infrastructure design manual

VERSION 4.2

Version 4.2 Adopted by IDM Board on the 1 November 2013

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Clause 1 Introduction

1.1 Background

This Infrastructure Design Manual (**Manual**) was originally prepared by the Cities of Greater Bendigo and Greater Shepparton and the Shire of Campaspe. Their joint initiative was one which recognised the benefits of municipalities working together towards consistent requirements and standards for the design and development of **Infrastructure**.

Since the preparation of the **Manual** many other **Councils** have adopted the **Manual**.

The first version of the **Manual** came into use in October 2007 when it was placed online. The **Manual** has its own webpage and can be viewed and downloaded at www.designmanual.com.au.

1.2 Benefits of a Common Manual

- Sharing financial and human resources to produce a **Manual** which will satisfy the requirements of each of the participating municipalities.
- Developing more consistency amongst design requirements for **Consultants** and **Developers** working in the participating municipalities.
- Provides a better point of reference for all parties at the Victorian Civil Appeals Tribunal (VCAT).
- Sharing ideas and practices helps the municipalities to adopt best practice.
- Document the participating **Council's** requirements for the design and development of **Infrastructure**.

1.3 Consultation

This **Manual** has been prepared following consultation and liaison with **Councils**, **Council** staff, **Consultants** and **Developers**. Each **Council** was responsible for its own consultation process. The consultative processes have ensured that the policies, procedures and guidelines in this **Manual** achieve as far as practical the three main aims of appropriate, affordable and equitable **Infrastructure** that serves the community and promotes growth.

1.4 Objectives

This **Manual** is designed to be used within the boundaries of all the municipalities who have adopted this **Manual**. The primary objectives of the **Manual** are:

- To clearly document **Council's** requirements for the design and development of **Infrastructure** that is or will become **Council's Infrastructure**.
- To standardise development submissions as much as possible and thus to expedite **Council's** engineering approvals.
- To ensure that minimum design criteria are met in regard to the design and construction of **Infrastructure** within the municipalities regardless of whether it is constructed by **Council** or a **Developer**.
- "To recognise and deal with the various issues currently impacting on the land development industry, in particular sustainability, integrated water cycle management, timeliness and affordability;"

When there is a conflict with Standard Drawings or other **Council** policies the **Manual** will take precedence where the matter relates to **Infrastructure** standards.

1.5 Principles

Several principles have been used to formulate the provisions of the IDM. Where that has occurred the word "principle" is attached a superscript to the particular clause. For example

> ***Developments*** *that contain more than 200 lots in the* ***ODP*** *may be required to establish bicycle routes through the development* [PRINCIPLE].

By hovering the mouse above the superscript principle the principle is displayed. Principles are also listed in Appendix J Notes on Engineering Principles.

1.6 Compliance

The **Councils** using this **Manual** will make every endeavour to follow the requirements of this **Manual** unless there are circumstances that exist that make it impractical or unreasonable to follow the requirements of this **Manual.** Examples of such circumstances include:

- Renewing an existing asset which does not comply with the standards specified in this **Manual**.
- Protecting native vegetation or the existing streetscape Where adopting the IDM standards would result in detriment to the neighbourhood character of an area.
- **Infrastructure** in a heritage precinct or heritage significant area.
- Infill **Development** where Council wants to maintain the surrounding or abutting standards

In addition **Council** may allow non compliance of specific requirements of this **Manual** where the **Developer** can demonstrate that the objectives of the IDM have been met. Application must be made in writing seeking approval for such non compliance

1.7 Innovation and Advances in Technology

Councils consider adopting and approving innovative solutions and using new technologies where Council is satisfied that the objectives of the relevant clauses of the **Manual** have been met even though the **Development** does not comply with specific technical provisions of the **Manual**.

1.8 Councils That Have Adopted the Manual

The following have adopted the **Manual**:

- Greater Shepparton City Council signed 2 August 2007
- Greater Bendigo City Council signed 31 October 2007
- Campaspe Shire Council – signed 14 August 2007
- Moira Shire Council signed 18 June 2007
- Greater Geelong City Council signed 18 October 2007
- Gannawarra Shire signed TBA
- Rural City of Wangaratta signed 29 October 2007

- Mansfield Shire Council signed 27 March 2008.
- Strathbogie Shire Council signed in December 2009
- Murrindindi Shire Council signed 27/10/2010
- South Gippsland Shire Council joined 17 March 2010
- Benalla Rural City Council
- Wellington Shire Council 18 May 2010
- East Gippsland Shire TBA
- Corangamite Shire Council signed TBA
- Central Goldfields Shire Council 26 May 2011
- Baw Baw Shire signed 24 August 2011
- Ballarat City Council signed 1/7/2011
- Hepburn Shire Council signed 23/12/2010
- Moorabool Shire Council signed 7/12/ 2011.
- Warrnambool City Council signed TBA
- Mitchell Shire Council signed TBA
- Yarriambiack Shire Council TBA
- Southern Grampians Shire Council TBA
- Ararat Rural City Council signed 18 October 2012
- Glenelg Shire Council TBA
- Golden Plains Shire Council adopted 16 July 2013.
- City of Wodonga TBA
- Towong Shire Council TBA
- Indigo Shire Council TBA
- Swan Hill Rural City 16 April 2013
- Macedon Ranges Shire Council TBA
- Pyrenees Shire Council 20 August 2013

- Colac Otway Shire Council 23 October 2013
- Surf Coast Shire Council TBA
- Mt Alexander Sire Council TBA

1.9 Applicable Standards

In the absence of specific information in this Manual and associated checklists or standard specifications, the relevant standard or authority requirements must apply.

1.10 Revision

The **Manual** is a living document and may be revised and amended from time to time.

To ensure that everyone has access to the latest version of the **Manual** it will only be available electronically on the **Manual**'s website at www.designmanual.com.au.

Suggestions on how this **Manual** can be improved can be forwarded by email to the Team Leader Development, City of Greater Shepparton, at jonathan.griffin@shepparton.vic.gov.au. "All submissions made in accordance with the above provisions will be considered by the IDM Technical Committee which will provide regular reports to the IDM Board of the recommended changes to be incorporated into the IDM."

Engineering queries relating to individual development submissions, status of approvals or further technical direction regarding **Infrastructure** design should be directed to the following people at the relevant municipalities:

- Design and Road Services Manager
  Shire of Campaspe
- Team Leader Development
  City of Greater Shepparton
- Infrastructure Development Engineer
  Strathbogie Shire Council
- Senior Subdivisions Engineer
  City of Greater Geelong
- Manager of Technical Services
  Rural City of Wangaratta
- Manager of Engineering
  South Gippsland Shire Council
- Coordinator Infrastructure Development
  Wellington Shire Council
- Development Engineer
  City of Greater Bendigo
- Project Manager Infrastructure Planning
  Shire of Moira
- Senior Civil Engineer
  Mansfield Shire Council
- Asset and Development Coordinator
  Murrindindi Shire Council
- Director Infrastructure Environment and Regulatory Services
  Gannawarra Shire Council
- Senior Development Engineer
  Benalla Rural City Council
- Development and Design Coordinator
  East Gippsland Shire

- Manager Assets Planning
  Corangamite Shire Council
- General Manager Technical Services
  Central Goldfields Shire Council
- Strategic Infrastructure Coordinator
  Baw Baw Shire
- Coordinator Engineering Development, Ballarat City Council.
- Infrastructure Planning Engineer, Warrnambool City Council
- Engineering Design Coordinator, Mitchell Shire Council.
- Asset Engineer, Yarriambiack Shire Council
- Manager Infrastructure, Southern Grampians Shire Council.
- Design and Project Management Coordinator, Ararat Rural City Council.
- Design and Development Engineer, Glenelg Shire Council.
- Works Manager, Golden Plains Shire Council.
- Senior Development Engineer, Wodonga City.
- Engineering Development Officer, Macedon Ranges Shire Council
- Manager of Assets, Towong Shire Council
- Senior Development Engineer, Moorabool Shire Council
- Manager Infrastructure Services, Indigo Shire Council
- Development Engineer, Hepburn Shire Council
- Senior Design Engineer, Swan Hill Rural City Council.
- Manager Engineering, Waste Operations Contracts, Pyrenees Shire Council
- Development Engineer, Colac Otway Shire Council
- Project Engineer, Surf Coast Shire Council
- Team Leader – Engineering, Mount Alexander Shire Council

Contact can be made with the people listed above via the **Manual**'s website at www.designmanual.com.au.

Clause 2 Definitions

Acceptance of Works — As described in Clause 7.5.

AHD — Australian Height Datum

Annual Exceedance Probability (**AEP**) — The probability of exceedance of a given discharge within a period of one year.

Average Recurrence Interval (**ARI**) — The average or expected value of the period between exceedance of a given event or discharge. This is usually calculated as the reciprocal of the **AEP**.

Carriageway — The distance between the inverts of kerbs for roads with kerb and channel and the distance between outer edges of shoulder for roads without kerb and channel.

Clear Zone — An area adjacent to traffic lanes which should be kept free from features that would be potentially hazardous to errant vehicles.

Consultant(s) — A person or company appointed by the developer to provide expert and technical services.

Construction Engineer — Unless approved otherwise by the **Council**, all road and drainage construction supervision must be undertaken by a **Qualified Engineer** who will hereafter be referred to as the **Construction Engineer**.

Construction Supervision — **Construction Supervision** is the responsibility of the **Developer** is carried out by the **Construction Engineer** or some other person as appointed by the **Developer**. It is not a **Council** responsibility.

Council — The relevant municipal organisation within whose boundaries the **Infrastructure** is to be constructed.

Council Engineer — An engineer appointed by **Council** to check and approve the **Developer's** designs and/or to inspect works for compliance with the standards set out in this **Manual**.

Council's Planning Department — The department within each **Council** that is responsible for the processing and administration of planning permits.

Council's Engineering Department — The department within each **Council** that is responsible for the review and approval of **Infrastructure** in relation to engineering standards. For the **Councils** within this **Manual** the engineering departments are as follows:

COUNCIL	DEPARTMENT
Ararat Rural City Council	Council Services
Ballarat City Council	Infrastructure Development
Baw Baw Shire Council	Assets and Engineering Services
Benalla Rural City Council	Infrastructure Services
Campaspe Shire	Road Services Department
Central Goldfields Shire Council	Engineering Services
City of Greater Geelong	Engineering Services

COUNCIL	DEPARTMENT
Colac Otway Shire Council	Infrastructure and Services
Corangamite Shire Council	Assets Planning Unit
East Gippsland Shire Council	Development Department
Gannawarra Shire Council	Infrastructure, Environment and Regulatory Services.
Glenelg Shire Council	Assets and Infrastructure
Golden Plains Shire Council	Works Department
Greater Bendigo City Council	Planning and Development
Greater Shepparton City Council	Planning Projects Department
Hepburn Shire Council	Engineering Services
Indigo Shire Council	Infrastructure Services
Macedon Ranges Shire Council	Engineering Infrastructure and ProjectsEngineering and Infrastructure
Mansfield Shire Council	Engineering Department
Mitchell Shire Council	Engineering and Infrastructure
Moira Shire Council	Infrastructure Planning
Moorabool Shire Council	Engineering Services
Mount Alexander Shire Council	Infrastructure
Murrindindi Shire Council	Engineering Services
Pyrenees Shire Council	Assets and Development Services
Rural City of Wangaratta	Technical Services
South Gippsland Shire Council	Engineering Department
Southern Grampians Shire Council	Infrastructure Department
Strathbogie Shire Council	Engineering Department
Surf Coast Shire Council	Infrastructure Development
Swan Hill Rural City Council	Engineering Services
Towong Shire Council	Technical Services
Warrnambool City Council	Technical Services
Wellington Shire Council	Built and Natural Environment
Wodonga City Council	Infrastructure and Sustainability

COUNCIL	DEPARTMENT
Yarriambiack Shire Council	Technical Services

Design Engineer or **Designer**	Unless approved otherwise by the **Council**, all road and drainage designs must be completed by a **Qualified Engineer**, who will hereafter be referred to as the **Design Engineer** or **Designer**.
Developer(s)	The person or company that owns the development.
Developer's Representative	The **Developer's Representative** is either the **Construction Engineer** or the **Design Engineer** as required by the context.
Development	is "the carrying out of building, engineering, mining or other operations in, over or under land or the making of any material change in the use of any building or other land".
Infrastructure	Physical works including roads, paths, playground and recreation equipment, landscaping and drainage systems (including retardation and treatment) and ancillary assets such as signs.
Manual	The Infrastructure Design Manual.
MUSIC	The Model for Urban Stormwater Improvement Conceptualisation (MUSIC) is a software tool that simulates the behaviour of stormwater in catchments.
Qualified Engineer	A person eligible to be registered as a civil engineer on the National Professional Engineers Register and experienced in the relevant field of practice.
Road Verge	The distance between the invert of kerb and the near road reserve boundary.
Superintendent	The **Construction Engineer**, or another qualified and experienced person appointed by the **Developer** to carry out the functions of the Superintendent as defined in the *General Conditions of Contract – AS 2124 or AS4000*.
TMAR	Traffic Management Assessment Report as described in Clause 9.2.1.
TIAR	Traffic Impact Assessment Report as described in Clause 9.2.2.
WSUD	The integration of urban water cycle management within planning and design is known as Water Sensitive Urban Design (**WSUD**).

Clause 3 Subdivisions and Planning Permit Applications

3.1 General

The **Councils'** planning schemes control the development and use of land, including subdivision of land, within the municipal boundaries. The *Planning and Environment Act 1987* provides the legislative basis for the planning scheme and its administration. The system of planning controls provides for the issue of planning permits, usually subject to conditions, as well as the endorsement of submitted plans where appropriate. Subdivision and development of land sits within a planning hierarchy that comprises a framework of State, regional and local policies that enable decisions about the use and development of land to be made including:

- The State and Local Planning Policy Framework
- Precinct Structure Plans
- Planning Permit Applications

The State Planning Policy Framework (SPPF) within the Victoria Planning Provisions provides overarching policy to guide land use, subdivision and development in Victoria. The Local Planning Policy Framework (LPPF) provides local policy context.

Requirements for the layout and design of residential subdivision are set out in Clause 56 in all municipal planning schemes.

Precinct Structure Plans set the future structure for individual suburbs. The Precinct Structure Plan shows how the objectives of Clause 56 of the local planning scheme will be achieved within the precinct. A permit application under a Precinct Structure Plan must meet particular Objectives set out in Clause 56 and should meet the Standards set out in Clause 56, as appropriate. The Precinct Structure Plan is incorporated into the local planning scheme to guide the use and development of land in the precinct over the long term.

Planning Permits can be issued in response to an application for a planning permit to subdivide, develop or use land. A planning permit must be generally in accordance with the Precinct Structure Plan and meet the requirements set out in the Precinct Structure Plan.

It is the responsibility of each **Council** to ensure that development and land use occurs in accordance with any issued planning consent, and to undertake enforcement of the planning provisions where contravention of the planning scheme takes place.

Any persons considering the development of land or change of land use should ensure that they are fully informed concerning the provisions of the relevant planning scheme. In particular, they should understand the circumstances where a planning permit is required, and the procedures to be followed in gaining the necessary planning consents.

It is recommended that predevelopment meetings be held with Council staff prior to preparing a planning permit application for larger developments.

The requirement to be fully informed about the Victorian Planning Provisions extends to applicants, **Consultants**, and to the general public, so that the rights and responsibilities of landowners and citizens are understood. All participants in the planning process are encouraged to consult with **Council** staff, particularly applicants for planning consent, before submitting planning permit applications and where appropriate referral authorities such as VicRoads.

With regard to unauthorised or uncompleted works that have been carried out in the past, **Developers**, **Consultants**, authorities and landowners are encouraged to discuss these matters with **Council** officers. As a general rule, **Council** will expect any existing works to be altered, removed or reconstructed in order to reflect current requirements.

3.2 Information to be Submitted

Applications requiring a planning permit must be submitted on standard forms that are available from the planning department of the relevant **Council**.

A development proposal that is not generally consistent with a Precinct Structure Plan it is prohibited

Developments may involve the construction of engineering works, or may potentially impact upon existing **Council** assets such as roads and/or drainage systems. In these instances, the applicant should also include the following information, as a minimum, to enable engineering review to take place.

- Plans of existing site conditions showing:
    - Existing surface contours at the interval specified in Table 1 and clear identification of both natural and constructed drainage flowpaths.
    - Level information on adjacent sites, where the development proposal involves any lotfilling or construction of structures that may impact upon the overland flow of stormwater.
    - Existing vehicle crossings. Photos may be beneficial to determine the standard of existing features, such as vehicle crossings. If crossings have been constructed after November 1995, reference should be provided regarding the previous *Consent for 'Occupation of a Road for Works'*, or similar **Council** approval.
    - Details of existing house or lot drainage such as pipe layouts, pipe sizes and discharge point.
    - Impervious surfaces.
    - Onsite wastewater management system arrangements.
    - Existing carparking, footpaths and landscaping where present.
- Conceptual layout of the proposed development.
    - Proposed Public Open Space and linkages.
    - Impervious surfaces.
    - Footpath details.
    - Carparking details.
    - Landscaping, including proposed vegetation, irrigation and furniture.
    - Street lighting style details.
    - Vehicle wash-down areas for industrial and/or commercial uses.
    - Onsite wastewater management system details.
- A written response to Planning Scheme requirements for any subdivision of land or major development.
- Traffic generation, existing and proposed.

- Drainage Master Plan and computations.
- Cultural Heritage Management Plan.
- Proposed **WSUD** treatments and **MUSIC** analysis including report on **WSUD** design intent, confirming how compliance with **Council** specific requirements will be achieved. Copies of any site assessments, or similar investigation undertaken including but not limited to flora and fauna, cultural heritage, environmental and sanitisation.

Table 1 Contour Intervals

Description	Average Slope of Allotment	Contour Interval
Sites > or = 1000m²	0-1%	100mm
	1-2%	200mm
	2%-5%	300mm
	5% plus	500mm
Sites <1000m²		Minimum number of spot levels required is one on each corner of the allotment and centroid together with arrows showing direction of flow.

3.3 Engineering Referrals

Where further information is required before a formal engineering response can be given, the request for that information must be made within the nominated timeframes and the 'clock stops'. The clock starts again when adequate information is received.

The timeframes for dealing with engineering referrals for planning applications are those specified in the *Planning and Environment Act*. **Councils** may have specific performance targets and contact should be made with **Councils** to determine what their response times are for the various types of engineering referrals.

A copy of the standard conditions for planning permits is included in **Appendix A: TYPICAL Standard Conditions for Planning** Permits.

3.4 Engineering Fees

When a development involves construction of engineering works, or may potentially impact upon the existing **Council** roads and drainage systems, a plan checking and supervision fee may apply. Unless otherwise approved in writing, this fee must be in accordance with the *Subdivision Act* and must be 3.25% of the value of the works to be taken over by **Council**.

If more than one construction inspection or **Acceptance of Works** inspection is required (refer Clause 7.5) because the **Council Engineer** has been called prematurely (i.e. before works are ready/complete) an extra fee of $50.00 per inspection must apply for the first additional inspection, $100.00 for the second additional inspection and $150 for the third additional inspection, unless varied by a previous written agreement.

3.5 Development Contributions

Development Contributions will be generally controlled by the use of predevelopment agreements or other arrangements or Section 173 agreements, planning permit conditions and/or Development Contributions Plans. Development Contributions may be required for roadworks, drainage, Public Open Space, traffic management works, community development or other works that benefit the **Developer** and/or others.

Where adequate drainage or other **Infrastructure** is not available, other arrangements may need to be in place to allow suitable **Infrastructure** to be provided. **Developers** should access any Council policies relating to drainage levies and/or headworks charges to obtain information as to the amount of any levy or charge applicable in such cases.

Any contribution from **Council** will be made in accordance with **Council's** relevant policies, copies of which are available on **Council's** web-sites. Because such works will be 'Capital Works' or new assets, **Councils** must make provision within their approved budgets. Accordingly **Developers** should submit plans, specifications, cost estimates and other relevant documents detailing any request for a contribution prior to January each year. In all instances the allocation of **Council** funding cannot be guaranteed for any financial year.. The cost estimates should detail the proposed contribution of all benefiting parties and the date or trigger for the amount expected from **Council**.

3.6 Certification of Plans of Subdivision

Certification of a Plan of Subdivision must only occur if the plan of subdivision is in accordance with the requirements of the planning permit and any approved Functional Layout Plan.

Clause 4 Outline Development Plans

4.1 Objectives

The objectives of the **Outline Development Plan (ODP)** are as follows:

- To ensure compliance with planning scheme requirements, particularly where overlays exist.
- To ensure that adequate information is provided at initial planning stages to allow the orderly review, assessment and approval of land development.
- To ensure that **Developments** provide effective and economical **Infrastructure** that services the area.
- To ensure that staged or multi-**Developer** projects are able to be delivered in a safe, efficient and effective manner.
- To ensure that **Infrastructure** is planned for the full potential of development and that unnecessary duplication or oversizing of **Infrastructure** is avoided.

4.2 General

An **ODP** will generally be required for any of the following **Developments**:

- Where the land is subject to a Development Plan Overlay (DPO) and/or Incorporated Plan Overlay (IPO).
- Multiple-staged subdivision development.
- **Developments** where more than one landowner is potentially involved.
- Single staged subdivisions with more than 10 allotments.
- Where directed by **Council**.

Details of overlays already incorporated into the **Councils'** planning schemes can be obtained via the Department of Transport, Planning and Local Infrastructure (DTPLI) website, or by contacting the **Council's Planning Department**. Draft Development Plan Overlays may be under consideration by **Council**, and consultation with the planning department is essential.

The **ODP** must prepared by an experienced **Consultant** appointed by the **Developer**, or a group of **Developers**. **Council** assistance will be given where available, but the **Developer** or **Developers** will meet the cost of preparing the ODP.

ODPs should be submitted for review with a written response to the provisions in the Planning Scheme (for residential **Developments**), and guidelines contained within this **Manual**. Consideration should also be given to the *'Safer Design Guidelines for Victoria'* published by DSE, and the draft VicRoads brochure *'Safer Urban Environments – Road Safety and Land Use Planning Guide'* and any Healthy Urban Design Guidelines developed by **Councils**.

Unless agreed otherwise, any submission and review of an **ODP** will require a meeting with **Council's** planning and engineering staff. Relevant service authorities and other referral authorities such as VicRoads and DSE should be invited to attend this meeting as required. The **Developer's Representative** will be responsible for co-ordinating the meeting.

4.3 Requirements

Any **ODP** submitted for consideration by **Council** must be prepared in accordance with the planning scheme requirements and should, as a minimum, include or consider the following:

- Existing surface level contours to Australian Height Datum (**AHD**) as per the requirements of Table 1.
- Existing features, adjoining property features that may impact upon the engineering design including the type and standard of trees, historical aspects, topographical features, abnormal or significant features.
- Proposed surface level contours that will enable the development to be 'self-draining' during normal and minor system blockage conditions for up to a 100 year annual recurrence interval (**ARI**) event.
- A traffic engineering report designating street hierarchy, maximum predicted traffic volumes, traffic control, bus routes, overall road network and intersection concepts and other relevant information as may be requested.
- General layout of allotments, indicating approximate size, range, shape and orientation of allotments.
- Location and approximate size of Public Open Space.
- Consistency with any approved strategy or plan for a particular urban area. This may include, but not be limited to **Council's** cycling strategies, playground strategies or spatial network plans.
- Open space areas and facilities should be provided in locations that maximise accessibilities for all users, including people with poor mobility, such as older adults and people with a physical disability, and parents with prams and strollers.
- Local open space should not be located on major roads, however there should be good sight lines into an open area from neighbouring streets, house, schools or other buildings. Isolated pockets of land within a park (i.e. dead spaces) or those areas which cannot be overlooked should be avoided.
- Local parks and playgrounds should have active frontages on at least three sides to provide surveillance, and should avoid bordering rear yards.
- Parks must comprise a minimum area of 0.75 Ha.
- Drainage and flooding provisions, including location and size of drainage reserves, and drainage retardation and treatment systems. This information should also comply with the relevant requirements of Catchment Management Authorities or Melbourne Water where the drainage catchment falls within their jurisdiction.
- That legal and practical access has been assessed as existing for all parcels within the development with respect to topography, native vegetation cover and existing soil conditions.
- **WSUD** philosophy.
- Interconnectivity of road, cycle, and pedestrian networks, internal and external to the subject area.
- Identification of social and community **Infrastructure** requirements, including the locations and type of facilities proposed.
- Identification of public transport requirements.

- Identification of CFA requirements in relation to water supplies and access.
- If applicable, the 1 in 100 year flood levels supplied by the relevant floodplain authority.
- Details of any proposed use of recycled water.

Engineering design requirements for an **ODP** proposal are as follows:

- Residential subdivision **Developments** must be designed to meet the provisions of the Clause 56 of the planning scheme, except where varied by this Manual.
- Drainage surface flow paths must have practical and satisfactory destinations. Surface flow paths should not be directed through property easements or re-directed into piped systems. Surface flow should be directed on road reserves or through **Council's** drainage reserve. Surface flow paths re-directed through piped systems will only be considered in exceptional situations. In this instance, these systems must be designed for the peak flow resulting from a 100 year **ARI** storm event.
- Arterial, sub-arterial and trunk collector roads must have a design layout suitable for future connections, or be positioned relative to boundaries such that viable future extensions can be achieved.
- Cul-de-sacs must be shown with court bowl ends. Hammerhead or 'T' heads are not permitted *PRINCIPLE*. Nooks and extended driveways can be utilised provided they are common property and there is a drainage pit provided at the boundary of the common property and the road reserve and garbage pads are provided on the road reserve.
- The road network must not give rise to traffic 'overload' in minor streets. Suitable shorter alternative routes may need to be provided. The layout should demonstrate good traffic circulation and distribution to higher-order streets. The objectives of Clause 56.03 of the planning scheme should be considered when designing and assessing road networks for residential subdivisions.
- The road and intersection design must create efficient clearance of traffic, particularly at school sites and other public facilities. The proposed road network should not overload or detrimentally affect existing or proposed residential streets and intersections.
- Adequate sight distance should be provided, especially where road alignment deflections occur at acute angles.
- Road layouts should provide natural traffic speed control, appropriate to the street category. The introduction of specific speed control devices should be considered only as a secondary option. Roundabouts may be implemented at intersections. However, care must be taken to provide adequate sized roundabouts and therefore road reservation boundaries must be designed to accommodate the radius required and sightlines.
- Road layouts should be designed for all road users appropriate to the street type, including service vehicles, emergency vehicles, waste collection vehicles and street-sweepers. Bus routes need to be considered when developing road networks and be based on the Department of Infrastructure publication entitled *'Public Transport Guidelines for Land Use Development'.*
- Road reserve widths must be adequate for the intended road type, and should comply with Clause 12.3.2. The **ODP** should include a typical cross-section of differing road types, detailing the intended function of the road, e.g. bike lanes, drainage, landscaping.
- Proposed street names must conform to the Guidelines for Geographic Names Victoria and with any relevant **Council** policy.

In addition to the engineering information to be provided on the **ODP**, additional information will be required in support of the proposal. This may include, but not be limited to, the following:

- A Traffic Management Strategy addressing the impact and management of traffic relating to the development.
- A Drainage Management Strategy addressing the management of both quantity and quality stormwater. This includes stormwater arriving from upstream, passing through, and moving downstream from the site; Evidence of a written agreement, approval or clearance from the adjoining owners, if surface flow paths discharge to neighbouring properties.
- Approval from all relevant service authorities whose assets or land may be affected by surface or pipe flow discharge. In particular it should be noted that a separate permit (Works on Waterway) from the relevant Catchment Management Authority may be required if:
    - There is a direct connection to a waterway.
    - There is a bridge or culvert over a waterway.
    - Construction of floodways especially if piping of a waterway is proposed.
    - Water quality **Infrastructure** in proximity to a waterway.
    - Construction of a retardation basin.
    - Where construction or development may be impacted by mainstream or coastal inundation. Works on or near a designated waterway (refer to relevant CMA), including fill in a floodplain.
    - When required by the relevant Catchment Authority

- Approval from the relevant authority for any changes in road status including:
    - Established responsibilities for the construction and maintenance of the road
    - Determination of legal and practical access

Clause 5 Design Requirements

5.1 Objectives

The objectives of these design requirements are as follows:

- To ensure expediency for **Developers** by providing clear guidelines regarding the engineering requirements of **Council**.
- To ensure that new and upgraded **Infrastructure** is of consistent standard across the municipalities.
- To ensure that the works are designed such that they will fulfil the purpose for which they are intended.
- To ensure that minimum design standards are achieved and that works meet **Councils'** legislative obligations.
- To ensure that community amenity will be improved through development.
- To ensure that environmental, public and employee risk during and after development is considered.
- To ensure that maintenance requirements are considered at the planning and design stages.
- To ensure all relevant statutory authorities/stakeholders have been consulted and their requirements have been considered in the design.

5.2 General

Comprehensive design criteria included in the Manual convey engineering requirements for the internal or external delivery of design, construction and acceptance of roads and drainage **Infrastructure**, while considering local conditions and the requirements of the **Council**.

For **Developer's Representatives,** the Manual provides the basis for expedient approvals for works built by **Developers** for incorporation into the **Infrastructure** systems controlled by the **Council**. The engineering process for **Developments**, including subdivisions, is outlined as a flowchart included in **Appendix B: Engineering Approval Process for Developments)**. **Council** does not guarantee any document accuracy or correctness, regardless of any review undertaken by **Council** and its responsible officers.

Engineering plans and documentation must be submitted at three separate stages during the design process as follows:

1. Functional Layout Plan
2. Detailed Design Plans
3. Final Design Plans

The Functional Layout Plan process is aimed at improving outcomes and reducing timelines for approvals. It may require more work upfront to ensure that time is saved in the later stages of approvals. While the Functional Layout Plans should be consistent with any relevant Precinct Structure Plan or Outline Development Plan, the process will also ensure that both designers and Council have confidence in proceeding to the development of detailed engineering and landscape designs and plans.

The preparation of Functional Layout Plans is therefore considered to be part of a best practice approach to the documentation of subdivision developments, and as such it is highly recommended in cases where there is no specific requirement on a planning permit. Functional Layout Plan(s) should show all engineering elements which may influence

either the dimensions of the plan of subdivision, the functionality of civil infrastructure, the achievement of an acceptable landscaped area or the preservation of prescribed features on the site.

Once Functional Layout Plan(s) are approved, the subdivision layout and the infrastructure shown must be delivered in accordance with the approved plan. However, the approved Functional Layout Plan(s) are not a definitive statement of all construction requirements. Detailed engineering plans provide this information. Approval does not provide consent to the omission of infrastructure that is not shown on the Functional Layout Plan(s) nor can it be final acceptance of items that are incidental to fixing dimensions on the plan of subdivision or drawn only for the purpose of clarity.

5.3 Checklists and Auditing

The detailed checklists appended to this **Manual** provide designers with documentation to demonstrate that the requirements of the **Council** have been satisfied. Designers are required to sign off the relevant checklists, to verify that the specified criteria have been met.

For **Developers**, these checklists form an integral part of each submission of documentation, and provide the basis for fast-tracking approvals. **Councils**, to check authenticity, will randomly undertake audits of submitted checklists. **Consultants** providing reliable checklists will be ranked accordingly and attract less auditing. Others may experience delays in the approval process due to increased rates of auditing.

Where **Developer's** submissions are accompanied by completed checklists, **Council's Engineering Department** will not spend time checking quality or minor documentation details, and will therefore be able to review documentation in a significantly shorter time.

Where **Developer's** submissions are not accompanied by completed checklists, or where auditing has shown that previous checklists have not been reliably completed, **Council's Engineering Department** will be required to review the submission in greater detail. This may include a check of design details and quality of documentation against the checklists. As a result, responses or approvals of submitted documents will not be able to be fast-tracked.

5.4 Developer's Representatives

It is not the responsibility of the **Council** to design, construct, or supervise the construction of roads and drainage **Infrastructure** for private land development. It is the responsibility of the **Developer** to engage suitably qualified and experienced personnel who will carry out these functions to the satisfaction of the **Council**.

The **Developer** must ensure that these persons:

- Possess a professional indemnity insurance policy that covers design, construction and supervision and includes a provision for a maximum possible claim.
- Do not have a pecuniary interest with either the **Developer**, or Constructor, unless independent certification is provided.

Unless approved otherwise by the **Council**, all subdivision road and drainage designs must be undertaken by a **Qualified Engineer**, who will hereafter be referred to as the **Design Engineer** or **Designer.**

Unless approved otherwise by the **Council**, all subdivision road and drainage **Construction Supervision** must be undertaken by a **Qualified Engineer** who will hereafter be referred to as the **Construction Engineer**.

While it is generally preferred that the **Design Engineer** and **Construction Engineer** be the same person, the **Developer** may have reason to choose not to utilize this arrangement. All parties must be employed at the expense of the **Developer**.

For the purpose of this **Manual**, in all matters relating to the design and design approval of the development roads, drainage and landscaping works, the **Design Engineer** must be deemed to be the **Developer's Representative**.

For the purpose of this **Manual**, in all matters relating to the construction and handover of the development roads, drainage and landscaping works, the **Construction Engineer** will be deemed to be the **Developer's Representative**.

5.5 Pre-Design Site Inspection

A pre-design site inspection is expected to be undertaken prior to any detailed design work commencing unless otherwise agreed.

For Designers undertaking works on behalf of **Council** or **Developers** it is recommended that a pre-design site inspection should be held with a representative from the **Council's Engineering Department** to discuss specific issues and requirements for the site and surrounds.

5.6 Co-Ordination Of Works By Developers

It is the responsibility of the **Developer**, or their representative, to co-ordinate the works to be undertaken as part of the development. Works may include roads, drainage, water, sewerage, power, telecommunications, gas, landscaping, and other works as required by the planning permit. The design, documentation and installation of all services **Infrastructure** required to service the development should be in accordance with the relevant authority's criteria, specifications and instructions.

Unless otherwise approved by the **Council's Engineering Department**, alignments of services in **Developments** must be in accordance with the requirements of the *'Management of Road and Utility Infrastructure in Road Reserves, Code of Practice'* printed Dec 2004, the *'Co-ordination of Streetworks Code of Practice*, Victoria' reprinted 1995, and other relevant regulation or code established in relation to the *Road Management Act*.

Engineering plan approval for the construction of roads and drainage will not be granted until a master services plan has been provided showing alignments and structures of all services. It is the responsibility of the **Developer** or their representative to provide sufficient information on the master services plan to clearly identify potential clashes of services, and clearly nominate the clearance between these services where they cross. Footpath alignments and kerb crossings should be shown on the master services plan, as should proposed landscaping features such as trees and irrigation systems.

5.7 Variation from Design Guidelines

Any proposal to deviate from the **Manual** guidelines at any stage of the works must be made in writing with supporting reasons and must be approved in writing by the **Council's Engineering Department** prior to commencement of any work involving the proposed variation. The **Design Engineer** will be held responsible for the sufficiency of any such design variation.

It is the responsibility of the **Design Engineer** to review any planning permit conditions and determine whether any engineering approval for design variation requires an amendment to the Planning Permit conditions, and to arrange application to **Council's Planning Department** for planning permit amendment if required.

Note
Variations approved for some subdivisions or **Developments** do not imply approval for other current or future proposals.

5.8 Documents to be Submitted

Engineering plans and documentation must be submitted at three separate stages during the design process, in accordance with the following sections.

For **Council's** internal design staff the level of detail and specific requirements must be agreed upon prior to the design commencing, but for roads and drainage should be in accordance with the following sections.

5.8.1 Approval of Functional Layout Submission

Preliminary engineering plans are to be submitted to **Council's Engineering Department** for review. The submission must identify any key engineering assumptions specific to the proposed development. This submission can occur before or after an application for planning permit is made.

The approval of functional layout submissions must be prepared on the basis of this **Manual** in accordance with general engineering principles, the planning permit conditions and all other information collated from the site. The **Design Engineer** must initially provide adequate data on the proposed roads, drainage and parking for the development to enable approval of functional layout to be issued by the **Council**.

Road Design:

The submission should include one hardcopy set (A3 plans) of road layout and parking plans showing:

- Layout of roads and allotments with nominated Carriageway widths (between invert of kerbs) and nominated road reserve widths.
- Layout of road hierarchy and estimated traffic volumes.
- Typical road reserve cross-sections.
- Conceptual layout of proposed intersections internal and external to the development.
- Carparking layout plan in accordance with the requirements of this **Manual** and the Planning Scheme with the **Manual** to take precedence where there is a conflict between the requirements of both documents.
- Vehicle turning movement plan (refer Clause 12.3.8).
- Details of any staging of the development and impact on the road network.

Drainage Design:

The submission should include one hardcopy set (A3 plans) of the overall drainage strategy showing:

- Total catchment area, nominated sub-catchment areas and co-efficient of runoff for each sub-catchment.
- Layout of proposed drainage systems with approximate sizes of trunk drainage (not final pipe sizes).
- Natural surface contour lines to the **AHD**.
- 100 year **ARI** flood levels where applicable.
- Detailed design contour lines to **AHD**.

- Nominated overland flow path for 100 year **ARI** storm events.
- Nominated drainage discharge point and any treatment concepts.
- Existing drainage services and proposed connection points to both existing and future **Developments**.
- Details of any staging of the development and impact on the drainage network**.**
- Details of **WSUD** sizing and layout.

It should be noted that for small **Developments** many of these requirements may not be applicable.

The submission seeking approval for the functional layout should be accompanied by a brief report outlining key engineering issues and their proposed treatment, and by a completed checklist as found in **Appendix C: Checklists and Forms for Developer's Representatives**. Connectivity to existing **Infrastructure** should be demonstrated, as should relevant social and community linkages.

If **Council** requires a traffic management strategy it should be submitted with the request for approval of functional layout (refer to Clause 9). The road safety audit team should be nominated to **Council's Engineering Department** at this time for their consideration (refer Clause 10).

By establishing **Council's** documented approval of functional layout at this detailed design stage, the **Designer** can proceed to detailed design with confidence that their adopted strategies are acceptable to **Council**. On receipt of approval of functional layout the **Design Engineer** may proceed with the detailed design.

5.8.2 Detailed Design Submission

Once approval of functional layout has been received, design work should be carried through to a near-to-complete stage. This work should then be submitted to **Council's Engineering Department** for review of the design and documentation after coordinating with VicRoads where appropriate. It is intended that submission as detailed design will negate the need to produce excessive numbers of copies should further amendment be needed. Detailed design approval may be granted subject to minor amendments. Should significant amendments be required, documents will be required to be resubmitted for detailed design approval.

Detailed design documentation must be prepared to meet the requirements of this **Manual** in accordance with general engineering principles, the planning permit conditions and all other information collated from the site, the requirements of any relevant Precinct Structure Plan, the approved Functional Layout Plan(s), the service authorities and the like.

One (1) hardcopy set and one (1) electronic copy of draft plans and specifications are to be submitted to **Council** for comment, prior to lodging final design plans and specifications for approval. The hard copy set of plans is to be unbound and the copies of the specifications are to be bound. Completed checklists as found in **Appendix C: Checklists and Forms for Developer's Representatives** must accompany this submission.

Documentation must be prepared in accordance **with Appendix D: Information to be Shown on Plans**, and will include a master services plan. The master services plan must show the overall layout of all services within the limit of works and must include both existing and proposed services. The purpose of the plan is to enable clashes of services to be clearly identified and to demonstrate that appropriate clearances are achieved. Individual cables are not required for electrical, telecommunication and similar services, but may instead be shown as a single line representing the alignment of trenches. The location of street lights, sub stations, pump stations, etc must be shown on the master services plan, as must major landscaping features.

With the detailed design submission the **Design Engineer** must also provide a copy of hydraulic calculations showing aboveground and underground flows in and out of the system for major and minor storm events (refer Clause 16).

Pavement design computations must be provided with the request for detailed design approval, including soil Californian Bearing Ratio (CBR) results from laboratory analysis.

For infrastructure that will be vested in Council or is located adjacent to or abutting Council owned infrastructure, Council property or reserve or Public Open Space, a Certificate of Compliance for Design and a Certificate of Compliance for Construction is required for the following infrastructure items constructed as a part of a subdivision development:

- Retaining walls along property boundaries(>1.0m high);
- Entrance structures;
- Gazebos;
- Bridges;
- Boardwalks/elevated walkways/jetties; and
- Other structures as applicable.

