Planning Agreement
Explanatory Note

Environmental Planning and Assessment Regulation 2000

(Clause 25E)

1 Summary

The purpose of this Explanatory Note is to provide a summary to support the notification of the proposed planning agreement (Planning Agreement) under section 7.4 of the Environmental Planning and Assessment Act 1979 (NSW) (EP&A Act).

This Explanatory Note has been prepared jointly by the parties as required by clause 25E of the Environmental Planning and Assessment Regulation 2000 (NSW) (EP&A Regulation).

2 Parties

The parties to the Planning Agreement are:

(1) The Hills Shire Council (ABN 25 034 494 656) (Council); and
(2) Mirvac Projects (Retail and Commercial Pty Limited (ABN 34 151 466 241) ATF Mirvac Pennant Hills Residential Trust (ABN 80 199 861 372) (Developer).

3 Descriptions of Subject Land

The Land to which the Planning Agreement is as follows:

(1) Folio Identifier: Lot 61 DP 737386
(2) Location: 55 Coonara Avenue, West Pennant Hills

4 Introduction and Background

(1) The Developer has lodged a Planning Proposal with Council seeking to amend The Hills Local Environmental Plan 2012 to allow (subject to development approval) the development of the Land as medium to high density residential incorporating 600 dwellings on the Land.

(2) If the Planning Proposal is accepted, the Developer intends to seek development consent for the development of the Land into 400 apartment dwellings and 200 medium density dwellings, including terrace style dwellings on lots with a minimum size of 86sqm.

(3) The draft Planning Agreement requires the Developer to provide the Material Public Benefits set out in the Planning Agreement in conjunction with the proposed development if the Planning Proposal is successfully and the development consent is granted.

5 Summary of Objectives, Nature and Effect of the Planning Agreement

(1) The Planning Agreement relates to the delivery of infrastructure to support the demand for facilities arising from the development of the Land and is generally consistent with The Hills LEP 2012 and The Hills DCP 2012 proposed for 55 Coonara Avenue, West Pennant Hills.

(2) The Developer has offered to provide the following Material Public Benefits in accordance with the Planning Agreement, these include:

   (a) Dedication of an area not less than 2.493 hectares as public open space and associated on grade car parking and access road (with a contribution value of $25M) (Open Space).

   The Developer must provide the Open Space prior to the first to occur of:
(i) the issue of an Occupation Certificate for the 400th lot within the development of the Land; or

(ii) the issue of an Occupation Certificate for the 150th dwelling in the housing stage of the development of the Land.

(b) The design and construction of a synthetic soccer field on the Open Space in accordance with the standards set out in the Planning Agreement (with a contribution value of $2.2M) (Soccer Field). The Developer must provide the Soccer Field prior to the first to occur of:

(i) the issue of an Occupation Certificate for the 400th lot within the development of the Land; or

(ii) the issue of an Occupation Certificate for the 150th dwelling in the housing stage of the development of the Land.

(c) The staged construction and dedication of public road to be generally in accordance with Council's Design Guidelines for Subdivision and Developments dated September 2011 (with a contribution value of $19.3M, being $16.6M land value; and $2.7M of capital costs for road construction) (Perimeter Road). The Developer must provide the Perimeter Road as follows:

(i) Progressively with each stage of the Perimeter Road being required to be completed prior to the first Occupation Certificate for any stage of the development which is adjacent to that part of the Perimeter Road.

(ii) By the time that the Open Space and the Soccer Field are required to be completed, the Perimeter Road must be completed sufficiently to allow public road access to those facilities.

(d) A Monetary Contribution to Council in an amount necessary to meet any costs incurred and compensation required to be paid by Council if it is required to acquire that part of the Land zoned E2 at some stage in the future (Monetary Contribution). The Monetary Contribution is required to be paid upon Council becoming liable for the payment of any of the costs and/or compensation referred to above.

6 Assessment of the Merits of the Planning Agreement

6.1 The planning purposes served by the Planning Agreement

The Planning Agreement provides a reasonable means of achieving and securing outcomes envisaged by The Hills LEP 2012 and The Hills DCP 2012 by identifying the works, method of payment and timing to ensure the public benefits secured by the Planning Agreement meet the demand for public facilities resulting from the development.

6.2 Promotion of the public interest

The public benefits to be secured by the Planning Agreement will flow from the achievement of the Planning Agreement’s objectives (refer to part Error! Reference source not found. of the Explanatory Note).

Significant efficiencies will be achieved through the Planning Agreement by allowing the Developer:

(1) greater involvement in the timing and scope of the Material Public Benefits; and

(2) the ability to coordinate the concurrent roll-out of residential lots and local infrastructure in the most efficient way.

The expected efficiencies, together with anticipated public benefits of the Planning Agreement, are described below:
(1) The Planning Agreement relieves Council of the obligation of delivering part of the public open space required for the Proposed Development (which is more ably delivered by the Developer).

