventilator at the end.

(d) The minimum height of the vent pipe shall be 10 m above the SPS slab level and shall extend at least 1.0 m above the tops of surrounding roofs within a radius of 50m. Vent pipe design shall also be subject to aesthetic

considerations. (refer S.D.277)

13. Where the pump station site is exposed to possible flooding by a 100 year flood event, the Designer shall consult with TSC to establish a flood planning level and associated design requirements. Suitable flood mitigation measures will be site specific and could include: ***Protection Against Flooding***

    (a) Elevating electrical cabinets to ensure that the cabinet footing level is 0.5 m above the 100 year flood level. This is the preferred option where the difference in elevation between the top of the pump station slab and the top of the switchboard platform slab is less than 1.8 m.

    (b) Where an electrical building is required, the floor level is to be 0.5 m above the 100 year flood level.

    (c) Provision of a waterproof electrical cabinet to TSC requirements.

14. The Designer shall provide for the design of pump wells to resist flotation both during the construction/installation stage and whilst operating under design flood conditions. ***Protection Against Flotation***

15. Package pump station units may be designed, with the prior concurrence of TSC, where the area being serviced is small and/or their inclusion contributes to an overall lesser depth of excavation in the system. ***Package Units***

16. Council shall not accept the ownership of the pumping stations servicing less than 50 lots, unless otherwise approved by TSC. ***Ownership***

17. The Designer shall provide for internal surfaces of wet wells, collection MH and SRM discharge MH to be prepared and coated with a corrosion resistant system approved by TSC. All bolted connections within wet wells shall be stainless steel complying with AS 4087. ***Surface Protection***

18. The NSW Office of Environment and Heritage (OEH) licences for sewerage treatment systems now include the collection system and require risk assessment and steps to mitigate the risk of overflows from the sewerage system. Accordingly, the design of sewerage systems for large developments should include a risk assessment to ensure that the prescribed minimums are adequate to produce the lowest possible risk. This assessment should be carried out in consultation with Council Officers and may result in infrastructure in excess of the minimum requirements set out in Council's Design Specifications and standard drawings. Risk assessment should comply with the licensing guidelines for Sewerage Transport Systems available on the OEH website http://www.environment.nsw.gov.au/water/sewagetreatment.htm ***Sewer Overflow Risk Analysis***

19. At least 8 hours ADWF total storage shall be provided within the system. Overflow management shall not allow discharge to natural watercourse under any circumstances. Overflow management strategies shall be subject to TSC approval. One or more of the following measures may be necessary: ***Overflows***

    (a) Provision of an emergency generator to ensure uninterrupted pumping during power failures. Emergency generators are mandatory on regional sewage pump stations ***Emergency Generator***

    (b) Provision of onsite overflow storage. If an overflow storage facility is required, provision shall be made to ensure automatic emptying of the storage facility once the overflow condition has passed. ***Overflow Storage***

    (c) Provision of a diesel pump plumbed into the site which would operate should the switchboard loose power. ***Diesel Pump***

20. (a) The Designer shall provide an alarm in the pumping system to indicate the occurrence of a sewage overflow. The overflow sensor shall be installed at the lowest point in the catchment (either at the pump station or at a sewer manhole if the manhole cover level is lower than the pump station cover level). ***Alarms and Signals***

    (b) Where overflow storage has been provided, the overflow alarm level shall be set at the invert level of the overflow pipe. Where no overflow storage has been provided, the alarm level shall be set immediately below the cover level of the pump station or manhole.

21. Where gravity sewer manhole covers are below the level of the pump station slab level, bolt down covers shall be provided. A minimum difference in elevation of 1.3m is to be provided between adjacent house floor levels and the cover level of the bolted down manhole(s). ***Bolted down manhole cover***

22. TSC preferred equipment details are listed on the standard drawings and/or specifications. Supply of alternative equipment shall be subject to TSC approval. Where the term "Approved Equivalent" is used on the standard drawings this requires the Designer to gain approval from TSC at the design stage to use alternative equipment. The Designer will be required to submit sufficient supporting documentation to enable TSC to assess the suitability of the alternative equipment. ***Preferred Equipment and Approved Equivalent***