In particular circumstances, Building Permits may be required, as well as Certificates of Compliance.

Quality Assurance sections of the specification should as a minimum list witness points and hold points as nominated in **Appendix E: List of Council Inspections**. The **Council** may choose to be present for specific hold points that relate to roads and drainage construction and documentation should reflect this.

If **Council** requires a Road Safety Audit report it should be submitted with the request for detailed design approval.

After review by the **Council's Engineering Department** one set of plans and specification will be returned to the **Design Engineer**, with mark-ups or comments regarding any required amendments.

5.8.3 Final Design Submission

Once detailed design approval has been received, design work should be carried through to completion ensuring coordination with VicRoads has occurred where appropriate and then submitted to **Council's Engineering Department** for review of the final design documentation.

On completion of the final design plans and specifications, the **Design Engineer** must provide three (3) hardcopies and one (1) electronic copy of these to the **Council's Engineering Department** with a covering letter certifying that these fully comply with the guidelines of this **Manual**, except for approved variations. An additional set of hardcopy plans should be provided if landscaping is to be incorporated into the development. All hard copy sets of plans are to be unbound and all copies of the specification are to be bound.

An estimate of the road and drainage construction works must be provided prior to the issue of the statement of compliance for the development, for the purpose of establishing payment for the prescribed checking fee.

It is not the responsibility of **Council** to guarantee thorough checking of all calculations and design details. It is the entire responsibility of the **Design Engineer** submitting the documents to ensure that designs and specifications comply with the **Manual**, relevant Australian standards and relevant local, state and federal government legislation.

Final design approval is conditional on the above basis and does not relieve the **Developer** from rectifying any errors and omissions that become evident during construction. Where the engineering plans and/or calculations have been subject to significant revision following approval of the design, amended drawings must be resubmitted to Council for its approval. All revisions shall be documented, including (where appropriate) the use of revision clouds and labelling within the title block, provided clarity is maintained on the drawings. Where drawing clarity would be compromised, separate documentation of revisions will be considered

Approval of design drawings is current for two (2) years only from the date of that approval. If the engineering works have not substantially commenced within the two-year period, the Manager of **Council's Engineering Department** may require that revised engineering drawings and construction specification be submitted for approval.

Should the Plan of Subdivision be altered after the Final Design approval, it shall be the responsibility of the designer to resubmit a copy of the Certified Plan (as amended) together with amended engineering drawings to Council for approval.

Upon final design approval one (1) copy of stamped & signed plans and specifications must be returned to the **Design Engineer**.

Final design approval should be received prior to construction commencement. Tendering of works prior to receipt of final design approval will be undertaken solely at the **Developer's** risk.

The issue of a planning permit and approval of Final Design does not constitute consent to undertake works within existing road reserves under the management and responsibility of **Council** or VicRoads.

Clause 6 Documentation

6.1 Objectives

The objectives of these documentation requirements are as follows:

- To provide consistency in the presentation of design information.
- To eliminate duplication of data entry into various record systems.
- To provide an 'as constructed' record of **Councils'** assets.

6.2 General Requirements

Council's Engineering Department will generally arrange or undertake the registration, storage and maintenance of engineering plans in hardcopy format.

In addition to this, all **Councils** operate electronic data management systems for all correspondence to and from the organisation, including plans. Letters, forms, certificates and minor reports (generally up to 20 pages) that are received are transferred to electronic format by its records department, however, major reports and all plans larger than A3 are required to be submitted in electronic and hardcopy format.

Council's Engineering Department must be advised of the installation dates of any approved Major traffic Control Item to enable advice to be forwarded to VicRoads within 30 calendar days of enacting VicRoads delegation.

6.3 Plans

Plans must be prepared as outlined in the following sections. Electronic submissions of plans will be such that any reproduction from the electronic files will achieve a hardcopy that is an exact duplicate of any hardcopy submission.

6.3.1 Sheet Size

Plans must be submitted on A1 or A3 sheets that comply with Australian Standard AS1100 Part 3.

6.3.2 Scales

For general consultation prior to planning permit issue, plans may be submitted as A1 or A3 sheets.

ODPs should generally be submitted on A1 sheets at scale of 1:1000.

When requesting approval of functional layout, plans should be submitted on A3 sheets with the following scales:

Lot Layout	1:1000
Roads Plan	1:1000
Intersection Plans	1:200 or 1:250
Drainage Plans	1:1000

When requesting detailed design approval or final design approval, or providing as constructed information, plans should be submitted on A1 sheets with the following scales:

Layout Plans	1:500
Longitudinal Sections	Horizontal 1:500 Vertical 1:50
Cross Sections	Horizontal 1 in 100 Vertical 1:50 or 1 in 100
Intersection Plans	1:200 or 1:100
Details	1:10 or 1:25

When submitting whole farm plans for approval, plans must be submitted on A2 or A1 sheets at a scale of 1:1500.

6.3.3 Datum

All levels must be to Australian Height Datum (**AHD**). Plans should nominate a minimum of two (2) permanent survey marks (PSM's) and their respective numbers/identification, and any temporary benchmarks (TBM's) relevant to the works. Where it is not possible to nominate two survey marks by agreement **Council** may allow the use of only one survey mark.

For subdivisions the plans must nominate all the permanent survey marks and their respective numbers/identification created to comply with the requirements of regulation 11 (3) of the *Surveying (Cadastral Surveys) Regulations 2005.*

The origin of all road chainage must be nominated in the plans. Road chainages should commence at clearly designated and identifiable locations.

6.3.4 Standard Details

All construction details must comply with the **Council's** standard drawings. Where special structures or modifications to standard drawings are required, details of such works are to be submitted with the detailed construction plans for detailed design approval.

6.3.5 Drawing Numbers

Plans should generally reference planning permit numbers. This planning permit number will, as a minimum, be clearly shown on the cover sheet or face sheet of any drawing set and be contained within the title block of each drawing.

Councils will provide plan numbers for any plans prepared for them if this is required. There is no requirement for plan numbers for subdivision and **Developments**.

6.4 Standard Drawings

The **Design Engineer** should adopt details as shown on the **Council's** standard drawings where possible. While standard **Infrastructure** is considered highly desirable across the municipalities, the standard drawings should only be used where the item/structure and application is considered standard. The standard drawings are not to be used in lieu of responsibly engineered and detailed structures. Where the standard drawings are not considered appropriate for the application, variations from the standard details should be fully documented to the satisfaction of the **Council**. Cross-referencing standard drawings with variations made by note will only be accepted where those variations are considered minor and where directions are clear.

Standard drawings are available in **Appendix F: Standard Drawings**.

It is the responsibility of the **Design Engineer** to ensure that the standard drawing used is correct for the application and consultation with **Council's Engineering Department** may be necessary.

6.5 Specifications

Project specifications must ensure that all works are undertaken to meet the requirements of the **Council**, and that there can be no outstanding liabilities when the projects are handed over at completion.

Specifications for contracted works must include a quality section nominating minimum hold points and witness points, including as a minimum, those inspections nominated in **Appendix E: List of Council Inspections**.

Specification for assets must ensure that the design life as listed below can be achieved with industry standard maintenance:

- Concrete structures generally 80 years
- Bridges
  - Concrete 100 years
  - Steel 80 years
  - Timber 50 years
- Buildings/structures 50 years
- Road pavements See Clause 12.7 of this **Manual.**

6.6 Information to be Shown on Plans

The **Design Engineer** is responsible for ensuring that information on plans is shown in sufficient detail to enable works to be constructed in accordance with its design intent and to the satisfaction of the **Council**. Information shown on plans should include, but is not necessarily limited to, those items listed in **Appendix D: Information to be Shown on Plans.**

Clause 7 Construction Phase

7.1 Objectives

The objectives of these construction requirements are as follows:

- To ensure that the works are constructed such that they fulfil the purpose for which they were intended.
- To ensure that long-term maintenance requirements are considered.
- To ensure that there is no detrimental effect on other existing assets in the locality.
- To ensure that the works are safe, both during and after construction.
- To ensure that environmental impacts are minimised both during and after construction.

7.2 Commencement of Construction for Developers

Construction must not commence until **Council** has granted Final Design approval and where a subdivision is involved, the Plan of Subdivision has been certified. Any premature commencement of works must be wholly at the **Developer's** risk.

The **Construction Engineer** must notify the **Council's Engineering Department** of commencement of construction by providing the following documents:

- 'Intention to Commence Construction' form.
- Construction Management Plan incorporating the following:
    - Construction Program.
    - Inspection and Test Plans.
    - Traffic Management Plans.
    - Environmental Management provisions including protection of stormwater quality and measures to prevent the spread of noxious weeds.
- Copy of Approved Consent for Works within Road Reserves.
- Copy of relevant insurance certificates.

The 'Intention to Commence Construction' form may be found in **Appendix C: Checklists and Forms for Developer's Representatives**.

7.3 Public Liability Insurances

Contractors engaged on development works within the municipalities must take out Public Liability Insurance to the minimum value of $10 million. The policy should specifically indemnify **Council** from all claims arising from the execution of the works.

7.4 Construction Supervision for Developers

As described in Clause **Error! Reference source not found.**, the **Construction Engineer** appointed by the **Developer** must supervise the construction of all roads and drains within a **Development**, and either the **Construction Engineer**, or another person appointed by the **Developer,** must act as the **Superintendent**. Neither **Council's Engineering Department** nor any member of that department can be responsible for these functions. The functions of the **Superintendent** will not be deemed to be completed until the **Developer** is released from the Defects Liability Period. All correspondence during the defects liability period will be directed to the **Superintendent**.

A 'Construction Supervision Memorandum of Understanding' must be signed by the **Developer** and the **Council**, prior to the commencement of works, for all **Developments** involving the construction of **Infrastructure** to be handed over to **Council**.

The **Council Engineer** or an officer nominated by the **Council Engineer** must inspect the works at critical milestones and may inspect at witness points to ensure that the works are constructed in accordance with **Council** requirements and the approved plan. The **Construction Engineer** must contact the **Council's Engineering Department** to arrange for joint inspections at each hold point relating to road and drainage construction and for advising of witness points as detailed in **Appendix E: List of Council Inspections,** and must be present at all joint inspections. It is not the role of **Council** to give a Contractor a direct instruction regarding the works, however as much guidance and assistance as possible will be given on site to assist the construction program.

Generally a minimum of 48 hours' notice should be given when requesting a Council Officer to attend a construction inspection or advising of a witness point, unless noted otherwise within this Manual.

7.5 Acceptance of Works for Developers

When the works are completed the **Construction Engineer** must arrange for acceptance of the works by the **Council**. Acceptance will be subject to timely provision of the documentation, and compliance with the procedures, detailed in this **Manual**. **Council** reserves the right not to accept the works if other construction activities, such as lot-filling, installation of utility services or provision of street lighting, have not been completed.

The **Construction Engineer** must arrange for a joint inspection of the works to be made, together with the **Council** Representative and the Contractor. The **Developer** should be invited to attend. The purpose of the visit must be to identify any outstanding items or minor defects for recording, and to determine whether works are completed to the **Council's** satisfaction such that they may be accepted into **Council's** asset systems. **Council** requires one (1) weeks' notice for the **Acceptance of Works** inspection.

The **Construction Engineer** must determine that all works are completed in accordance with the approved plans, prior to calling for the joint inspection (refer to **Appendix C: Checklists and Forms for Developer's Representatives**). The whole of the site must be completed in a tidy manner, including all required reinstatement of existing surfaces, erection of all signs and street lighting. Pump stations may be commissioned at this inspection, but the relevant operational and maintenance information must be provided to **Council** at least one week prior to the date of inspection. Streets should be swept prior to the final inspection.

Subsequent to the **Acceptance of Works** inspection the **Developer's Representative** must forward to the **Council**:

- Certification that the works have been completed in accordance with the documents previously approved by the **Council** (Checklist found in **Appendix C: Checklists and Forms for Developer's Representatives**).
- 'As Constructed' drawings in hardcopy format and in electronic format compatible with **Council's** Asset Management system and also in AutoCAD format.
- Operation and Maintenance (O&M) Manuals for pump stations.

- Asset Record Sheets for all assets classes including roads, drainage, lighting, street trees, playgrounds, irrigation systems, structures, landscaping etc.

Operations and Maintenance manuals are to be handed over to **Council** at commencement of the Defects Liability Period for any pump stations, retardation basins and wetlands. Training of **Council** staff may be required for specific **Infrastructure**. Such training of **Council** staff will be undertaken at the cost of the **Developer**, and should be undertaken at, or prior to, the **Acceptance of Works** inspection.

Following the inspection, and after receipt of the above-mentioned documentation, the **Council** must forward a letter to the **Developer's Representative** advising of **Council's Acceptance of Works**, thus indicating that physical works have been completed and are of sufficient standard that they may be incorporated into the **Council's** asset system. The Letter of Acceptance may include a list of minor defects that are to be corrected within one month of the inspection, or other period nominated within this letter.

Council's Engineering Department will forward a copy of the Letter of Acceptance to the Planning Department.

Satisfactory site inspection and issue of a Letter of Acceptance is not to be taken as engineering approval for Statement of Compliance to be issued for the development. It is only one step in the Statement of Compliance process, as there may be other engineering conditions on the planning permit to be addressed.

7.6 As Constructed Information

Following the completion of civil works in a subdivision or development "As Constructed" information must be prepared by a registered surveyor/**Qualified Engineer**. The "As Constructed" plans must be endorsed by the **Consultant's** Representative and the Contractor's Representative and forwarded to **Council's Engineering Department** prior to lodging a request for Statement of Compliance.

Plans must be prepared in accordance with **Appendix D: Information to be Shown on Plans**.

For works constructed by **Council's** internal works departments, As Constructed Plans must be prepared in accordance with **Appendix D: Information to be Shown on Plans** and signed off by the **Construction Engineer**.

Selection Table 1 shows those Councils which require drainage "As Constructed" plans to be provided in DSpec Format.

Selection Table 1 Drainage "As Constructed" Requirements

Councils Requiring "As Constructed" Drainage Information to Be provided in D Spec format
Ballarat City Council
Baw Baw Shire
Campaspe Shire.
Central Goldfields Shire
Colac Otway Shire Council
Glenelg Shire Council
Greater Shepparton City Council.
Macedon Ranges Shire Council

Councils Requiring "As Constructed" Drainage Information to Be provided in D Spec format
Moorabool Shire Council
Mount Alexander Shire Council
Rural City of Wangaratta.
South Gippsland Shire Council.
Southern Grampians Shire Council
Strathbogie Shire Council.
Surf Coast Shire Council
Warrnambool City Council
Yarriambiack Shire Council

The Councils listed in Selection Table 2 require as constructed plans to be provided in AutoCAD electronic format to GDA 94 spatial coordinates for translation into the Council's GIS.

Selection Table 2 Specific "As Constructed" Requirements

Councils Requiring AutoCAD electronic format
Ararat Rural City Council
Ballarat City Council (MGA Zone 54)
Baw Baw Shire
Central Goldfields Shire
Glenelg Shire Council
Golden Plains Shire Council
Mount Alexander Shire Council
Murrindindi Shire Council.
Pyrenees Shire Council
Southern Grampians Shire Council
Surf Coast Shire Council.
Swan Hill Rural City Council.
Warrnambool City Council.
Wellington Shire Council.
Yarriambiack Shire Council

7.7 Statement of Compliance

The **Construction Engineer** must direct the request for issue of Statement of Compliance to the **Council's Planning Department**. The **Council's Planning Department** will in turn direct a request for approval of issue of Statement of Compliance from the **Council's Engineering Department** (refer to **Appendix B: Engineering Approval Process for Developments**.)

The signed Defects Liability Agreement should be lodged with, or prior to, the request for Statement of compliance (refer to Clause 8.3).

When satisfied that all engineering conditions on the planning permit are complied with **Council's Engineering Department** must advise the **Council's Planning Department** that it has no objection to the issue of Statement of Compliance.

Council's Planning Department must seek, where appropriate, confirmation from VicRoads and other referral authorities that there are no objections to the issue of a statement of compliance.

Prior to consenting to the Statement of Compliance, the following is required:

- The engineering and landscape works must have either reached Practical Completion or Council has accepted a bond for uncompleted works;
- Payment of construction supervision fees in accordance with Clause 5 of the *Subdivision (Permit and Certification Fees) Regulations 2000* (currently to the value of 2.5% of the total estimated cost of constructing the works which are subject to supervision);
- Payment of any non-standard public lighting fees in accordance with this manual or the Planning Permit. Where non-standard public lighting fees apply, a public lighting plan approved by the current Service Provider shall also be submitted.
- "As constructed" survey data and asset information in electronic format in accordance with this **Manual** and other documentation required by the Planning Permit;
- Completed Inspection and Test Plans;
- Certificates of Compliance for any structural works;
- Reports, maintenance plans and other documentation required by the Planning Permit have been submitted;
- Payment of any required maintenance bonds for the infrastructure.

7.8 Locating Underground Assets

Any person or organisation that owns underground assets including pipes and cables has a responsibility or duty of care to ensure that information about the location of these services is easily available for people intending to undertake excavation activities.

People who represent a company responsible for any excavation work also have a duty of care to locate underground services or assets that are in the vicinity of the dig site, and then find and expose them before excavating near or around them. The duty of care is:

- To protect workers and the public from serious injury due to the rupture of an underground asset such as a natural gas pipe, high voltage electricity cable, petroleum or industrial gas pipe. Any damage to these assets can cause very serious damage to structures and potential injury to many people.
- To minimise the potential for damage and loss of service due to damage or rupture of the same assets. Extensive networks can be closed down for long periods with serious consequences of disruption and incurring penalties. The repair and replacement costs can also be very expensive.

The preferred method of obtaining information about the location of underground assets is the Dial Before You Dig service.

It should be noted that not all services are covered by the Dial Before You Dig service and in particular some Council's underground drainage services are not covered. In such cases contact should be made with the Council for information concerning the location of their underground drainage assets.

Features of the Dial Before You Dig service are:

- It is often the only method used by people intending to carry out excavation works when searching for information about the location of underground pipes and cables at a proposed dig site.
- It is referred to in publications from WorkSafe Victoria and Energy Safe Victoria as best practice.
- The service aims to provide all excavators with the best possible access to plans and information direct from asset owners of underground services using a national enquiry service.
- Its overall purpose is to educate and promote the importance of safe digging practices to the excavation community and to develop its membership base to include all asset owners of underground services.
- A request for information can be made by logging on at the web site (www.1100.com.au) or by phoning 1100. Customer details and the proposed area of the dig site will be sent to all asset owners registered with Dial before You Dig in that area and information will be sent back directly by the asset owner within two working days for excavation works. This may take up to 10 working days for planning and design requests.

Dial Before You Dig's Service Guidelines for Victoria outlines the responsibilities of all underground asset owners to register assets and provide information when requested, and also the responsibilities of people intending to undertake excavation work to obtain information about underground assets in the area and follow safe work practices. The guidelines can be obtained from:

(http://www.1100.com.au/Aboutus/ServiceGuidelinesforVictoria.aspx)

Clause 8 Defects Liability Period for Developers

8.1 Objectives

The objectives of the Defects Liability Period are as follows:

- To ensure that assets which are to be handed over to **Council** have been constructed to **Council's** standard and are suitable for the purpose that they have been built.
- To ensure safety to the community and users is not compromised by delays in rectification to works resulting from defects.

8.2 General

A Defects Liability Period must apply to all **Council Infrastructure** constructed by **Developers**, and must relate to any fault, deficiency or inadequacy of the works from defective design, workmanship or materials.

During the Defects Liability Period the **Council** will carry out operational maintenance in accordance with its normal practice, unless specified otherwise. The **Developer** will be held responsible for all maintenance costs arising from design error, defective workmanship and/or defective materials.

8.3 Commencement of Defects Liability Period

The Defects Liability Period will commence from the date of Practical Completion or the issue to Council of the title(s) for roads created within the Plan of Subdivision when Council is then deemed the Road Manager as defined by the Road Management Act, whichever is the later.

Unless specified otherwise on the planning permit, the Defects Liability Period for all assets, other than landscaping assets that are to be vested in **Council** will be 12 months. Landscaping assets will have a Defect Liability Period of 24 months.

If more than 8 weeks have elapsed between the **Acceptance of Works** inspection and the issue of Statement of Compliance, **Council** may request that a formal handover meeting be held prior to commencement of the Defects Liability Period to review and amend any outstanding minor defects and site-specific issues.

The **Developer** must enter into an agreement with **Council** regarding defects responsibilities for maintenance and correction of defects (e.g. those items arising from defective workmanship or materials) during this period. The agreement must be signed prior to issue of Statement of Compliance.

8.4 Guarantee of Work

Unless agreed otherwise in writing, the **Developer** must post a Guarantee of Work with **Council** prior to the issue of Statement of Compliance. The guarantee may be in the form of bank guarantee, cheque or cash and may be used for rectification of any and all design and construction defects. Bank guarantees must have no expiry date noted on the guarantee. Where a cheque is lodged, the guarantee will only be considered received after the bank has cleared the cheque.

The guarantee must be to the minimum value of 5% of the total cost of roads, drainage and hard landscaping, and the calculated amount must be based on the priced Bill of Quantities. The guarantee must be lodged with the **Council** for the term of the Defects Liability Period. If differing periods are nominated for different **Infrastructure**, the **Developer** may choose to lodge individual bank guarantees, or a single bank guarantee for the whole amount to be held.

The guarantee for soft landscaping must be a percentage as agreed by the parties.

The guarantee must be released at the termination of the Defects Liability Period, subject to the satisfactory completion of defect rectification works required by the Manager of the **Council's Engineering Department**.

The Guarantee of Works as described herein does not pertain to bonding of minor outstanding works or defects as may be approved by **Council** from time to time.

In the event that damage to infrastructure occurs during the defects period and the contractor can prove, to the satisfaction of Council, that this is not the result of defective workmanship Council will be responsible for the carrying out the repairs at its costs and recovering the cost from those who caused the damage.

8.5 Bonding of Outstanding Works

Bonding of outstanding works should only be considered as a 'last resort' due to the problems experienced with the administration of bonds, the insufficiency of bonds to cover the works and the length of time taken for the works to be completed.

In considering the appropriateness of uncompleted landscape works bonds, the following matters should be considered:

- Where it would otherwise be unreasonable to withhold consent to statement of compliance;
- To provide the opportunity for growth and development during appropriate planting seasons;
- Where deferment of the landscape works will assist in the staging of future works; and
- Where deferment will avoid undue wear and tear or possible damage to the landscape works taking into account other development works (i.e. housing construction) which will follow.

If agreement is provided by Council, the uncompleted landscape works bond must be lodged following the approval of landscape plans and detailed documentation and before statement of compliance. Uncompleted landscape works bonds will be returned to the developer following the completion of all required landscape works to the satisfaction of Council.

Where **Council** does approve the lodging of a bond the value of the bond must be $5,000 ex GST or 1.5 times the estimated cost of completing the works, whichever is the greater.

If the works are not completed within 12 months, unless otherwise agreed in writing, the **Council** may organise the works to be done and pay for those works from the bond including the cost of supervising the works and associated administration.

Where a bond is permitted to be lodged with **Council** it must consist of:

- Cash, or
- An unlimited bank guarantee.

8.6 Defective Items

Defective items becoming apparent during the Defects Liability Period will be referred to the **Construction Engineer** for remedial action by the **Developer**. Failure by the **Developer** to comply with such instruction to rectify works will result in forfeiture of the part or all of the guarantee, as required, for the **Council** to undertake remedial/maintenance works required by the order. Similarly if the required works are of an emergency nature, rectification works will be undertaken or arranged by the **Council** at the **Developer's** expense. The Letter of Release referred to in Clause 8.7 will not be issued until payment for such repairs has been received.

During the Defects Liability Period the **Developer** no longer has possession of site, and must obtain a permit from the relevant authority giving *Consent to Work within a Road Reserve* before undertaking any remedial work in the road reserve.

8.7 Release from Defects Liability

Shortly before the end of the Defects Liability Period, the **Developer's Representative** must arrange for a joint inspection of the works to be made, together with the **Council's** representative and the Contractor. The **Developer** should be invited to attend. The purpose of the visit will be to determine if there are any defective items requiring rectification by the **Developer**. **Council** requires one week's notice for this inspection. Following this inspection, and after rectification of defective items, the **Council** will forward the Letter of Release to the **Construction Engineer** to release the **Developer** from any further defects liability.

Clause 9 Traffic Management Strategy

9.1 Objectives

The objective of the Traffic Management Strategy within the **Development** and surrounds is to provide efficient traffic flow and a safe road environment for all users.

9.2 General

The **Developer** may be required to provide new roads as part of their development and/or upgrade existing roads. The **Design Engineer** must identify the impact of the development upon the existing road network and the assessment of the impact. Where mitigating works are required, these must be provided to the satisfaction of the **Council**.

A **Qualified Engineer** must prepare the Traffic Management Strategy. **Council** may request information regarding the proposed **Consultant's** experience prior to approving the Traffic Management Strategy.

A Traffic Management Strategy may comprise one or both of the following:

- **TMAR** that determines the road layout, road widths, functions and connectivity for all road users and/or
- **TIAR** to determine impact on external road network and identify appropriate mitigating works.

Some **Developments** that do not create new roads or intersections may still generate sufficient traffic volume or traffic movement to warrant a traffic management assessment e.g. supermarket. Such a development may also require a Traffic Impact Assessment.

Where a **TMAR** is required to be prepared as a condition of the Planning Permit, the submitted plans must not receive endorsement until the traffic control requirements are approved in principle by the **Council's Engineering Department**.

The provisions of this section apply to development carried out by **Council**.

9.2.1 Traffic Management Assessment Report

The need for the Traffic Management Assessment Report (TMAR) should be determined at the time of issue of the planning permit, or before, and may be triggered by the following:

- Construction of a new road.
- Construction of a new intersection.
- Potential for further development (may need **ODP** to assess).
- Multiple **Developers** within a specific locality.
- Large industry or retail/commercial development.

9.2.2 Traffic Impact Assessment Report

The need for the **TIAR** should be determined at the time of issue of the planning permit, or before, and may be triggered by the following:

- Where **Developments** generate either:
  - an overall increase in traffic volumes of 10% or greater, and/or

- An increase of 100 vehicles per day or greater.

Where both VicRoads and the **Council** require a **TIAR** one report may be prepared meeting the requirements of both organisations.

9.3 Requirements

Provision for buses is to be identified at the functional layout phase. Provision for bicycles and pedestrians must be identified at the detailed design phase. All collector roads must include bicycle paths/lanes, and/or shared paths, and should be designed as bus routes. As per Planning Scheme guidelines, pedestrian and bicycle paths should generally be located along streets fronted by dwellings, however, alternative routes may be established through Public Open Space as long as is can be demonstrated that safety and security of path users, local residents and property are maintained. Routes should be planned to achieve linkages to other existing and proposed bus, bicycle and pedestrian routes and be based on the principles found in the Department of Infrastructures publication entitled *'Public Transport Guidelines for Land Use Development'.*

Developments that contain more than 200 lots in the **ODP** may be required to establish bicycle routes through the development *PRINCIPLE*. Development proposals should complement and enhance the principles of any **Council** Bike Strategy Plans.

Provision must be made to ensure that no emergency service vehicles, waste and recycling collection vehicles and street-sweepers are required to reverse within the development *PRINCIPLE*. Staging of works must not negate this requirement and temporary turning areas may need to be established between development stages including carriageway easements as necessary.

Issues to be addressed in the **TMAR** must include, but need not be limited to, the following:

- Estimated traffic volumes.
- Major traffic control items.
- Proposed road closures.
- Determination of road function and connectivity.
- Impact of staged development.
- Off street and on street parking.
- Pedestrian and cyclists movements within and outside the development.
- Egress and entry to the development.
- For large retail commercial and industrial **Developments** loading and unloading of deliveries.
- Traffic calming devices should accord with Clause 12.6 and may consider the following:
  - Roundabouts.
  - Traffic islands.
  - Parallel slow points.

- Road humps.
- Bus routes, bus stops, and bus bays.

Issues to be addressed in the **TIAR** must include, but need not be limited to, the following:

- Estimated traffic volumes.
- Proposed road closures.
- Impact of staged development.
- Pedestrian and cyclist movements.
- Egress and entry to the development.
- Recommendations for appropriate mitigating works.

TMARs and **TIAR**s should clearly present any recommendations. Particular note is to be made where any recommendations are not to be delivered by the **Developer** and state the reasons for this. **Council** may then choose to consider these recommendations amongst its own Capital Works Program. The Traffic Management Strategy should also address Planning Scheme objectives and standards as outlined in Section 56.03 of the Planning Scheme.

Major Traffic Control Items may need written approval from **Council** or VicRoads prior to implementation. The **Designer** should determine these needs and ensure that these approvals are obtained in a timely manner such that they do not impact on the programmed works.

Traffic generation should be calculated in accordance with Clause 12.3.1 unless directed otherwise by the **Council's Engineering Department**.

Parking within the development must be shown on a separate plan to the satisfaction of the **Council** at the time 'Approval of functional layout' is sought. **Developments** that create new roads (e.g. subdivisions) require submission of a parking plan demonstrating at least one practical space per two allotments to the satisfaction of the **Council** where parking provisions are achieved outside of any court bowls.

For larger industrial commercial and retail **Developments** the traffic management assessment must consider traffic and pedestrian conflict points, location of loading zones and movement of forklifts and other vehicles for loading and unloading, ingress and egress from the site, provision of disabled parking, and parking requirements overall.

Clause 10 Road Safety Audits

10.1 Objectives

The objective of a road safety audit of development **Infrastructure** is to provide the safest outcome for a project/development.

10.2 General

Road safety should be considered throughout all phases of road upgrade or construction. For **Developments** within the municipality traffic safety must be formally considered at both design and construction stages of road development. By conducting road safety audits at the design stage before a road is built provides the most cost-effective outcomes.

The provisions of this section apply to development carried out by **Council**.

10.3 Requirements

Road Safety Audits be undertaken for all development designs that require a Traffic Management Strategy (refer to Clause 9) and must be conducted at the detailed design stage and again after construction is completed.

Audits must be conducted by a VicRoads Accredited Road Safety Auditor, other than the road **Designer**, and must be carried out in accordance with Austroads *"Guide to Road Safety Part 6: Road Safety Audit"* and any VicRoads supplement to those guidelines.

Audit teams should involve two or more experienced or qualified people with at least one Senior Road Safety Auditor on the team. When selecting the audit team the **Design Engineer** must be responsible for determining that the Senior Road Safety Auditor has suitable experience for the type for works proposed, or that such experience is incorporated into the audit team. **Council** should be advised of the nominated audit team at the time of request for approval of functional layout.

The **Design Engineer** is responsible for deciding on the action required in response to the audit report and its recommendations, however consultation with **Council** is encouraged if recommendations are complicated or require community involvement. A copy of the road safety audit report, with documented responses to recommendations, must be provided to **Council** with the detailed design documentation. The report of the audit conducted after construction has been completed must be provided to Council prior to the issue of a Statement of Compliance, where relevant, or to the commencement of use.

Clause 11 Drainage Strategy Plans

11.1 Objectives

The objective of the Drainage Strategy Plan is to identify and record the manner by which the quantity and quality of stormwater must be managed for any catchment in which a development occurs or drainage **Infrastructure** works take place.

11.2 General

The design and management of stormwater runoff must be consistent with any relevant Stormwater Management Plan, details of which can be obtained from **Council's** engineering or planning departments. In addition to Stormwater Management Plans, **Councils** may have completed a number of additional drainage studies for catchments within their municipalities. Any relevant drainage reports must be made available for reference – contact the **Council** for access to any relevant reports.

Where the drainage system has not been previously defined for a proposed subdivision in an **ODP**, **Developers** may be required to provide a separate Drainage Strategy Plan. The **Developer** must engage a fully qualified **Consultant** to prepare the Drainage Strategy Plan that addresses all runoff generated within the development or project area, or transmitted from upstream catchments through the project area. The Drainage Strategy Plan submission must include catchment and sub-catchment plans, conceptual drainage systems including treatment, and the proposed location and method of stormwater discharge from the system.

The need for the Drainage Strategy Plan should be determined at or before the time of issue of the planning permit, and may be triggered by the following:

- Whenever an **ODP** is prepared.
- Whenever there is a request to have land rezoned under the planning scheme.
- Where **Developments** include the construction of the following:
  - A new retardation basin.
  - A new treatment facility; or
  - A new drainage outfall.
- There is potential for significant further development within the catchment.
- The catchment involves multiple **Developers** within a specific locality.
- Greater than 5 lots discharging to a common drainage system/basin.
- Large industry or commercial use.

Where a Drainage Strategy Plan is required to be prepared as a condition of the Planning Permit, the submitted plans must not receive endorsement until the plan is approved in principle by the **Council's Engineering Department**.

11.3 Requirements

Where drainage strategy plans are required to be prepared for submission by the **Developer** the following applies:

- The catchment area is to be carefully analysed and determined and the resultant defined area submitted to the **Council's Engineering Department** for review.

- The **Designer** is to base the calculated peak flow on the full potential development of both the project and upstream areas for normal flow situations as well as the overland flooding caused by pipe blockages, general flooding and high water levels.

- Where overland floodwaters or flood-storage is or will be altered or changed as part of a **Development**, compensatory works must be assessed and implemented.

- Where active floodways, floodplains and or flowpaths are present, no development will be approved without hydraulic modelling and analysis. The analysis must identify the extent, velocities and depth of overland flood flows on the development as well as similar impact on the catchment external to the development site. The **Developer** may be further required to submit a risk assessment report including details of proposed works to ensure that the potential for loss of life, risk to health and damage to property is minimised, and how the flood conveyance or storage will be accommodated.

- Changes to any existing wetland should only be considered after all other alternatives have been exhausted. The function of a floodplain is to convey and store flood waters and preserve the inherent values of Wetlands. Assessment using the relevant authority's drainage lines will be undertaken to ensure active and passive flows and seepage are preserved in any application.

- Proposed outfall conditions including quality objectives are to be clearly documented for approval by **Council** and other authorities if applicable.

- The **Designer** should ensure that the number of retarding basins and pump stations are minimised to reduce **Council's** ongoing operating and maintenance costs.

Clause 12 Design of Roads

12.1 Objectives

The objectives of the Design of Roads requirements are as follows:

- To develop a network and alignment that balances the existing and future requirements.
- To provide a serviceable pavement for the specified lifetime with minimal maintenance.
- To ensure that staged construction methods are planned to meet the immediate, medium term and ultimate pavement and drainage design requirements.
- To provide smooth, safe, trafficable horizontal and vertical alignments, adequate sight distance with consideration being given to road classification requirements, road users and utilities.

12.2 General

This section sets out the standard design criteria for road works. It is not intended to prohibit any alternative arrangements or approaches. Innovative or non-standard designs may be considered, but not necessarily accepted. Sufficient data and principles of design for any innovative or nonstandard design must to allow Council's Engineering Department to assess the merits of that design.

Aspects not specifically referred to in this **Manual** should be generally in accordance with the following documents:

- Austroads*: "Guide to Road Design"*, incorporating AGRD01 to AGRD07 and all subsections.
- Standard Drawings appended.

Road design plans must be prepared in accordance with **Appendix D: Information to be Shown on Plans**.

All the required physical works must be installed as part of the development. They must be appropriate and in accordance with **Council** standards. Where the **Developer** is unable to provide the physical roads and accesses then **Council** may consider a contribution that is equivalent to the total actual cost of preparation of plans, specifications and the construction of the **Infrastructure**.

12.3 Urban Roads

The design and construction of roads and allotment accesses should meet or exceed the requirements of the Austroads, The Planning Scheme, this **Manual** and any relevant Acts, Regulations and Australian Standards.

12.3.1 Road Classification

The classification of residential streets within any development should in accordance the 'Urban Road / Street Characteristics Tables' found within Clause 12.3.2.

In response to the *Road Management Act*, **Councils** may have established an alternative road hierarchy to determine routine maintenance requirements, as well as establishing the overall management of its road network. The road classification referred to within this **Manual** relate specifically to the design and construction of new or upgraded roads.

Access Lanes as defined in The Planning Scheme are not considered desirable by the **Councils** listed in Selection Table 3, and should not be provided within **Developments** unless specific approval is obtained from the **Council's Engineering Department** *PRINCIPLE*. Roads of width and function similar to Access Lanes may be approved as private

roads or common property. However, **Council** may require specific treatment such as fencing, paving and drainage. It is recommended that negotiation of this issue be addressed as early as possible in the planning process.

Selection Table 3 Access Lanes

Access Lanes Are Not Considered Desirable In These Councils Unless Specific Approval Obtained
Ararat Rural City Council
Ballarat City Council
Baw Baw Shire
Benalla Rural City Council
Campaspe Shire Council
Central Goldfields Shire
City of Greater Geelong
Colac Otway Shire Council
Gannawarra Shire Council
Glenelg Shire Council
Golden Plains Shire Council
Greater Bendigo City Council.
Greater Shepparton City Council
Indigo Shire Council
Macedon Ranges Shire Council
Mansfield Shire Council
Mitchell Shire Council
Moorabool Shire Council
Mount Alexander Shire Council
Murrindindi Shire Council
Rural City of Wangaratta
South Gippsland Shire Council
Southern Grampians Shire Council
Strathbogie Shire Council
Swan Hill Rural City Council
Towong Shire Council
Warrnambool City Council
Wellington Shire Council
Yarriambiack Shire Council

Ultimate traffic volumes for road classification and road design are to be based upon approved multipliers of existing traffic movements (measured), through traffic, and an estimate of traffic generated by proposed and future development. Estimated traffic volumes for undeveloped areas must be based upon the following:

- Residential allotments — at least 10 vehicle movements per day per lot.
- Commercial/Industrial — To be determined on a case by case basis utilising the RTA NSW *"Guide to Traffic Generating Developments 2002".*

Where alternative traffic generations assumptions are used in the preparation of a Traffic Impact Study, details of alternatives must be provided to **Council** for approval.

Where **Council** holds traffic count data on relevant roads, this information must be made available to the **Design Engineer**. In some instances, the **Developer** may be asked to undertake additional traffic count data collection on affected roads to ascertain predevelopment traffic volumes and types. This will generally only be asked of the **Developer** when traffic count data is greater than three years old, or significant development has taken place since traffic count data was last collected. Where traffic volumes and type vary seasonally, the **Design Engineer** must use data conservatively and clearly present assumptions with the request for approval of functional layout.

12.3.2 Road / Street Characteristics and Road Reserve Widths for Developers

The classification, function and general composition of roads and streets within any development are detailed in the 'Urban Road / Street Characteristics Tables below.

Road reserve widths are to be sufficient to accommodate the road **Carriageway**, required services with approved clearances, pedestrian and bicycle access, parking, landscaping, drainage and bus routes. Should the development design incorporate **WSUD** principles the road reserve may need to be further increased.

Minimum road reserve widths in urban residential **Developments** are detailed in Table 2 found within this **Manual**.
PRINCIPLE Lesser width industrial road reserve may be permitted for short industrial cul-de-sacs however turning at the court bowl will not be compromised.

Footpath, bus, bicycle and pedestrian provisions are detailed elsewhere in the Manual. Minimum road reserve widths will not be allowed where they compromise the provision and standard of these road users.

Road reserve boundaries may be curved around court bowls, but where they are to be fenced as chords, these should not be less than 10 metres. Where a number of such chords occur adjacent to each other, they should, as far as possible, be practically equal.