23. TSC preferred sewer pump station fall prevention system shall be installed. Unless otherwise approved, a four sided void protection lid (McBerns or Austal International) shall be provided. ***Fall prevention system***

24. Pump stations shall have a flow meter installed on the outlet downstream of manifold. Flow meters shall be factory calibrated by the supplier and the calibration test results shall be provided to Council to enable recalibration of the meter in future if necessary. ***Flow Meters***

25. Private Sewer Ejection pump stations (also known as Grinder, Pump-Up or Low Pressure pump stations) may be used where approved by TSC. The design of sewer pressure systems shall comply with WSA07-2007. ***Private Sewer Ejection pump stations***

D12.21 PUMPS, PIPEWORK, FITTINGS & VALVES

1. Unless otherwise approved by TSC, pumps shall be submersible by Flygt, KSB/Ajax, Mono/ABS or Grundfos/Sarlin three-phase power. ***Pump Manufacturer***

2. The Designer shall provide for pump stations to be fitted with identical suitably sized pumps, in conventional duty pump/standby pump arrangement. ***Pump Configuration***

3. Each pump shall be capable of passing solids of not less than 75mm diameter unless grinding equipment is incorporated ***Impeller Clearance***

4. Each pump shall be capable of being removed with the aid of fixed guide rails. Pumps shall be supplied complete with lifting handles to allow easy removal from the bottom of pump wells with lifting equipment. Each pump shall be provided with one hot dip galvanised lifting chain. ***Pump Removal***

5. Pump sets are to be interchangeable within each pump station. ***Inter-changeable***

6. Each pump shall have maximum speed of 1500 rpm (4 pole). ***Pump Speed***

7. Each pump shall have minimum capacity equal to PWWF. ***Pump Capacity***

8. Each pump should be designed for maximum 10 starts per hour. (also refer to ***Starts per Hour***

Section D12.20.5 (c).)

9.	The Designer shall design structural steelwork in accordance with HB 48.	***Structural Steelwork***
10.	Pump numbering convention shall be such that when looking in the direction of flow in the rising main, pump 1 is situated on the LHS and pump 2 on the RHS. Brass numbering tags shall be provided.	***Pump Numbering***
11.	The Developer shall supply Operation and Maintenance manuals in accordance with Appendix C of WSA101 (available free of charge on WSA website) and C402 - Sewerage System.	***O&M Manuals***
12.	The actual duty point of each pump as recorded at commissioning shall be clearly recorded on the pump curves for inclusion in the Operation and Maintenance manuals.	***Actual Duty Points***
13.	If the minimum equipment spacing and clearance requirements as detailed on T.S.C S.D.220/03 cannot be satisfied, a larger pump well shall be provided.	***Equipment Spacing***
14.	One pump (pump 2) shall be fitted with a flush valve installed in accordance with the manufacturer's recommendations.	***Flush Valve***
15.	Pressure pipes within the pump well, valve pit or cast into concrete shall be Flanged Class ductile iron. Buried pressure pipes shall be minimum class PN20 RRJ ductile iron or class 12 uPVC.	***Pipe Type & Class***
16.	All pipe and fitting flange drilling shall be to AS4087 figure B5. Bolts shall be SS316 and nuts and washers SS304. Anti-seize paste shall be applied to threads.	***Flange Bolting***
17.	Pipes and fittings inside the pump well or valve pit shall be FBN coated internally and externally. Buried ductile iron pipes shall be wrapped in polyethylene sleeves.	***Pipe Coating***
18.	Discharge pipes within the valve pit shall be provided with tapping points complete with ¾ inch BSP threaded stainless steel ball valves.	***Pressure Tappings***
19.	Sluice valves shall be resilient seated, FBN coated, clockwise closing with non-rising spindles.	***Sluice Valves***
20.	Unless otherwise approved by TSC, non-return valves shall either be the full body swing flex type by Val-matic or the ball check type by AVK.	***Non-return Valves***
21.	Isolating valves on gravity inlet pipes 375mm diameter or larger shall be the uni-directional knife gate type, SS316, clockwise closing with non-rising spindles.	***Knife Gate Valves***
22.	The Designer shall specify special requirements, if any, for materials to be used in the pump station, taking into consideration the nature and composition of the sewage to be pumped.	***Special Requirements***
23.	The Designer shall take energy efficiency into consideration when designing pumps. Each pump shall have a soft start motor. Variable Frequency Drive (VFD) pumps shall be considered for large flow pumps, or where pump injects directly to a rising main with an upstream pumping station, or where a control building is required.	***Energy Efficiency***
24.	The Designer shall provide Council with a System Assessment of the Pump Operation to demonstrate the Best Efficiency Point (BEP) and where the proposed pumps shall operate on the system curve. Council shall review the operation of the proposed pump to determine the pump suitability.	***System Curve Requirement***