Table 2 Urban Road / Street Characteristics

Street Type	Indicative Maximum Traffic Volume	Carriageway Width	Minimum Reserve Width See Note 5 & 6	Minimum Verge Width	Parking Provision within Carriageway	Pedestrian / Cycle Provision within Road Reserve See Note 7	Kerbing
Access Lane (second road frontage)	300 veh/day	5.5m See Note 6.	As determined by turning movements		Yes one side	No footpath	Nil if concrete road with central drain or SM2 or modified SM2. See Note 3.
Access Place	300 veh/day max. (maximum length 100m)	6.0m See Note 6.	14.0m	3.5m See Note 2.	Yes (one side)	Footpath both sides. No separate cycle provision	B2, SM2 or modified SM2. See Note 3.
Access Street	1000 veh/day max	7.3m	16.0m	3.5m See Note 2.	Yes (both sides)	Footpath both sides. No separate cycle provision	B2, SM2 or modified SM2. See Note 3.
Collector/ Connector Street Level 1	3000 veh/day max	11.0m	24.0m	6.0m	Yes (both sides)	Shared path both sides	Barrier B2 Kerb outstands or splitters required at intersections and pedestrian crossing points
Collector/ Connector Street Level 2 (alternatively called trunk collector)	6000 veh/day max	2 x 7.0m + 5.0m median	34.0m	6.0m	Yes (both sides)	Footpath both sides. Shared path both sides.	Barrier B2
Residential Court Bowl	n/a	10.0m radius	28.0m	3.5m See Note 2	n/a	Footpath both sides. No separate cycle provision	SM2 or modified SM2. See Note 3.
Commercial Street	n/a	22.0m	32.3m	5.0m	Yes (both sides)	Footpath both sides. Cycle provision where	Barrier B2

Street Type	Indicative Maximum Traffic Volume	Carriageway Width	Minimum Reserve Width See Note 5 & 6	Minimum Verge Width	Parking Provision within Carriageway	Pedestrian / Cycle Provision within Road Reserve See Note 7	Kerbing
						directed	
Industrial Street	n/a	12.5m See Note 1 below	25.0m	6.0m See Note 4	Yes (both sides)	Yes (both sides)	Barrier B2
Industrial Court Bowl	n/a	15.0m radius	37.0m	3.5m See Note 2	n/a	Yes	Barrier B2

Note 1

Higher traffic volumes and intended use/s of carriageway may require greater **Carriageway** widths.

Note 2

The **Developers** must ensure that verge widths are sufficient to accommodate services that are required to be located within the verge.

Note 3

Selection Table 4 shows the kerb profiles used by municipalities:

Selection Table 4 Kerb Profiles

B2	SM2	SM2 Modified
Golden Plains Shire Council	Golden Plains Shire Council	Golden Plains Shire Council
Macedon Ranges Shire Council		Macedon Ranges Shire Council
Mount Alexander Shire Council	Mount Alexander Shire Council (shall consider where justification is demonstrated)	Mount Alexander Shire Council (shall consider where justification is demonstrated)
Pyrenees Shire Council	Pyrenees Shire Council	Pyrenees Shire Council
Surf Coast Shire Council	Ararat Rural City Council	Ballarat City Council
Wellington Shire Council	Ballarat City Council	Baw Baw Shire Council
	Benalla Rural City Council	Campaspe Shire Council
	Colac Otway Shire Council	Central Goldfields Shire Council
	Corangamite Shire Council	City of Greater Bendigo
	Glenelg Shire Council	East Gippsland Shire Council
	Moorabool Shire Council	Indigo Shire Council
	Strathbogie Shire Council	Mansfield Shire Council
	Swan Hill Rural City Council	Mitchell Shire Council
	Warrnambool City Council	Moira Shire Council
	Yarriambiack Shire Council	Rural City of Wangaratta Council

B2	SM2	SM2 Modified
		South Gippsland Shire Council
		Southern Grampians Shire Council
		Towong Shire Council
		Wellington Shire Council
		Wodonga City Council

Note 4

Verge widths may be reduced to 3 metres in the following situations:

- Court bowls less than 100m in length.
- Where access gates are set back from the property boundary by 3 metres.

Note 5

The minimum width of the road reserve cannot be calculated by adding the minimum distances of the components within the road reserve.

Note 6

Designers and **Developers** need to ensure that the road reserve width adopted complies with the requirements of the following documents and Authority requirements:

- Department of Transport - *Public Transport Guidelines*.
- Various walkability and bicycle strategies.
- CFA may require the minimum **Carriageway** width to be 7.3m in certain areas unless parking is restricted to one side.
- Where service vehicles use access lanes then the minimum carriageway width will be 6m.

Note 7

Where a Council has a bicycle strategy/policy/plan that requires on-road bicycle lanes then the Council may agree to reduce the number of shared paths required from two to one to reflect the provision of on-road bicycle lanes and consequently the pavement width will be increased to 8m minimum.

Important Notes

Cross sections of the various street types shown in Selection Table 4 can be found in Standard Drawings numbered SD600-620.

Where reference is made to the **Carriageway** within this **Manual** the **Carriageway** is defined as the distance between the inverts of kerbs for roads with kerb and channel.

Where reference is made to the **Road Verge** for urban streets within this **Manual** the **Road Verge** is defined as the distance between the invert of kerb and the near road reserve boundary.

Selection Table 4 does NOT apply to roads within the Gannawarra Shire Council or City of Ballarat boundaries. Classifications and construction of new roads are to be in accordance with **Council's** Roads Management Plan and Road Asset Management Plan.

12.3.3 Widths and Treatments of Other Reserves

The widths and treatments of other reserves are to be determined utilising good urban design principles such as 'Safer Design Guidelines', 'Active by Design' and other relevant guidelines to reduce crime, improve public safety and enhance the local amenity.

Where pedestrian and/or bicycle access reserves are incorporated into **Developments** the minimum reserve width is 10 metres The width may be need to be increased for reserves deeper than one average allotment see Clause 24. A vehicle crossing layback and full concrete crossing to title boundary must be provided to all pedestrian and bicycle reserves. Removable bollards must be provided within the reserve 1 metre offset from each adjacent road reserve in sufficient numbers and spacing to prevent vehicular access. Where mountable kerb and channel is used the layback may be omitted, although the sealed crossing must still be constructed from the back of kerb to the Title boundary.

A landscaping and lighting plan should be provided to the satisfaction of **Council's Engineering Department** for all proposed reserves.

Where reserves are required specifically for provision of services other than those under **Council's** responsibility, those reserves must be vested with the relevant authority.

12.3.4 Road Geometry

The geometric design of arterial roads must be in accordance with the "*Guide to Road Design Part 3: Geometrical Design"* and any VicRoads supplement to that publication. For roads that are the responsibility of **Council**, road geometry must provide sufficient space such that emergency service vehicles, waste collection vehicles and street-cleaning vehicles may carry out their functions while travelling in a forward-only direction throughout the development. Cul-de-sacs must be of bowl geometry. 'T' or 'Y' cul-de-sac heads are not permitted*PRINCIPLE*.

Staging of works does not negate this requirement and temporary turning areas may need to be established between development stages including **Carriageway** easements as required. Where temporary turning areas are to be provided on private land and not in the road reserve a Section 173 agreement may need to be provided upon the subject land to provide turning area until such time as the road is extended and/or a permanent turning area is established.

Parking, bicycle and bus requirements may impact upon the minimum widths and adequacy for these functions must be demonstrated at the approval of functional layout stage.

The horizontal alignment of all roads is to be designed in accordance with the requirements of Austroads *"Urban Road Design Manual Part 3: Geometric Design".*

Where horizontal curves are superelevated, the **Design Engineer** must ensure that any low points in the kerb and channel resulting from the application of superelevation are adequately drained.

12.3.5 Sight Distances

Consideration must be given to sight distances, particularly at street intersections and on crest vertical curves. Reference must be made to the relevant Austroads "*Guide to Road Design"* and any VicRoads supplement to those guidelines as follows:

- General road design Austroads *"Guide to Road Design Part 3: Geometric Design"*
- Intersections – Austroads *"Guide to Road Design Part 4A: Signalised and Unsignalised Intersections"*
- Roundabouts – Austroads *"Guide to Road Design Part 4B: Roundabouts"*

Landscaping plans must be prepared with consideration to sight distance requirements, as must any proposal for 'Estate Entrance Structures'.

Plans submitted for approval must show all existing and proposed features in sufficient detail to demonstrate that appropriate sight distances are achieved.

12.3.6 Vertical Alignment and Vertical Curve Requirements

The maximum permissible grade on an arterial road must be in accordance with Austroads *"Guide to Road Design Part 3: Geometric Design"* and any VicRoads supplement to those guidelines.

Road design grading should be extended a minimum of 100 metres beyond the end of the street where such street is to be extended in the future. Where new roads meet existing roads the **Designer** must check the grading for a distance of 50 metres to check that roads match well and that no abrupt change in grade occurs.

Vertical curves must be provided at all changes of grade in road centreline greater than 1.0%, or changes in grade of kerb and channel greater than 0.5 and comply with the design guidelines set out in the Austroads publication *'Guide to Road Design Part3: Geometric Design'* and any VicRoads supplement to that publication. In particular, vertical curves on subdivision streets must provide the following Stopping Sight Distances:

Table 3 Stopping Sight Distances

Type of Street	Target Street Speed km/hr
Access Place or Access Street	30
Collector Street Level 1	50
Collector Street Level 2	70

12.3.7 Limiting Longitudinal Gradients

Where kerb and channel is installed, road grades must fall within the limits shown in Table 4.

Table 4 Limiting Longitudinal Gradients

Type of Grade	Grade
Desirable **minimum** grade	0.5 % (1 in 200)
Absolute **minimum** grade	0.33 % (1 in 300)
Desirable **maximum** grade	10 % (1 in 10)
Absolute **maximum** grade	20% (1 in 5) or greater with specific **Council** approval.

The kerb and channel grades on curves must be calculated along the outer kerb for minimum grade and along the inner kerb when grades approach maximum limits.

In special circumstances, in extremely flat locations a grade of 0.25% (1 in 400) may be considered. The lengths of these flatter grades should be limited.

At intersections, each kerb is to be graded individually around the return and designed to match the kerb grade of the adjoining street and to follow as closely as possible the vertical curve produced on the pavement by designing to match the through street.

The desirable minimum grade for kerb returns is 0.75% and absolute minimum is 0.25%.

12.3.8 Vehicle Turning Movements

Vehicle turning movements are to be examined for design vehicles and check vehicles using the Austroads Design Vehicle and Turning Path Templates, 2006. Road space should be provided such that the design vehicle is able to negotiate a left turn from the left lane without crossing adjacent lanes *PRINCIPLE* and without the need to reverse to complete the turning movement. Check vehicles may impinge upon adjacent lanes as they represent infrequent vehicles accessing local streets, such as articulated vehicles delivering building materials in new estates or furniture carrying vehicles.

The intersection design must be such that 600mm clearance for above ground structures is applied to the total swept path of the design vehicle, and not just to the wheel path. Vehicle accesses and driveways are NOT to be used for turning movements*PRINCIPLE*. All roadway, right-of-ways and vehicle crossings are to be designed to accommodate a standard vehicle (car).

Turning movement plans must be provided to **Council** with the approval of functional layout submission and must show turning movements as nominated in Table 5 Turning Movement Plans.

Table 5 Turning Movement Plans

Intersecting Road Types	Design Vehicle	Checking Vehicle
Access Streets / Access Street *or* Access Streets / Access Place *(residential and commercial for access to loading bays)*	Service Vehicle *(b)* (8.8m) Radius 9m	Single Unit Truck/Bus (12.5m) Radius 9m
Access Streets / Access Street *or* Access Streets / Access Place *(industrial)* *(a)*	Single articulated (19m) Radius 9m	Extended single articulated (25m) Radius 12.5m
Collector Street / Access Street *or* Collector Street / Access Place *(residential)*	Service Vehicle *(b)* (8.8m) Radius 9m	Single Unit Truck / Bus (12.5m) Radius 9m
Collector Street / Collector Street *(residential)*	Single Unit Truck / Bus (12.5m) Radius 12.5m	Single articulated (19m) Radius 12.5m
Collector Street / Collector Street *(industrial)*	Single articulated (19m) Radius 12.5m	Extended single articulated (25m) Radius 15m

(a) Use these for intersections with industrial land use for local/collector intersections.

(b) Service vehicle dimensions and turning should be based on fire appliance rather than a waste vehicle.

12.3.9 Cross Section Profiles

Cross-sections must accord with road **Carriageway** and road reserve widths nominated elsewhere within this **Manual**. Typical cross-sections should be included in the documentation and should nominate:

- Type of kerb and channel.
- Pavement construction including material type and depth.
- Surface details.
- Subsoil drainage, if required.
- Typical footpath offsets.
- Typical service corridors.
- Typical landscaping corridors.
- Crossfalls.

The normal crossfall on bituminous pavements should be 3%. Should design speeds require super-elevation of horizontal curves, design of crossfall should be based on the Austroads *"Guide to Road Design Part 3: Geometric Design".*

Shoulder crossfalls should be 5%. Where shoulder crossfalls greater than 6% are proposed to be used, at intersections or horizontal curves, approval should be sought from **Council's Engineering Department.**

The relative change in grade of kerb line and centreline is not to exceed 0.5%.

Central spoon drains in the road pavement are undesirable and will only be permitted for road pavements that will be incorporated as Common Property. This restriction does not apply to fully concreted pavements with crossfall to the centre of the road with centrally grated pits.

Footpath crossfalls must be 1:50 desirable and 1:40 maximum, unless approved otherwise on a site-specific basis.

Footpath alignments must be 300mm offset maximum from the property boundary in existing development and 50mm minimum from the property boundary in new **Developments**, unless approved otherwise on a site-specific basis.

Verge crossfalls between footpath and back of kerb must be 1:15 desirable maximum and 1:10 absolute maximum, and must extend into properties at the same grade for a nominal distance of 500 mm. Should steeper verges be proposed, the **Designer** is to demonstrate that car access can be provided to effected allotments.

Wherever new kerb and channel or footpath is to be constructed adjacent to existing roadways and/or wherever excessive crossfalls occur on either the road pavement or nature strip, all vehicle crossings to allotments must be checked using standard car templates to ensure that car access can be provided.

Batter slopes should be as is appropriate for the predominant use of the locality, but in areas within the **Clear Zone** maximum batter slopes are as follows:

- Desirable: 1 in 6; Maximum 1 in 4.
- Residential area driveway slopes 1 in 10 maximum.

Whenever it is impractical to provide batters flatter than the maximum slopes specified, **Developers** must provide special treatment such as retaining walls within the property and in areas prone to erosion consideration must be given to erosion control measures.

Unless demonstrated to be impractical, road designs should avoid filling on the low side street alignment

12.3.10 Kerb and Channel

All urban streets must be constructed with a sealed pavement and provided with kerb and channel unless alternative treatment is integral to a **WSUD** application.

Kerb and channel must be such that adequate and safe access to each allotment is available to vehicles, bicycles and pedestrians, and that drainage needs are fulfilled. Kerb and channel types are to be constructed in accordance with **Council's** Standard Drawings as found in **Appendix F: Standard Drawings**, and with the following:

- Modified semi-mountable kerb and channel may be used for urban residential **Developments**. Where barrier kerb and channel is used, laybacks and vehicle crossovers may be provided at the time of development.
- The provisions for vehicular access must comply with Section 12.9 of this manual.
- The transition between differing types of kerb and channel should be either (i) immediately after a kerb crossing, or (ii) over a 3 metre length after a Side Entry Pit (SEP) where pit has standard/barrier lintel and pit is located at tangent point of kerb return.
- Semi-mountable kerb must be used adjacent to medians and traffic islands.
- Subsoil drainage must be provided below all kerb and channel laid within the boundaries of the **Councils** listed in Selection Table 5 unless the following conditions apply:
    - Subgrade is rock or sand.
    - No underground drainage is available to connect the subsoil drainage to.
    - The geographical location does not require it (need to contact each **Council** to determine if this applies).

Selection Table 5 Subsoil Drainage

Subsoil Drainage Required Below Kerb and Channel
Ballarat City Council
Baw Baw Shire Council
Benalla Rural City Council
Colac Otway Shire Council
Corangamite Shire Council
East Gippsland Shire Council
Glenelg Shire Council
Golden Plains Shire Council
Indigo Shire Council
Macedon Ranges Shire Council
Mitchell Shire
Moira Shire
Moorabool Shire Council
Murrindindi Shire Council

Subsoil Drainage Required Below Kerb and Channel
Pyrenees Shire Council
Rural City of Wangaratta
South Gippsland Shire Council
Southern Grampians Shire Council
Strathbogie Shire Council
Swan Hill Rural City Council
Towong Shire Council
Warrnambool City Council
Wellington Shire Council
Wodonga City Council
Yarriambiack Shire Council

Where non-standard kerb profiles are to be matched, consultation with **Council's Engineering Department** will be required to determine the most appropriate kerb to be used.

Developments in areas with heritage characteristics may require heritage style kerb and channel construction. For example, some heritage areas of Echuca and Rushworth may require timber kerb. Heritage style kerb and channel should comply with **Council's** Standard Drawings unless otherwise approved.

Where it is considered impractical to construct an isolated section of kerb and channel, **Council** may instead accept a contribution-in-lieu, based on an estimate of the full works prepared by the **Council's Engineering Department**.

Kerb crossings must be constructed at approved locations and must comply with **Council's** Standard Drawings as found in **Appendix F: Standard Drawings**.

Kerb crossings near intersections must be located far enough from the intersection such that each ramp is fully constructed to height of back of kerb, as per standard drawings.

Control joints must be constructed as per **Council's** Standard Drawings, refer **Appendix F: Standard Drawings**.

12.4 Rural Roads

The following requirements generally apply to new roads and upgrading of existing roads affected by rural, rural living and low density residential **Developments**.

12.4.1 General

The design and construction of roads and allotment accesses should meet or exceed the requirements of the Austroads "*Guide to Road Design*", this **Manual** and any relevant Acts, Regulations and Australian Standards.

New and upgraded roads in Rural Living and Low-Density Residential **Developments** must be to full road construction standards. Any contribution by **Council** toward the cost of the road construction will be in accordance with the relevant **Councils'** policy.

Traffic generated as a result of a Rural Development, Rural Living or Low Density Residential Development must be encouraged to use the route as identified for access in the submitted documents. To that end **Council** may require the all off-site intersections be constructed or upgraded and that additional signage be provided.

Where works are being proposed within an existing road reserve an 'Occupation for a Road for Works' permit must be obtained from **Council** prior to commencement of works.

12.4.2 Road Reserves

Road reserve widths must be sufficient to accommodate the road **Carriageway**, required services with approved clearances, pedestrian and bicycle access where appropriate, parking, drainage and bus routes where development is significant. Should the development design incorporate **WSUD** devices, an increased road reserve width may be required.

Minimum road reserve widths in rural living and low density **Developments** must be 20 metres, however additional reserve width is encouraged to facilitate landscaping and pedestrian/bicycle facilities.

Splays at intersections must be in accordance with Clause 12.5.5 of this **Manual**.

Table 6 Rural Road Characteristics

Road Type	Indicative Maximum Traffic Volume	Minimum Reserve Width	Minimum Seal Width	Minimum Shoulder Width	Kerbing (see also Clause 12.4.9)
Rural Living Access Road	1000 veh/day max. (maximum length 1000m)	20.0m	6.2m	1.5m	nil
Rural Living Collector Road	6000 veh/day max.	25.0m	6.2m 7.0m for Councils listed below in Selection Table 6.	1.5m	nil
Rural Living or Low Density Residential Court Bowls	n/a	32.0m	9.5m [1] 10.5m [2]	1.5m [1] 0.0 [2]	n/a [1] SM2 [2]
Low Density Residential Access Road	1000 veh/day max. (maximum length 1000m)	20.0m	6.2m	1.5m	n/a
Low Density	6000 veh/day max.	**6.2m and 7m Councils (see Selection Table 5 below)**			

Road Type	Indicative Maximum Traffic Volume	Minimum Reserve Width	Minimum Seal Width	Minimum Shoulder Width	Kerbing (see also Clause 12.4.9)
Residential Collector Road		20.0m	See Selection Table 7 below	1.5m	n/a
Rural Access and Rural Collector	0-50 vpd 51-150 vpd 151vpd +	**Standard A Councils (see Selection Table 6 below)**			
		20.0m	4.0m gravel 4.0m seal 6.2m seal	1.5m	n/a
	0-50 vpd 50vpd plus	**Standard B Councils (see Selection Table 6 below)**			
		20.0m	6.0m seal 6.0m seal	Nil 1.5m	n/a

Cross sections for the above road types can be viewed in Standard Drawings numbered SD600 to 625.

IMPORTANT – Table 6 must be read in conjunction with the following notes

Note 1

These seal widths apply within the boundaries of all Councils, other than those specified in Note 2, where waste collection vehicles are allowed to travel on the unsealed shoulders of the court bowl, on the condition that the shoulders are constructed with full depth pavement.

Note 2

These seal widths and kerbs where court bowls include kerbing apply within the boundaries of Councils listed below:

Wodonga City Council

Note 3

Table 6 does NOT apply to roads within the Ararat Rural City Council and Gannawarra Shire Council boundaries. Classifications and construction of new roads are to be in accordance with **Council's** Roads Management Plan and Road Asset Management Plan.

Selection Table 6 For Rural Living Collector Roads

7.0m Wide Seal
Baw Baw Shire Council
Macedon Ranges Shire Council
Mount Alexander Shire Council
Warrnambool City Council
Wodonga City Council

Selection Table 7 For Low Density Residential Collector Roads

6.2m Wide Seal	7.0m Wide Seal
Benalla Rural City Council	Ballarat City Council
Campaspe Shire Council	Glenelg Shire Council
Central Goldfields Shire	Greater Bendigo City Council
City of Greater Geelong	Macedon Ranges Shire Council
Colac Otway Shire Council	Mitchell Shire Council
Corangamite Shire Council	Mount Alexander Shire Council
East Gippsland Shire Council	Pyrenees Shire Council
Golden Plains Shire Council	South Gippsland Shire Council
Greater Shepparton City Council	Warrnambool City Council
Indigo Shire Council	Wodonga City Council
Mansfield Shire Council	Yarriambiack Shire Council
Moira Shire	
Moorabool Shire Council	
Murrindindi Shire Council	
Rural City of Wangaratta	
Southern Grampians Shire Council	
Strathbogie Shire Council	
Surf Coast Shire Council	
Towong Shire Council	
Wellington Shire Council	

Selection Table 8 For Rural Access

Standard A Councils	Standard B Councils
Ararat Rural City Council	Baw Baw Shire Council
Ballarat City Council	Macedon Ranges Shire Council
Benalla Rural City Council	Mitchell Shire Council
Campaspe Shire	Warrnambool City Council
Central Goldfields Shire	Wellington Shire Council
City of Greater Geelong	Wodonga City Council
Colac Otway Shire Council	
Corangamite Shire Council	
East Gippsland Shire Council	
Gannawarra Shire Council	
Glenelg Shire Council	

Standard A Councils	Standard B Councils
Golden Plains Shire Council	
Greater Bendigo City Council	
Greater Shepparton City Council	
Indigo Shire Council	
Mansfield Shire Council	
Moira Shire Council	
Moorabool Shire Council	
Mount Alexander Shire Council	
Murrindindi Shire Council	
Rural City of Wangaratta	
South Gippsland Shire Council	
Southern Grampians Shire Council	
Strathbogie Shire Council	
Surf Coast Shire Council	
Swan Hill Rural City Council	
Towong Shire Council	
Yarriambiack Shire Council	

12.4.3 Road Geometry, Horizontal and Vertical Alignments

The geometric design of rural roads, including horizontal and vertical alignments, is to be based on Austroads *"Guide to Road Design Part 3: Geometric Design*" and any VicRoads supplement to those guidelines, unless otherwise noted within this **Manual**.

Widths must be in accordance with Clause 12.4.7. Further to this, road geometry in rural living **Developments** must provide sufficient space such that emergency service vehicles and waste collection vehicles may carry out their functions while travelling in a forward-only direction throughout the development. Significant Rural Living and Low-Density Residential **Developments** may require provision for school buses. Roads must be designed such that these vehicles do not need to reverse.

Staging of works does not negate the requirement for forward only turning and temporary turning areas may need to be established between development stages including **Carriageway** easements as required. This may therefore require temporary table drains around these turning areas.

Road design grading should be extended a minimum of 100 metres beyond the end of the street where such street is to be extended in the future. Where new roads meet existing roads the **Designer** must check the grading for a distance of 100 metres to check that roads match well and that no abrupt change in grade occurs.

12.4.4 Sight Distances

Adequate horizontal and vertical sight distance should be provided for the design speed in accordance with Austroads publication *'Guide to Road Design Part 3: Geometric Design'* and any VicRoads supplement to those guidelines. The design speed to be used for a particular road must be the legal road speed limit for that road.

Landscaping plans must be prepared with consideration to sight distance requirements, as must any proposal for 'Estate Entrance Structures'. Plans submitted for approval must show all existing and proposed features in sufficient detail to demonstrate that appropriate sight distances are achieved.

12.4.5 Vertical Curve Requirements

Vertical curve design should comply with Austroads publication *'Guide to Road Design Part 3: Geometric Design'* and any VicRoads supplement to those guidelines. Vertical curves on rural roads must be designed to provide Stopping Sight Distances for the design speed for the particular road. Vertical curves should coincide with the horizontal curves wherever practical.

12.4.6 Limiting Longitudinal Gradients

Rural type roads without kerb and channel may have a minimum longitudinal grade of 0.2%, unless otherwise agreed in writing, subject to the table drains being independently graded at a minimum of 0.5%. The maximum longitudinal grade for rural roads is 15%, unless otherwise agreed, and must be restricted to a distance of 150 metres maximum. The maximum longitudinal grade for rural roads adjacent to intersections is 10%.

12.4.7 Cross Section Profiles

There must be two lanes of traffic on Rural Living and Low Density **Developments**.

Cross section design should not be terminated at the property boundaries but should be extended sufficiently to determine cut and fill requirements and to show such on plans.

The normal crossfall on bituminous pavements should be 3%. Should design speeds require super-elevation of horizontal curves, design of crossfall should be based on the current Austroads *"Guide to Road Design Part 3: Geometric Design"* and any VicRoads supplement to those guidelines.

Where crossfalls of greater than 6% at intersections or horizontal curves are proposed, approval should be sought from **Council's Engineering Department**.

Batter slopes are to be as is appropriate for the predominant use of the locality and must be designed with consideration to **Clear Zones** as defined in Austroads *"Guide to Road Safety Part 6: Roadside Design, Safety Barriers"* and any VicRoads supplement to those guidelines. In areas within the **Clear Zone** batter slopes can be as follows:

- Desirable: 1 in 6, Maximum 1 in 4
- Residential area driveway slopes: 1 in 10 maximum

Whenever it is impractical to provide batters flatter than the maximum slopes specified, **Developers** must provide special treatment such as retaining walls within the property and in areas prone to erosion consideration must be given to erosion control measures.

12.4.8 Vehicle Turning Movements

The **Design Engineer** must be responsible for identifying all possible turning movements and make allowance for these in the development design. Turning movements must be shown on plans and provided at the **Council's** request.

12.4.9 Kerb and Channel at Cut Embankments

Where steep sect ions of road are in cut (embankments), consideration should be given to the placement of kerb and channel to prevent the scouring of roadside drains.

12.5 Intersection Design

12.5.1 General

Intersections are to be designed and constructed such that they function in a safe, convenient and appropriate manner for the type of street and development. They are to be designed in accordance with Austroads publication *'Guide to Road Design Part 4A: Non-Signalised and Signalised Intersections"* and Austroads *"Guide to Road Design Part 4B: Roundabouts'* and any VicRoads supplement to those guidelines.

Intersections with state rural or urban roads or national highways are to be designed, approved and constructed in accordance with VicRoads requirements.

The road network should be designed such that at least 90% of dwellings must be within 400 metres safe walking distance from an existing or proposed bus or tram route and from existing or proposed Public Open Space facilities. Pedestrian path mapping should be provided to support to the proposed road network layout.

'T'-junctions should be adopted in preference to four-way intersections. Where 4-way intersections, or cross intersections, are to be constructed, traffic control treatment may be required.

Where staggered 'T'-junctions are to be provided in rural areas the intersecting roads should be located a minimum distance of 2 X stopping distance of the travel speed along the through-road (1.5 second reaction time). Where staggered 'T'-junctions are proposed for rural cross-intersections, these arrangements should preferably be of the 'right to left' type.

Staggered T's require VicRoads or VicRoads delegated **Council** approval.

Where intersections are in a configuration deemed likely to cause traffic problems, the **Developer** may be required to construct traffic islands, or such traffic facilities to provide traffic control and safety. Roads centrelines should intersect at an angle between 70 and -110 degrees.

12.5.2 Level of Treatment

The appropriate level of treatment at intersections depends on the characteristics of existing and proposed connecting roads. Consideration must be given to Austroads publication *'Guide to Road Design Part 4A: Non-Signalised and Signalised Intersections'* and any VicRoads supplement to those guidelines when determining the level of treatment at intersections.

If roundabouts are incorporated into intersections, roundabout must be designed in accordance with the current edition of Austroads publication *'Guide to Road Design Part 4B: Roundabouts'* and any VicRoads supplement to those guidelines.

Roundabouts are Major Traffic Control Items requiring VicRoads approval. On municipal roads, VicRoads has delegated such approval to **Councils** under a number of conditions, one of which requires timely reporting back to VicRoads.

12.5.3 Special Considerations

For intersections where the proportion of over-dimension or large combination vehicles is higher than the normal percentage in the traffic stream the intersection requirements may be more significant. The Traffic Management Strategy should address this issue and make recommendation regarding these intersections (see Clause 9).

12.5.4 Intersection Spacing

The spacing of intersections should generally comply with the requirements of the Planning Scheme, unless otherwise agreed with **Council's Engineering Department**.

Intersection spacing on State Arterials requires VicRoads approval. Access to State Arterials will be in accordance with Access Management Policies that may apply. **Developers** are encouraged to discuss access to State Arterials early in the Town Planning application process.

Intersections must be designed and located to provide a safe environment for all street users, with clear indication of right-of-way priority for pedestrians, cyclists and vehicles.

12.5.5 Splays

Splays of suitable dimensions must be provided at all corners of all intersections.

At intersections involving at least one collector road (or higher classification) the minimum splay at the intersecting roads is 5 x 5 metre. At intersecting roads of lesser classification the minimum splay to be provided is 3 x 3 metre.

Larger splays may be required to secure traffic safety and/or accommodate the provision of services.

12.5.6 Kerb Returns

At intersections, the minimum kerb return or edge of seal radius is as follows:

- Residential areas 7.5 m
- Collector Street 12.50 m
- Arterial Road 15.00 m
- Industrial / Rural areas 12.0 m

Further to this, kerb radii must be designed based upon turning movement requirements as detailed in Clause 12.3.8.

12.6 Traffic Calming

Calming devices such as thresholds, slow points, road humps, chicanes and splitter islands should be designed in accordance with the requirements of the Austroads publication *'Guide to Traffic Engineering Management Part 8: Local Area Traffic Management'* and any VicRoads supplement to those guidelines.

It should be noted that some traffic calming devices, for example road humps, are Major Traffic Control Items requiring special approval. It is the Designers responsibility to obtain the necessary approvals. Designers should refer to Table 2.1 of the *VicRoads Traffic Engineering Manual Volume 1*.

Traffic calming devices are to be approved by **Council's Engineering Department**. The following issues need to be addressed as a minimum:

- Streetscape
  - Reduce the linearity of the street by segmentation.
  - Avoid continuous long straight lines (e.g. kerb lines).
  - Enhance existing landscape character.
  - Maximise continuity between existing and new landscape areas.
- Location of Devices/Changes
  - Devices other than at intersections should be located to be consistent with streetscape requirements.
  - Existing street lighting, drainage pits, driveways, and services may decide the exact location of devices.
  - Slowing devices are optimally located at spacings of 100-150m *PRINCIPLE*.
- Design Vehicles
  - Emergency vehicles must be able to reach all residences and properties.
  - Local streets with a 'feeding' function between arterial roads and minor local streets might be designed for an Austroads Design Single Unit Truck/Bus.
  - Where bus routes are involved, buses should be able to pass without mounting kerbs and with minimised discomfort to passengers.
- In newly developing areas where street systems are being developed in line with LATM principles, provision should be made for building construction traffic. Control of Vehicle Speeds
  - Maximum vehicle speeds can only be reduced by deviation of the travelled path. Pavement narrowings have only minor effects on average speeds, and usually little or no effect on maximum speeds.
  - Speed reduction can be achieved using devices that shift vehicle paths laterally (slow points, roundabouts, corners) or vertically (humps, platform intersections, platforms pedestrian/school/bicycle crossings).
  - Speed reduction can be helped by creating a visual environment conducive to lower speeds. This can be achieved by 'segmenting' streets into relatively short lengths (less than 300m) using appropriate devices, streetscapes, or street alignment to create short sight lines.

- Visibility Requirements (sight distance)
    - Adequate sight distances should be provided for pedestrians, cyclists and drivers to allow evasive action by either party in a potential conflict situation and must reflect the likely operating speeds.
    - Sight distances to be considered include those of and for pedestrians and cyclists, as well as for others.
    - Night time visibility of street features must be adequate. Speed control devices particularly should be located near existing street lighting if practicable and all street features/furniture should be delineated for night time operation. Additional street lighting must be provided by the **Developer** at proposed new speed control devices located away from existing street lighting.
- Critical Dimensions
    - Many devices will be designed for the normal use by cars, but with provision (such as mountable kerbs) for large vehicles. Some typical dimensions include:
        - Pavement narrowings:
            - Single lane 3.50 metres between kerb inverts
            - 3.75 metres between obstructions
            - two lane 5.50 metres minimum between kerb inverts
        - Bicycle lanes (allowing for adjacent pavement narrowings) are to be at least 1.2 metres wide (reduced to 1.0 metres in special circumstances in accordance with Austroads publication *'Guide to Road Design Part 3: Geometric Design* (section 4.8)' and any VicRoads supplement to those guidelines).
        - Plateau or performance areas are to be 75 mm to 150 mm high, with 1 in 15 ramp slope.
        - The clear sight path through slowing devices is to be at least 1.0 metre wide. This represents the width of the portion of **Carriageway** which does not have its line of sight through the device blocked by streetscape materials, usually vegetation.
        - The dimensions of mountable areas required for the passage of large vehicles are to be determined by applying the appropriate turning templates.

12.7 Pavement Design

The minimum depth of flexible or rigid pavement for the proposed pavement and proposed pavement materials must be determined by design, with the pavement design submitted to **Council's Engineering Department** for consideration. When requested by the **Council**, samples and/or results of geotechnical testing and the source of the pavement material must be provided. Specific designs must be submitted for rigid pavements comprising deep lift asphalt and/or stabilisation

12.7.1 Sub-Grade Analyses

Pavement design must be based on the results of sub-grade analysis, including testing for soaked Californian Bearing Ratio (CBR), carried out by a NATA registered testing laboratory. Sub-grade soil samples must be taken at maximum intervals of 200 metres, in the bowls of all courts, at all intersections and at all obvious locations where existing sub-grade material changes suddenly. Core samples must be bored to a minimum depth of 600 mm below final road sub-grade level. The soil sample used for laboratory testing must be taken from the core at sub-grade level. Full details of

sub-grade test results and core samples must be submitted to **Council** with the detailed design plans. Wherever soft sub-grade is encountered the depth to the next solid layer must be determined by probe.

12.7.2 Flexible Road Pavements

Flexible road pavement designs must be undertaken in accordance with Austroads *'Guide to Pavement Technology, 2010'* Pavement design must be carried out using equivalent standard axle loadings based on an average traffic generation rate of 10 vehicles per day per residential lot and a 20 year design life for residential and commercial roads. Pavement design for industrial roads must be based on an average traffic generation rate of 45 vehicles per day per industrial lot and a 40 year design life. For rural roads and low density **Developments**, it may be appropriate to use Austroads publication *'Pavements Design for Light Traffic'* published 2006.

12.7.3 Concrete Street Pavements

Concrete street pavement must be based on Austroads *'Guide to Pavement Technology 2010, Guide to Structural Design of Road Pavements'* revised 2006, to a minimum 20 year life span.

12.7.4 Interlocking Pavers

For safety, operational and maintenance issues interlocking block street pavement will not be generally approved. However in situations where approval is given the pavers must be laid on a mortar bed on a drained reinforced pavement designed in accordance with the document referred to in Clause 12.7.3, to a minimum 20 year life span.

12.7.5 Minimum Pavement Thickness

Notwithstanding any of the above requirements, the pavement thickness must not be less than the amount specified in Selection Table 9 for roads in which kerb and channel is to be constructed, 200mm for unkerbed roads, and 150mm for car parks. The sub base layer must extend a minimum of 100mm past the rear face of any kerb and/or guttering. Note these minimums do not apply to roads serving industrial or commercial areas.

Selection Table 9 Minimum Pavement Depth

Minimum Pavement Depth = 250mm	Minimum Pavement Depth = 300mm
Ararat Rural City Council	Ballarat City Council
Benalla Rural City Council	Baw Baw Shire Council
Campaspe Shire	Central Goldfields Shire Council
City of Greater Geelong	Colac Otway Shire Council
Gannawarra Shire Council	Corangamite Shire Council
Greater Bendigo City Council	East Gippsland Shire Council
Greater Shepparton City Council	Glenelg Shire Council
Indigo Shire Council	Golden Plains Shire Council
Mansfield Shire Council	Macedon Ranges Shire Council
Moira Shire Council	Mitchell Shire Council
Murrindindi Shire Council	Moorabool Shire Council
Strathbogie Shire Council	Mount Alexander Shire Council
Towong Shire Council	Pyrenees Shire Council
	Rural City of Wangaratta
	South Gippsland Shire Council

Minimum Pavement Depth = 250mm	Minimum Pavement Depth = 300mm
	Southern Grampians Shire Council
	Surf Coast Shire Council
	Swan Hill Rural City Council
	Warrnambool City Council
	Wellington Shire Council
	Wodonga City Council
	Yarriambiack Shire Council

12.7.6 Minimum Shoulder Thickness

For unkerbed roads, the base layer must extend at least to the nominated width of the shoulder, and must be a minimum thickness of 150mm, except in rural court bowls where the full pavement thickness may be required to extend to the full width of the shoulder (See Clause 12.4.3).

12.7.7 Compaction Requirements

Depending on traffic volumes and actual pavement design, compaction will be in accordance with *VicRoads Standard Specifications for Roadworks and Bridgeworks* (Clause 304.07). A Dynamic Cone Penetrometer may be used to verify compaction of trimmed and prepared subgrade material. Compaction testing of base and sub-base material must be carried out by a NATA approved laboratory or by calibrated nuclear densometer test to the relevant Australian Standard. Tests should be taken at $^2/_3$ depth of the pavement where possible. Copies of all geotechnical results are to be submitted to **Council**.

Compaction testing and proof-rolling must be undertaken on the same day.

12.7.8 Sub-Grade

The subgrade must be compacted to 98% standard compaction with all building sites compacted to 95% standard compaction, or in accordance with the Construction Specification and/or AS 3798.

12.7.9 Sub-Base

The typical flexible pavement sub-base must be compacted in accordance with Scale C in VicRoads Table 304.071 using fine crushed rock.

The number of tests to be undertaken is as specified in 0.

Compaction testing of the sub base is only required in areas of fill.

12.7.10 Base

The typical flexible pavement base must be compacted to the average mean 98% minimum modified dry density (MMDD) with test locations to be approximately one (1) metre offset from the kerb or edge of seal and measured at 2/3rd the depth of the layer.

The number of tests to be undertaken is as specified in 0.

Table 7 Location and Number of Compaction Tests

Location	All Roads
Court bowls	3 No
Intersections	2 No
Straights	1 per 500 m^2

Tests must be taken on alternate sides of the road and be evenly spaced.

12.7.11 Proof-Rolling

Proof rolling of the sub-base and base must be undertaken at the expense of the contractor, in accordance with *AS 3798* and in accordance with the requirements of Section 173 and Section 204.12 of the VicRoads specifications. The subgrade must not deflect more than 2 mm vertically within 300 mm of the test roller in isolated locations. If deflection of the subgrade is found in more than 20% of the project area then the total area must be reworked. There must be no visible deformation or cracking of the pavement during a sub-base or base proof roll. Areas that fail a proof roll test are the responsibility of the contractor to rectify. Adequate notice must be given to **Council's** representatives for attendance of proof-rolling inspections, refer to Clause 7.4. If the proof-rolling test fails due to excessive moisture etc. then another **Council** inspection is required and appropriate notice should be given.

12.7.12 Soft Areas in Pavements

Where unsuitable material exists or develops during construction, it must be rectified to the satisfaction of the **Council**. Possible treatment methods include cement and/or lime stabilisation, replacement of the underlying material with pavement, the use of geotextiles and/or the lowering of sub-surface drainage to below the level of the area to be rectified. Rectified pavements must achieve the required levels of compaction as specified above.

'As Constructed' drawings or quality documentation must show the extent of all reworked soft areas and any form of treatment taken.

12.7.13 Pavement Wearing Course

Pavements must, at the expense of the contractor, be proof rolled and density tested, immediately prior to priming. The frequency of density tests must be in accordance with *AS 3798* and *AS 1289 Geotechnical Testing* or as otherwise specified by the **Council**.

Pavements must be trimmed to shape, swept and have a surface consistency suitable for priming. Adequate protection should be provided for signs, concrete edgings, and traffic control devices to prevent over-spray during priming or tack coating.

The preferred road surface for all urban residential roads is a minimum of 30mm Type N Asphaltic Concrete seal. The surface of the final wearing course must be between 5-10 mm above the concrete edging and detailed on the construction plans for each edging type. The wearing course must be flush with the lip of the kerb and channel at all footpath kerb crossings (to eliminate any trip hazard).

All new and upgraded roads, including widened roads, that are located in or adjacent to commercial or industrial **Developments or any Collector Street level 1** must be sealed with a Type H Asphaltic Concrete of suitable thickness for the expected traffic loading, with the minimum thickness to be 40mm.

All new or upgraded Collector Streets Level 2 or roundabouts must be sealed with a Type H Asphaltic Concrete of suitable thickness for the expected traffic loading, with the minimum thickness to be 50mm.

A two-coat bitumen seal may be considered as an alternative in some residential **Developments**, such as those located in heritage areas, subject to the approval of **Council**. New and upgraded roads constructed in areas with heritage characteristics may require specific colours of gravel to be used. Liaison with **Council's Engineering Department** and **Council's Planning Department** will be required in these instances.

Where a dispute arises concerning the finished surface texture or construction methods, wearing course core samples and compaction testing may be required. The **Developer's Consultant** must, prior to construction, specify the hotmix design or attention to the design mix including aggregate size and any additives e.g. colour additives.

For all new and upgraded roads, including widened roads, located in or adjacent to Rural, Rural Living and Low Density Residential **Developments**, the minimum required wearing surface must be a two coat seal. The first coat should use a 10 mm nominal size aggregate, followed by a final coat of using 7 mm aggregate. Where there are significant turning movements of heavy vehicles, the first coat should use 14 mm aggregate, followed by a final coat using 7 mm aggregate.

Where roadways under this section may in **Council's** opinion be subject to turning movements that will cause stone loss from a spray seal finish, **Developers** may be required to provide either an asphalt wearing course or asphalt overlay.

12.8 Traffic Control Devices

The **Design Engineer** must determine any necessary traffic control devices in accordance with Austroads "*Guide to Traffic Management Part 8: Local Area Traffic Management"* and any VicRoads supplement to those guidelines and VicRoads "*Traffic Engineering Manuals Volumes 1 & 2"*. The supply and installation of traffic control devices must comply with *AS1742 Parts 1-15 'Manual of Uniform Traffic Control Devices'*.

It should be noted that Major Traffic Control Items require special approval. It is the **Designer's** responsibility to obtain the necessary approvals. Designers should refer to Table 2.1 of the VicRoads "*Traffic Engineering Manual Volume 1".*

12.8.1 Signposting and Pavement Marking

Signposting and pavement marking should generally be provided to roads, intersections, traffic control devices, cycleways and car parks in accordance with *AS1742 Parts 1 – 15* and the VicRoads "*Traffic Engineering Manual Volumes 1 and 2"*. Street name plates are to be the standard type throughout the relevant **Council**, unless otherwise approved in writing.

Styles for signposting should comply with any Style Guide developed by **Council**.

12.8.2 Guardfence

Where there is a warrant (e.g. an identified hazard in the **Clear Zone**) guard fence is to be installed in accordance with the VicRoads specification, where shown on the approved engineering plan or as directed by **Council's Engineering Department**.

12.9 Vehicular Access

Vehicular access to each and every allotment within a subdivision development must be provided at the time of development. Vehicle crossings however are not required to be constructed at the time of development where mountable or semi mountable kerb and channel is used, as these may be constructed during later building works when the final location is known. The exception to this are the **Councils** listed in Selection Table 10 where vehicle crossings are to be constructed and the **Councils** where vehicle crossings are not required for any kerb profile.

Selection Table 10 Vehicle Crossings

Vehicle crossings are to be provided for all kerb profiles	Vehicle crossings are not required for any kerb profile.
Benalla Rural City Council	Ballarat City Council*
Central Goldfields Shire Council	Baw Baw Shire Council
Corangamite Shire Council	City of Greater Bendigo
Golden Plains Shire Council	Colac Otway Shire Council
Greater Shepparton City Council	East Gippsland Shire Council.
Macedon Ranges Shire Council	Glenelg Shire Council
Mansfield Shire Council	Wellington Shire Council
Mitchell Shire Council	Wodonga City Council
Murrindindi Shire Council	
Pyrenees Shire Council	
Strathbogie Shire Council	
Swan Hill Rural City Council	
Warrnambool City Council	
Yarriambiack Shire Council	

*Note City of Ballarat will enforce if a developer nominates vehicle crossings as part of their development.

Where **Developments** include construction of barrier kerb and channel or SM2 kerb and channel, a vehicle crossing and layback section in the kerb and channel must be provided to each allotment frontage at the time of development.

Vehicle crossings must be constructed in accordance with the Standard Drawings.

12.9.1 Urban Vehicle Crossings

This section applies to urban areas regardless of whether there is kerb and channel.

Driveways and direct vehicle access to trunk collector streets should be designed to allow forward entry and exit from properties. The maximum number of vehicle crossings to residential properties is two (2) crossings, neither of which exceeds 3.5m in width. Where two crossings are provided, the minimum distance between them should be 9m. The maximum width of a single crossing must be 6.0m. Crossings must be constructed in accordance with the requirements of Standard Drawing Numbers 235 and 240.

Crossings to adjacent properties should either be fully combined, with a maximum width of 6.0 metres, or have a minimum separation of 9 metres.

Vehicle crossings to residential corner allotments are to be located a minimum of 6 metres from the intersection of road reserves and 2 metres clear of pedestrian kerb crossings.

All crossings must be constructed with an all-weather surface for that section of crossing contained within the road reserve. That portion of the crossing that passes through the footpath zone must conform to the requirements of *Australian Standard AS1428.1 2009 'Design for Access and Mobility'*. A surface that matches the texture and colour of the adjacent footpaths is preferred, however alternative surfaces may be approved conditional upon compliance with *Australian Standard AS1428.1 2009 'Design for Access and Mobility'*. Patterns that result in surface irregularities of

greater than 5mm are prohibited. Coloured edge strips will only be permitted adjacent and parallel to the alignment of footpaths. Feature edge strips must not cross the path of travel along the footpath.

Footpaths of 75mm thickness are acceptable only where there are existing lots and the risk of site construction damage is negligible. Where greenfield sites and future housing is still to be done, then the depth of the footpath must be 125mm throughout.

In accordance with the requirements of Clause 12.3.9, where grades through vehicle crossings exceeding 1:10 the **Design Engineer** must demonstrate using standard car templates that car access can be provided to effected allotments.

12.9.2 Rural Vehicle Crossings

Roads should be located and designed such that vehicular access can be readily obtained at every allotment of a subdivision. Where the natural surface slopes steeply to or from the road, the access to each lot should be given special consideration. The locating of an access onto a vertical curve along the road is to be avoided where there is inadequate sight distance for safe entry and exit from the property.

All rural vehicle access crossings must include a culvert unless the location of the access is at an obvious high point. The minimum width of culvert is 4.88 metres (refer to **Appendix D: Information to be Shown on Plans)**. All culverts must have an endwall at each end of the pipe. Trafficable endwalls must be used wherever the culvert/endwall is located within the **Clear Zone** (refer to Standard Drawings).

The minimum pipe size varies according to the slope of the terrain. In flat terrain the minimum pipe size is ∅375mm in rural and rural living zones, and pipes must be laid such that the pipe invert is 150mm lower than the invert of the table drain. In steeper terrain the minimum pipe size is ∅300mm I where the steeper grades reduce the risk of silting and blockage.

The minimum pipe size is ∅300mm in low density residential zones where table drain batters are flat enough to allow mowing. In these instances pipes must be laid such that the pipe invert matches the table drain invert.

Reinforced concrete swale crossings can be used where the depth of the table drain is less than 350mm deep and the product of the depth and the peak flow velocity is less than 0.35 provided that **Council's Engineering Department** is satisfied that the crossing can be safely and conveniently negotiated by standard cars. At existing entrances with either a ∅300mm or ∅375mm culvert, new endwalls may be added to the existing culvert as long as the existing pipes are in good condition, are laid at the correct level, and are demonstrated to have sufficient hydraulic capacity.

Culverts must be designed with the following hydraulic capacity:

- 5 year **ARI** capacity before property culvert overtops.
- 50 year **ARI** capacity results in overtopping of maximum depth of 300mm.
- No water must encroach on edge of shoulder on sealed roads, or edge of gravel on gravel roads.

Council will require rural vehicle crossings to be upgraded to meet current standards whenever rural land is subdivided, unless the location of the access is at an obvious high point. Where a planning permit relates to boundary realignment only, there will generally be no engineering requirement for upgrade to accesses, unless the proposed realignment would see a significant change in the use of such access.

12.10 Requirement For Dust Suppression Works

Dust suppression works may be required where a proposed new house or an existing dwelling is likely to experience significant detrimental impacts arising from the dust generated by traffic travelling along a gravel road created from either:

- Additional traffic resulting from a proposed development e.g. traffic generated from a new piggery or a new subdivision; or
- Existing traffic.

The requirement for dust suppression works will vary from **Council** to **Council** due to variation in road making materials used and the annual rainfall expected. Those **Councils** that do require dust suppression works are listed in Columns 1 and 3 in Selection Table 11. Contact should be made with those **Councils** to determine their specific requirements.

Selection Table 11 Dust Suppression

Dust Suppression Works Required	Councils – Council Funds Dust Suppression Works	Councils – Where Dust Suppression Works are Determined on a Case by Case Basis
Campaspe Shire	Greater Shepparton City Council	Ararat Rural City Council
Macedon Ranges Shire Council		Ballarat City Council
Moira Shire Council		Baw Baw Shire Council
		Benalla Rural City Council
		Central Goldfields Shire Council
		Colac Otway Shire Council
		Corangamite Shire Council
		Glenelg Shire Council
		Golden Plains Shire Council
		Greater Bendigo City Council
		Indigo Shire Council
		Mitchell Shire Council
		Moorabool Shire Council
		Murrindindi Shire Council
		Rural City of Wangaratta
		Southern Grampians Shire Council
		Strathbogie Shire Council
		Swan Hill Rural City Council
		Towong Shire Council
		Warrnambool City Council
		Wellington Shire Council
		Wodonga City Council

Dust Suppression Works Required	Councils – Council Funds Dust Suppression Works	Councils – Where Dust Suppression Works are Determined on a Case by Case Basis
		Yarriambiack Shire Council

Clause 13 Mobility and Access Provisions

13.1 Objectives

The objectives of mobility and access provisions are as follows:

- To promote walking and cycling to daily activities.
- To promote universal access within the community.
- To promote community health and wellbeing associated with increased physical activity.

13.2 General

The **Developer** must provide continuous footpaths for all property frontages and sideages in urban residential and commercial **Developments** *PRINCIPLE* in accordance with Table 2 found in Clause 12.3.2. **Developers** may also be required to establish connective links to existing footpaths where demand is directly related to the development. Connective links are generally required of commercial **Developments** to off-site carparking related to the development.

13.3 Requirements

The following requirements apply to footpaths and pedestrian accesses:

- Footpaths are to be constructed at the time of development in accordance with **Appendix E: List of Council Inspections and Inspection Checklists**.
- Footpath alignments are to be 300mm offset maximum from property boundaries in existing areas and 50mm maximum from property boundaries in new **Developments**.
- The minimum footpath width to be 1.5m in residential areas and 2.0 metres in commercial areas.
- The desirable maximum crossfall on footpaths is 1 in 50 and the absolute maximum crossfall is 1 in 40, including kerb crossings. Kerb crossings must be provided in accordance with *Australian Standard AS/NZS1428.4, 2009 'Design for Access and Mobility – Means to Assist the Orientation of People with Vision Impairment – Tactile Ground Surface Indicators'* at locations identified in consultation with the **Council's Engineering Department**.
- Footpaths must be constructed of either concrete or asphalt, and must conform to Australian Standards *AS/NZS1428.4, 2009 'Design for Access and Mobility – Means to Assist the Orientation of People with Vision Impairment – Tactile Ground Surface Indicators'* for surface finish.

  Tactile Ground Surface Indicators (TGSI's) are to be provided in accordance with Australian Standard *AS/NZS1428.4, 2009 'Design for Access and Mobility – Means to Assist the Orientation of People with Vision Impairment – Tactile Ground Surface Indicators"*; Vic Roads *Traffic Engineering Manual Volume 1* – Section 4.9 and **Appendix B: Engineering Approval Process for Developments**. **Councils** listed in 0 only require TGSI's to be installed in the central commercial area of urban centres.

Selection Table 12 Tactile Ground Surface Indicators

TGSI's Requirements For Central Commercial Areas of Urban Areas Only
Benalla Rural City Council
East Gippsland Shire Council
Golden Plains Shire Council
Greater Shepparton City Council
Indigo Shire Council
Macedon Ranges Shire Council
Mansfield Shire Council
Mount Alexander Shire Council
South Gippsland Shire Council
Towong Shire Council
Wellington Shire Council
Yarriambiack Shire Council

- Footpaths must slope away from the property boundary, and be elevated above the adjacent nature strip. In general, reverse fall on nature strips is undesirable and will only be approved where no other practical alternative is available.

- Details of service pits to be located within the footpath or pedestrian areas are to be provided to **Council** for approval with the request for approval of the detailed design.

- Patterned finished to footpaths or pedestrian accesses will require the specific approval of the **Council's Engineering Department**.

- Minimum width for shared paths to be 2.5m and designed and constructed in accordance with the Austroads publication *'Guide to Road Design Part 6A: Pedestrian and Cyclist Paths, 2010'* and any VicRoads supplement to those guidelines. Where a shared path crosses a pedestrian bridge a minimum lateral clearance of 0.5m on both sides of the shared path must be provided where the speed of cyclists is less than 20km/hr. Where higher bicycle speeds are likely a minimum lateral clearance of 1m on both sides of the shared path must be provided.

- Footpaths must not abut kerbs, unless approved in writing by **Council's Engineering Department** *PRINCIPLE*. Where indented parking is proposed in the street a minimum distance of 1.0 metre clearance must be provided from footpaths and bicycle paths.

Clause 14 Carparking

14.1 Objectives

To ensure that carparking is provided of sufficient number and standard that services residents, visitors, staff, customers, service vehicles and other users.

14.2 General

The number of parking spaces to be provided for any development should be in accordance with the **Council's** Planning Scheme or in accordance with an approved Traffic Impact Assessment Report. All required physical works should be constructed as part of the development and must be in accordance with approved plans and specifications to the satisfaction of **Council's Engineering Department**. The design must ensure that parked vehicles do not obstruct the passage of vehicles, do not create traffic hazards or undue pedestrian hazards and do not detract from the streetscape amenity.

If the **Developer** is unable to provide the required on-site carparking spaces for residents, staff and visitors, and **Council** has not identified and not addressed an existing or future need in the vicinity of the development, then the Development may be refused. In some instances the development may be permitted to proceed on the basis that alternative carparking can be provided that meets the following requirements detailed in Clause 14.3.

If the **Council** has a Parking Strategy that identifies existing or proposed parking within 100 metres of the proposed development, the **Developer** may be required to contribute to the actual costs for the provision of off-site vehicle spaces, and enter into a Section 173 Agreement with **Council** to detail such.

14.3 Requirements

The following parking requirements apply to all **Developments**:

- The parking requirements for normal levels of activity associated with any land use should be accommodated on-site and should be located and of dimensions that allow convenient and safe access and usage.
- All parking, both on and off site, must be finished with an all-weather seal and line marked. Gravel surfaces must only be permitted with written permission of **Council's Engineering Department**.
- The layout and access arrangements for all on-street and off-street parking areas should conform to Austroads publication *'Guide to Traffic Management: Part 11 Parking'* or Australian Standard *AS2890.1 – 2004 Off Street Parking, AS2890.2 – 2002 Off Street Commercial Vehicle Parking, AS2890.3 Bicycle Parking Facilities, Australian Standard AS2890.5 -1993.On Street Parking and AS2890.6 Off Street Parking for People with Disabilities.*
- The number of on-site parking and off-site parking spaces for non-residential land uses should conform to parking standards as specified on the planning permit where applicable, or in accordance with **Council's** relevant Parking Strategies.
- Lighting is to be provided to the satisfaction of **Council's Engineering Department**.
- Loading/unloading requirements should consider forklift/ pedestrian conflicts and other movements on the site.

In addition to the above, the following parking requirements apply to all residential subdivisions **Developments**:

- The availability of parking should be adequate to minimise the possibility of driveway access being obstructed by cars parked on the opposite side of the street.
- Where a particular dwelling may generate a high demand for parking, the **Developer** may provide adequate additional parking within the road reserve for visitors, service vehicles and any excess resident parking. Such parking is to be convenient to dwellings.
- All verge spaces and indented parking must be constructed of concrete, interlocking pavers, bitumen or asphalt with crushed rock pavement base, and are designed to withstand the loads and manoeuvring stresses of vehicles expected to use those spaces.
- The **Developer** must identify the measures proposed to set aside resident parking and ensure casual visitor access is limited to people proposing to use the **Development.**

In addition to the general requirements, the following parking requirements apply to all on-site parking:

- In designing the pavement, the **Design Engineer** must make specific allowance for traffic load concentrations within car park areas such as entrances and exits.
- All loading/unloading zones are to be constructed of concrete pavement or concrete segmental pavers to resist damage from diesel and fuel spills. Paving should be mottled to mask spills.

Where parking is to be provided by contribution to **Council** in accordance with an identified Parking Strategy, the following requirements must apply:

- Customer parking spaces must be located within 100 metres of the development site.
- Dedicated permanent staff parking spaces can be provided within 500m of the site at the **Developer's** cost.
- There is a direct pedestrian linkage with the Development, or one must be provided by the **Developer**.
- Disabled parking spaces are provided in accordance with the requirements of the *Disability and Discrimination Act* and relevant Australian Standards.
- Lighting is provided to the satisfaction of **Council's Engineering Department**.
- The carpark design includes retention of significant existing vegetation, proposed landscaping, the selection of colours and materials for any structures on the site.
- The status of each element within the proposed car park, including common property, **Council** reserves, indented road reserves, and parking spaces, must be confirmed in writing by **Council's Engineering Department**.
- Agreement is reached regarding public indemnity for the carpark.
- Access and availability to Public Transport systems must be considered.
- The proposal must accommodate existing or future location of non-residential uses such as schools, commercial and industrial premises and local shops in, or likely to be developed in the area.
- The effect of on-street parking works is to slow vehicle speeds and enhance the pedestrian environment.

Clause 15 Earthworks and Lotfilling

15.1 Objectives

The objectives of the earthworks and lotfilling requirements are as follows:

- To ensure that the **Development** does not cause or aggravate the flooding of other properties by filling land or diverting existing flow paths.
- To ensure that buildings are located on a natural surface above the 1% flood level or on approved filled ground, so as to comply with the constraints of *Regulation 6.2 of the Building Regulations 1994* and the *Health Act*.
- To ensure earthworks and lotfilling activities do not result in the spread of noxious weeds, as specified in Section 70A and 71 of the *Catchment and Land Protection Act 1994*;.
- To ensure that the recommendations of the Catchment Management Authorities or other relevant agencies or organisations are complied with.
- To ensure that earthworks and lotfilling works does not result in erosion dust, mud or debris leaving the site.
- To maintain privacy and security of adjacent landowners.

15.2 General

Typical earthworks may include lotfilling or the construction of a dams, open drainage systems, levies, access tracks, flood protection devices overland flow paths and vegetation removal.

Approval of engineering plans by **Council's Engineering Department** relates to the suitability of earthworks to achieve road and drainage systems to the satisfaction of **Council**. Engineering approval does not negate the need for planning approval of such earthworks.

Where required the **Developer** must ensure that a planning permit is obtained where required, for any earthworks. Where works are to be staged consideration, should be given to the entire site and not individual stages. This will eliminate the need for multiple planning permits. Existing depressions must not be filled unless the consent of the Relevant Authority is given in writing, and any required permits obtained.

15.3 Requirements

The following earthworks and lot filling requirements apply to all **Developments**:

- All work must be undertaken in accordance with *AS 3798-2007 Guidelines on Earthworks for Commercial and Residential Developments.*
- Earthworks within an area of land liable to flooding must not adversely impact on the Floodplain characteristics. Existing depressions must not be filled either temporarily or permanently unless the consent of the Relevant Authority is given in writing and any relevant permits obtained.
- All works constructed within a floodway must have all spoil removed to an area that is above the 1% flood level.
- All new urban subdivision allotments must be graded, cut or filled, such that a minimum grade of 1:200 is achieved along the low side of the allotment toward the drainage outlet.

- The finished surface level of buildings must be a minimum of 300mm above the 100 year **ARI** flood level.
- The finished surface of lotfilling must be equal to or above the 100 year **ARI** flood level subject to the requirements of the relevant Catchment Management Authority or responsible authority.
- The extent and depth of all proposed lotfilling must be denoted on the construction plans. Where depths of fill on allotments exceed 300 mm, those areas are to be clearly differentiated from fill of depth less than 300 mm.
- Full records must be kept of all areas filled and the information must be recorded on the 'as constructed' plans.
- Where the depth of fill is greater than 300 mm lotfilling must be compacted to the requirements of Table 204.131 Compaction Requirements Scale C of *VicRoads Specification* and trimmed and shaped to match existing site levels, except in areas nominated for soft landscaping.
- Lotfilling testing must be included in the Contractor's Inspection and Test Plans submitted for **Council's** consideration.
- The requirements for the backfilling of drainage trenches are specified in the Standard Drawing.
- Where earthworks abut structures, the Design Engineer must demonstrate the continued safety and integrity of those structures to the satisfaction of **Council's Engineering Department**.
- The desirable maximum depth of fill allowable against fencing is 200mm and requires a plinth at the bottom of the fencing.
- Retaining walls must be provided when the depth of fill exceeds 200mm or maximum batter slopes are exceeded.
- No water is to be directed to flow into adjoining properties.
- Ideally no fill should be imported onto any development site. Where fill is imported onto any development then written records must be provided to indicate the source of the fill and to provide evidence that the soil is not contaminated as per the DSE practice note for potentially contaminated land.
- All reasonable precautions must be taken to prevent the spread of noxious weeds from or to the worksite. (Refer also Clause 22.7).
- Dust mud and debris must be prevented from leaving any development site during and after construction (refer also Clause 22.3).
- All areas that are to involve earthworks must have the topsoil stripped, stockpiled and reinstated. Before completing the site works the depth of topsoil replicating predevelopment depths must be placed and rehabilitated over all areas where there have been earth works.
- Special consideration must be given to sites that may have been subject to biological or chemical contamination. **Council**, EPA or other Relevant Authorities may require a full analysis of any potentially effected sites and in some circumstances require an Environmental Impact Statement.

Clause 16 Urban Drainage

16.1 Objectives

The general objectives of urban drainage are:

- To collect and control all stormwater generated within the subdivision or development.
- To collect and control all stormwater entering a subdivision from the water shed outside the subdivision.
- To provide an effective outlet for all collected stormwater, from the subdivision or development to a natural watercourse, relevant authority's drain or approved outfall.
- To achieve these objectives without detrimentally affecting the environment generally, surface and subsurface water quality, groundwater infiltration characteristics, the adjoining landowners and other landowners in the vicinity of the drainage outlet and watercourses either upstream or downstream of the subdivision.

16.2 General

Drainage design must be in accordance with the provisions of *'Australian Rainfall and Runoff – Flood Analysis and Design' – 2001.*

Drainage designers should also refer to *'Water Sensitive Urban Design Engineering Procedures'* published by Melbourne Water, *'Urban Stormwater Best Practice Environmental Management Guidelines 2006'*, published by the CSIRO 1999 and *Australian Standard AS3500.3 Stormwater Drainage*.

Drainage design must take the entire drainage catchment into account, not just the area included in the subdivision or development. **Design Engineer**s must base the calculated peak flow on the full potential development of both the project and upstream areas for normal flow situations as well as the overland flooding caused by pipe blockages, general flooding and high water levels. Staged upgrading of the system can only be undertaken with the approval of **Council**.

Prior to commencing detailed design, the **Design Engineer** must determine the possible ultimate zoning of all external catchment areas contributing to the drainage system within the subdivision or development. This may require consultation with the **Council's Engineering Department and Council's Planning Department**.

16.3 Major and Minor Drainage Systems

The **Design Engineer** must adopt the 'major/minor' approach to urban drainage systems as outlined in Chapter 14 of *'Australian Rainfall and Runoff – Flood Analysis and Design' – 2001*. The 'Minor' system refers to the underground system, designed to an **ARI** as determined in Clause 16.6. The 'Major' system refers to overland flow paths that are to be designed to convey the major storm flows when the capacity of the minor system is exceeded.

The minor system generally refers to a pipeline network with sufficient capacity to collect and convey the flows from nominated design storm events (see Clause 16.6). These pipelines prevent stormwater damage to properties and also limit the frequency and quantity of surface water to a level that is acceptable to the community. The pipelines do not always follow the natural drainage paths and are usually aligned along property boundaries and the roadway kerb and channels.

A major drainage system caters for the runoff from storms of higher intensity than for which the minor drainage system has been designed. The major drainage system is designed to handle flows resulting from storms with a 100-year **ARI**. These flows must follow a designated overland flow path, which must be:

- A road if the catchment area is small and/or
- A drainage reserve if it is impractical for unsafe for a road to carry the excess flows.

The finished floor level of buildings must be at least 300mm above the 100 year **ARI** flood level or in accordance with the requirements of the relevant authority and codes.

16.4 Hydrology

The drainage design must include a drainage catchment plan showing the total catchment area and sub areas that are the basis of the design, together with a drainage computations sheet.

Partial areas must be taken into account when determining peak flow sites. Particularly in instances where the catchment contains sub areas, such as reserves, that may have relatively large time of concentration in conjunction with a small coefficient of runoff. In some instances a partial area design discharge may result in runoff that is less (or the same) than a discharge that has been calculated at some upstream point. Careful checking of the partial area flows may be required to determine the largest flow. The largest flow must be used for the design of the stormwater system downstream of the connection point.

Particularly when assessing the major drainage system it may be more appropriate to use a Unit Hydrograph or Non-Linear Run-Off Routing model. The **Design Engineer** must determine the most appropriate methodology for each application. Various drainage tools, programs and construction methods are available to the **Design Engineer** to achieve the objectives of the drainage system. Regardless of the technique or method used, detailed documentation must be required to be submitted for detailed design approval.

Two separate recognised runoff estimation methods must be used for catchment areas greater than 50 hectares to enable comparison of runoff estimates.

16.5 Rainfall Data

Intensity/Frequency/Duration curves (IFD) are available from the Bureau of Meteorology Website
http://www.bom.gov.au/cgi-bin/hydro/has/CDIRSWebBasic

Online resources are provided that allow curves to be established for any Australian location based on its latitude and longitude.

16.6 Average Recurrence Interval

The design of underground drainage system must be based on the ARIs shown in Table 8:

Table 8 Average Recurrence Intervals For Minor Drainage In Urban Areas

Drainage System	Capacity
Urban Residential Areas	5 yr **ARI**
Commercial centres of 10 shops or less	10 yr **ARI**
Industrial areas or where surcharge would seriously affect private property	10 yr **ARI**
Drainage through Private Industrial Property	20 yr **ARI**
Commercial areas	20 yr **ARI**

The initial time of concentration from building to property boundary is assumed to be six (6) minutes in urban residential areas. Special consideration will be necessary for other areas and/or circumstances.

The capacity of the road reserve in urban areas inclusive of the underground system must be 100 yr **ARI** except where pipes discharge to retarding basins refer to Clause 18.5. Overland flow paths must be clearly demonstrated.

16.7 Coefficients Of Run-Off

Table 9 specifies minimum coefficients of runoff to be used in the design of drainage systems:

Table 9 Coefficients Of Runoff

Catchment Type	Coefficient of Runoff (applies to all return periods for most Councils)	Coefficient of Runoff (applies to 5 year return period for those Councils listed in Selection Table 13)
Low density residential areas – lot areas >2000 m^2 to 4000 m^2	0.40	0.35
Residential areas – lot areas >1000 m^2 to 2000 m^2	0.50 See note 2 below	0.40
Residential areas – lot areas >600 m^2 to 1,000 m^2	0.70 See note 2 below	0.55
Residential areas – lot areas >450 m^2 to 600 m^2	0.75	0.60
Residential areas – lot areas >300 m^2 to 450m^2	0.80	0.65
Residential areas – lot areas <300 m^2	0.80 See Note 1 below	0.80
Residential areas (medium density, i.e. Units, including potential unit development sites)	0.90	
Commercial zones	0.90	
Industrial zones	0.90	
Residential road reserves	0.75	
Landscaped areas	0.25	
Public Open Space	0.35	
Paved areas	0.95	

Note 1

The co-efficient of runoff shown in Table 9 for low density and residential area above does not include the road reserves within these subdivisions.

Note 2

Where there is a likelihood of further subdivision occurring of allotments in new subdivisions an allowance of 10% must be added to the coefficients to avoid the need for on-site detention for these future subdivisions.

Note 3

The **Councils** listed in Selection Table 13 have differing coefficients of runoff for 5 year and 100 year **ARI**'s. All other **Councils** use the coefficients listed in the first column of Table 9.

Selection Table 13 Differing Coefficients Of Runoff

Councils That Use Differing Coefficients of Runoff for 5 and 100 Year ARI's
Greater Bendigo City Council
Greater Geelong City Council
Macedon Ranges Shire Council
Wellington Shire Council
Yarriambiack Shire Council

In all cases the co-efficient of runoff must be checked against *'Australian Rainfall and Runoff – Flood Analysis and Design' – 2001.* For areas of special use, e.g. schools, community centres, sporting developments etc, an investigation is to be carried out to determine the likely percentage of impervious area and pervious areas to determine the appropriate co-efficient of runoff.

16.8 Hydraulic Design

Designs must be based on hydraulic grade line (H.G.L) analysis using appropriate pipe friction and drainage structure head loss coefficients.

The H.G.L. must be greater than 150 mm below the invert of the kerb for minor flows.

The H.G.L. must be less than 350 mm above the invert of the kerb for major flows.

The H.G.L. due to partial full flows is to be ignored, and assumed to match the obvert of the pipe. However part full velocities must be checked.

Pipe designs are to be based on hydraulic grade line analysis, using the appropriate pipe parameters for Colebrook – White formula or Mannings formula shown in Table 10.

Table 10 Pipe Roughness Values

Pipe Material	N	K
Spun precast concrete	0.013	0.6
Fibre reinforced concrete	0.011	0.3
UPVC	0.009	0.06

It should be noted that Table 10 does not preclude other pipe materials being used.

16.8.1 Pipe Velocities

The design pipe velocities are:

- Minimum – pipe running ½ full or greater – 0.75 m/s
- Minimum – pipe less than ½ full - 1.00 m/s
- Maximum – 5.00 m/s

16.8.2 Minimum Pipe Grades

In general the absolute minimum grade of a stormwater pipe is listed in Selection Table 14, however flatter grades may be approved where it is demonstrated the velocities are greater than those listed in the headings of the table.

Selection Table 14 Minimum Pipe Grades

Minimum Grade of Stormwater Pipe to be 1 in 500 and Have a Minimum Velocity of 0.7m/sec	Minimum Grade of Stormwater Pipe to be 1 in 300 and Have a Minimum Velocity of 1.0m/sec
Benalla Rural City Council	Ararat Rural City Council
Campaspe Shire Council	Ballarat City Council
Colac Otway Shire Council	Baw Baw Shire Council
Gannawarra Shire Council	Central Goldfields Shire Council
Greater Shepparton City Council	City of Greater Geelong
Mansfield Shire Council	Corangamite Shire Council
Moira Shire	East Gippsland Shire Council.
Wellington Shire Council	Glenelg Shire Council
Yarriambiack Shire Council	Golden Plains Shire Council
	Greater Bendigo City Council
	Indigo Shire Council
	Macedon Ranges Shire Council
	Mitchell Shire Council
	Moorabool Shire Council
	Murrindindi Shire Council (minimum grade 1 in 200)
	Pyrenees Shire Council

Minimum Grade of Stormwater Pipe to be 1 in 500 and Have a Minimum Velocity of 0.7m/sec	Minimum Grade of Stormwater Pipe to be 1 in 300 and Have a Minimum Velocity of 1.0m/sec
	Rural City of Wangaratta
	South Gippsland Shire Council
	Southern Grampians Shire Council
	Strathbogie Shire Council
	Surf Coast Shire Council
	Swan Hill Rural City Council
	Towong Shire Council
	Warrnambool City Council
	Wodonga City Council

16.8.3 Minimum Pipe Cover

The minimum cover is as per the Standard Drawings Additional cover should be provided wherever crossings with large sized services are anticipated.

Pipe classes must be determined having regard to the proposed cover.

Wherever an external area contributes to the system, the drain must be designed at a depth sufficient to serve the total upstream area.

Any exceptions to the minimum cover requirements are to be discussed with **Council's Engineering Department** at approval of functional layout stage.

16.8.4 Curved Pipelines

Curved pipelines are permitted only where they are of constant radius in the horizontal direction only, and are in accordance with the pipe manufacturer's specifications.

16.8.5 Pipe Alignments at Pits

The following considerations apply to the alignment of pipes at pits:

- Generally, when designing the pipe system under pressure, the pipe obverts should coincide at junctions, but in flat terrain, the inverts may coincide.
- Where practical, the pipes at junctions should be aligned such that the projected area of the upstream pipe is wholly contained within the downstream pipe.

Generally, side entry pits should be spaced so that the pits are able to deliver the design flows into the pipes. It may be necessary to consult inlet capacity charts to confirm their capacities.

16.8.6 Pit Losses

Pit losses to be allowed for must be calculated on the basis of:

$$K \frac{V_O^2}{2g}$$ Where Vo is the outlet velocity calculated from $$\frac{Q_O}{A_O}$$

Where K is a head loss co-efficient. Values of K for various pit configurations are given in Austroads *"Road Design Guidelines - Part 5 General and Hydrology Considerations"* and any VicRoads Supplement to those guidelines.

16.8.7 Pit Locations

Generally side entry pits are to be spaced so that the length of flow in channels does not exceed 80 metres.

Channel flow approaching an intersection is to be collected before the tangent point, expect where it can be demonstrated that adequate capacity is available in the kerb and channel to carry water around the return.

Side Entry Pits are to be clear of radials, kerb crossings and driveways.

Double side entry pits must be used where approach grades to intersections are in excess of 6% and at all low points in roads, unless the **Designer** demonstrates that a single side entry pit provides sufficient inlet capacity for the pipes to operate at their required capacity.

In all cases, design consideration must be given to pit location and pit inlet capacities.

16.9 Main Drains

Pipes of ∅750mm or greater are to be designed as main drains and as such, large direction changes through standard pits must not be permitted. Consideration should be given to use of special manholes, additional pits and/or bends at all changes of direction.

Design criteria for main outfall drains must be determined after discussion with the Manager of the **Council's Engineering Department**.

16.10 Pipes

16.10.1 Pipe Size and Joints

The minimum pipe size for property inlets is generally 100mm dia UPVC servicing a single dwelling and 150mm UPVC to service two dwellings. Councils may require larger sized property inlets where the runoff being generated from the property requires it.

Pipes that are part of **Councils'** assets will have a minimum diameter of 225mm where there is no runoff from a road or street. Where the pipe does take runoff from a road or street the minimum pipe diameter will be 375mm to reduce the risk of blockage.

The **Design Engineer** may apply in writing to **Council's Engineering Department** for approval to vary the above minimum sizes. Such applications must be accompanied by computations to show that minimum pipe velocities have been achieved and that the capacity of the pipe is adequate for the flows that it is being provided for. Further the application must detail how blockages are to be avoided for pipes that are taking runoff from a road or street.

Pipes that are part of **Councils'** assets are to have spigot-socket rubber ring joints unless specific approval has been given by **Council's Engineering Department**.

16.10.2 Pipe Class and Bedding

In all instances the pipe class must be determined using Australian Standards. Construction techniques should be considered when selecting class of pipe, and restrictions to plant and compaction techniques may need to be specified to suit class of pipe.

Pipe bedding must be in accordance with the pipe manufactures recommendations for the particular loading and pipe class.

16.10.3 Pipe Type – Special Provisions

Council's prefer steel reinforced concrete pipes. Other types of pipe may be approved by Councils.

In particular, the use of HDPE pipes may be approved where works are designed in accordance with *AS/NZS 2566.1 – 1998 'Buried Flexible Pipes – Part 1 Structural Design'* and installed in accordance with *AS/NZS 2566.2 – '1998 Buried Flexible Pipes – Part 2 Installation'*. Approval will be considered upon receipt of a detailed installation proposal, outlining construction techniques and an inspection and test plan. In particular the proposal needs to demonstrate how the manufacturer's recommendations and Australian Standards for the installation of HDPE pipelines are to be achieved and the testing regime by which installation standards are to be confirmed. Restrictions to plant and compaction techniques may need to be specified to suit the type of pipe.

16.11 Structures

16.11.1 Drainage Structures

Drainage structures must comply with **Council's** standard drawings for such structures. Where modification to details or special structures is required, details must be submitted with the detailed design documentation. Acute intersection angles between drainage lines at pits will not be permitted.

Murrindindi Shire Council requires floors of pits shown in the Standard Drawings in **Appendix F: Standard Drawings** to be shaped to suit the pipe radius and change of pipe lower inverts, unless otherwise approved by the **Council**.

Junction pits at the back of kerb within intersections are to be avoided if possible.

16.11.2 Minimum Drops at Pits

Minimum drops at pits are required to provide sufficient slope along the pit inverts to clear debris, and to provide tolerance in setting pipe invert levels. Generally the minimum drop through pits is 20 mm. However, in all circumstances where changes in direction occur, a number of pipes enter the one pit, large inlet and outlet velocity differences exist or grated or side-entry pits are used, losses must be considered and provided for.

16.11.3 Maximum Drops at Pits

Where drop pits are proposed with a level difference greater than 2 metres between any incoming pipe and the pit outlet, pits must be designed in accordance with the Austroads "*Road Design Guidelines - Part 5 – General and Hydrology Considerations"* and any VicRoads Supplement to those guidelines.

16.11.4 Side Entry Pits and Grated Pits

Pit functions and capacities must be in accordance with Austroads "*Road Design Guidelines - Part 5A Drainage – Road Surfaces, Networks, Basins and Subsurface"* and any VicRoads Supplement to those guidelines. Pit construction must be in accordance with **Council's** Standard Drawings.

Prefabricated pits may be used subject to approval by **Council's Engineering Department**. Technical details including material, specification, dimensions, product data sheet, any advantages or disadvantages and the location must be submitted prior to approval. **Council's Engineering Department** may require that a certificate be provided by a **Qualified Engineer** to confirm the structural integrity of the pits in the proposed application.

16.11.5 Pit Covers

Pit covers must have a clear opening of sufficient dimension and orientation to comply with OH&S and confined space entry requirements.

Heavy duty lids or plastic lock-down lids may be required in high risk areas such as Public Open Spaces, recreation reserves, school areas etc. Elsewhere covers are to be installed with class rating in accordance with potential traffic loadings.

Trafficable gatic, or approved equivalent, load bearing covers are to be provided on all side entry pits located in exposed kerb areas, e.g. at intersections, and on all pits located in industrial **Developments**. The drainage network should be designed to locate pits away from exposed kerb areas wherever possible

16.12 Litter Collection Pits

Approved litter collection pits must be provided towards the end of any drainage line that discharges to a watercourse and/or drainage basin. The pit must be located such that comfortable access by maintenance vehicles is achieved. Access must be in a forward only direction where the pit is located in road reserves, drainage reserves or other areas with public access.

The default period for the cleaning of litter collection pits is 6 months for design purposes.