D12.22 ELECTRICAL

1. Notwithstanding other clauses mentioned herein, the Designer shall be responsible for the design of the equipment as suitable for the purpose. Equipment design shall comply with the requirements of the relevant standard specification and TSC Standard Drawing Sets SD820/00 to SD820/17 as applicable. ***Design Responsibility***

2. If CT metering is required (ie over 100Amps per phase), a control building to house electrical switchboards is required. Deviations from this rule will require approval from TSC. ***Drives Larger than 45kW***

3. Where VFD's are required, the switchboard shall be housed within a purpose built building of brick construction. ***VFD's***

4. The switchboard shall be provided with a generator connection point. ***Generator Connection***

5. The Designer shall provide for Switchgear Control Assembly (SCA), SCA housing and electrical requirements as detailed in C402 – Sewerage System and TSC Standard Drawing Sets SD820/00 to SD820/17. ***SCA and Electrical***

6. Where more than one (1) item of equipment is designed to form a particular function, all such items of equipment shall be identical and completely interchangeable (eg pilot lights, pushbuttons, relays, etc). ***Inter-changeability***

7. The switchboard shall be installed visibly and physically accessible above areas at risk of flooding. Double door switchboards shall be provided where pumps are > 32 Amps or flow meters are required. ***Switchboard***

8. Ambient conditions shall be within the normally accepted limits of 0°C to 45°C. ***Ambient Conditions***

9. The switchboard shall be connected to the local electricity supply system. ***Connection to Local Supply***

   Nominal system parameters:

   (a) 415 volt, 3-phase, 4-wire, 50 Hz, solidly earthed neutral system.

   (b) Prospective Fault Current: As specified by the Local Supply Authority.

10. The works shall be designed in accordance with and subject to the provisions of EL01-EL019, except where modified by this Specification. ***Standards***

11. The pump station shall be designed for fully automatic operation in the unmanned condition. ***Automatic Operation***

12. The Developer shall provide a switchboard door having a 3 point stainless steel 316 locking system with a padlock. The developer shall purchase the padlock from the local electricity distributor. . ***Switchboard Locking System***

D12.23 WATER SUPPLY

1. The Developer shall lodge an application with TSC to have a metered water supply complete with RPZ installed by TSC and shall pay all associated fees to TSC.

D12.24 DELETED

D12.25 TELEMETRY

1. The Designer shall provide for telemetry requirements in accordance with TSC Standard Drawing Sets SD820/00 to SD820/17 as applicable. ***Schedule***

2. The telemetry system is to be compatible with the Clear SCADA system. ***Compatibility***

D12.26 OTHER APPURTENANCES

1. The Designer shall provide for machinery lifting equipment including pump chains. Safe lifting capacity of chains shall be capable of lifting pumps. Chains shall be hot dip galvanised after fabrication. ***Lifting Equipment***

2. The Designer shall provide pressure tapping for gauges for all valves, including isolation and non-return valves and as detailed in C402 – Sewerage System. ***Gauges***

RISING MAINS

D12.27 GENERAL

1. Rising mains and fittings may be of Ductile Iron (Epoxy Lined or Calcium Aluminate (CA) Cement Mortar Lining), or UPVC AS 1477 Series 2 (min. Cl. 12) or heavier construction. Pressure pipelines for road crossings or where located under road pavements shall be DICL PN20, uPVC or OPVC class 16. ***Material***

   Polyethylene (PE 80 or PE 100) may be used for a small diameter sewer rising main where it is part of a pressure sewer system or in other situations with the approval of the Director. Scours and air valves are required on sags and crests. Automatic gas release valves are required on sharp crests. Alternatively, risers constructed to Council's standard drawing may be considered if environmentally acceptable.