16.13 Outfall Structures and Energy Dissipators

Outfall structures or discharge points for floodways at receiving waters must be designed in accordance with the requirements of the responsible authorities for the relevant land and receiving waters. Energy dissipators for pipes should normally be of the impact type.

16.14 Pump Stations

All pump stations must comply with the following requirements:

- Pump station to be either prefabricated or constructed on site as required.
- Pump stations must be erected at a level above the 1% flood level.
- All pump stations must be capable of being isolated with an approved penstock.
- Typically a fully submersible pump would be required in a wet well.
- For large discharge rates **Council** may require an above ground roofed or weather protected pump in a double chamber pit including a penstock for back-flow isolation.
- Pumps must include duty and standby units, which are alternated regularly and must be:
    - Flygt submersibles or equivalent installations with means of accessing the pump components at ground level for ease of maintenance.
    - Drywell installations with self-priming pumpsets.
- Float level controls to be 'Bestibell' rods or equivalent, with capacity to switch pumpsets on and off at various levels. The selection of a pump(s) must comply with outfall requirements including cut-in and cut-out probes to ensure that the pump(s) does not operate if the outfall drain(s) is running full.
- Switching equipment to include connection to telephone landline and appropriate alarm systems, as part of **Council's** emergency on-call system.

- Provision must be made for the alarm system to be converted to a telemetry system, able to supply operational data on a regular basis, and/or upon interrogation, by a radio link or, with the written consent of **Council,** by mobile phone.

- The pump station electrical cabinet must include:
    - Main switch and distribution circuit breakers and supply authority meters.
    - Vandal shielded warning lights.
    - Lights and cabinet are to be visible from the nearest roadway during daylight hours and must show the following: Green constant-normal operation. Red constant-fault. Red flashing-high water level.
    - Door operated cubicle light.
    - General power outlets accessible from outside of the switchboard but within the cabinet (10 amp).
    - Orientation of the cabinet to ensure that the pump station manhole is visible from the position required to operate the control panel.
    - A vandal proof lockable handle is to be installed on the door to the cabinet. Contact with the **Council** must be made to obtain the details of the key type to be used.
    - An external connection for an alternate power supply including phase reversal switch.
    - A selector switch for automatic or manual operation. Thermistor motor over-temperature protection relays.
    - Auto cyclic duty/stand-by controller for multiple pump facility.
    - Sufficient space to allow installation of a future telemetric monitoring system.
    - A controller to monitor high basin water level alarm, high outfall water level alarm, low level alarm, duty start and stop, no flow condition or power off condition.

- A velocity or energy dissipation system acceptable to the **Council's Engineering Department** must be provided to ensure that the incoming stormwater will not cause erosion to the bed or banks of the basin.

- The inlet(s) to the pump(s) should be appropriately screened to prevent the pump(s) being fouled.

16.15 Subsoil Drainage

Appropriate sub-surface drainage must be installed where ground water or overland flows may adversely affect the performance of areas set aside as Public Open Space or Reserves. All sub-surface drainage must be installed in accordance with Section 702 of the *Vic Roads Standard Specifications for Road Works and Bridge Works* and must include flushing points at the remote end from the outlet pit.

The desirable minimum grade for any sub-surface drainage for pavements is 1 in 250 with an absolute minimum of 1 in 300.

Typically, circular 100 mm rigid wall or flexible UPVC Class 1000 slotted including geotextile sock where required, is installed under each concrete pavement edging to a minimum depth of subgrade level.

The **Developer's Consultant** must include and submit to the **Council**, full details of all sub-surface drainage proposed to be used in the Development.

16.16 Property Drains

In a green-fields development no property drainage may discharge to kerb and channel without the written approval of the manager of the **Council's Engineering Department**.

Connections to pits are preferred over pipe-to-pipe connections. Where property drains discharge directly to underground drains, connection works must be in accordance with **Council's** Standard Drawings.

Connection must be made directly to a stormwater pit unless there is an existing pipe in the road reserve adjoining the property to which the property drain can be connected using a standard 'jump up' as shown in the **Council's** Standard Drawings. Where these requirements cannot be met but there is an existing barrier kerb, then the connection may be made to the barrier kerb.

In in-fill urban residential and commercial **Developments** where connection to underground drains is impractical, two (2) kerb adaptors per 20 metres of frontage are to be provided at the time of development. Kerb adaptors must be located clear of all driveway crossings and a minimum distance of 1 metre from kerb crossings.

Generally galvanised steel or UPVC adaptors are approved for use unless there is a specific **Council** requirement as detailed in Selection Table 155.

Selection Table 15 Kerb Adaptors

Galvanised Steel Kerb Adaptors	UPVC Kerb Adaptors
Baw Baw Shire Council	Ballarat City Council
Campaspe Shire Council	City of Greater Bendigo
Colac Otway Shire Council	Wellington Shire Council
Glenelg Shire Council	Yarriambiack Shire Council
Golden Plains Shire Council	
Macedon Ranges Shire Council	
Mount Alexander Shire Council	
Surf Coast Shire Council	
Swan Hill Rural City Council	

Easement drains must be provided to all allotments that fall to the rear and must be deep enough to serve the entire allotment. A property inlet, as per **Council's** Standard Drawings, must be constructed at the low corner of each allotment. The minimum fall towards the underground drainage outlet along the low side of allotments is 1 in 200.

16.17 Major Drainage Requirements

The major drainage system must collect major storm runoff from a catchment, in excess of the capacity of the minor drainage system, and convey this runoff to the receiving waters with minimal nuisance, danger or damage. The major drainage system must be so designed and constructed as to ensure a reasonable level of safety and access for pedestrian and vehicular traffic, limit flooding of private and public property and minimises the inflow of pollutants to receiving waters.

The design of major drainage systems should take into account the potential use of wetlands, gross pollutant traps and sediment interception ponds, particularly immediately downstream of urban areas.

Major drainage within railway reserves should be limited to cross track drainage rather than longitudinal drainage. The Design Engineer must obtain approval from the relevant authority for all **Infrastructure** proposed to be located in railway reserves before seeking detailed design approval from **Council**. The **Developer** must pay all associated costs for such drainage works, including the licence fees (for a period of at least 10 years) specified by the relevant authority.

Minimum requirements of the major drainage system are as follows:

- Design of major drainage systems must be based on the critical 100 year **ARI** storm with some consideration given to the impact of a rarer storm event. The critical storm must be determined by routing storms of varying duration until peak flows (Q100) are identified. Two recognised flow estimation methods (runoff routing computer models) in addition to the Rational Method must be used for comparative purposes for urban catchments or sub-catchments greater than 50 Ha.

- Hydraulic Grade Line analysis must be used for design of floodways, low flow pipes and retarding basins. The width of major floodways must be governed by the greater of the hydraulic requirements or the width for suitable maintenance (including mowing of grassed trapezoidal drains).

- Street drainage in urban areas must not be directed into easements drains.

- The depth of overland flows in urban areas must be controlled by freeboard to properties or upper limits of surface flow depth/velocity criteria for public safety as detailed in Austroads "*Road Design Guidelines - Part 5A Drainage – Road Surfaces, Networks, Basins and Subsurface"* and any VicRoads supplement to those guidelines.

16.18 Floodways

Major floodways generally comprise engineered open waterways, and often make use of roadways, trapezoidal channels and sometimes sheet flow through open spaces. Major floodways are generally located within road reserves, drainage reserves or Public Open Space. **Council** will not accept major floodways through easements on private land in urban situations and Q100 must be contained entirely within reserves for urban areas.

Where overland floodwaters or flood-storage is or will be altered or changed as part of a Development, compensatory works must be assessed and implemented.

Where active floodways are present it is unlikely that development will be approved without hydraulic modelling and analysis. The **Designer** may also be requested to submit a risk assessment report including details of proposed works to ensure that the potential for loss of life, risk to health and damage to property is minimised, and how the flood conveyance or storage will be accommodated.

Hydraulic modelling will be undertaken by a suitably qualified person or organisation. The analysis and resulting works must ensure that all adjacent landholders are not affected in any detrimental manner as a result of the proposal. The analysis must also identify the extent, velocities and depth of overland flood flows on the development.

The alteration or change to any existing wetland must only be considered after all other alternatives have been considered. The function of a Floodplain is to convey and store floodwater and preserve the inherent values of wetlands.

The minimum requirements that apply to design and treatment of floodways, and open unlined drains, are as follows:

- Depth of floodways should be kept to a minimum (generally less than 1.2m).
- Desirable maximum batter slope is 1 in 8; absolute maximum batter slopes must be 1 in 5. Desirable minimum crossfall for inverts is 1 in 40. Minimum bed width is to be 2.5 metres.
- Permissible scour velocities and minimum permissible velocities for public safety must govern maximum longitudinal grades for major floodways.
- Desirable minimum longitudinal grade for major floodways is 1 in 200 in order to minimise the likelihood of ponding and siltation. Absolute minimum grade is 1 in 300.
- Flexible structures, utilising rock gabions, rock mattresses and geotextile fabric are preferred for grade control structures, minor energy dissipaters and major erosion/scour protection measures.
- Floodways utilising a low flow pipe must be sized for the entire **ARI** design flow (Q100) based on the assumption that the low flow pipeline is fully blocked during major storms. Low flow pipes must be designed in accordance with the following:
    - Desirable minimum cover for low flow pipes is 450 mm and absolute minimum cover is 350 mm. Appropriate pipe classes should be adopted accordingly for the design circumstance, and with due consideration to plant used for drain maintenance.
    - Low flow pipes providing outlet drainage for retarding basins must be designed with invert levels of adequate depth to command the pipes located within the basin.
    - The design flow for low flow pipes must be for a three (3) month **ARI** flow as an absolute minimum.
    - Minimum grade of low flow pipes must be sufficient to generate self-cleansing velocities.
    - Minimum size of low flow pipes is ∅375mm.
    - Maximum spacing of pits on straight sections of low flow pipes is 80 metres.
    - Low flow pipelines, including pits and other structures should be aligned to minimise hydraulic losses. Pits/structures on low flow pipes must generally be designed to minimise hydraulic losses. In some cases however, pits/structures may be specifically designed to dissipate energy, e.g. drop chamber energy dissipators (with large diameter/minimum grade outlets) may be included.
- Major floodways that cannot be provided with a low flow pipe due to inadequate longitudinal grades or level constraints must be designed with a lined low flow invert or trickle flow channel where feasible. Subsurface drainage is generally required in this instance.
- Pipes discharging into major floodways must be connected to the low flow pipe with surcharge pits provided as necessary.

16.19 Drainage Reserves

Where drainage reserves are incorporated into **Developments** the minimum reserve width should be 10 metres. Reserve widths must accommodate a drain with sufficient capacity to cater for a 100 year **ARI** storm event. All-weather access tracks may be required on both sides of the drains with batter slopes greater than 1:8 grade. Pump stations, electrical supplies, water-quality treatment **Infrastructure** must be sited with sufficient room for construction and maintenance vehicle turning at an appropriate location, refer to Clause 18.5.8.

Wherever possible drainage reserves should generally be sited to abut Public Open Space areas, but will only contribute to the provision of Public Open Space in accordance with requirements of Clause 18.2. Consideration should be given to increasing reserve width for conservation and landscaping purposes.

Where drainage **Infrastructure** within the drainage reserve does not comply with standards for public access, the reserve must be fenced to prohibit public access. A landscaping plan and fencing details must be provided to the **Council** for approval. Fencing and landscaping must be completed at the full cost of the **Developer**.

16.20 Building Over Council Drainage Easements

Consent from **Council** is required to construct a building/structure over a **Council** drain.

16.21 Urban Drainage Easements

In urban areas the general minimum drainage easement widths are drainage only 2 metres and combined drainage and sewer easements 3 metres.

Where practicable, easements shall be matched and aligned with those existing on adjacent properties to provide continuity for utility services and ensure the proposed use for which the easement is created can be achieved.

Clause 17 Rural Drainage

17.1 Objectives

The general objectives of rural drainage are:

- To collect and control all stormwater generated within the development or subdivision to ensure that it is discharged from the site in a way that does not detrimentally impact on any upstream or downstream property.
- Any **Developments** or subdivisions that have the potential to increase the rate and quantity of stormwater runoff must incorporate retardation to rural runoff rates where applicable.
- To provide an effective outlet to an approved outfall.
- To ensure that culverts and waterways are designed so the safe passage of vehicles is maintained at all times.
- To restrict stormwater flows to natural drainage lines and ensure that drainage catchment boundaries are not crossed.
- To comply with the objectives and requirements of any relevant Floodplain Authority.
- To ensure that there be no detrimental effect on:
    - The environment generally.
    - Surface and subsurface water quality.
    - Groundwater infiltration characteristics.
    - Adjoining landowners and other landowners in the vicinity of the drainage outlet.
    - Watercourses either upstream or downstream of the development or subdivision.

17.2 General

Drainage design must give consideration to the entire drainage catchment, not just the area included in any individual development or subdivision and must be in accordance with the provisions of the Austroads "*Road Design Guidelines - Part 5 Drainage – General and Hydrology Considerations"* and any VicRoads Supplement to those guidelines.

The **Design Engineer** must consider upstream developments, overland flow paths, natural drainage lines, the possible removal of unnatural drainage obstructions, the depth of flooding that may occur on roads and private property and other factors which may impact on or be affected by the design of any rural drainage system.

The **Design Engineer** must ensure that their design complies with the requirements of s16 of the Water Act 1989 and s199 of the Local Government Act 1989. In particular under:

- S16 of the *Water Act 1989* - The Council is considered a landowner/manager of local roads and therefore the construction and maintenance of local roads must not cause water to flow from the road reserve in an unreasonable manner or prevent the natural flow of water across or along a local road reserve from occurring in a reasonable manner.
- S199 of the *Local Government Act 1989* states that Council must give notice of its intention to divert or concentrate the drainage flowing onto a road or discharge it or permit it to flow onto, into or through any land.

Any persons may make a submission to Council under section 223 of the Act. In practice this means that any new culverts placed under a road would require the Council to give notice of its intention.

17.3 Requirements

Stormwater runoff estimation for rural catchments (undeveloped areas) must be based upon hydrological methods and data contained within the latest issue of Austroads "*Road Design Guidelines - Part 5 Drainage – General and Hydrology Considerations"* and any VicRoads Supplement to those guidelines, unless otherwise specified within this **Manual**.

Two recognised flow estimation methods (runoff routing computer models) must be used for comparative purposes when dealing with rural farming catchments or sub-catchments greater than 50 Ha.

17.4 Minor Drainage

In addition to relevant sections of Clause 16.3 the following requirements apply to the minor drainage systems in rural living, low density and rural areas:

- The minimum pipe size for road cross-culverts is ∅375mm in order that maintenance of the culvert is facilitated.
- The minimum slope of earth drains are listed in Selection Table 16:

Selection Table 16 Minimum Slope Of Earth Drains

Minimum Slope of Earth Drain 1 in 2000	Minimum Slope of Earth Drain 1 in 500
Benalla Rural City Council	Ararat Rural City Council
Campaspe Shire Council	Ballarat City Council
Gannawarra Shire Council	Baw Baw Shire Council
Greater Shepparton City Council	Central Goldfields Shire Council
Swan Hill Rural City Council	City of Greater Geelong
Yarriambiack Shire Council	Colac Otway Shire Council
	East Gippsland Shire Council
	Glenelg Shire Council
	Golden Plains Shire Council
	Greater Bendigo City Council
	Indigo Shire Council
	Macedon Ranges Shire Council
	Mansfield Shire Council
	Mitchell Shire Council
	Moorabool Shire Council
	Mount Alexander Shire Council
	Murrindindi Shire Council
	Pyrenees Shire Council
	Rural City of Wangaratta
	South Gippsland Shire Council

Minimum Slope of Earth Drain 1 in 2000	Minimum Slope of Earth Drain 1 in 500
	Strathbogie Shire Council
	Surf Coast Shire Council
	Towong Shire Council
	Warrnambool City Council
	Wellington Shire Council
	Wodonga City Council

- The minimum bed width of the drain is 1m unless otherwise approved.
- The desirable maximum batter slope of earth drains within the **Clear Zone** is 1 in 6, with the absolute maximum batter slope of 1 in 4. Where the drain is located outside the **Clear Zone** the maximum batter slope is 1 in 1.5.
- Driveable endwalls complying with VicRoads Standard Drawing SD1991 must be provided for all culverts that are parallel to the traffic flow and located within the **Clear Zone**.
- Wherever possible cross-culverts should be extended to terminate outside of the **Clear Zone**. Driveable endwalls complying with **Council's** standard drawings must be provided for cross-culverts whose ends are located within the **Clear Zone**.
- The discharge of any roadside table drain into a drainage authority drain requires that authority's approval and the structure must be constructed in accordance with their requirements.
- Section 199 of *Local Government Act 1989* requires **Council** to give notice to all affected landowners for any drainage works that will divert or concentrate drainage waters.
- Property connections in low density residential **Developments** must discharge through the side of the endwall and not directly into the table drain.

Culverts must be sized with the following capacities:

Table 11 Average Recurrence Intervals For Rural Drainage

Drainage System	Capacity
Rural road culverts	10 yr **ARI**
Major rural culverts	100 yr **ARI**

The design should consider how to provide for flows exceeding the capacity of the pipe so as to avoid flooding in these events e.g. floodway to be incorporated with culvert installation.

17.5 Major Drainage

The major drainage system must collect major storm runoff from a catchment, in excess of the capacity of the minor drainage system, and convey this runoff to the receiving waters with minimal nuisance, danger or damage. The major drainage system must be designed and constructed such that its function ensures a reasonable level of vehicular traffic safety and accessibility limits flooding of private and public property and minimises pollutants inflows to receiving waters.

Design of major drainage systems must consider use of wetlands, gross pollutant traps and sediment interception ponds.

Major drainage within railway reserves should be limited to cross track drainage rather than longitudinal drainage and the **Design Engineer** must obtain approval from the relevant authority for all such **Infrastructure** before seeking detailed design approval from **Council. The Developer** must pay all associated costs for such drainage works including licence fees (for a period of 10 years) specified by the relevant authority.

Council will consider major floodways through easements in private land in rural living **Developments** where alternatives are not practicable.

Minimum requirements of the major drainage system in rural areas are as follows:

- Design of major drainage systems must be based on the critical 100 year **ARI** storm with some consideration given to the impact of a rarer storm event. The critical storm must be determined by routing storms of varying duration until peak flows (Q100) are identified.

- Hydraulic Grade Line analysis must be used for design of floodways, low flow pipes and retarding basins. The width of major floodways must be governed by the greater of the hydraulic requirements or the width for suitable maintenance (including mowing of grassed trapezoidal drains).

- The depth of overland flows must be controlled so as to maintain public safety and avoid damage to properties, having regard to the criteria in Austroads "*Road Design Guidelines - Part 5 – General and Hydrology Considerations"* and any VicRoads Supplement to those guidelines.

- Road drainage in Low Density Residential and Rural Living areas may be directed into easements drains.

- Minimum width of easements for open drains in rural areas is 5 metres.

Clause 18 Retardation Basins

18.1 Objectives

- To protect property and **Infrastructure** from flooding occurring from a nominated rainfall event by the provision of retardation basins.
- To limit, as much as possible, the number of retardation basins servicing an area in order to reduce **Council's** future maintenance expenditure.
- To ensure that standalone retardation basins drain completely within a reasonable time following each rainfall event and, wherever practicable, are constructed so that the area can be used for passive or active recreation or other uses such as car parks as determined by **Council**.
- To incorporate stormwater treatment and litter traps into the retardation basin design where practical and required by **Council**.
- To protect **Council's** existing stormwater drainage assets from overloading as a result of new **Developments** which increase the amount of stormwater runoff being generated from a particular property. This can be achieved through on-site detention or increasing outfall drainage capacity.
- To protect other drainage authority's drainage assets from exceeding the design capacity as a result of works carried out by **Council** or **Developers** that will become the property of the **Council**.
- To protect the public from risk of injury or death.
- To standardise the type and operation of pumping systems and outfalls associated with retardation basins.
- To improve the quality of stormwater runoff being discharged from a particular development using **WSUD** principles.
- To ensure that retardation basins are so designed and constructed as to:
    - be aesthetically pleasing,
    - have regard to the area in which they will be located,
    - avoid any adverse impact on amenity in the surrounding areas.

18.2 The Use of Drainage Basins for P.O.S Purposes

Developers and **Design Engineers** need to satisfy the requirements of clause 56.05-2 of the relevant planning scheme and in particular Standard C13. The provision of Public Open Space should include:

- Active open space of at least 8 hectares in area within 1 kilometre of 95% of all dwellings that is:
    - Suitably dimensioned and designed to provide for the intended use, buffer areas around sporting fields and passive open space.
    - Sufficient to incorporate two football/cricket ovals.
    - Appropriate for the intended use in terms of quality and orientation.

- Located on flat land (which can be cost effectively graded).
- Located with access to, or making provision for, a recycled or sustainable water supply.
- Adjoin schools and other community facilities where practical.
- Designed to achieve sharing of space between sports.

- Linear parks and trails along waterways, vegetation corridors and road reserves within 1 kilometre of 95 % of all dwellings
- Local parks within 400 metres safe walking distance of at least 95% of all dwellings. Where not designed to include active open space, local parks should be generally 1 hectare in area and be suitable dimensioned and designed to provide for their intended use and to allow easy adaption in response to changing community preferences

In order to be accepted as Public Open Space, the relevant portion of any proposed drainage retardation basin must, in addition to satisfying the above conditions:

- be at least 10 metres in width.
- incorporate the construction of shared walkways.
- have a crossfall within a 10 m wide corridor around any path. .
- be linked to POS being provided in the area.
- not be inundated by a 100 year **ARI** event unless otherwise agreed by **Council., and**
- in no case be inundated by any event up to and including a 5 year **ARI** event.

18.3 The Provision of Public Open Space

There are various potential triggers for **Developers** wishing to subdivide to provide Public Open Space. In particular:

- In most cases, where land will be subdivided into more than 16 lots, the development will be required to meet the objectives and standards set out in Clause 56 of the Planning Scheme, and the provision of open space may be required to exceed 5% of the total developed area.
- Any requirements set out in the schedule to Clause 52.01 must be satisfied. If no such requirements are specified, the requirements of the *Subdivision Act 1988* will apply.

Developers and **Design Engineers** must satisfy the requirements of clause 56.05-2 of the relevant planning scheme and in particular Standard C13. The provision of Public Open Space should include:

- Active open space of at least 8 hectares in area within 1 kilometre of 95% of all dwellings that is:
  - Is suitably dimensioned and designed to provide for the intended use, buffer areas around sporting fields and passive open space.
  - Can incorporate two football/cricket ovals.
  - Is appropriate for the intended use in terms of quality and orientation.

- Is located on flat land (which can be cost effectively graded).
- Has access to, or can make provision for, a recycled or sustainable water supply.
- Adjoins schools and other community facilities where practical.
- Is designed to achieve sharing of space between sports.

- Linear parks and trails along waterways, vegetation corridors and road reserves within 1 kilometre of 95% of all dwellings
- Local parks within 400 metres safe walking distance of at least 95% of all dwellings. Where not designed to include active open space, local parks should be generally 1 hectare in area and be suitable dimensioned and designed to provide for their intended use and to allow easy adaption in response to changing community preferences.

For the purposes of this section the **Developer** must as part of an application for a planning permit or a development plan provide **Council**, for its approval, a Public Open Space plans and a report showing how the provisions of clause 56 of the relevant planning scheme and the specific requirements of this **Manual** are to be satisfied.

The plans must show as a minimum:

- The location of existing Public Open Space within 2 kilometres of the proposed development and the area of such Public Open Space.
- How the proposed Public Open Space and any existing Public Open Space are linked.
- Any drainage basins or reserves that are to be assessed as satisfying the requirements for the provision of Public Open Space.
- How the distance requirements of clause 56 for large and local parks are satisfied for properties to be developed.
- Details of landscaping.

The report must show how the objectives and specific requirements for Public Open Space are satisfied. The report must also include the specific landscaping specifications and details that are to be applied to the Public Open Space to reasonably allow **Council** to estimate the future maintenance costs of the Public Open Space.

Developers need to satisfy the requirements of clause 52.01 of the relevant planning scheme where a contribution or amount of land is specified in the schedule to clause 52.01. This clause applies to residential, industrial or commercial **Developments**. In some cases where considerable Public Open Space is being provided and being developed as required by clause 56, **Council** may determine, in its sole discretion, that any Public Open Space requirement under clause 52.01 is satisfied.

If no amount is specified in the schedule to clause 52.01 of the relevant planning scheme, a contribution for Public Open Space may still be required under Section 18 of the *Subdivision Act 1988*. The *Subdivision Act* specifies criteria for the assessment of whether Public Open Space may be required. A requirement under the *Subdivision Act* will generally be relevant in circumstances where Public Open Space is not being provided as part of the subdivision pursuant to clause 56 of the relevant planning scheme.

18.4 General

Detailed design and documentation of drainage basins and/or similar detention facilities are to be prepared by a **Qualified Engineer**..

The **ODP** must demonstrate that any required stormwater retardation or detention systems can be integrated into the drainage system.. The retarding basin location must be in accordance with an approved **ODP/Relevant Council Strategy/Stormwater Management Plan**. Where an **ODP** has not been prepared and approved for the subject land, the **Developer** must liaise with **Council** to obtain approval for the siting of retarding basins. Drainage catchment boundaries may be increased if written approval is obtained from the relevant drainage authority.

Any design must be consistent with the requirements of **Council**, the local Catchment Management Authority (CMA) and Local Irrigation and Drainage Authority e.g. retarding basins with outfall to relevant authority drains are typically designed for the 100 year storm event of 24 hour duration, with a 'no-outfall' condition and having a maximum discharge rate to the relevant authority drainage system of 1.2 lit/sec/ha (in the case of the relevant water authority).

Land that has been identified for stormwater retardation basins to be maintained by **Council**, whether existing or proposed, must be shown on a Plan of Subdivision as a Municipal Reserve for drainage purposes and is vested in the **Council**.

In circumstances where retarding basins are not to be maintained by **Council** and are located within land that is common property, **Council** is unlikely to be a member of the body corporate. In such cases a Section 173 Agreement must be placed on each benefiting allotment to ensure that drainage of **Council's** roads or reserves is not compromised by any act, or failure to act, by the body corporate.

When a retardation basin is required for any development, the basin and any overland flow paths should be constructed as part of stage one works. . Where the **Design Engineer** considers that the retardation basin is not required to service the first stage of the works, they must submit plans, computations, and approvals from the relevant authorities to Council, demonstrating that satisfactory alternate provisions can be made for storage and outfall.

18.5 Retardation Basin Design Requirements

18.5.1 Location and Siting

Retardation basins must not be sited in areas zoned Urban Floodway Zone, or land affected by a Flood Overlay. Siting basins within an area affected by a Land Subject to Inundation Overlay requires specific prior approval from Council and all other relevant authorities.

Retardation basins may need to be protected from unrelated overland flows entering the basin and therefore, apart from the above limitations, must not be located in areas designated on the floodplain maps maintained by the Department of the Environment and Primary Industries as an active floodway. Works must be carried out to minimise erosion and maintenance resulting from overland flows entering the basin.

Siting of retardation basins must have regard to:

- The physical dimensions required for storage volume including the flattest possible batters, access to the basin bed, and maintenance of batters and edges.
- Pre-development catchments.
- Existing developed catchments.
- Existing drainage including piped, swale drains, or flow paths.
- Existing and proposed drainage easements.
- Ground water depth and seasonal fluctuations.

- Subsoil characteristics.
- Location and point of discharge.
- Soil type and seepage rate.
- Land uses and zoning.
- Effect of overland flows external to the catchment.
- Potential risk or affect on people, fauna and flora.
- Amenity of the area.
- Benefiting landholder issues.
- Provision of a suitable discharge method by:
    - Selection of a suitable pump station and associated electrical equipment location capable of being situated in close proximity to public view.
    - Gravity.
    - A combination of gravity and a pumped outfall.
- Availability of mains electricity for pumping and/or future telemetry.
- Maintenance issues and all weather access.
- Water quality.
- Whether or not the retarding basin is proposed to be used or included in the calculation for Public Open Space.
- The location of overland flows into the basin and the treatment(s) to minimise erosion.
- Inlet velocity and the need to install energy dissipation structures.
- 1% flood level or highest recorded flood level information.

18.5.2 Design Criteria

Retarding basins must be designed for the critical 100 year **ARI** storm. Retarding basins with established areas downstream and no clear and safe overland flow paths must be designed for the critical 100 year **ARI** storm with consideration given to a rarer storm event.

Where it can be demonstrated that a 100 year **ARI** storm event will be irrelevant due to cross catchment storm flows and overland flows swamping the catchment and/or the basin, a lesser storm event and corresponding storage capacity may be considered by **Council**.

The minimum freeboard must be 300 mm for earth structures and 200 mm for hard structures. **Council** will require a minimum freeboard to top basin water level (following 100 year **ARI** peak storm, no outfall condition) equal to lowest kerb invert level in the catchment area. Futhermore:

- The top water level in the retarding basin resulting from the minor drainage storm event as detailed in Table 11 must be no higher than the invert of the lowest inlet pipe to the basin.

- The overland flow path for a major storm must be designed such that the minor system contribution to flow is ignored, i.e. inlet pipe is blocked.

- For storage calculations, the volume of storage in pits and pipes in the minor system is ignored.

18.5.3 Inlet Structures

Any inlet to a basin must have an approved inlet drainage structure and may have a low-flow pipe, where practicable, connected to the pump station capable of a flow (not under head) equal to the maximum pump discharge rate.

Any inlet pipe to a basin must be fitted with a headwall and an approved structure that will allow debris escape and impede the entry of children.

All inlet headwalls will be fitted with an approved post and rail barrier to prevent falls and to identify the location of headwalls and wingwalls.

18.5.4 Low Flow Pipes

Retardation basins must incorporate a low flow pipe system having a minimum pipe size 300 mm dia. The low flow pipe system must be designed to match the outflow capacity where this is less than a 5 year **ARI** storm event.

18.5.5 Overflow Systems

A suitable overflow system must be provided to cater for rarer storm events than what the system has been designed for and to provide for a blockage in the system. All overflows are to be directed away from buildings, adjoining properties and associated **Infrastructure**. The overflow system must be designed to cater with a 100 year **ARI** storm event.

The minimum depth of overland flow must be designed so that it is no higher than 300mm below the lowest floor level of any dwelling impacted by the overflow.

18.5.6 Depth of Retardation Basins

Significant areas of municipalities listed in Selection Table 17 are subject to shallow ground water tables and as a result it is desirable that all excavations are limited to 0.5 metres above the water table.

Selection Table 17 Shallow Groundwater Tables

Municipalities Affected by Shallow Groundwater Tables
Campaspe Shire Council
East Gippsland Shire Council
Gannawarra Shire Council
Glenelg Shire Council
Greater Shepparton City Council
Warrnambool City Council
Wellington Shire Council

Retarding basins may require an impervious lining or other treatment to the approval of **Council** to prevent the ingress of groundwater.

Groundwater may be able to be extracted and used, subject to the relevant authority's requirements.

Any structure that penetrates the groundwater zone such as footings and drainage must be appropriately treated to prevent possible damage caused by contact with ground water.

If the use of the land changes from that of agricultural production then any former grants for subsoil/groundwater pumps may be required to be refunded. Any development that does not retain an irrigation right will be required to finalise any outstanding debts or annual maintenance charges for ground water pumps. The **Council** will not accept any future charges in this regard unless written approval has been obtained

The depth of all other retardation basins for which the public have access will be determined having regard to the safety of persons who may fall into or enter into the basin during times of operation. To allow for this contingency, basins must be designed with inside batters having a maximum slope of 1 in 8. This slope will determine the maximum depth of many retardation basins.

18.5.7 Batter Slopes in Earthen Basins

Where public access is to be provided the desirable maximum batters for retardation basins is 1 in 8 for both cut and fill situations. The absolute maximum batter is 1 in 5 both cut and fill situations. The use of the absolute maximum batter slopes must only be permitted after approval in writing has been obtained from the **Council**. The desirable minimum crossfall for floor is 1 in 400 graded to the outlet point.

The batter slopes for retardation basins which are securely fenced must have regard to the following factors:

- soil type.
- erosion.
- maintenance.
- safety and minimisation of risk.

18.5.8 Access Requirements

All weather access is to be provided to the retarding basin and any associated structures and pumps to enable maintenance to be carried out. The access must be designed so that there is no need to reverse at any time.

To ensure that maintenance of any portion of the basin and its associated works can be safely carried out, a 5m wide reserve is required around the perimeter of any retardation basin, unless the **Council** has given prior written approval for alternative arrangements.

18.5.9 Risk Analysis

A risk assessment report is to be prepared by **Design Engineer** for all drainage structures, including basins and associated structures. The risk assessment should be undertaken in accordance with the principles of *AS/NZS 31000, 2009 Risk Management.*

The **Design Engineer** is responsible for deciding on the action required in response to the risk assessment report and its recommendations, however consultation with **Council** is encouraged if recommendations are complicated, require community involvement, or have significant ongoing maintenance issues.

A copy of the risk assessment report, with recommendations and associated works, must be provided to **Council** with the detailed design documentation.

18.5.10 Fencing and Security

Unless prior written approval has been obtained from the **Council**, retardation basins which are not accessible to the public must be fenced and secured against casual entrance.

Where batters are steeper than those specified in Clause 18.5.2 a full risk assessment must be submitted to the **Council** for consideration.

Where the risk assessment determines that the above ground storage system or retardation basin should be fenced due to public risk, an 1800mm high chainmesh fence must be installed for the entire perimeter. Suitable access via lockable gates must be provided for maintenance purposes.

18.5.11 Landscaping

A fully detailed landscape plan for all retarding basins must be submitted to **Council** for approval.

18.5.12 Maintenance

A heavy duty grate or cover must be provided for each pit that is located in the wheel path of vehicles. In other circumstances, light duty grates and covers may be sufficient.

Access covers and grates are to be designed such as to provide a 'standard' lifting system approved by **Council**.

Any large pipe inlets into the basin must be grated in a satisfactory manner to prevent entry to the stormwater drain. The grates must be designed so that they can easily be maintained and so that they will not cause blockages during storm events.

Pits, pipes and screens that require regular cleaning and maintenance are to be readily accessible with all openings of suitable geometry to allow for cleaning and removal of debris and silt accumulations.

Clause 19 On-site Detention Systems

19.1 Objectives

The objectives of on-site detention systems are as follows:

- The ensure that the capacity of existing drainage **Infrastructure** is not be exceeded as a result of **Developments** which increase the volume and rate of stormwater runoff beyond the capacities for which the **Infrastructure was** originally designed.
- To ensure that the likely cumulative impact of similar **Developments** will not exceed the capacity of the existing drainage system.
- To reduce runoff and peak flows from urban and rural **Developments** into receiving waters
- To minimise development costs of drainage **Infrastructure** by reducing peak outflows.
- To ensure that on-site detention systems can be effectively maintained by landowners and provide a cost effective method of meeting the other objectives of this section.

19.2 General

19.2.1 Types of Developments requiring on-site detention

The following types of development typically require on-site detention:

- Multi-unit development in new residential areas where this has not been incorporated into the design of the drainage system for these areas.
- Multi-unit development in older residential estates where the drainage system at the time of design and construction provided a capacity less than the current standard of 5 year **ARI** recurrence interval, and was typically about a 1 **ARI** year recurrence interval.
- Industrial development where the pipes have been designed for less than the current design recurrence interval of 10 year **ARI**.
- Commercial development where the pipes have been designed for less than the current design recurrence interval of 20 year **ARI.**
- Low density residential development in rural areas.

19.2.2 Methodology

This **Manual** provides a simplified method for **Design Engineers**, builders and owners to estimate the requirements for on-site detention to limit discharges into the existing drainage system to the actual capacity of that system. Note that specific calculations carried out by a **Qualified Engineer** will be required when the peak discharge rates nominated by **Council's Engineering Department** are less than those assumed in the simplified method.

19.3 Requirements

19.3.1 General Requirements

Where on-site detention is required in order to discharge into **Council's** existing drainage system the **Developer** must provide computations to **Council's** satisfaction which show how the permissible rate of discharge and the volume of on-site detention required have been determined and demonstrate that **Council's** existing drainage system will not be adversely impacted by the development.

The permitted discharge from the site must be calculated and based on the design capacity of the receiving pipe and not upon the predevelopment rate.

19.3.2 Design Methodology

The **Design Engineer** may establish on-site detention requirements by the Swinburne Institute of Technology method or by another recognised method approved by **Council's Engineering Department**. Unless the **Design Engineer** can show that other values would be more appropriate, such calculations should be based on the following parameters:

- Recurrence interval for original design event — 1 year
- Recurrence interval for current design event — see Section 16.8 of this Manual
- Coefficients of runoff — see Section 16.7 of this Manual

19.3.3 Design Methodology for Small Developments

The provisions of this clause only apply to small developments and do not apply to multi-lot residential, industrial and commercial developments.

The **Developer** may use Table 13 for determining storage volumes and allowable discharge rates for the various types of small **Developments** within the municipalities provided that the catchment in which the development is located has similar rainfall intensity characteristics to those shown in Table 12.

Table 12 Rainfall Intensities Used To Calculate Storage Volumes and Discharge Rates

RECURRENCE INTERVAL	INTENSITY FOR 21 MINUTE STORM MM/HR
1 Year **ARI**	27
5 Year **ARI**	47.2
10 Year **ARI**	55
20 Year **ARI**	64

Table 13 Storage Volumes and Discharge Rates For Small On-site Detention Systems

TYPE OF DEVELOPMENT	ORIGINAL AND REQUIRED COEFFICIENT OF RUNOFF AND ORIGINAL AND REQUIRED RECURRENCE INTERVAL	STORAGE VOLUME REQUIRED	ALLOWABLE DISCHARGE RATE
Multi-unit development in new areas (e.g. greenfield site or recently developed area)	C=0.5 for a 5 year **ARI** to C=0.8 for a 5 year **ARI**	5 litres of storage for every square metre of lot area	65 lit/sec/ha
Multi-unit development in older residential areas (infill)	Assumed original : C=0.5 for a 1 year **ARI** to Required : C=0.8 for a 5 year **ARI**	9 litres of storage for every square metre of lot area	37 lit/sec/ha
Industrial development *	C=0.5 for a 1 year **ARI** to C=0.9 for 10 year **ARI**	13 litres of storage for every square metre of lot area	30 lit/sec/ha
Industrial development*	C=0.9 for a 1 year **ARI** to C=0.9 for 10 year **ARI**	9 litres of storage for every square metre of lot area	64 lit/sec/ha
Commercial development	C=0.9 for a 1 year **ARI** to C=0.9 a 20 year **ARI**	11 litres of storage for every square metre of lot area	64 lit/sec/ha

The figures contained in the Table 13 have been calculated using a simplified rational method. The permissible site discharge rate from the on-site detention system is based upon on a time of concentration of 21 minutes (for the whole catchment of the existing underground drain) for the original recurrence interval used in designing the drainage network that receives the outflow from the on-site detention system.

For catchments with different rainfall intensity characteristics than shown in Table 12 the allowable discharge rate can be calculated by multiplying the appropriate allowable discharge rate in Table 13 by the relevant I_{21} for the catchment divided by the relevant I_{21} from Table 12.

An average concentration time of 21 minutes is considered reasonable for most mid-catchment locations within an urban setting. However, when the development location so requires, or when the existing drainage infrastructure is known to be unable to accept the peak discharge flows predicted by Table 13, **Council's Engineering Department** may require that the **Design Engineer** carry out specific calculations to establish the appropriate storage volume for any **Development**.

Council's Engineering Department may waive the requirement for on-site detention where it can be shown that there are no adverse impacts resulting from the increased rate and volume of stormwater from the development e.g. adequate overland flow paths ensure that the level of service adopted by the **Council** is not compromised.

19.3.4 Specific Design Requirements

No part of the pipe system within a detention system, which conveys water must be less than 90 mm in diameter unless it is part of an approved manufactured system or it is part of the restriction to achieve to design flow rate e.g. orifice plates or pipes discharging from a above ground tank.

A suitable overflow system must be provided to cater for rarer storm events than what the system has been designed for, up to and including a 100 year **ARI** event and to provide for a blockage in the system. All overflows are to be directed away from buildings, adjoining properties and associated **Infrastructure**. The overflow system must be designed so that the maximum depth of overland flow is no higher than 300mm below the lowest floor level of any dwelling impacted by the overflow.

Time of Concentration

The time of concentration for the whole catchment and from the top end of the catchment downstream to the site is to be advised to **Council** in each case.

The following minimum information is to be supplied to **Council** for approval:

- Plan showing invert levels of all pipes 100mm or over.
- Plan showing the designed finished surface level of all driveways, carparking areas, landscaping areas and lawns.
- Plan showing floor levels of all buildings whether existing or proposed. Note all floor levels must be at least 300 mm above the top water level of the detention device when it is full to its design capacity.
- Cross section of the detention device.
- Existing surface levels at intervals not exceeding 10 metres. Note this is also required for adjoining properties.
- Plan showing location of detention device, position of all pipes and pits, pervious and impervious areas, buildings, driveways etc.
- Driveways, where these are used for on-site detention, must be bounded by kerbs of not less than 100 mm in width, and must be cast integrally with the main slab unless otherwise approved.
- One copy of drainage computations.
- One copy of structural computations where underground storage tanks are to be used for stormwater detention.
- Three copies of final engineering plans for final approval.

Approved Types of On-Site Detention Systems

There are various systems that have been approved for use as follows:

- Above-ground water storage tanks.
- Driveways bounded by kerbs of not less than 100 mm in width, cast integrally with the main slab unless otherwise approved, and discharging through a multi-cell unit or orifice plate which restricts the flow as required.
- Underground tanks of various configurations discharging by gravity through an orifice plate or multi-cell unit.

- Underground tanks with pumped outfalls.
- Lined, in-ground storage basins with pumped outfalls.
- Excavated earthen dams with gravity outfalls (in low density residential **Developments)**.

19.3.4.1 Maintenance of On-Site Detention Systems

For on-site detention systems to remain effective it is important that **Council** can inspect these systems to ensure that the landowner is properly maintaining their system in accordance with **Council** requirements.

Council may therefore require, a Section 173 agreement requiring the landowner to regularly maintain their on-site detention systems and requiring them to pay **Council** an annual inspection fee as set by **Council** from time to time. **Council** will arrange for preparation and registration of the Section 173 Agreements, at the cost of the **Developer**.

Clause 20 Stormwater Treatment

20.1 Objectives

- To ensure that all stormwater discharged to natural watercourses and other drainage authority's drains meet the requirements of the *Environment Protection Act 1970* and the water quality performance objectives for individual drainage catchments as provided in the State Environment Protection Policies (SEPP's).
- To implement the design requirements of the **Council's** Stormwater Management Plan.
- To ensure all designs incorporate consistent best practice **WSUD** measures and principles.
- To ensure treatment methods and associated structures are cost effective from a maintenance and operational perspective and that the risk to the public is minimised as far as practicable.
- Protect and enhance natural water systems within urban environments.
- Integrate stormwater treatment into the landscape, maximizing the visual and recreational amenity of **Developments**.
- Improve the quality of water draining from urban **Developments** into receiving environments.

20.2 General

All **Developers** must make provision for the improvement of water quality leaving the development site wherever possible treatment should be achieved by works located close to the nominated point of discharge for the **Development**. These works must be maintained, to the satisfaction of the **Council**, by the **Developer** until the end of the maintenance period.

All urban **Developments** should meet the requirements of the *"Urban Stormwater Best Practice Environmental Management Guidelines 1999'*, the *Water Sensitive Urban Design Engineering Procedures 2005* and the *'Water Sensitive Urban Design Guidelines January 2009'* prepared for various Victorian municipalities and Melbourne Water.

The following stormwater treatment methods may be considered, subject to **Council** approval, to enable compliance with the codes and guidelines.

- Bioretention swales.
- Bioretention basins.
- Vegetated swales.
- Underground sand filters.
- Sedimentation basins.
- Constructed wetlands.
- Pond system with edge vegetation.
- Water tanks.

- Gross pollutant traps.
- Litter traps.

Further to this **Council** may require setting aside areas of land and construction of works within a subdivision and/or development application for the specific purpose of stormwater treatment to ensure appropriate discharge water quality.

An appropriately qualified and experienced Environmental Specialist may need to be engaged by the **Developer** or the **Developer's Representative** to determine the requirements for the project.

20.3 Requirements

20.3.1 General Requirements

The following are general requirements for the provision of stormwater treatment:

- **Developments** should comply with principles and recommendations of *Water Sensitive Urban Design Guidelines 2009, Urban Stormwater – Best Practice Environmental Management Guidelines* and **Council's** Stormwater Management Plans to achieve the following water quality standards:
  - 80% retention of the typical urban annual load for Total Suspended Solids (TSS).
  - 45% retention of the typical urban annual load for Total Phosphorus (TP).
  - 45% retention of the typical urban annual load for Total Nitrogen (TN).
  - 70% retention of the typical urban annual load for gross pollutants (litter).
- Discharges for an average 1.5 year ARI are to be maintained at pre-development levels for stormwater treatments.
- Treatment types are determined by the **Developer**, subject to approval by **Council's Engineering Department** and must satisfy **Council** standards for (1) maintenance (2) ongoing costs and (3) stormwater quality standards achieved.
- **Developers** of industrial estates will be required to contribute to treatment off site if **Council** has whole of catchment treatment. **Developers** may also need pre-treatment within the proposed development in accordance with the requirements of **Council's** Stormwater Management Plan. Where whole of catchment treatment is not available **Developers** will be required to provide separate treatment for the development.
- Staging and construction of **Developments** is to be considered. Only construct treatments when there are sufficient houses built to generate sufficient runoff to keep plants alive. **Council** to bond the value of the plantings in preference to have planting at inappropriate time.
- No manual handling is to be involved for the cleaning and maintenance of structures and equipment associated with the treatment of stormwater. Routine maintenance must be carried out without need for access of confined spaces.
- **Developers** must undertake a risk assessment for all treatment sites. The assessment must include fencing, grates across drains, wetlands, retarding basins, pumping stations, and other associated structures.
- Operational documentation and manuals to be provided prior to the commencement of Defects Liability Period.

20.3.2 Gross Pollutant Traps

The design requirements for gross pollutant traps are as follows:

- For sizing gross pollutant trap (GPT) units the following design flows, depending upon the degree of hydraulic effectiveness required, are used:
  - Q (3 months) = 0.2 x Q5 year design flow typically has a hydraulic effectiveness of greater than 97%
  - Q (6 months) = 0.33 x Q5 year design flow typically has a hydraulic effectiveness of greater than 98.5%
  - Q (1 year) = 0.5 x Q5 year design flow typically has a hydraulic effectiveness of greater than 99%
- Selecting a design flow rate is a trade-off between the cost and space requirements of the device (a higher design flow will usually require a larger facility with additional costs) and the volume of water that could potentially bypass the measure and avoid treatment. GPTs will generally be designed to treat a minimum design flow of a 3 month **ARI**, the **Developer** will provide all weather access to all treatment sites to the satisfaction of **Council** and should allow for crane access to GPT's. Access must not require maintenance vehicles to reverse in new **Developments** or public areas.
- Discharge water quality standards must meet the requirements of the relevant drainage authority.
- For design purposes the cleaning frequency of GPT's is six (6) months.

20.3.3 Bioretention Swales

Bioretention Swales are not approved for use in any municipality unless a municipality has issued written approval for their use in that municipality.

Bioretention design requirements are as follows:

- Typically bioretention swales are best suited to slopes of 1 to 4% or where velocities during major storm events do not exceed 2m/s. Where excessive grades are identified as a constraint, check dams may be required to reduce velocities.
- Water ponding at entry points to the swale should not occur for longer than 1 hour after the cessation of rainfall prescribed in Clause 56.07-4 of the VPP.
- For maintenance requirements, grass swales requiring mowing must not have side slopes exceeding 1 in 4.
- Should be in accordance with the guidelines set out in Chapter 5 (Clause 5.3) of the *Water Sensitive Urban Design Engineering Procedures: Stormwater Manual (Melbourne Water, 2005).*

20.3.4 Bioretention Basins and Rain Gardens

The design requirements for bioretention basins and rain gardens are as follows:

- Water ponding at entry points to the swale should not occur for longer than 1 hour after the cessation of rainfall prescribed in Clause 56.07-4 of the VPP.
- Should be in accordance with the guidelines set out in Chapter 6 (Clause 6.3) of the *Water Sensitive Urban Design Engineering Procedures: Stormwater Manual (Melbourne Water, 2005).*
- The use of bioretention basins and rain gardens is as per Selection Table 18:

Selection Table 18 Bioretention Basins and Rain Gardens

Permitted in Private Property and Drainage Reserves	Permitted in Nature Strips	Permitted Except in Unsuitable Locations for Access, Permanent Subsurface Flow Conditions, Etc.	Not Permitted Under Any Circumstances
Ararat Rural City Council	Murrundindi Shire Council	Ballarat City Council	Pyrenees Shire Council
Baw Baw Shire Council	Wodonga City Council	Baw Baw Shire Council	
Benalla Rural City Council		City of Greater Bendigo	
Buloke Shire Council		Corangamite Shire Council	
Campaspe Shire Council		Glenelg Shire Council	
Mansfield Shire Council		Golden Plains Shire Council	
Moira Shire Council		Indigo Shire Council	
Mount Alexander Shire Council	Mount Alexander Shire Council	Macedon Ranges Shire Council	
Rural City Of Wangaratta		Mitchell Shire Council	
Strathbogie Shire Council		Moorabool Shire Council	
Towong Shire Council		South Gippsland Shire Council	
Wodonga City Council		Southern Grampians Shire Council	
		Swan Hill Rural City Council	
		Warrnambool City Council	
		Wellington Shire Council	
		Yarriambiack Shire Council	

20.3.5 Vegetated Swales/Grass Swales/Buffer Strips

The design requirements for vegetated swales/buffer strips are as follows:

- The longitudinal slope of a swale is the most important consideration. Swales are most efficient with slopes of 1% to 4%. Lower than this, swales become waterlogged and/or have stagnant pooling, while steeper slopes may have high velocities (with potential erosion and vegetation damage risks). Check banks (small porous walls) may be constructed to distribute flows evenly across the swale if they are identified as the most suitable treatment option in such areas.

- Swale side slopes are typically 1 in 9. For maintenance, grassed swales requiring mowing must not have side slopes exceeding 1 in 4.

- Should be in accordance with the guidelines set out in Chapter 8 (Clause 8.3) of the *Water Sensitive Urban Design Engineering Procedures: Stormwater Manual (Melbourne Water, 2005)*.

- Approved for use in open space reserves within a residential one zone, central median strips on roads subject to road reserve width and services unless otherwise stated in Selection Table 19.

- Other locations may be permitted as per Selection Table 19.

Selection Table 19 Vegetated Swales / Grass Swales / Buffer Strips

PERMITTED ON NARROW NATURE STRIPS ONLY AS PART OF AN OVERALL DESIGN STRATEGY INCORPORATING CONCRETE EDGE STRIPS, ENTRANCE CULVERTS AND SUPPORTING TREATMENTS.	NOT PERMITTED UNDER ANY CIRCUMSTANCES
Ararat Rural City Council	City of Greater Bendigo
Ballarat City Council	Mitchell Shire Council
Baw Baw Shire Council	Moorabool Shire Council
Benalla Rural City Council	
Colac Otway Shire Council	
Corangamite Shire Council	
Greater Bendigo City Council	
Macedon Ranges Shire Council	
Pyrenees Shire Council	
Rural City of Wangaratta	
Strathbogie Shire Council	
Towong Shire Council	
Wellington Shire Council	
Wodonga City Council	
Yarriambiack Shire Council	

20.3.6 Sand Filters

The design requirements for sand filters are as follows:

- Should be in accordance with the guidelines set out in Chapter 7 (Clause 7.3) of the *Water Sensitive Urban Design Engineering Procedures: Stormwater Manual (Melbourne Water, 2005).*

20.3.7 Sedimentation Basins

The design requirements for sedimentation basins are as follows:

- The design operation discharge for the basin should be a minimum of 1 year **ARI** peak discharge.

- A bypass structure should provide for flow bypass of downstream macrophyte zones and wetlands for events up to 100 year **ARI** event.
- The sedimentation basin is to be designed to remove 95% of the particles less than 125 µm in a 1 year **ARI** storm event.
- Approach batter slopes should be no steeper than 1:5 vertical to Horizontal (V:H). All edges should have safety benches of at least 1.5m to 3.0m wide from the edge of the normal top water level.
- Safety benches should have a maximum grade of 1:8(V:H) for the first 1.5m – 3.0m before changing to 1:5 (V:H) grade for at least the next 0.5m. Beyond this the grade may be to a maximum of 1:3 (V:H).
- An independent safety audit must be conducted for each design.
- The hard stand should be at least 3m wide and be designed to be capable of supporting a 20 tonne excavation plant. Multiple areas should be considered where the pond is greater than 7m wide. Adequate space for dewatering must be provided. Access ramps and tracks into pond cells and to all hardstand areas are required and must be capable of supporting a 20 tonne excavation plant for maintenance.
- Where sedimentation basins double as a landscape element, a weir is recommended as an appropriate discharge control structure.
- Install a rock layer in base above clay liner to indicate the limit of sediment (this reduces the risk of damage to the clay liner during future maintenance activities).
- For sedimentation basins less than 14m wide, access is to be provided along both edges for maintenance vehicles.
- For sedimentation basins greater than 14 m wide, drawdown of the basin is required with vehicular access available in the base of the facility.
- Should be in accordance with the guidelines set out in Chapter 4 (Clause 4.3) of the *Water Sensitive Urban Design Engineering Procedures: Stormwater Manual (Melbourne Water, 2005).*
- Not approved on steep land or as a permanent treatment where there is no maintenance regime in place to ensure regular removal of silt, debris etc.

20.3.8 Constructed Wetlands

The design requirements for constructed wetlands are as follows:

- The constructed wetland should treat at least 90% of Mean Annual Runoff (MAR) through the use of a stored event volume above the normal standing water level of the wetland.
- A high flow bypass should capable of taking flows in excess of design flows (typically a 1 year **ARI** event).
- The wetland design must meet safety requirements and implement reasonable safety measures. This includes fencing, safety barriers, signage and benching.
- An independent safety audit must be conducted for each design.
- Approach batter slopes should be no steeper than 1:5 vertical to Horizontal (V:H). All edges should have safety benches of at least 1.5m to 3.0m wide from the edge of the normal top water level.

- Safety benches should have a maximum grade of 1:8(V:H) for the first 1.5m – 3.0m before changing to 1:5 (V:H) grade for at least the next 0.5m. Beyond this the grade may be to a maximum of 1:3 (V:H).

- Hard stand areas should be provided adjacent to the inlet zone to allow for the maintenance and clean out of this zone.

- The riser outlet pipe should be sized to act as an emergency overflow equivalent to the one year **ARI** peak discharge.

- A minimum of a 0.3m freeboard on the embankment is required.

- Where possible wetlands should be constructed in the base of retardation basins to reduce the land requirement.

- When considering macrophyte layout it is important to optimise hydraulic efficiency (i.e. reduce dead zones and short circuiting of water). The optimal hydraulic efficiency value for constructed wetlands should be not less than 0.5 or greater than 0.7 where possible. Refer to Section 9.3.3 and figure 9.6 in the *Water Sensitive Urban Design Engineering Procedures: Stormwater Manual (Melbourne Water, 2005).*

- The wetland should be divided into four macrophyte zones, an open water zone and a littoral zone. The percentage allocation of each zone is outlined in table 9.2, Section 9.6.3 of the *Water Sensitive Urban Design Engineering Procedures: Stormwater Manual (Melbourne Water, 2005)* and should be followed.

- Suitable plant species options are listed in the addendum of the *Water Sensitive Urban Design Engineering Procedures: Stormwater Manual (Melbourne Water, 2005)*.

- A geotechnical investigation is required prior to design to determine soil profiles and infiltration rates. Hydrogeological investigations may also be required in areas where there is a likelihood of groundwater discharge or high seasonable water tables.

- Should be in accordance with the guidelines set out in Chapter 9 (Section 9.3) of the *Water Sensitive Urban Design Engineering Procedures: Stormwater Manual (Melbourne Water, 2005).*

- Not approved on steep land.

20.3.9 Ponds and Shallow Lake Systems

The design requirements for ponds and shallow lake systems are as follows:

- When considering macrophyte layout it is important to optimise hydraulic efficiency (i.e. reduce dead zones and short circuiting of water). The optimal hydraulic efficiency value for constructed wetlands should be not less than 0.5 or greater than 0.7 where possible. Refer to Section 9.3.3 and figure 9.6 in the *Water Sensitive Urban Design Engineering Procedures: Stormwater Manual (Melbourne Water, 2005).*

- Gentle slopes, safety benching, handrails and vegetation planting are methods that may be employed to account for public safety.

- An independent safety audit must be conducted for each design.

- Should be in accordance with the guidelines set out in Chapter 10 (Section 10.3) of the *Water Sensitive Urban Design Engineering Procedures: Stormwater Manual (Melbourne Water, 2005).*

- Not approved on steep land.

20.3.10 Rainwater Tanks

The design requirements for rainwater tanks are as follows:

- Continual water balance assessments using **MUSIC** should be performed to determine how much runoff rain tanks are removing from the catchment in terms of runoff volumes and associated pollutant loads.
- Rainwater tanks should be sized using the appropriate reference curves for the region (refer to Section 12.4.2 of the *Water Sensitive Urban Design Engineering Procedures: Stormwater Manual (Melbourne Water, 2005).*
- Should be in accordance with the guidelines set out in Chapter 12 (Section 12.2 and 12.4) of the *Water Sensitive Urban Design Engineering Procedures: Stormwater Manual (Melbourne Water, 2005).*

Clause 21 Stormwater Discharge Points

21.1 Objectives

Stormwater discharge points will be set by **Council** for all **Developments** including subdivisions, industrial, commercial and residential **Developments**.

Stormwater and legal points of discharge will be determined by **Councils** having regard to the following objectives:

- To avoid the capacity of existing drainage **Infrastructure** being exceeded as a result of **Developments** which increase the volume and rate of stormwater runoff beyond the levels for which the **Infrastructure** was originally designed for.
- To limit the percentage increase of the stormwater flow being generated by the development when compared to the whole catchment.
- To ensure that the likely cumulative impact of similar **Developments** will not adversely impact on the capacity of the existing drainage system.
- To provide on-site detention in order to protect the existing drainage system capacity for the uses and areas for which it was originally designed.
- To achieve the best balance between cost and effectiveness of draining to each of the drainage systems capable of accepting stormwater flow from the development.
- To ensure that any new drain required to be constructed to be constructed has been assessed from the perspective of serving future **Developments** and avoiding duplications. Equitable cost sharing arrangements must be determined on a case-by-case basis should drain sizes be increased to service other properties in the future. To ensure that stormwater is effectively treated, and that neither the resultant discharge nor the treatment processes themselves have an adverse impact on the environment and surrounding properties.

The low point of every lot, including reserves and balance lots shall be drained to the drainage connection point nominated by the relevant Council, and typically located either in the adjoining street drainage or in a drainage easement.

21.2 General

Since drainage systems have been designed to different design standards and **Developments** have taken place that have increased the volume and rate of stormwater runoff beyond the levels for which the existing drainage networks were designed, the impact of new **Developments** on the existing drainage systems must be assessed prior to allowing them to discharge directly into these networks.

An important objective for Council will be to ensure that more frequent flooding does not occur and that existing drainage problems are not increased as a result of new **Developments**.

Council may need to determine the impact of new **Developments** on existing drainage systems prior to determining the legal point of discharge. The impact will need to be assessed from both a volumetric and rate of flow perspectives.

Where the impact is likely to cause increased flooding frequency or flooding extent then **Council** will determine what works are necessary for a particular point in a drainage system to be the nominated point of discharge.

21.3 Requirements

Applications for nomination of point of discharge for dwellings should include the following information:

- Plan showing the proposed development including the pervious and impervious areas.
- Existing and proposed surface levels at an interval not exceeding 10 metres.
- Location and size of existing drains and easements within and adjacent to the site.

Applications for nomination of point of discharge for other **Developments** should include the following information:

- Plan showing the proposed development including the pervious and impervious areas.
- Existing and proposed surface levels at an interval not exceeding 10 metres.
- Description of the proposed development.
- Locality plan showing the development location and catchment boundaries.
- Location and size of existing drains and easements and reserves within and adjacent to the development.
- Drainage rights and/or easements must be obtained by the **Construction Engineer** from all downstream owners who may be affected by the discharge of stormwater wherever the point of discharge is not to either a Council-owned drain or watercourse.

Where **Council** determines that the development is likely to adversely impact the existing drainage system **Council** may require the **Developer** to provide further information including computations to determine the works that are necessary to minimise the impact of the development on the existing drainage system. These may include providing on-site detention designed in accordance with the provisions of Clause 19 of **this Manual.**

Clause 22 Environment Management During Construction

22.1 Objectives

The general objectives of environment management are to ensure that:

- All waste generated will be removed from the development and disposed of in accordance with the relevant Australian Standards, Acts, Regulations, Guidelines and Codes of Practice in such a way as to avoid nuisance, pollution or loss of amenity to the surrounding area. Waste materials should not be disposed by burning unless approved by the **Council**.
- Construction sites are managed in a way to minimise the impact of construction works on the environment.
- The relevant provisions of **Council's** Stormwater Management Plan are complied with in during construction.
- Existing vegetation which is not to be removed is adequately protected during construction.
- Stormwater discharged from the development during construction does not contaminate or degrade the quality of the receiving waters.
- The impact of crushed rock or debris being carried onto public roads or footpaths, from the development and to ensure no mud is removed from the site.
- Declared noxious weeds (or parts of), are not transported either to or from the worksite, either on vehicles or machinery or within soil or materials.
- Motorists are not put at risk as a result of dust reducing visibility when construction works are carried out on roadways and streets that are open to the traffic.
- Landowners and residents within the vicinity of construction approved by **Council** are not adversely impacted in accordance with the requirements of any regulation or guideline or Code of Practice of the Environment Protection Authority.

22.2 General

The **Construction Engineer** and Contractors engaged by the **Developer** must ensure that during the construction of works all appropriate steps are taken to minimise any detrimental impact on the environment.

All earthworks must be undertaken in accordance with the provisions of Australian Standard *AS3798, 2007 'Guidelines on Earthworks for Commercial and Residential Developments'.*

22.3 Erosion Control and Sediment Discharge

Dust mud and debris must be prevented from leaving any development site during and after construction.

Consideration should be given to recommendations within Austroads "*Road Design Guidelines - Part 5 – General and Hydrology Considerations"* and any VicRoads Supplement to those guidelines Drainage and EPA Publication 960 *'Do it Right on Site'*, Chapter 4 Erosion and Sediment.

During construction erosion control and sediment discharge controls may include the following:

- Cut-off drains are to be installed to intercept surface water before it reaches the areas of disturbed earth.

- Approved silt control measures must be installed prior to the entrance of all drains to ensure that all silt is retained within the site. Typical measures may include one or more of the following:
    - Settlement ponds.
    - Fence filters.
    - Gravel sausages made from a geo-textile sleeve for placement at kerbside drainage pits.
    - Straw bales on open, cut-off or diversions drains.
    - Temporary sumps in selected and approved drainage pits.
    - Landscaping or the promotion of vegetation downstream of the works but still within the site.

Subdivision access points are to be kept to a minimum to minimize the number of areas required for stabilization, vehicle cleaning and areas of road to be targeted for cleaning in the event that mud is tracked onto the road.

Soil movement at subdivision access and exit points to be controlled using a rumble grid or by requiring vehicles to travel the length of a stabilised access track.

All machinery should be prevented from accessing non-essential parts of the site.

Batter slopes should be kept at a grade of not more than 2:1 as per EPA Publication 960 and finished as soon as possible with a minimum thickness of 75mm of weed-free topsoil topped with either weed mat, mulch or hydro-mulched to establish vegetation such as suitable grass species to ensure that erosion is minimised.

All subdivision public land boundaries are to be suitably protected and maintained with adequate sediment control measures (i.e. sediment fence) as soon as is practical upon completion of works.

22.4 Dust During Construction

The **Developer** must ensure that dust suppression is undertaken in the form of constant water spraying or other natural based proprietary dust suppressant to ensure that dust caused by vehicles moving along roads to the development and within the development does not cause a nuisance to surrounding properties to the satisfaction of the **Council**.

22.5 Pollution

The Environmental Management Plans must address all possible sources of pollution and methods of control.

22.6 Noise

The **Developer** must ensure that all noise emitted from the site is within the specified limits, set by the EPA for the relevant activity, at all times. This includes the construction as well the operational phase of any development.

The current EPA policies and guidelines applicable are as follows:

- *SEPP (Control of Noise from Commerce, Industry and Trade) No N-1*.
- *Noise Control Guidelines TG 302/92*.

The maximum noise generated during the operational phase of the development must comply with the following:

- Day time – 45 dB(A).

- Evening – 37 dB(A).
- Night – 32dB(A).

If the **Council** receives a complaint from the public relating to noise generated from the site the **Developer** must undertake the appropriate noise testing to justify continued operation.

Depending on the nature of the development and the location of the site, the **Developer** may be required to install noise attenuation buffers/barriers and/or buffer zone.

22.7 Weed Importation and Transportation

The **Developer** must ensure that earthworks activities do not deposit noxious weeds or seeds of noxious weeds onto land. Ideally, no fill should be imported onto any development site. Areas that are to involve earthworks must have the topsoil stripped and stockpiled for reuse. Where insufficient material can be won from the site, material must be imported from a reputable supplier or from a site that is known to be free of weeds.

The key legislation relating to weed spread in Victoria is the *Catchment and Land Protection Act 1994*. Many of the provisions relating to weed spread are found in Section 70A and 71 of that Act. Among the provisions, this Act provides offences relating to precautions that must be taken when moving soil, sand, gravel or stone which may be infested with noxious weeds. Accordingly appropriate measures in accordance with the requirements of the approved construction plan (refer to Clause 7.2) must be undertaken to ensure that weed species are not transported on earthworks equipment or in soil or material leaving or entering the worksite.

22.8 Incident Reporting

The **Developer**, **Contractor** and **Construction Engineer** are individually and severally responsible for informing the Council and or the EPA of any incidents relating to environmental management, as soon as practicable after the incident.

Clause 23 Whole Farm Plans

23.1 Objectives

The objectives of **Council's** engineering assessment of whole farm plans (WFP's) are follows:

- That **Council Infrastructure** is not adversely impacted by the implementation of the whole farm plan.
- That property accesses are provided at appropriate locations and to the correct standard.

It should be noted that **Council's Planning Departments** have much broader objectives for whole farm plans to ensure that the certification of WFP's are appropriate. This will include referral to other authorities whose requirements are included in the application form.

23.2 Requirements

The requirements for Whole Farms Plans are as follows:

- The application for Certification of a Whole Farm Plan is complete. Multiple accesses to roads, and road crossings, have been minimised; and
- All accesses and crossings comply with section 12.9.2 of this **Manual**.

Clause 24 Landscaping and Road Furniture

24.1 Objectives

The general objectives for landscaping requirements are as follows:

- All landscaping must be suitable for the proposed use of the land on which it is located.
- The development of quality landscapes be encouraged.
- The landscaping be able to be effectively and economically maintained.
- The landscaping be compatible with the character of the area and with any structure plans, **ODP**s and urban design guidelines.
- The standard of **Infrastructure** to be provided for landscape works to be clearly specified.
- The risk to the public from any landscaping on public lands or lands maintained by **Council** be minimised.
- All landscaping complies with the requirements of Disability and Discrimination legislation.
- Open space be provided which will encourage usage by providing a relaxing, aesthetically enjoyable environment.
- All landscaping incorporates best practice design and environmental principles.
- A selection of plant species be identified for planting in landscapes having regard to indigenous species where practical.

24.2 General

Landscaping plans must be prepared and submitted to **Council** for approval for any of the following **Developments**:

- Land vested in **Council** e.g. road reserve, Public Open Space, drainage reserves.
- All multi-unit **Developments**.
- Commercial **Developments** incorporating a Carpark.
- Industrial **Developments**.
- Other types of development as per the requirements of any planning permit issued for that development.
- **ODP**s for an area. (Concept plans only).

Landscaping works must not commence until the landscaping plans submitted have been approved in writing by **Council**. Design, construction and maintenance issues must be documented prior to approval. The time for approving plans is as per the requirements of the *Subdivision Act*.

The definitions for local, large and district parks are found in section 56.05-2 of The Planning Scheme.

Playgrounds must be provided in Public Open Space as per the requirements of The Planning Scheme and in accordance with **Council's** playground strategy. Contact should be made with **Councils** to determine their requirements in relation to this section. Indicative sizes of the various types of parks are given in Clause 56 of the Planning Scheme.

All landscaping areas including playgrounds must be designed to comply with the requirements of Disability and Discrimination Legislation.

Guidelines to inform the design and provision of Public Open Space in residential areas include:

- Large shade trees or planting for future provision of shade trees.
- Seat/s.
- Litter bin/s.
- No linear open space reserves provided to carry a path should be less than 10m wide, and where practical locate paths along routes where clear sightlines are possible to assist navigation, to enhance security, and to provide visibility of potential hazards (i.e. people and cars).
- Dense shrubbery along linear paths must be avoided and plantings set well back from path edge.
- Linear paths should primarily be provided to add to and or link to strategic paths that connect residential areas with community facilities, shopping and commercial areas, other residential areas and or other key destinations or attractions.

All landscaped areas are to be graded to ensure appropriate drainage and the design should incorporate possible retention for irrigation purposes.

In determining whether approval is to be granted, **Council** will have regard to the estimated ongoing maintenance costs to be incurred by **Council** resulting from the proposed landscape development and whether the proposed level of service is sustainable in the long term.

To assist **Council** in determining the maintenance costs the **Developer** must provide **Council** with the level of service to be provided including details, where applicable, of:

- Irrigation details – manufacturer details, model numbers, degree of automation etc.
- Recommended watering frequencies.
- Recommended mowing frequencies.
- Types of grasses to be sowed.
- Recommended maintenance of rain gardens.
- Type of furniture.
- Lighting details.
- Playground equipment details.

An independent playground audit certification is to be provided before **Council** will issue a Statement of Compliance.

All playground equipment is to be maintained by the **Developer** to the end of the maintenance period.

All landscaped areas are to be graded to ensure appropriate drainage and the design should incorporate possible retention for irrigation purposes, considering public risk.

At practical completion the Developer will provide an asset list identifying the nature, quantities, dimensions and other parameters relevant to each asset and the costs of constructing those assets.

24.3 Requirements

24.3.1 Information to be Provided

Appendix D: Information to be Shown on Plans specifies the requirements of the landscaping information to be shown on the plans to be submitted to **Council** for approval.

24.3.2 Respect for Surrounding Environment

A design and development that respects the individual site, the local context and the regional characteristics is encouraged. This includes, but is not limited to, to the following:

- The retention of existing high quality vegetation (trees, understorey and grasses).
- Removal and/or control of weed species such as Willows (*Salix sp*) and identified native weeds close to water ways.
- The use of indigenous plants in close proximity (i.e. 20m or other distance as determined on a case by case basis) to a Nature or Bushland Reserve including National Park, Regional Park and State Forest.
- The use of locally indigenous species close to waterways and streams.
- The preservation and integration of heritage elements with a landscape design.

The respect for the location and the enhancement of our natural environment will help to develop fauna and flora habitat through the Municipality.

24.3.3 Environmentally Sustainable Landscape Design

Council is committed to an environmentally sustainable municipality. It encourages innovative landscape solutions to conserve water and energy and reduce waste in all private gardens. Measures for energy conservation in private gardens include:

- Use of materials produced from renewable resources.
- Use of recycled materials.
- Use of plants and planting patterns that contribute to the solar efficiency of the building.
- Use of mulch to improve water efficiency and reduce weed competition.
- Use of 'best practice' in water sensitive design.

24.3.4 Protection of Existing Vegetation

Healthy, pre-existing vegetation can be a significant asset. Healthy native vegetation can be home to a host of native fauna, especially if large trees include natural hollows etc. The **Council** encourages the retention of significant

vegetation on site and advises that under native vegetation legislation the removal of native vegetation is to be avoided and if this cannot be achieved, minimized. The removal of both native and non-native trees may require a planning permit and must comply with any requirements of the relevant planning scheme.

The following points are **Council's** requirements for protecting vegetation on development sites.

24.3.4.1 Trees

The drip line of a tree canopy delineates the zone from which all works including storage and parking must be excluded. All trees determined by **Council** to be protected must be fenced off at the canopy drip line with substantial exclusion zone fencing for (at least) the duration of construction (see Figure 1) and perhaps longer.

Note that the Department of the Environment and Primary Industry may have different requirements and where their requirements are greater than the **Council's,** DEPI requirements must be adopted.

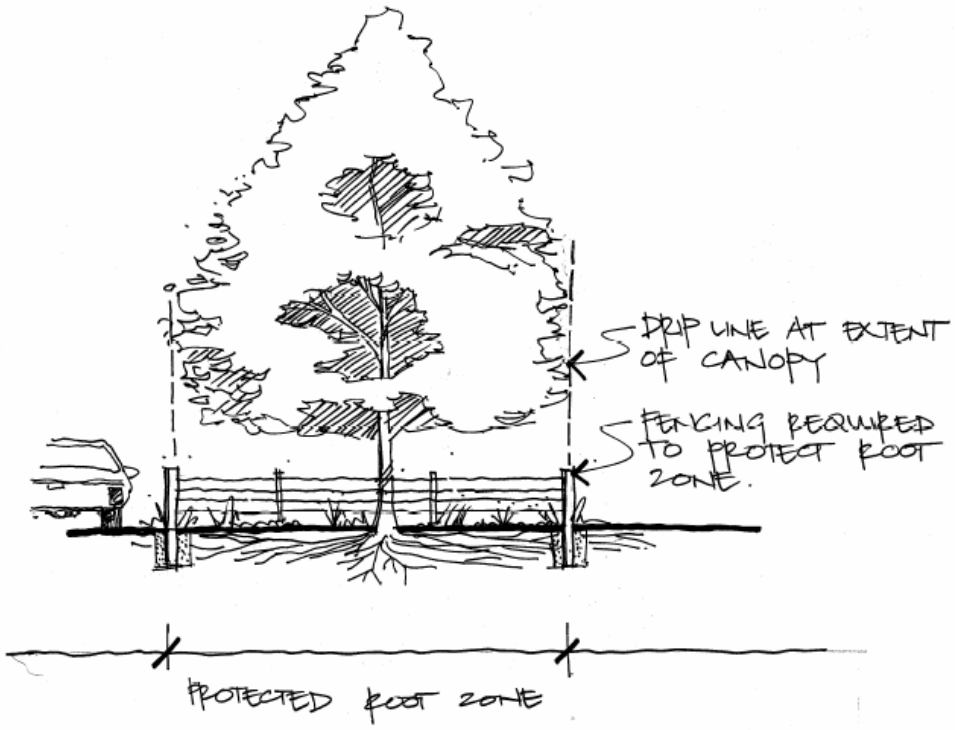

Figure 1 - Existing Tree and Other Vegetation Protection

24.3.4.2 Shrubs and Groundcover Plants

An established layer of shrubs and groundcovers in undisturbed soil provides the benefits of resisting weed invasion, preserving habitat values and broader landscape aesthetic values.

Vegetation of this nature deemed by the **Council** to be protected is to be fenced during construction. (See Figure 1).

As a minimum, fencing of vegetation to be retained must encompass the area designated on the approved plans and must consist of at least:

- Treated pine strainer posts.

- Star picket intermediate posts.
- Four strands of 12-gauge fencing wire.

The overall design and planning of the site should ensure all spaces are useable, adequately proportioned and maximize planting opportunities.

The **Developer** must**:**

- Ensure type and size of planting, especially trees, is appropriate to the space available.
- Use small trees and shrubs to effectively screen service areas and block unwanted views Use Small trees and shrubs to reduce the visual impact of traffic along driveways and adjoining streets.
- Ensure that the location and mature size of plantings do not conflict with structures and services.
- Locate lawn areas only where they provide functional or visual benefit.

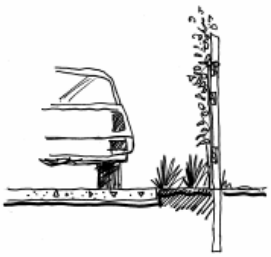

Fig 2 - Small spaces: small shrubs & climbers

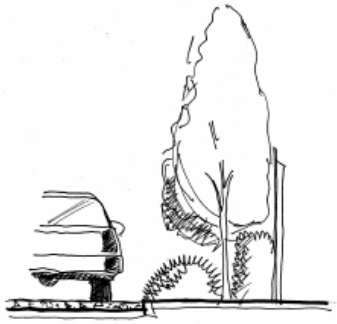

Fig 3 - Medium spaces: small trees, medium-small shrubs

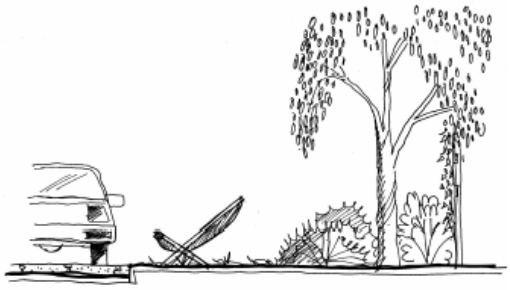

Fig 4 - Large spaces: trees, shrubs, ground covers, grasses

Where trees are planted in car parks the minimum distance around the tree to be without pavement or seal is defined by the drip of the mature tree to be planted unless otherwise approved by **Council**.

24.3.5 Plant Selection

Tree selection should be in accordance with **Council's** Street Tree Policy or equivalent unless otherwise approved by **Council**.

When selecting trees and tall shrubs it is essential that the mature height and trunk diameter is appropriate for the location. Care should be taken to avoid potential damage to structures and services by planting trees away from buildings and services, including sewers, drains, gas and electricity services.

As a general rule local indigenous plant species are to be considered as the first choice for plants. These are plant species that would have occurred in the region prior to European settlement.

In some situations indigenous plantings do not meet the functional, horticultural, or heritage requirements and either other Australian natives, or exotic plants may be considered.

Points to consider when choosing plant species.

- Select drought tolerant species.
- Plants that have similar water requirements can be grouped together to reduce the water demands of a landscape.
- Limit high water demanding plants to small focal areas.
- Flowering local trees and shrubs should be included in the design where appropriate as they provide food for many native bird species.
- Match species growing requirements to site conditions to ensure successful growth e.g. sun-loving plants in shaded locations will perform poorly.
- Selection to include some plants that will grow quickly to achieve an immediate effect and some that take longer to achieve a desired form and are longer lived.

24.3.6 Timing of Tree Planting

Tree planting should ideally occur between the months of April to September inclusive. If trees are planted outside this period by **Developers** then supplementary watering must be provided by the **Developer** as necessary at their cost. Where this work is undertaken outside of the Statement of Compliance period to meet the requirements of this clause then an agreement will be entered into between the **Council** and the **Developer** to ensure that this work is undertaken and maintained in accordance with **Council's** requirements.

24.3.7 Planting Principles

Tree planting guidelines are based on the urban design concept that a strong visual effect can be obtained by using a bold and simple layout without complicated and numerous variations in style and materials. The following tree planting principles have been developed to address the various site conditions found in our streetscapes.

- Symmetrical planting- similar tree species on both sides of the road. This is the preferred layout but is not always possible because of site constraints.
- Asymmetrical planting- different sized species and/or form on either side of the road. This layout is appropriate where powerlines occupy one side of a road, or where a narrow street allows planting on one side only.
- Formal planting- a formal streetscape is created where the roadway forms a grid pattern, usually at right angles to each other. Formal planting should be symmetrical and use a single tree species at regular spacing intervals.
- Informal planting- random placement of trees. Appropriate in some urban road settings where street locations have a direct or visual relationship to a natural environment, such as a river or bushland.
- Single tree species per street- generally a single street tree species is desirable, and should be pursued unless restricted by site constraints. Feature specimen planting may be considered at key intersections, central business zones, pedestrian crossings and the like.
- Solar orientation in certain situations street planting can be designed to provide shade and also allow winter sun.