2. The designer shall be wholly responsible for the design of the rising main including locations and functionality of scour points. In general the requirements of WSA 04-2005-2.1 Sewage Pumping Station Code of Australia Section 10.9.5 shall be considered in the detailed design. A complete set of project specific detailed design drawings shall be provided to the Certifying Engineer. ***Scour Valves***

3. Discharge manholes are to be vented away from dwellings. Suitable ventilation and odour control facilities shall be provided if required. Odour control and staging shall be addressed. Rising main entry to the discharge manhole should preferably be from below the floor bench level. Concrete discharge manholes are to be coated with an epoxy paint system approved by TSC. Polypropylene discharge manhole chambers designed to resist chemical attack (H_2S) may be designed subject to approval from TSC. Discharge manholes shall have an outlet pipeline connected to a vent stack. Refer to WSA 04-2005-2.1, 10.11 and S.D.277. ***Discharge Manhole***

4. Minimum gravity sewer diameter of 75 mm more than the pressure main shall be provided for rising main discharge. ***Size***

5. Pressure sewer system rising mains shall be minimum DN 50 for residential, industrial and commercial zones. (Refer to WSA 07-2007). ***Pressure Sewerage Systems***

D12.28 DESIGN PARAMETERS

Minimum grades	1:500 uphill	1:300 downhill
Minimum velocity	0.6m/sec	
Pref. Minimum velocity	1.0m/sec	
Maximum velocity	3.0m/sec	
Maximum sewage detention time in a pipe	4 hrs or provide oxygen injection	
Minimum diameter	75mm unless grinder pumps approved	

D12.29 AUTOMATIC GAS RELEASE VALVES

Gas release valves

Gas release valves shall be min 50mm nominal diameter Vent-O-Mat Model RGXv, or approved equivalent and shall have an isolation valve. The isolation valve shall be

(a) For 50mm dia: A fully SS ball valve

(b) For 80mm dia and larger: A sluice valve, fully coated with fusion bonded powder and shall have a vertical extension spindle and spindle cup extended through the valve chamber top slab. For details see Council's standard drawing.

TRUNK SEWERS

D12.30 DESIGN REQUIREMENT

1. A sewer greater than 3m in depth or greater than 300 mm in diameter shall be designated as "trunk" sewers. ***Designation***

2. "Trunk" sewers shall be routed away from the built environment. ***Location***

3. House connection shall not be permitted to "trunk" sewers. Side collection lines shall be installed. ***Side Lines***

4. Long "trunk" sewers shall be equipped with shaft venting. ***Ventilation***

5. Sewers deeper than 5m will not be permitted. ***Maximum depths***

5. "Trunk" sewers and fittings shall be series 1 white uPVC pressure pipe RRJ min class 12 unless otherwise approved by TSC. ***Materials***

DOCUMENTATION

D12.31 PLAN AND DRAWING REQUIREMENTS

1. At Development Application Stage a Sewerage Management concept report including assumptions, calculations used in determining design flows and layout plans shall be provided. Other pertinent considerations including pipeline self cleansing, detention time in rising mains, septicity and odour control and staging of capacity information shall be submitted to TSC for approval. For smaller developments (ie: < 2000 square meters), Clauses D12.05.4 (a), (b) and (i) shall be submitted for approval provided as a minimum (see Development Design Specification D13 - Engineering Drawings (Subdivisions)). ***Development Application***

2. For large developments including subdivisions (ie: > 2000 square meters), at Development Application Stage the Sewerage Management concept report shall include (where applicable) how capacity for future stages is incorporated and any upgrade works to either the existing or future system to enable the servicing of the development. (Refer to Clause D12.05.4). (see Development Design Specification D13 - Engineering Drawings (Subdivisions)). ***Development Application***

3. At Construction Certificate Detailed Engineering plans plus (if applicable) reporting regarding any design details required prior to constructions certificate conditions (see Development Design Specification D13 - Engineering Drawings (Subdivisions)). ***Construction Certificate or S68 Applications.***