24.3.8 Vehicular Access

Vehicle access to land vested in **Council** for Public Open Space must be restricted except for maintenance purposes via use of appropriate fencing and bollards (refer to Council Urban Style Guide for styles). Locks are to be provided as per **Council's** standard key system.

24.3.9 Clear Zones

The design of all landscaped areas should ensure the following concerns are adequately addressed:

- Safety of employees maintaining these areas.
- Safety of motorists within the vicinity of these areas.
- **Clear Zones** appropriate to the speed of vehicles are maintained where landscaping areas are adjacent to roads.

All **Councils**, other than those listed in Selection Table 20, require as a minimum requirement that a 600mm impervious clear area is to be maintained from the edge of seal or invert of kerb or edge of gravel. In this area approved paving or similar materials will be used so that no regular maintenance of these areas will be required.

Selection Table 20 Clear Zones

Councils Requiring A Minimum of 1200mm Impervious Clear Area
Campaspe Shire Council
City of Greater Bendigo
Glenelg Shire Council
Pyrenees Shire Council
Wellington Shire Council
Yarriambiack Shire Council

Where traffic volumes on the abutting road exceed 500 vpd or the speed is greater than 50kph a detailed risk assessment must be carried out to determine the appropriate **Clear Zone** and the risks to and the safety requirements of employees maintaining these areas.

24.3.10 Entrance Features

All entrance features are to be located on property owned by the **Developer** and be maintained by the **Developer**. **Council** will not give permission for entrance features to be located on **Council** road reserves or other land vested in **Council**.

24.3.11 Maintenance Responsibility

At the time of practical completion for the development a defects period of 12 months will commence and **Council** will be responsible for the maintenance of the landscaping works. The **Developer** will provide **Council** with all documentation on pumps, controllers, playgrounds and any other document that will assist in the maintenance of landscaped areas.

Note that tree planting can be carried out after the time of practical completion and statement of compliance with the approval of **Council** as per the requirements of 24.3.7.

24.3.12 Irrigation Systems

Any irrigation system must be automatic and of a type approved by **Council** and must be fully operational before the use commences.

An irrigation design is to be provided for **Council** approval prior to commencement of any project on site. The design is to take into consideration the following factors:

- Pump design and location.
- Back flow devices and meters, if required, are to be located below ground and located to allow access and the type and manufacture must be approved by **Council** prior to installation.
- Minimum diameter of irrigation line for areas with greater than 8 stations is to be 32mm.
- Moisture sensors to be included if required by **Council**.

All materials used in the construction of the irrigation system are to be commercial quality. Unless agreed otherwise the following should be used or their equivalent:

- ICC Controllers.
- Hunter sprinkler heads on articulated risers.
- Class 9 min material to solenoids.
- Controllers are to be placed within a secure lockable box.
- Sprinklers are to be set so that when in operation they extend above the natural surface by 100mm.
- Solar Powered irrigations systems may be considered by **Councils** where the **Developer** can demonstrate adequate robustness. This will require an application in writing to be made for a variation to the **Manual** to use solar powered irrigation systems..

24.3.13 Referred Documents

Designers Engineers and **Developers** are advised that **Council** has specific policies and requirements in relation to landscape designs and contact should be made with the relevant **Council** to obtain the details of their specific requirements.

24.3.14 Landscaping on Existing Road Reserves

No landscaping other than lawn must be permitted on nature strips and **Council's** reserves without the approval of **Council** and in accordance with any Local Law governing development on road reserves. To obtain approval for landscaping other than lawn the **Developer** must satisfy **Council** that the material can meet the following performance criteria:

- There will be no increase to public risk (e.g. stones on footpaths increase tripping hazard).
- The nature strip must be able to be used safely by pedestrians.
- The product or material must not be able to be easily removed or used for nuisance purposes.
- There must be a consistent neighbourhood landscaping approach.

24.3.15 Soft Landscaping

Minimum 100mm (imported) approved top soil is to be used.

Existing vegetation is to be treated to remove weeds.

Grass species are to be approved by **Council** prior to placement. Design should generally allow for a maximum of 50% of the area to be irrigated to minimise water use, unless approved otherwise (such as on site retention for re-use).

Planting of garden beds is to contain native species as approved by **Council**.

Garden beds to have an approved weed mat placed between the top soil and mulch.

Mulch is to be one of the following:

- An approved first grade clean chipped bark material 75mm min in depth and average diameter of 20mm.
- Crushed brick, stone or inorganic material, if approved.
- Other materials approved by **Council**.

24.3.16 Hard Landscaping

Footpaths and shared paths widths are to be in accordance with Clause 13 of this **Manual**.

Approved granitic sand when used must be a minimum 100mm in depth compacted to 95% of MMDD.

Paths constructed from materials other than concrete must be edged so that material does not spill into adjacent areas. Timber edging may be used only when the design and construction have been approved by **Council**.

24.3.17 Furniture

Furniture used in landscaped areas is to be in accordance with the relevant **Council's** Urban Style Guide, or as approved by **Council**.

The **Manual** is to be used to identify the styles of furniture to be used and include seats, barbeques, bins, dog bins, bollards, post and rail fences, bus stops etc relevant to the location. If no information is available for the site, approval will be required from **Council** on a case by case basis. Susceptibility to vandalism will be considered by **Council** before giving approval for any furniture.

Consideration should be given to the context in which furniture is to be installed. Relevant matters may, for example, include bus stop capacity, proximity to hospitals, and the proportion of senior citizens wishing to access the area concerned.

24.3.18 Other Matters

Urban art and information boards must be provided to encourage use of the Public Open Space. Urban art e located on a nature strip must satisfy the **Clear Zone** requirements under the road design sections of this **Manual**. Arrangements of such items must be approved by Council prior to installation. Specific approval must be obtained from **Council's Engineering Department** to locate urban or public art on the nature strip.

Park name boards are to be in accordance with **Council's** standard drawing (where available) and are to be approved by **Council**.

Clause 25 Associated Infrastructure

25.1 Objectives

The objectives of associated **Infrastructure** are as follows:

- All associated **Infrastructure** that is to be vested in the **Council** must meet **Council's** requirements and standards as set out in this **Manual**.
- In giving approval for associated **Infrastructure Council** will have regard to any future maintenance and operating costs, the likely availability of replacement parts and conformity with any **Council** policy or strategy e.g. green house emissions.
- The urban character and amenity of a locality, neighbourhood or development should not be adversely impacted by the proposed associated in **Infrastructure**.
- The location of the proposed associated **Infrastructure** must not conflict with other existing or proposed services and **Council Infrastructure**.
- Council will consider the requirements of all servicing authorities before giving approval for any particular service.
- The requirements of any relevant Codes of Practice, Australian Standard, regulation or act of parliament is considered by **Council** before approving the type and location of any associated **Infrastructure**.

25.2 General

The design, documentation and installation of all related **Infrastructure** required to service the development must be in accordance with the relevant Authority's criteria, specifications and instructions.

25.3 Telecommunications

The design, documentation and installation of all related **Infrastructure** required to service the development must be in accordance with the relevant Authority's criteria, specifications and instructions.

The **Design Engineer** must liaise with the authority responsible for telecommunications, and coordinate the design and construction of the required **Infrastructure**, in association with all other works required for the development.

25.4 Gas

The design, documentation and installation of all related **Infrastructure** required to service the development must be in accordance with the relevant Authority criteria, specifications and instructions.

The **Design Engineer** must be responsible to liaise with the Authority responsible for gas **Infrastructure**, and co-ordinate the design and construction of the required **Infrastructure**, in association with all other works required for the development.

25.5 Water & Sewer

The design, documentation and installation of all related **Infrastructure** required to service the development must be in accordance with the relevant Authority's criteria, specifications and instructions.

The **Design Engineer** must be responsible to liaise with the authority responsible for water and sewerage **Infrastructure**, and co-ordinate the design and construction of the required **Infrastructure**, in association with all other works required for the development.

The location and spacing of fire hydrants are to be to the satisfaction of the Country Fire Authority.

25.6 Electrical

The design, documentation and installation of all electrical **Infrastructure** required to service the development must be in accordance with the Authority responsible for electrical, specifications and instructions.

For Commercial and Industrial **Developments** a power supply plan must be provided documenting the supply standard for each lot.

Detailed requirements for public lighting are presented in Clause 26 of this **Manual**.

25.7 Emergency Services Telecommunications Authority – Emergency Markers

The **Design Engineer** must be responsible for the provision of emergency markers in accordance with the provisions of the Emergency Marker Signage Guidelines.

Emergency Markers can be located, but not be restricted to the following locations:

- Locations with a history of emergency events or known incident sites;
- Locations offering higher risk activities to the visitor, e.g. mountain bike riding, rock climbing, abseiling etc:
- Walking trails and shared paths – Emergency Markers should be located at major trail heads, significant features, or intersections. Emergency Markers on linear trails should be placed approximately every 500m;
- Water bodies, swimming holes, and beach, river or lake access & egress points;
- Piers and Jetties should have a marker at the beginning and end of the infrastructure. Emergency Markers may be placed at intervals of 250 - 500m if the length of the asset warrants;
- Remote areas that act as a thoroughfare or receive significant visitation;
- Recreational playgrounds with no verifiable address points or visible naming convention e.g., a person could not see the signage, describe with certainty the unique feature or the open space was that of a linear path, or large recreation facility with multiple recreations uses, such as more than one oval, bbq area, playgrounds.

Clause 26 Public Lighting

26.1 Objectives

The objective of this section is to ensure the consistent, equitable and environmentally responsible provision of public lighting and to provide public lighting to the appropriate standards that considers the safety and security of all sectors of the community.

26.2 Provision for Public Lighting

All roads within the new subdivision must be provided with public lighting in accordance with the requirements of the relevant Australian Standards. New lighting must be located outside the **Clear Zones** wherever possible, and must meet the standards for Category V or Category P lighting, as appropriate.

Category V lighting is applicable on roads where visual requirements of motorists are dominant, such as sub-arterial roads. Category P lighting is applicable on roads (and other public outdoor areas) where the visual requirements of pedestrians are dominant, such as local roads and outdoor shopping precincts.

All public lighting must incorporate the use of energy efficient globes (eg.T5, CF42).

26.3 Lighting Design

Lighting design must be in accordance with the relevant Australian Standards, including the current issue of *AS/ANZ 1158 – Lighting for Roads and Public Spaces.*

Lighting installations for Arterial Roads and associated intersections are reviewed and approved by VicRoads as the responsible coordinating road authority. Copies of drawings must be forwarded to **Council** for assessment after which advice will be forwarded to VicRoads prior to approval.

Allowance for pole locations must be provided within all road reserves and offsets must be shown in 'Service Location Tables' on FLP's and Road Construction Plans.

A minimum 800mm offset must be provided from back of kerb to pole for all roads with P category lighting, including laneways and shared zones where kerbing is provided.

A minimum 1000mm clearance is required from face of pole to:

- Edge of **Carriageway** in laneways, shared zones and extended driveways where no kerbing is provided. Kerb outstands may be requested for pole protection in some circumstances.

- Edge of pram crossings and private vehicle crossings within naturestrips.

'Easy Fit' pole bases/foundations are required where maintenance access is restricted (e.g. in laneways, 'paper roads' and shared driveways).

With the exception of lighting in speed zones of 50 km/hr or less, frangible poles must be adopted for roads with V category lighting in accordance with *AS 1158 – Lighting for Roads and Public Places*. The specific pole type (impact absorbing or slip base) must be determined according to VicRoads standards and must be nominated on the drawings.

Provision of public lighting is required for all principal footpaths and bike paths within parks and reserves of any development. All cabling for this purpose must be from a metered point of supply at the reserve boundary and **Council** will accept responsibility for the tariff.

Bollard lighting is acceptable only in reserves where vertical illumination is not required for the relevant lighting category.

Lighting obstructions (e.g. from existing large trees) must be taken into account when locating poles and assessing luminance requirements.

In rural areas is that low density and rural living **Developments** should, as a minimum, provide one light at intersections and one at the end of the court bowl *PRINCIPLE*. This number may be reduced for short cul-de-sacs where it can be demonstrated that lesser lighting is sufficient.

The amount and type of lighting, including recommended light technical parameters, in any external public area, is driven by three main considerations:

- The type and quantity of pedestrian and vehicular traffic in the area (to facilitate safe movement).
- The security risk of the area (to discourage illegal acts).
- The need to enhance the amenity of the area (to increase aesthetic appeal).

26.4 Decorative (Non Standard) Lighting

Council approval is required to use decorative (non standard) lighting in any area.

Council may determine the boundaries of a street lighting precinct within its urban area so as to have a consistent lighting standard within that precinct.

The manufacture, type and model of the Decorative (non standard) lighting must be determined after consultation with the **Developers**/landowners within the boundaries of the precinct at the time the precinct boundaries are being determined. The precincts that have been adopted are shown in **Appendix H: Street Lighting**.

Decorative (non standard) lighting will only be approved in identified precincts. Note that decorative (non standard) lighting is not to be used in industrial estates.

Decorative or non standard lighting, lamps and luminaries must comply with the Public Lighting Service Provider's technical requirements and must be approved by **Council**.

Council will consider approving use of decorative (non standard) lighting when subdivisions have a minimum of 50 allotments and when the **Developer** has obtained written agreement from an approved Public Lighting Service Provider for:

- The street lighting design.
- The type of the decorative lighting **Infrastructure** and fittings.
- The applicability of the standard street lighting tariff.

The Public Lighting Services Provider will energise public lighting with the estate only after receiving written notification from the **Council** that the proposed design has been approved.

Unless otherwise specified, all new standard street lighting will be supplied from an underground supply. Overhead supply will only be installed under exceptional circumstances and on a case by case basis, and must be approved by the Public Lighting Service Provider.

26.4.1 Decorative (Non Standard Lighting Fees)

Under the Victorian Electricity Supply Industry guidelines, the **Council**, or the **Developer**, remains responsible for the ongoing supply and replacement of decorative (non standard) poles and fittings.

In order to compensate the **Council** for additional costs incurred for future maintenance and replacement of decorative (non standard) fittings, the **Developer** must:

- Supply all initial stock of poles, lamps, photo electric cells and other fittings.
- Arrange for and meet the cost of all installation to the satisfaction of the **Council** and the Public Lighting Service Provider.
- Accept responsibility for all maintenance and replacement costs of poles and lanterns until the expiry of the defects liability period where decorative lighting is erected. **Developers** must supply replacement damaged or non-operational poles or fittings within 48 hours from notice given by **Council** to allow the Public Lighting Service Provider to arrange the required maintenance and replacement works.

The **Developer** must also make a cash contribution to **Council** for the future replacement and maintenance of these assets based upon the cost of supplying poles and lanterns, including ballast, where applicable. The unit value of the cash contribution will be based on the purchase price applying at the date the Statement of Compliance is issued. The total contribution will be based on the value of the number of lights and lanterns as shown in Table 14:

Table 14 Decorative Lighting Contributions

Location	Number of Street Lights in Subdivision	Number if Street Lights Used to Determine Cash Contribution	Number if Lanterns to be Used to Determine Cash Contribution
Within Street Lighting Precinct	0-10	1	2
	11-20	10% of the total number of lights provided in the subdivision.	20% of the total number of lights provided in the subdivision.
	21-50	7.5% of the total number of lights provided in the subdivision.	15% of the total number of lights provided in the subdivision.
	51 plus	5% of the total number of lights provided in the subdivision.	10% of the total number of lights provided in the subdivision.
Not within a Street Lighting Precinct	0-10	1	2
	11 plus	10% of the total number of street lights provided in the subdivision.	20% of the total number of street lights provided in the subdivision.

26.5 Pre-Submission Requirements

Prior to the submission of Public Lighting Plans the following must be confirmed with **Council**:

- Lighting design categories for all roads and pathways.
- Locations of all principal pathways in parks/reserves outside road reserves.
- Locations and type of other items/structures that may require public lighting.

For any lighting type not previously accepted by **Council** provide full information on the proposed pole and lantern together with details of the current supply and delivery cost of a single unit and likely availability into the future.

Council will not normally accept items from a limited production line.

A Functional Layout Plan has been endorsed in accordance with the planning permit.

APPENDIX A: TYPICAL STANDARD CONDITIONS FOR PLANNING PERMITS

APPENDIX B: ENGINEERING APPROVAL PROCESS FOR DEVELOPMENTS

appendices\appendix C approval process.pdf

APPENDIX C: CHECKLISTS AND FORMS FOR DEVELOPER'S REPRESENTATIVES

DESIGN ENGINEER'S CHECKLIST #D1 – TO BE SUBMITTED WITH REQUEST FOR APPROVAL OF FUNCTIONAL LAYOUT

DEVELOPMENT TITLE **STAGE**_____

PLANNING PERMIT NUMBER **CONSULTANT'S REFERENCE**_____

CONSULTANT'S REPRESENTATIVE **NUMBER OF PLANS IN SET** _____

CHECKLIST #D1		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
General		
The design is in accordance with the planning permit conditions and the endorsed plan.		
Do other planning permits affect this development? (if yes, list permit numbers)		
The design in accordance with the ODP.		
The functional design is in accordance with Council's Infrastructure Design Manual.		
Consultation has taken place with all relevant authorities, as listed: (attach separate list if necessary).		
Consultation has taken place with all relevant landowners and affected persons, as listed: (attach separate list if necessary).		
The Design Engineer has inspected the site.		
A detailed field survey has been undertaken of the site.		
Environmental values of the site have been identified.		
Protection of native vegetation and habitat has been considered and is reflected in lot layout and overall design.		
Revegetation requirements have been considered and are documented.		
Protection of water bodies and waterways has been considered.		

CHECKLIST #D1		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
Service location plans have been obtained for ALL services.		
Plans clearly show allotment layout, with allotments numbered and dimensioned, reserves clearly identified and proposed easements shown.		
Road Layout Plans		
Street names are nominated.		
Plans show Road Hierarchy.		
Estimated traffic volumes are shown on plans (for each stage of any staged developments).		
Road widths between inverts of kerbs are nominated.		
Road reserve widths are clearly nominated on plans.		
Kerb profiles are nominated.		
Public transport, including DOT, requirements have been reflected in the road widths.		
Local area traffic management has been considered and reflected in proposed designs.		
Intersections internal to the development are shown in sufficient detail to support proposed design, including proposed kerb radii.		
Intersections external to the development are shown in sufficient detail to support proposed design.		
Critical vehicle turning movements are shown on separate plans, including turning at intersections and cul-de-sacs.		
Plans show traffic implications of staged development if relevant.		
Carpark Layout Plans		
Carpark layout plan shows on-street, off-street and disabled parking as required.		
Drainage Layout Plans		
The total catchment area has been identified and is shown for review.		
Plans show Natural Surface Contour Lines to AHD.		

CHECKLIST #D1		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
100 year **ARI** flood levels are identified on plans.		
Plans show approximate Design Contour Lines to AHD.		
Proposed sub-catchment boundaries are shown on drainage layout plan.		
Plans show the co-efficient of runoff for each sub-catchment.		
Plans shown layout of proposed drainage systems with approximate sizes.		
Pipe materials are nominated.		
Overland flow path is nominated and approximate depth of flow is shown.		
Drainage discharge point is shown.		
Proposed treatment shown in sufficient detail to support approval of functional layout.		
Existing drainage services are confirmed on plans and proposed connection points shown.		
Plans show drainage implications of staged development if relevant.		
Associated Documents		
A Traffic Management Report was prepared and accompanies this submission.		
Note any deviations between the proposed design and the recommendations within the Traffic Management Report.		
The need for Developer contributions or headworks charges has been identified and a preliminary cost-sharing proposal to Council for early consideration.		

The plans provided with this submission for approval of functional layout have been prepared in accordance with the relevant sections of the Council's Manual. All of the above checklist items have been initialled as correct and complete, or marked N/A (not applicable) as appropriate.

Signed _____ Dated _____

DESIGN ENGINEER'S CHECKLIST #D2 – REQUEST FOR DETAILED DESIGN APPROVAL

DEVELOPMENT TITLE **STAGE** _____

PLANNING PERMIT NUMBER **CONSULTANT'S REFERENCE** _____

CONSULTANT'S REPRESENTATIVE **NUMBER OF PLANS IN SET** _____

CHECKLIST #D2		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
General Design Requirements		
The detailed design is in accordance with the planning permit conditions and the endorsed plan, and physical design features incorporated on construction plans.		
Plan of subdivision has been certified at the time of this submission?		
The detailed design is in accordance with the plan for certification?		
Easement locations and widths are in accordance with certified plan?		
The detailed design is in accordance with Council's Infrastructure Design Manual.		
Environmental protection during development construction has been considered and requirements are documented (e.g. erosion protection, silt migration etc.)		
Revegetation requirements have been considered and are documented.		
Protection of water bodies and waterways has been considered and requirements are documented.		
List approvals already received from other service authorities.		
General Plan Requirements		
Drawing list is presented.		
Council-nominated drawings numbers are shown.		
Locality plan is presented.		
North arrow is shown on all layout plans and detailed plans (should be shown up or to left).		
All plans have correct scales shown.		

CHECKLIST #D2		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
All plans have comprehensive legends.		
Do plans include standard notes? Are they applicable and clear?		
Plans clearly show allotment layout, with allotments numbered and dimensioned, and reserves and easements are clearly identified.		
Limit of works is shown on all layout plans in set.		
Dams, wells, depressions and watercourses are identified and fill requirements identified.		
Existing fill areas are shown.		
Existing features and structures are shown.		
Existing service locations and poles are shown.		
Existing trees are shown. Does design attempt to retain trees?		
Existing native vegetation is shown and suitably specified? Does design attempt to retain significant native vegetation?		
Road Layout Plans		
Datum shown to AHD.		
Scales are in accordance with the Manual requirements.		
PSM's and TBM's marked on plans.		
Proposed service locations and offsets are tabulated.		
All required service conduit locations are indicated on the plans.		
Footpaths minimum width of 1.5 m, and located at correct offset.		
Shared paths minimum width of 2.5 m, and location clearly shown.		
Kerb crossings are at appropriate locations and are fully documented.		
Vehicle crossings are shown on plans.		
All vehicle crossings cater for standard car.		
Are any crossings located over easements?		
Are any crossings located closer than 9m to the intersection?		

CHECKLIST #D2		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
All turning movements have been checked in accordance with Manual, and intersections designed accordingly.		
Street names are shown on plans and have been approved by Council.		
Road widths between inverts of kerbs are nominated.		
Kerb profiles are nominated.		
Road chainages are shown.		
Street Name Signage, Linemarking, and Traffic Control Plans		
Locations and type of all new signage is shown on plans, and comply with Australian Standards.		
Any existing signage to be removed or relocated is shown on plans.		
Locations and type of all linemarking is shown on plans, and comply with Australian Standards.		
Any existing linemarking to be removed is shown on plans.		
Traffic calming devices are designed and documented in accordance with Austroads "*Guide to Road Design*" and any VicRoads supplement to those guidelines and the Manual, and as per approval of functional layout.		
Limit of works of roads include temporary turning area if required. 'No Road' signage or hazard markers to be provided unless otherwise agreed with Council.		
Road Longitudinal Sections		
Road names are shown on longitudinal sections.		
Scales are in accordance with the Manual requirements.		
Datum RL to AHD shown.		
Natural surface profile and levels shown at crown.		
Design surface profile and levels shown at crown.		
Levels have been checked by Design Engineer and (i) comply with Manual, and (ii) match into existing.		
Depth of cut/fill to crown is shown.		

CHECKLIST #D2		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
Design surface profile and levels shown at left and right back of kerb (including high and low points).		
Gradings as + or – percent to two (2) decimal places shown in direction of chainages.		
Grades have been checked by Design Engineer and (i) comply with Manual, and (ii) match into existing. Min. grade = % Max. grade = % Match existing?		
All vertical curve lengths and I.P values are shown.		
Vertical curve levels are shown at maximum intervals of 10 metres.		
Minimum kerb grades are achieved.		
Levels and grades given on long sections have been checked by the Design Engineer.		
Check levels and grades match into existing abutting roadworks.		
Minimum length of vertical curve for >1% grade change to be 15 m (except on kerb returns).		
External road grading for future stages to extend a minimum of 100 metres.		
Vertical curves and longitudinal grades provide satisfactory sight distances for standard roads, particularly at intersections.		
Coordination of vertical and horizontal curves has desirable design outcome? Is vertical curve entirely within or outside horizontal curve?		
Road Cross-Sections		
Design Engineer has checked that cross-sections agree with longitudinal sections.		
Datum is shown on every cross-section.		
Scales comply with Manual.		
Road names and chainage references are shown.		

CHECKLIST #D2		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
Natural and design levels are given at: • Back of kerb. • Lip of kerb. • Crown. • Property lines. • Front of footpath. • Table drain inverts (where applicable). • Top and toe of batters (where applicable).		
All crossfalls are in accordance with the Manual: - pavements - nature strips - footpaths – batters.		
Typical Cross-Sections and Traffic/Road Details		
Typical cross-sections are presented in accordance with the 'Information to be Shown on Plans' requirements of the Manual.		
Typical cross-sections note road name and chainage references, if applicable.		
Profile and geometry of design surface grades are shown as % or 1 in X and comply with Manual requirements.		
Details of road pavement construction, including materials, compaction and type of seal are shown.		
Details of footpath construction, including materials, compaction and seal are shown, or standard drawing noted.		
Typical alignment of services, subsoil drainage and landscaping are shown.		
Kerb and channel types are nominated.		
Kerb and channel construction is detailed or standard drawings noted.		
Intersection, Court and Curve Details		
Road names are shown.		
Road chainages are shown.		

CHECKLIST #D2		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
Intersection details are shown at correct scales in accordance with Manual.		
At least four kerb levels are given on every kerb radial.		
Tangent point levels and chainages align with longitudinal and cross sections.		
Set-out details are shown including angle, radii and tangent points.		
Design Surface contours are shown to AHD at 50 mm maximum intervals.		
Back of kerb levels are shown to AHD.		
Footpath levels are shown.		
Location of low points are shown.		
Services (inc drainage) are shown in detail.		
Landscaping is shown in detail.		
Footpath and kerb crossings are shown in detail.		
Drainage Layout Plans		
Design Engineer has checked that drainage design in accordance with AR&R.		
Datum shown to AHD.		
Scales are in accordance with the Manual requirements.		
PSM's and TBM's marked on plans to AHD.		
Finished surface levels are shown where the natural surface is altered.		
Plans clearly show allotment layout, with allotments numbered and reserves and easements are clearly identified.		
1 in 100 year flood levels shown.		
Road names are shown.		
Plans shown layout of proposed drainage systems with offset from property boundaries.		
Pipe materials and diameters are shown.		
Concrete pipes are to be RRJ only.		

CHECKLIST #D2		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
Non-concrete pipes have Council approval.		
Non-concrete pipes to bed, lay and joint and backfill in accordance with manufacturer's specifications.		
Overland flow path is shown and outfall has Council approval.		
Kerb and channel and footpath is depressed where overland flow path leaves road pavement.		
Subsurface drains, house drains and property inlets are shown.		
Pits are at appropriate locations (e.g. away from kerb returns, vehicle crossings, kerb crossings etc.).		
Pit spacing is 80m maximum.		
Pit capacity checked by Design Engineer.		
Double SEP's at confined low points only.		
Change in angle is not greater than 90°.		
Pits/headwalls are numbered.		
Set-out point of pits is clearly shown on legend.		
Footpath spoon drains have adequate outfall.		
Back of kerb drainage (e.g. roundabout kerbs) has adequate outfall.		
All existing fences, buildings, trees etc shown in path of overland flows.		
All proposed fences, buildings, trees etc shown in path of overland flows.		
Existing or proposed open earth drains, dams, watercourses, boreholes, sink holes, wells and springs within the area are shown.		
Extent of required erosion protection is shown at headwalls and other structures.		
Drop structures are shown.		
All properties have identified drainage discharge points (to underground drainage systems for industrial and commercial developments, and residential wherever possible).		

CHECKLIST #D2		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
Drainage Longitudinal Sections		
Longitudinal sections are prepared for all legs of drainage, and for open drains, and nominated overland flow paths.		
Scales are in accordance with the Manual requirements.		
Comprehensive legend is shown.		
Datum RL to AHD shown.		
Drainage line numbers names are shown on longitudinal sections.		
Drainage line chainages are shown on longitudinal sections.		
Lengths of drainage sections do not exceed 80 metres.		
Pipe diameter, class and grade is shown for all legs of drainage.		
Pipe classes have been determined with consideration to construction loads, not just final cover. Cross-check compaction requirements in documentation.		
Pipes with steep grades are documented to include anchor blocks.		
Pit number and pit type is shown.		
Pit type matches capacity requirements.		
Any special pits are fully documented.		
Internal pit dimensions are shown.		
Pit inlet and outlet levels are shown.		
Depths of pits to invert levels are shown.		
Finished top of pit levels and finished surface level adjacent to pits are shown.		
Pit lid type and class are shown.		
Origin/destination pits for inlet and outlets.		
Junction line numbers are noted.		
Design pipes are plotted on longitudinal section.		
Hydraulic grade line is plotted and levels given.		

CHECKLIST #D2		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
Check that maximum depth in roadway is 500mm (i.e. at invert).		
Check that depth x flow factor is acceptable.		
Required 150mm freeboard to kerb invert is achieved for minor storms.		
Energy losses in drainage system are accounted for.		
Crosses with other services are plotted and clearances nominated (street names should be referred to identify crossings).		
Design flows are shown (litres/second).		
Design velocities are shown (metres/second) and comply with Manual.		
FCR backfill is specified under road pavements, footpaths, crossovers and building lines.		
The location and type of special backfill requirements are noted (e.g. to prevent piping of backfill material).		
Design is in accordance with AS3725 and its commentary.		
Open Drains		
Shape of drain is suitable for maintenance.		
Drain is accessible from both sides and all-weather tracks provided.		
Depth of floodways is shown on cross-sections and less than 1.5 metres.		
Scour velocities and siltation were both checked in determining longitudinal grades.		
Grade control / drop structures are fully documented.		
Low flow pipe has been provided in accordance with the Manual.		
Outfall structures are provided and energy dissipators provided if needed.		
300mm minimum freeboard is achieved.		
Detail Plans		
Non-standard drainage structures are fully detailed for construction - headwalls - drop structures - erosion protection at outlet structures - erosion protection for batters where needed.		
Non-standard pits are fully documented including reinforcement and pit lid details.		

CHECKLIST #D2		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
Structural details of all retaining walls are shown, as well as details of natural surface levels and design surface levels, foundation requirements, drainage requirements, and type of finish.		
Details of street furniture.		
Drainage pump stations fully documented.		
Layout and details of power installation documented.		
Details of any estate entrance structures, including structural details, location details and method of finish.		
Traffic calming devices are fully detailed to ensure construction is in accordance with design requirements (e.g. splitter islands, chicanes, speed humps, roundabout construction).		
Lotfilling Plans		
Natural surface contours are shown with 50 mm maximum intervals.		
Design surface contours are shown with 50 mm maximum intervals.		
Finished surface levels are shown and all allotments have minimum 1 in 200 grade toward low point.		
1 in 100 year flood levels to be shown on plans and all lots to be filled to above these levels.		
Proposed fill in excess of 300mm is clearly denoted on plans.		
Material and compaction requirements are fully documented to relevant Australian Standard in either plans or specification.		
Extent of lotfilling, top and toe of batters and retaining walls all noted.		
Drainage Retardation and Treatment		
Computations are provided to verify the volume of the basin.		
Erosion protection is fully documented.		
Inlet structures are fully documented.		
Overflow is identified and appropriate.		
Freeboard is achieved.		

CHECKLIST #D2		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
Wetland plantings have alternative source of water for establishing plants and for periodic dry spells.		
Master Services Plans		
Plans show numbered allotments, road reserves and road carriageways.		
Street light types are nominated for approval.		
ALL underground service alignments are shown, including non-essential services such as gas, raw water and irrigation lines.		
ALL major aboveground features are shown such as street lights, power supply pillars, fencing, landscaping etc.		
Landscaping Plans		
Detailed irrigation layout plans is provided showing valves, controllers, pipe material and sizes, alignments, nozzle details, and backflow devices.		
Planting schedule is included, including size of plants.		
Location of major plantings is clearly shown.		
Planting requirements are documented including dimension of hole, root barrier, backfill, mulch, stakes, tree grates, tree guards, and stakes are details.		
Street furniture is detailed including type, colour, location and installation.		
Associated Documents		
If required, a TMAR was prepared and accompanies this submission.		
If required, a TIAR was prepared and accompanies this submission.		
If required, a Road Safety Audit Report was prepared and accompanies this submission.		
Note any deviations between the proposed design and the recommendations within the Road Safety Audit report.		
Hydrological calculations are provided for whole of catchment and partial areas if relevant, and 100yr ARI design flows calculated at critical points. (Method nominated and assumptions clearly stated ARI's in accordance with Manual.)		
Hydraulic calculations are provided for above and underground drainage, for major and minor storm events. (Method nominated and assumptions clearly stated. Roughness coefficients nominated).		

CHECKLIST #D2		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
Copy of geotechnical reports are provided with submission.		
Road pavement design is provided with submission.		
Quality assurance sections are included in specification.		
Risk assessment report is provided for drainage retardation and treatment Infrastructure.		
Operation and maintenance (O&M) manuals are provided with this submission?		
Structural computations are provided, where applicable, with this submission?		

The plans, specifications and associated documents provided with this submission for detailed design approval have been prepared in accordance with the relevant sections of the Council's Manual. All of the above checklist items have been initialled as correct and complete, or marked N/A (not applicable) as appropriate.

Signed _____ Dated _____

DESIGN ENGINEER'S CHECKLIST #D3 – REQUEST FOR FINAL DESIGN APPROVAL

DEVELOPMENT TITLE **STAGE** _____

PLANNING PERMIT NUMBER **CONSULTANT'S REFERENCE** _____

Consultant's Representative **Number of Plans in set** _____

CHECKLIST #D3		
ITEM	**Y / N / NA OR COMMENT**	**DESIGNER'S INITIALS**
GENERAL		
Detailed design approval was received from Council – note date.		
The final design is in accordance with the planning permit conditions and the endorsed plan, and physical design features incorporated on construction plans.		
Plan of subdivision has been certified at the time of this submission?		
List approvals already received from other service authorities. 26.5.2 26.5.3 26.5.4		
Plans		
Final plans reflect amendments required by Council under previous reviews?		
Other		
Engineer's estimate is provided with this submission?		
Are separate streetscaping/landscaping plans included?		

The plans, specifications and associated documents provided with this submission for detailed design approval have been prepared in accordance with the relevant sections of the Council's Manual. All of the above checklist items have been initialled as correct and complete, or marked N/A (not applicable) as appropriate.

Signed _____ Dated _____

DESIGN ENGINEER'S FORM #D4 – INTENTION TO COMMENCE CONSTRUCTION

DEVELOPMENT TITLE **STAGE** _____

PLANNING PERMIT NUMBER **CONSULTANT'S REFERENCE** _____

DESIGNER

Works within Road Reserve Permit Number

We hereby advise the (Insert the name of the relevant **Council**) that construction of the above-mentioned development is due to commence. The following information is provided:

1. The Developer's Representative during construction is _____ (for formal notices as required)
2. The Construction Engineer during construction is _____ (for daily liaison on engineering matters)
3. The Contractor appointed to carry out construction _____
4. The Contractor's nominated representative on site is _____
5. Other related parties include _____
6. The proposed date of the commencement of works is _____

The following documentation accompanies this notice:

- Construction Program.
- Inspection and Test Plans.

Signed _____ Dated _____

CONSTRUCTION ENGINEER'S CHECKLIST #D4 – REQUEST FOR ACCEPTANCE OF WORKS INSPECTION

DEVELOPMENT TITLE **STAGE** _____

PLANNING PERMIT NUMBER **CONSULTANT'S REPRESENTATIVE** _____

CHECKLIST #D4		
THE FOLLOWING ITEMS HAVE BEEN COMPLETED	**Y / N / NA OR COMMENT**	**CONSTRUCTION ENGINEER'S INITIALS**
All road construction works are complete.		
Signs are in place in accordance with the approval plans.		
Linemarking is complete.		
All drainage works are complete, clean and ready for inspection.		
Fencing works are complete if required.		
Pump stations have been commissioned or are ready to be commissioned at the Acceptance of Works inspection (note that O&M manuals are to be provided one week prior to commissioning, draft manuals are acceptable).		
Footpaths and kerb crossings are complete.		
Nature strips are reinstated and in a tidy manner.		
Earthworks at the site have been completed.		
Erosion protection works are complete.		
Litter traps are complete.		
Street lighting is complete.		
Landscaping is complete.		
Streets have been swept.		
Installation dates for any major traffic control items have been provided to Council.		

All construction works should be complete prior to calling for an Acceptance of Works inspection. Any outstanding works must be noted below:

An Acceptance of Works inspection is requested of Council. Proposed date and time _____

_____

Signed _____ Dated _____

APPENDIX D: INFORMATION TO BE SHOWN ON PLANS

MINIMUM REQUIREMENTS FOR ALL PLANS

The following information must be shown on all plans submitted to Council:

- Development or Project Title, including stage if applicable.
- Planning Permit reference if applicable.
- Scales.
- Plan No. and Sheet No.
- Schedule and date of amendments.
- Signed Design Certification, by a **Qualified Engineer.**
- Signed Checking Certification, by a **Qualified Engineer.**

ROAD LAYOUT PLANS

Road layout plans must as a minimum show the following:

- North arrows and appropriate scale bars.
- Limit of Works to be constructed including ALL connections to existing work.
- All proposed allotments and reserves within the development.
- Allotment numbers and dimensions.
- All easements and land acquisitions.
- All streets to be constructed, including proposed street names.
- Existing and proposed PSM's and TBM's.
- Chainages on traverse lines at all tangent points and cross-sections (at intervals of not more than 20 metres, along the centre line of roads).
- Kerb radii (to back of kerb) and kerb type and offsets.
- Footpaths, bicycle paths, and/or shared paths, and all pedestrian kerb crossings to concord with the Disability Discrimination Act. Levels should be sufficiently documented to demonstrate compliance with requirements of Australian Standard AS1428 'Design for Access and Mobility'.
- Service conduit positions, including water, stormwater, telephone and electricity conduits where required (locations to be marked on footpaths or kerbs during construction).
- Locations of all existing driveways, drains, pits, services (existing and proposed) and poles.
- Street name signs at all intersections.
- All existing and proposed fill areas and depths of fill.

- All probable or known slip areas and unstable area.
- Set out detail for all horizontal curves.
- Locations and description of roadside furniture and regulatory warning and guide signs where required.
- Linemarking.
- Extent of sight benching.
- Locations of culvert crossings and hard-standing areas for vehicle access into allotments.

ROAD LONGITUDINAL PLANS

Road Longitudinal Section plans should as a minimum show the following:

- Centreline chainage.
- Street name.
- Centreline and top of kerb levels required at lease every 20 metres on straight grades and a maximum distance of 10 metres on vertical curves, at all tangent points, changes of grade, low points and at each end of vertical curves.
- Plot of each proposed top of kerb, back of path and existing surface level on title boundaries.
- Length of vertical curves and intersection points.
- Kerb and centreline grades.
- Grading on rural roads to include a grading of table drains on the same section.
- Location of intersecting streets and court bowls, including temporary court bowls for streets that are constructed in stages.
- Road grading a minimum distance of 100 metres beyond the end of works.
- Kerb levels shown on returns at quarter points in addition to tangent points. This may be tabulated as an alternative.
- Kerb return grading showing the grading into the adjoining street. Note this is not required if detailed contours are provided.
- In courts, grading of the kerb around the court bowl.
- Level and location of all existing services to be in conflict with proposed works.
- Datum RL.
- Low points indicated.

Road Cross-Section Plans

Cross-section must be drawn for chainages at 20 metres on straight grades and a maximum of 10 metres on vertical curves Cross-sections must also be shown at all tangent points and at extreme changes in existing surface conditions. Road cross-section plans must as a minimum show the following:

- Levels of existing surface for the full width of the road reserve.
- Street name.
- Design levels for kerb, footpaths and road pavement for urban works.
- Position and level of crown of road.
- Extent of batters and open drains.
- Existing buildings on adjacent allotments abutting streets including floor levels.
- Location and level of existing services (level where there is to be a conflict with proposed works).
- Road chainage of cross-section.
- Datum RL.
- Pavement boxing profile indicated.
- Road reserve boundary and details at title boundaries.

Typical Road Cross-Sections

Typical cross-sections should be included in documentation where applicable and must show the nature and location of the following:

- Profile and geometry of finished surface.
- Location of subsoil drainage and conduits for services.
- Details of footpath and road pavement profile.
- Cut/fill batter slopes.
- Kerb and channel type.
- Kerb and channel offsets from title boundaries.
- Drainage location.
- Service Infrastructure location and typical details.
- Pavement materials, compaction requirements and nominated seal.
- Road reserve width.
- Road **Carriageway** width (between kerb inverts).

Intersection and Court Details

Details should include:

- All kerb types, driveways, crossings, footpaths and kerb crossings.
- Street Names.
- Grades and vertical curves.
- Contours on all finished road pavements indicating surface drainage flow.
- Road chainages.
- Proposed top of kerb and footpath levels.
- Location of low points.
- Levels at all tangent points, along crown of road and crown/high point in court bowl.
- Radii sizes and tangents points.
- Set out details for all horizontal curves.
- A minimum of four kerb levels around kerb returns.
- Location of all stormwater pipes and pits.
- Land acquisitions and easements.
- Scale Bar.
- Other Services.

Drainage Layout Plans

Drainage layout Plans should as a minimum show the following:

- Limit of Works to be constructed including all connections to existing work.
- All proposed allotments (numbered), reserves and easements within the development
- All streets to be constructed, including proposed street names.
- Existing and proposed PSM's and TBM's.
- All drains to be constructed, including stormwater treatment structures and outfall drains.
- Existing surface levels at the corners of all allotments and all significant changes of grade within the allotment, or alternatively contour information of sufficient detail to show same.
- Flood levels where applicable.
- Drainage Pipe diameters and offsets from property boundaries to pipe centreline.

- Drainage Pit numbers.
- Subsurface drains, house drains and property inlets.
- All existing fences, buildings, trees, etc on the street alignment or land through which drains or flow paths must pass.
- Existing or proposed open earth drains, dams, watercourses, bore holes, sink holes, wells and springs within the area.
- Existing dams and water course, boreholes, sink holes, wells and springs within the area.

Drainage Longitudinal Sections

A drainage longitudinal section for each leg of drainage must be plotted regardless of the length of the leg. Drainage longitudinal sections should as a minimum show the following:

- Centreline chainage.
- Existing and finished surface levels at 20m spacing maximum, and at all grade changes.
- Invert level of pipe at the inlet and outlet to pits.
- Datum level.
- Pit description.
- Depth to invert of pits from finished surface.
- Pipe size, grade, class and material.
- Actual velocities, actual discharge and pipe capacity.
- Plot of design pipe.
- Plot of hydraulic grade lines and levels.
- Pit numbers (as allocated by Engineering Design Services).
- All existing services on the section where the designed pipe crosses.
- A pit schedule detailing:
    - Pit number.
    - Pit type.
    - Internal dimension of pits.
    - Inlet and outlet levels.
    - Pipe sizes.
    - Finished top of pit level.

- Depth of pit.
- Pit lid details.
- Comments specific to pit.

- The location of the pipe (i.e. Street name, reserve, lot number) on the longitudinal section.
- The location and type of special backfill in trenches.
- Street names relevant to road crossings.

Drainage Retardation and Treatment Drawings

On-Site detention and drainage retardation drawings should as a minimum show the following:

- Limit of Works to be constructed including all connections to existing and proposed work.
- Property boundaries and easements within the limit of works.
- Areas of fill greater than 300mm depth.
- Existing and proposed PSM's and TBM's.
- Flood levels where applicable.
- Drainage Pipe diameters and grades.
- Drainage Pit numbers.
- All existing or proposed fences, buildings, trees, Public Open Space features in the vicinity of the works.
- Invert levels of all inlet and outfall structures including pipes and open drains.
- Surface levels and freeboard.
- Batter slopes and grades of basin floor.
- Orifice plate details or similar for on-site detention systems.
- Top Water Levels during both the minor storm event and 100 ARI storm event.
- The hydraulic grade line in the inlet pipe/drain for both the minor storm event and 100 ARI storm event.
- Invert levels and cover levels of associated pits and litter traps.
- Design catchment and storage volume requirements.
- Planting schedules for wetlands including quantity and species of all plantings.

Detail Drawings

Detail drawings should as a minimum show the following:

- Structural details of retaining walls.
- All special drainage structures.
- Method of downstream erosion control at endwalls.
- Method of erosion control for batters in areas susceptible to erosion.
- Structural pits, switching mechanisms, operating levels and pump details for pump stations.
- Structural details of any Estate entrance structures.
- Details of street furniture.

Landscape Drawings

Landscape plans should as a minimum show the following:

- Planting schedules and any specific planting requirements such as size of hole, root barriers, fertiliser etc.
- Location and spacing of all trees, shrubs and plants etc.
- Location and details of any trees or vegetation to be removed.
- Irrigation details including metering, backflow prevention devices, pipe diameter and materials, valve details.
- Path, bollard and fencing construction details.
- Street furniture and signage details including type, location and fixing requirements.
- Lighting details.
- Supply and installation details of playground equipment.
- Open water bodies to cross reference to other retardation basin or drainage plans.
- Details of services within landscaped areas.

Master Services Plans

Master Services Plans should as a minimum show the following:

- All services must include as a minimum drainage, treated/potable water, raw water, sewer, Telstra, gas, electrical, private works.
- Trench alignments of all services within the limit of works (single line representation for shared trench).
- All pits to scale and street lighting to be shown.
- Any structural or mechanical protection if applicable.
- Kerb alignments and kerb crossings.

- Clear identification of incidents where minimum vertical or horizontal clearances are not achieved and detail of actual clearance.

As Constructed Drawings

As Constructed plans must detail all design information and highlight any deviation from the approved design plans.

As Constructed drawings must be provided in pdf format as a minimum.

-

APPENDIX E: LIST OF COUNCIL INSPECTIONS AND INSPECTION CHECKLISTS

The following represents the minimum number of Council inspections and are considered hold points:

- Pre-start for civil works.
- Pre-start for landscaping works.
- Prior to covers being placed in pits.
- Prior to placement of kerb and channel.
- Prior to pouring footpath (excluding City of Greater Bendigo, Wellington Shire, Central Goldfields Shire, Baw Baw Shire, Moira Shire and Pyrenees Shire Council see witness points below).
- At proof-rolling of sub-grade.
- Prior to placement of each pavement course.
- Prior to placement of the primer coat.
- Prior to the placement of first asphalt course or sealing.
- Prior to pouring concrete on large reinforced concrete structures.
- Prior to placement of GPT's, litter traps, precast pumpstations.
- Prior to planting out wetlands.
- Prior to removal of native vegetation and other existing vegetation.
- Prior to planting (landscaping).

The following are witness points (Council are made aware of the works but works are not held up awaiting inspection).

- Prior to backfilling stormwater drains.
- Prior to backfilling subsoil drains.
- Prior to pouring footpath (For Greater Bendigo City Council, Wellington Shire, Central Goldfields, Shire Moira Shire and Pyrenees Shire Council only).

PRE-START MEETING CHECKLIST - LANDSCAPING

SUBDIVISION FILE NO. _____ **DATE OF INSPECTION:** _____

PERSONS PRESENT AT INSPECTION: _____

LOCATION/STAGE/SECTION _____

CHECKLIST ITEMS	YES	NO	NOT REQUIRED	COMMENTS
Contact details between superintendent, Council and contractor been exchanged?	☐	☐	☐	
Has MOU for supervision responsibility been signed?	☐	☐	☐	
Copy of Council approved construction plans available for viewing	☐	☐	☐	
Check whether there is an approved environmental management plan and checked requirements?	☐	☐	☐	
Copy of works program been viewed by Council to plan inspections?	☐	☐	☐	
Are any works proposed in existing road reserve?	☐	☐	☐	
If yes to above, has contractors public liability certificate of currency been sighted and traffic management plan approved?	☐	☐	☐	
Any special design requirements considered?	☐	☐	☐	
Approval to proceed to next stage	☐	☐		

ADDITIONAL COMMENTS

_____

_____

_____

_____

COUNCIL REPRESENTATIVE SIGNATURE _____

SUPERINTENDENT SIGNATURE _____

PRIOR TO PLANTING – LANDSCAPING

SUBDIVISION FILE NO. _____ **DATE OF INSPECTION:** _____

PERSONS PRESENT AT INSPECTION: _____

LOCATION/STAGE/SECTION _____

CHECKLIST ITEMS	YES	NO	NOT REQUIRED	COMMENTS
Weeds removed?	☐	☐	☐	
Topsoiling in place?	☐	☐	☐	
Mulching in place?	☐	☐	☐	
Watering system in?	☐	☐	☐	
Civil Works Complete (i.e. outfall to wetlands, footpaths through parks etc)	☐	☐	☐	
Approval to proceed to next stage	☐	☐		

ADDITIONAL COMMENTS

_____

_____

_____

_____

_____

_____

COUNCIL REPRESENTATIVE SIGNATURE _____

SUPERINTENDENT SIGNATURE _____

PRELIMINARY ACCEPTANCE INSPECTION-LANDSCAPING

SUBDIVISION FILE NO. _____ **DATE OF INSPECTION:** _____

PERSONS PRESENT AT INSPECTION: _____

LOCATION/STAGE/SECTION _____

CHECKLIST ITEMS	YES	NO	NOT REQUIRED	COMMENTS
Watering system turned on and demonstrated to operations?	☐	☐	☐	
Plantings in place and alive?	☐	☐	☐	
Mulching in place?	☐	☐	☐	
Trees staked and tied and minimum offset from kerb	☐	☐	☐	
Traffic islands and nature strips don't have rutting from vehicle traffic?	☐	☐	☐	
All required structures are in place and completed? (i.e. Playground, footpaths, bollards etc)	☐	☐	☐	
Batters are stable and are not scouring?	☐	☐	☐	
Access is provided and bollards restricting access are in place?	☐	☐	☐	
Provision of maintenance instructions?	☐	☐	☐	
Provided asset list for handover?	☐	☐	☐	
Has Council's maintenance staff been notified?	☐	☐	☐	
Approval to proceed to next stage	☐	☐		

ADDITIONAL COMMENTS

_____

_____

_____

_____

_____

COUNCIL REPRESENTATIVE SIGNATURE _____

SUPERINTENDENT SIGNATURE _____

FINAL ACCEPTANCE INSPECTION – LANDSCAPING

SUBDIVISION FILE NO. _____ **DATE OF INSPECTION:** _____

PERSONS PRESENT AT INSPECTION: _____

LOCATION/STAGE/SECTION _____

CHECKLIST ITEMS	Yes	No	Not Required	Comments
Plants alive and in place?	☐	☐	☐	
Trees staked and tied	☐	☐	☐	
Islands and nature strips don't have rutting from traffic?	☐	☐	☐	
Mulching in place?	☐	☐	☐	
Top soil has not subsided?	☐	☐	☐	
Batters are stable and are not scouring?	☐	☐	☐	
Access is provided and bollards restricting access are in place?	☐	☐	☐	
Final Acceptance Issued	☐	☐		

ADDITIONAL COMMENTS

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COUNCIL REPRESENTATIVE SIGNATURE _____

SUPERINTENDENT SIGNATURE _____

PRE-START MEETING CHECKLIST – CIVIL WORKS

SUBDIVISION FILE NO. _____ **DATE OF INSPECTION:** _____

PERSONS PRESENT AT INSPECTION: _____

LOCATION/STAGE/SECTION _____

CHECKLIST ITEMS	YES	NO	NOT REQUIRED	COMMENTS
Contact details between superintendent, Council and contractor been exchanged?	☐	☐	☐	
Copy of Council approved construction plans available for viewing	☐	☐	☐	
Has MOU for supervision responsibility been signed?	☐	☐	☐	
Has traffic management plan been sighted?	☐	☐	☐	
Check approved environmental management plan? Have requirements been met?	☐	☐	☐	
Has works on road permit been sighted?	☐	☐	☐	
Copy of works program been viewed by Council to plan inspections?	☐	☐	☐	
Has a check of the planning permit conditions been undertaken in relation to any conditions which state 'prior to works commencing'? Have all these requirements been satisfied?	☐	☐	☐	
Discussed measures to protect native vegetation?	☐	☐	☐	
Are any works proposed in existing road reserve?	☐	☐	☐	
If yes to above, has contractors public liability certificate of currency been sighted and traffic management plan approved?	☐	☐	☐	
Any special design requirements considered?	☐	☐	☐	
Approval to proceed to next stage	☐	☐		

ADDITIONAL COMMENTS

COUNCIL REPRESENTATIVE SIGNATURE _____

SUPERINTENDENT SIGNATURE _____

DRAINAGE INSPECTION – CIVIL WORKS

SUBDIVISION FILE NO. _____ **DATE OF INSPECTION:** _____

PERSONS PRESENT AT INSPECTION: _____

LOCATION/STAGE/SECTION _____

	CHECKLIST ITEMS	YES	NO	NOT REQUIRED	COMMENTS
General	Have hold points and witness points been complied with?	☐	☐	☐	
Trenching					
	Shoring and access in place	☐	☐	☐	
Pipes					
	Bedding of sufficient depth & compacted	☐	☐	☐	
	Pipes not sitting on collars causing 'beaming'?	☐	☐	☐	
	Vertical/horizontal alignment checked and satisfactory?	☐	☐	☐	
	Direction of laying satisfactory? (i.e. collar on upstream end?)	☐	☐	☐	
	Rubber ring jointing is satisfactory?	☐	☐	☐	
	If butt jointed pipes approved, rubber bands should be used at the joints.	☐	☐	☐	
	House drain connected to top of pipe with approved connection?	☐	☐	☐	
	Check that pipes are sound i.e. not cracked.	☐	☐	☐	
	Lifting hole bungs in place.	☐	☐	☐	
	Size of pipes, bedding materials etc conform to design. Has evidence been provided where applicable?	☐	☐	☐	
Back Filling					
	Haunching and backfill material as specified and compacted?	☐	☐	☐	
	Any biofiltration backfill as specified?	☐	☐	☐	

	CHECKLIST ITEMS	YES	NO	NOT REQUIRED	COMMENTS
Pits					
	Base material is placed and compacted?	☐	☐	☐	
	Inner & outer formworks and reinforcement are in place?	☐	☐	☐	
	No collars are incorporated within the pits walls?	☐	☐	☐	
	Precast pits have been supplied and installed as per plan?	☐	☐	☐	
	Holes are mortared up for precast pits.	☐	☐	☐	
	The strength of concrete used to construct pits meets Manual requirements?	☐	☐	☐	
Approval to proceed to next stage		☐	☐		

ADDITIONAL COMMENTS

COUNCIL REPRESENTATIVE SIGNATURE _____

SUPERINTENDENT SIGNATURE _____

SUBGRADE INSPECTION – CIVIL WORKS

SUBDIVISION FILE NO. _____ **DATE OF INSPECTION:** _____

PERSONS PRESENT AT INSPECTION: _____

LOCATION/STAGE/SECTION _____

CHECKLIST ITEMS	YES	NO	NOT REQUIRED	COMMENTS
Level pegs are to be established at adequate intervals with TOK level marked.	☐	☐	☐	
Shape is in accordance with endorsed plans and FSL checked with string line	☐	☐	☐	
Proof roll passed with no soft spots?	☐	☐	☐	
Subgrade is free from oversize floaters (more than 75mm) and surface rock.	☐	☐	☐	
Subgrade is free from roots and other foreign material?	☐	☐	☐	
All fill below road pavements has been compacted to 98% standard. And results presented to Council?	☐	☐	☐	
Service and drainage trenches backfilled with class 3 crushed rock and compacted satisfactorily?	☐	☐	☐	
Approval to proceed to next stage	☐	☐		

ADDITIONAL COMMENTS

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COUNCIL REPRESENTATIVE SIGNATURE _____

SUPERINTENDENT SIGNATURE _____

SUB BASE INSPECTION – CIVIL WORKS

SUBDIVISION FILE NO _____ **DATE OF INSPECTION:** _____

PERSONS PRESENT AT INSPECTION: _____

LOCATION/STAGE/SECTION _____

CHECKLIST ITEMS	YES	NO	NOT REQUIRED	COMMENTS
Proof roll passed with no soft spots?	☐	☐	☐	
Compaction test results submitted to Council?	☐	☐	☐	
Depth of layer as per design?	☐	☐	☐	
Shape is in accordance with endorsed plans and FSL checked with string line	☐	☐	☐	
Approval to proceed to next stage	☐	☐		

ADDITIONAL COMMENTS

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COUNCIL REPRESENTATIVE SIGNATURE _____

SUPERINTENDENT SIGNATURE _____

KERB & CHANNEL PRE-POUR INSPECTION - CIVIL WORKS

SUBDIVISION FILE NO _____ **DATE OF INSPECTION:** _____

PERSONS PRESENT AT INSPECTION: _____

LOCATION/STAGE/SECTION _____

CHECKLIST ITEMS	YES	NO	NOT REQUIRED	COMMENTS
Where matching with existing kerb & channel check and rectify level, alignment and condition	☐	☐	☐	
Construction platform (part of sub base as per the design) placed over subgrade?	☐	☐	☐	
Kerb and channel to be placed on compacted sub base pavement or compacted min 75mm thick class 3 FCR bedding whichever is the greater. (if sub base is in fill, sub base compaction test results are to be submitted to Council. 98% Modified as per the Manual Section 12.7.7)	☐	☐	☐	
Uniform grade on kerb and channel and alignment?	☐	☐	☐	
Laybacks identified placed min. 75mm thick class 3 FCR compacted bedding and boxing completed?	☐	☐	☐	
Check subsoil drain connections.	☐	☐	☐	
Check pits are in the correct location.	☐	☐	☐	
Transition identified and base prepared for transition between kerb profiles?	☐	☐	☐	
Underground services identified for kerb stamping.	☐	☐	☐	
Line of kerb identified and provides correct road width.	☐	☐	☐	
Throat transitions at SEP's?	☐	☐	☐	
Any special design requirements considered?	☐	☐	☐	
Approval to proceed to next stage	☐	☐		

ADDITIONAL COMMENTS

COUNCIL REPRESENTATIVE SIGNATURE _____

SUPERINTENDENT SIGNATURE _____

FOOTPATH PRE-POUR INSPECTION – CIVIL WORKS

SUBDIVISION FILE NO _____ **DATE OF INSPECTION:** _____

PERSONS PRESENT AT INSPECTION: _____

LOCATION/STAGE/SECTION _____

CHECKLIST ITEMS	YES	NO	NOT REQUIRED	COMMENTS
Where matching with existing footpath check and rectify level, alignment and condition.	☐	☐	☐	
Boxing in place and at correct level?	☐	☐	☐	
Bedding is compacted and to thickness as specified in the endorsed plan?	☐	☐	☐	
Re-enforcement is in and sitting on chairs?	☐	☐	☐	
Expansion joints located, prepared and dowelled satisfactorily?	☐	☐	☐	
House drain, services and required conduits are in place?	☐	☐	☐	
Approval to proceed to next stage	☐	☐		

ADDITIONAL COMMENTS

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COUNCIL REPRESENTATIVE SIGNATURE _____

SUPERINTENDENT SIGNATURE _____

KERB AND CHANNEL OR FOOTPATH POUR – CIVIL WORKS

SUBDIVISION FILE NO _____ **DATE OF INSPECTION:** _____

PERSONS PRESENT AT INSPECTION: _____

LOCATION/STAGE/SECTION _____

CHECKLIST ITEMS	YES	NO	NOT REQUIRED	COMMENTS
Construction/expansion joints at correct spacing	☐	☐	☐	
Depth of construction joints sufficient?	☐	☐	☐	
Dowelling included?	☐	☐	☐	
Expansion joints are dowelled and greased and reinforcement cut?	☐	☐	☐	
Check that service pits are at the correct levels?	☐	☐	☐	
Check that tactile markers have been installed. Note some Council's only require these in central commercial areas.	☐	☐	☐	
Check expansion joints are provided in accordance with the relevant standard drawing.	☐	☐	☐	
Approval to proceed to next stage	☐	☐		

ADDITIONAL COMMENTS

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COUNCIL REPRESENTATIVE SIGNATURE _____

SUPERINTENDENT SIGNATURE _____

BASE INSPECTION (PRIOR TO PRIMING) – CIVIL WORKS

SUBDIVISION FILE NO _____ **DATE OF INSPECTION:** _____

PERSONS PRESENT AT INSPECTION: _____

LOCATION/STAGE/SECTION _____

CHECKLIST ITEMS	YES	NO	NOT REQUIRED	COMMENTS
Proof roll passed with no soft spots?	☐	☐	☐	
Compaction test results submitted to Council? (100% modified as per the Manual Clause 12.7.7)	☐	☐	☐	
Depth of layer as per pavement design?	☐	☐	☐	
Shape is in accordance with endorsed plans and checked with string line?	☐	☐	☐	
Surface condition is clean, isn't coarse or fatty and papering is down?	☐	☐	☐	
Check papering is down?	☐	☐	☐	
Is a uniform surface provided?				
Approval to proceed to next stage	☐	☐		

ADDITIONAL COMMENTS

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COUNCIL REPRESENTATIVE SIGNATURE _____

SUPERINTENDENT SIGNATURE _____

PRIOR TO WEARING COURSE BEING PLACED – CIVIL WORKS

SUBDIVISION FILE NO _____ **DATE OF INSPECTION:** _____

PERSONS PRESENT AT INSPECTION: _____

LOCATION/STAGE/SECTION _____

CHECKLIST ITEMS	YES	NO	NOT REQUIRED	COMMENTS
Where matching with existing asphalt check and rectify level, alignment and joint	☐	☐	☐	
Prime is down in sufficient quantity and evenness?	☐	☐	☐	
Surface is clean of mud?	☐	☐	☐	
Tack coat being placed between asphalt layers?	☐	☐	☐	
Check papering is down?	☐	☐	☐	
If on site check temperature of asphalt.	☐	☐	☐	
Approval to proceed to next stage	☐	☐		

ADDITIONAL COMMENTS

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COUNCIL REPRESENTATIVE SIGNATURE _____

SUPERINTENDENT SIGNATURE _____

PRACTICAL COMPLETION (PRELIMINARY) INSPECTION – CIVIL WORKS

SUBDIVISION FILE NO _____ **DATE OF INSPECTION:** _____

PERSONS PRESENT AT INSPECTION: _____

LOCATION/STAGE/SECTION _____

CHECKLIST ITEMS	YES	NO	NOT REQUIRED	COMMENTS
All construction works are completed as per the approved plans or can be issued once the outstanding works are bonded.	☐	☐	☐	
Site is generally tidy (i.e. no rubbish, wheel ruts have been removed etc)	☐	☐	☐	
Cracking/surface of road pavement and concreting is satisfactory?	☐	☐	☐	
Pit openings located over pit?	☐	☐	☐	
Pit lids (inserts) are off, pits are clean?	☐	☐	☐	
Pit walls are vertical?	☐	☐	☐	
All house drains and property inlets are installed and house drain riser is in place.	☐	☐	☐	
Easy access through pit opening	☐	☐	☐	
Kerb and channel is stamped indicating location of conduits and house drains?	☐	☐	☐	
Line marking, signs and street plates are in place?	☐	☐	☐	
Light and sign poles are vertical?	☐	☐	☐	
Temporary turning facilities, including **Carriageway** easement as required, with hazard chevrons in place?	☐	☐	☐	
Pit lid levels are flush with FSL?	☐	☐	☐	
Pit lid levels and FSL provide detention as specified in bioretention areas	☐	☐	☐	
Number of plants as specified in bioretention areas	☐	☐	☐	
Pit lid (frames) are sitting on all sides.	☐	☐	☐	
Pit lids are off and pits are clean?	☐	☐	☐	
Lot levels and grading is satisfactory?	☐	☐	☐	
Top soil is in place?	☐	☐	☐	

CHECKLIST ITEMS	YES	NO	NOT REQUIRED	COMMENTS
Naturestrips free of debris	☐	☐	☐	
No subsidence has been identified?	☐	☐	☐	
Fire hydrants in place and marked with RRPM/post and are at the correct level?	☐	☐	☐	
Service Authority assets are at the correct level?	☐	☐	☐	
Outfalls have grates to prevent entry and are locked with an approved Council key?	☐	☐	☐	
Are EMP provisions in position?	☐	☐	☐	
Pump station is OK and operational manuals have been handed over.	☐	☐	☐	
Defects list has been agreed to?	☐	☐	☐	
Asset statement and as constructed plans have been provided?	☐	☐		
Certificate of Practical Completion has been issued?	☐	☐		
Were maintenance staff at the meeting or is a separate handover meeting required?	☐	☐		

ADDITIONAL COMMENTS

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COUNCIL REPRESENTATIVE SIGNATURE _____

SUPERINTENDENT SIGNATURE _____

FINAL ACCEPTANCE INSPECTION (END OF DEFECTS PERIOD) – CIVIL WORKS

SUBDIVISION FILE NO _____ **DATE OF INSPECTION:** _____

PERSONS PRESENT AT INSPECTION: _____

LOCATION/STAGE/SECTION _____

CHECKLIST ITEMS	YES	NO	NOT REQUIRED	COMMENTS
Site is generally tidy (i.e. no rubbish, wheel ruts have been removed etc)	☐	☐	☐	
Cracking/surface of road pavement and concreting is satisfactory?	☐	☐	☐	
No subsidence has been identified?	☐	☐	☐	
Electronic surveillance of all pipe drains was carried out at the end of the maintenance period and information provided to Council?	☐	☐	☐	
Light and sign poles are vertical?	☐	☐	☐	
No subsidence has been identified?	☐	☐	☐	
No failure of infrastructure has been identified?	☐	☐	☐	
Omissions have been completed as per omissions and defects list?	☐	☐	☐	
Final Acceptance	☐	☐		

ADDITIONAL COMMENTS

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COUNCIL REPRESENTATIVE SIGNATURE _____

SUPERINTENDENT SIGNATURE _____

APPENDIX F: STANDARD DRAWINGS

The Standard Drawings can be downloaded from the **Manual** website www.designmanual.com.au

APPENDIX G: STANDARD S173 AGREEMENT

STANDARD S173 AGREEMENT FOR ON-SITE DETENTION

Councils will prepare and lodge S173 agreements for on-site detention at the cost of the Developer.

The following is an extract of the typical wording of the 'Covenants of the Owner'.

The Owner covenants with the Council that:

1. The on-site detention for stormwater for the specified lots will each be designed by a **Qualified Engineer** and must be approved by the Council prior to construction. A copy of each of the approved plans will be held by Council for future reference.

2. Each on-site detention stormwater system must be constructed either prior to, or currently with, the construction of any dwelling on the specified lots. Each on-site detention stormwater system on the specified lots must be completed prior to connection to Council's drainage system. The Owner will notify the Council when on-site detention works commence on the specified lots and request an inspection from the Council at the completion of works.

3. They will maintain, and not modify without prior Council written approval, each on-site detention system and will allow each on-site stormwater detention system to be inspected by a duly appointed officer of the Council at mutually agreed times.

4. The Owner will pay for all the costs associated with the construction and maintenance of each on-site detention system.

5. The Council must register this Agreement at the Lands Title Office at the cost of the Owner on the title or titles for the land.

APPENDIX H: STREET LIGHTING

appendices\Public_Lighting_Non_Std_FA051-Nov-05.pdf

APPENDIX I: COUNCIL REVIEW CHECKLISTS

COUNCIL CHECKLIST #C1 – DEVELOPMENT PLANS SUBMITTED FOR APPROVAL OF FUNCTIONAL LAYOUT

Planning Permit Number _____ Designer _____

Development Title _____ Stage _____

Design Unit Reference_____ Consultants Reference _____

Date Received _____ Date Checked _____

Checked By _____ Number of Plans in set _____

COUNCIL CHECKLIST #C1		
ITEM	**SATISFACTORY Y / N / NA**	**REMARK**
General		
Has submission been accompanied by completed checklist as per Manual requirements?		
Has an ODP been prepared?		
Is the submission consistent with ODP?		
Is the submission consistent with endorsed plan?		
Is the submission consistent with planning permit conditions?		
Is the proposed staging of the development appropriate? (e.g. is the impact of staging works on traffic routes and intersections appropriate, and are there drainage consequences of staging?)		
Is a lot layout provided with lots numbered and dimensioned, and reserves clearly identified.		
Has Council's 5 year Capital Works program been reviewed?		
Is there any interface or overlap between the development and proposed Capital Works program?		
Is the Public Open Space provided in correct area? (should have been identified at planning stage but re-check)		
Is access to Public Open Space appropriate? Request information if not shown.		
Are linkages to adjoining developments appropriate? Request information if not shown.		

COUNCIL CHECKLIST #C1		
ITEM	**SATISFACTORY Y / N / NA**	**REMARK**
Road Layout Plans		
Street names are nominated. (Check with Planning Dept. and Asset Mgt Dept. whether names okay and advise Design Engineer if no approved)		
Plans show Road Hierarchy.		
Estimated traffic volumes are shown on plans (check consistency with road hierarchy?)		
Nominate road widths between inverts of kerbs are satisfactory?		
Nominated kerb types satisfactory?		
Intersections internal to the development are shown in sufficient detail to support proposed design, including proposed kerb radii.		
Intersections external to the development are shown in sufficient detail to support proposed design.		
Critical vehicle turning movements are shown at intersections and cul-de-sacs and satisfactory.		
Drainage Layout Plans		
Plans show Natural Surface Contour Lines to AHD.		
Plans show the total catchment area, nominated sub-catchment areas and co-efficient of runoff for each sub-catchment, including allowance for connection of adjoining properties outside development.		
Plans shown layout of proposed drainage systems with approximate sizes.		
Overland flow path is nominated and satisfactory.		
Drainage discharge point is shown and proposed treatment shown in sufficient detail to support approval of functional layout.		
Drainage treatment strategy is provided and appears satisfactory		
Existing drainage services are confirmed on plans and proposed connection points shown.		
Associated Documents		
Was a Traffic Management Report required?		

COUNCIL CHECKLIST #C1		
ITEM	**SATISFACTORY Y / N / NA**	**REMARK**
Is the Traffic Management Report satisfactory?		
Does the design reflect recommendations within the Traffic Management Report?		
Has the need for Developer contributions or headworks charges been identified? Has Developer's Representative provided preliminary proposal regarding cost-sharing arrangements with Council/others? Is it satisfactory?		

The following further information is required to be submitted:

_____

_____

_____

_____

_____

_____

Drawing numbers allocated to this project are _____ through to _____ as required

Approval of functional layout IS / IS NOT granted for the proposed development.

Signed _____ Dated _____

COUNCIL CHECKLIST #C2 – PLANS SUBMITTED FOR DETAILED DESIGN APPROVAL

Planning Permit Number _____ Designer _____

Development Title _____ Stage _____

Design Unit Reference_____ Consultants Reference _____

Date Received _____ Date Checked _____

Checked By _____ Number of Plans in set _____

COUNCIL CHECKLIST #C2		
ITEM	**SATISFACTORY Y / N / NA**	**REMARK**
Was approval of functional layout granted?		Date?
Has submission been accompanied by completed checklist as per Manual requirements?		
Has the subdivision plan been certified?		
Plans to state that datum to AHD (all layout plans)		
Plans show north point correctly (all plans)		
Suitable TBM's shown clearly on plans (all layout plans)		
Relevant PSM's shown clearly on plans and protected from works (all layout plans)		
Natural Surface Levels are shown at all lot corners and major changes of grade within the lots (all layout plans). Check minimum grade across lot of 1 in 200 is achieved. Check each lot has discharge point nominated.		
Was a Traffic Management Report provided?		
Does the detailed design reflect recommendations within the Traffic Management Strategy TMAR or TIAR documents?		
Was a Road Safety Audit required?		
Is the Road Safety Audit satisfactory?		
Has Council responded to the Road Safety Audit? (Design Services Manager to respond)		

COUNCIL CHECKLIST #C2		
ITEM	**SATISFACTORY Y / N / NA**	**REMARK**
Does the design reflect recommendations within the Road Safety Audit that were accepted by the Design Services Manager?		
Do plans show Council's nominated drawing numbers?		
Do plans show planning permit numbers?		
Is the methodology of the geotechnical report and pavement design satisfactory?		
Does design and documentation reflect recommendations within the geotechnical/pavement design report?		
Should garbage pads provided for areas where service vehicles cannot achieve reasonable access?		
Are indented parking bays to be provided, and are they adequately designed and documented?		
Are other services compatible with Council's engineering requirements?		
Is the location and type of street lighting clearly documented and compatible with engineering requirements?		
Is the Master Services Plan provided, and clashes identified?		
Are clearances between services (plan and vertical) achieved adequately?		
Do intersection designs drain properly?		
Are temporary provision for turnarounds and **Carriageway** easements as required, provided where future stage to be constructed?		
Are environmental protection requirements clearly documented?		

COUNCIL CHECKLIST #C2		
ITEM	**SATISFACTORY Y / N / NA**	**REMARK**
Have public risk issues been identified and Risk Report provided? Does design reflect recommendations? Does Council need to take further actions? Some issues to consider include: • Manholes in footpaths. • Changes in levels greater than 200mm. • Accessible headwalls. • Electrical substations. • Gantries. • Basin/wetland slopes greater than 1 in 5. Overland flow issues. Slopes away from footpath edges. Other potential risks arising from development.		
Are landscaping plans provided with this submission? If yes, forward to Parks & Gardens ASAP and arrange meeting with P&G staff if issues to be resolved.		
Is the landscaping design compatible with engineering requirements?		
Are street furniture details provided, and satisfactory to **Council**?		

COUNCIL CHECKLIST #C2		
ITEM	**SATISFACTORY Y / N / NA**	**REMARK**
Are hydrological and hydraulic calculations provided? • Methodology nominated? (check Manual if second model needed) • Assumptions reasonable? • Coefficients in accordance with Manual requirements? • Have external areas been provided for? Developed or undeveloped? Okay? Q_A Q_F • Check hydraulic grade line. • Pump selection okay?		
Are stormwater treatment facilities satisfactory with regard to: • Location. • Design. • Litter traps. • Erosion protection. • Independent watering systems. • Pump stations, controls and telemetry. • Consistency with design Manual requirements.		
Are copies of approvals to discharge to natural waterways or relevant authority drains provided?		
Are cost-sharing arrangements for Developer contributions or headworks charges resolved? Does this take into account arrangements for areas outside of development?		

The following further information is required to be submitted:

Detailed design approval IS / IS NOT granted for the proposed development.

Signed _____ Dated _____

COUNCIL CHECKLIST #C3 – PLANS SUBMITTED FOR FINAL DESIGN APPROVAL

Planning Permit Number _____ Designer _____

Development Title _____ Stage _____

Design Unit Reference_____ Consultants Reference _____

Date Received _____ Date Checked _____

Checked By _____ Number of Plans in set _____

COUNCIL CHECKLIST #C3		
ITEM	**SATISFACTORY Y / N / NA**	**REMARK**
General		
Was detailed design approval granted? (Record date)		
Has submission been accompanied by completed checklist as required by Manual?		
Have planning permits been reviewed and design appears to comply?		
Has the subdivision plan been certified and design is consistent?		
Have all amendments requested at detailed design stage been implemented?		
Was additional information provided, if applicable?		
Does additional information satisfy queries/requirements or is further information still needed?		
Was an estimate provided? Appear reasonable?		
Have all outstanding matters (cost sharing, etc) been finalised to Council's satisfaction?		

Final Design approval IS / IS NOT granted for the proposed development.

If construction has not commenced within two years of the approval date below, the approval expires and final design plans must be resubmitted for consideration by Council.

Signed _____ Dated _____

COUNCIL CHECKLIST #C4 – ISSUE OF STATEMENT OF COMPLIANCE

Planning Permit Number _____ Designer _____

Development Title _____ Stage _____

Design Unit Reference_____ Consultants Reference _____

Date Received _____ Date Checked _____

Checked By _____ Number of Plans in set _____

General		
Have ALL planning permit conditions been adhered to?		
Does the 'As Constructed' development comply with the approved design plans?		
Have any changes been approved?		
Are drains and kerb and channel clean?		
Has an Acceptance of Works inspection been undertaken with satisfactory outcome?		
Has 'As Constructed' information been provided to Council?		
Have 'Operation and Maintenance' manuals, where applicable, been provided for pumps, and other drainage features?		
Has training of Council staff been undertaken, if applicable?		
Is the drainage overland flow path for 100 year **ARI** flows free of obstruction?		
Are landscaping systems fit for take over?		

Engineering Design Services OBJECTS / HAS NO OBJECTION to the issue of Statement of Compliance.

Signed _____ Dated _____

APPENDIX J: NOTES ON COUNCIL'S ENGINEERING PRINCIPLES

PRINCIPLE	Clause 9.3	This principle provides additional requirements to that of The Planning Scheme, and relates to developments that do not necessarily include collector streets, but may still warrant establishing bicycle links through the development. Council must review and determine at planning permit stage the need for these facilities.
PRINCIPLE	Clause 9.3	The Planning Scheme allows three-point turning of service vehicles in developments. Council have adopted an engineering principle that no waste vehicle, emergency service vehicle or street-sweeper must need to reverse in developments. This is in response to recommendations made by the Coroner in relation to fatalities resulting from these types of vehicle movements. In addition to the Coroner's recommendation Council believes that cul-de-sacs are beneficial to the amenity of the residents living in the cul-de-sac because of footpath connectivity and safer environments for children.
PRINCIPLE	Clause 9.3	This principle provides additional requirements to that of The Planning Scheme, and relates to developments that do not necessarily include collector streets, but may still warrant establishing bicycle links through the development. Council must review and determine at planning permit stage the need for these facilities.
PRINCIPLE	Clause 9.3	The Planning Scheme allows three-point turning of service vehicles in developments. Council have adopted an engineering principle that no waste vehicle, emergency service vehicle or street-sweeper must need to reverse in developments. This is in response to recommendations made by the Coroner in relation to fatalities resulting from these types of vehicle movements. In addition to the Coroner's recommendation Council believes that cul-de-sacs are beneficial to the amenity of the residents living in the cul-de-sac because of footpath connectivity and safer environments for children.
PRINCIPLE	Clause 12.3.1	The Planning Scheme standards discuss Access Lanes. These are considered to be socially undesirable as they provide out-of-sight places where undesirable behaviour often takes place. Where they are approved, specific conditions may be imposed by Council such as open fencing to adjacent properties, planting restrictions etc to create more open and visible environment...
PRINCIPLE	Clause 12.3.2	These differ from The Planning Scheme standards, and are based upon reserve widths needed to accommodate desirable **Carriageway** widths and verge widths as outlined within the manual. Negative feedback has been received by Council regarding previous developments with lesser widths of road reserve, and those proposed herein are more in line with community expectations in areas outside of metropolitan areas.

PRINCIPLE	Clause 12.3.4 *	As discussed above.
PRINCIPLE	Clause 12.3.9	The Planning Scheme allows use of any part of the pavement for turning movements in some street types. Council has adopted an engineering principle that vehicles must use the correct side of the pavement for turning due to safety concerns. ARRB have issued draft user guide to Austroads turning templates consistent with Council's principle of using the correct lanes when turning.
PRINCIPLE	Clause 12.3.9	The Planning Scheme allows use of driveways for three-point turning of vehicles in developments. Council have adopted an engineering principle about not using driveways or vehicle accesses for turning around due to safety concerns.
PRINCIPLE	Clause 12.6	This differs from The Planning Scheme standards. This principle is based upon experience outside of the metropolitan area. This is also more in line with Austroads principles and consistent with advice to Council from experienced traffic engineers.
PRINCIPLE	Clause 13.2	The Planning Scheme requires footpaths for both sides of streets for Access Streets, or higher order streets, but not Access Places. Council requires footpaths are required for all frontages, including fully around court to in accordance with the principles of the Disability Discrimination Act 1992. This principle has also been determined through consultation with access impaired representatives of the community.
PRINCIPLE	Clause 13.3	The Planning Scheme allows footpaths to abut kerbs. Council principle is that they should be separated to avoid conflict between pedestrians and doors of parked cars and to provide a buffer between children and moving vehicles.
PRINCIPLE	Clause 26.2.1.1	Council has received numerous requests to address street lighting in these developments. This principle has been adopted to cover the gap in the various standards and to meet community expectations.