There are various provisions in the Planning Agreement relating to the implementation of the Planning Agreement which protect and uphold the public interest. These include the following:

(1) provisions requiring the Developer to rectify defects in works provided under the Planning Agreement; and

(2) various provisions relating to security including:

(a) registration of the Planning Agreement on the title of the Land (or providing bank guarantees/insurance bonds as alternate security); and

(b) compulsory acquisition of land by Council for $1.00 in the event the land is not dedicated at the time required under the Planning Agreement.

6.3 Promotion of Council’s charter

The Planning Agreement promotes the Council’s charter under section 8 of the Local Government Act 1993 by providing adequate, equitable and appropriate services and facilities for the community and to ensure that those services and facilities are managed efficiently and effectively. The Planning Agreement further keeps the local community informed of Council’s activities.

6.4 Capital works program

The Planning Agreement will assist in the delivery of infrastructure required to support growth within the West Pennant Hills locality. The works contained within the Planning Agreement are to be undertaken by the Developer and will not divert Council’s resources from the existing capital works program.

6.5 Compliance matters

The Planning Agreement specifies that the timing for the dedication of the Open Space and Delivery of the Soccer Field to be completed prior to the issue of the Occupation Certificate for the 400th dwelling or 150th dwelling in the housing stage whichever occurs first. The Perimeter Road is required to be delivered as the adjacent stages of development are completed.
## Planning Agreement

### Summary Sheet

<table>
<thead>
<tr>
<th><strong>Council</strong></th>
<th><strong>Name</strong></th>
<th>The Hills Shire Council</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Address</strong></td>
<td>3 Columbia Court</td>
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<tr>
<td><strong>Senior Manager</strong></td>
<td>Mr Michael Edgar – General Manager</td>
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<tr>
<td><strong>Representative</strong></td>
<td>Mr Michael Edgar – General Manager</td>
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<tr>
<th><strong>Developer</strong></th>
<th><strong>Name</strong></th>
<th>Mirvac Projects (Retail and Commercial) Pty Limited (ABN 34 151 466 241) ATF Mirvac Pennant Hills Residential Trust (ABN 80 199 861 372)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Address</strong></td>
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<td></td>
</tr>
<tr>
<td><strong>Senior Manager</strong></td>
<td>Stuart Penklis – Head of Residential</td>
<td></td>
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<tr>
<td><strong>Representative</strong></td>
<td>Toby Long – General Manager, Residential Development NSW &amp; Major Projects</td>
<td></td>
</tr>
</tbody>
</table>

### Land

Lot 61 in DP 737386.

### Instrument Change

means the instrument change as set out in the Planning Proposal.

### Planning Proposal

Department of Planning reference PP_2017_THILL_006_02

Council reference 1/2018/PLP

### Dedication Land

See Schedule 1

### Works

See Schedule 1
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Planning Agreement

Dated

Parties

The Hills Shire Council ABN 25 034 494 656 of 3 Columbia Court, Baulkham Hills, NSW 2153 (Council)

Mirvac Projects (Retail and Commercial) Pty Limited (ABN 34 151 466 241) as trustee for Mirvac Pennant Hills Residential Trust ABN 80 199 861 372 of Level 28, 200 George Street, Sydney NSW 2000 (Developer)

Background

A. Council is the consent authority pursuant to the Act for the Proposed Development.

B. The Developer is the registered proprietor of the Land.

C. Through lodgement of the Planning Proposal, the Developer has made an application to the Council for the Instrument Change so as to enable an application to be made to the Council for Development Consent.

D. As a consequence of the matters set out above, the Developer has offered to provide the Material Public Benefits on, and subject to, the terms set out in this Agreement if the Instrument Change occurs.

Operative provisions

1 Defined meanings

Words used in this document and the rules of interpretation that apply are set out and explained in clause 33 of this Agreement.

2 Planning agreement under the Act

The Parties agree that this document is a planning agreement within the meaning of subdivision 2, Division 7.1, Part 7 of the Act.

3 Application of this document

This document applies to:

(a) the Land,

(b) the Instrument Change, and

(c) the Proposed Development.
4 No restriction on Council’s Powers

4.1 This Agreement or anything done under this Agreement:

4.1.1 is not to be taken as approval or consent by Council as a regulatory authority, and

4.1.2 does not in any way inhibit, deter or prejudice Council in the proper exercise of its functions, duties or powers,

pursuant to any legislation including the Act, the Roads Act 1993 (NSW) and the Local Government Act 1993 (NSW).

5 Operation of this Agreement

5.1 This Agreement constitutes a planning agreement within the meaning of section 7.4 of the Act.

5.2 Clauses 7 to 22 inclusive and clause 27 of this Agreement are effective and binding on the parties from the date that the Instrument Change commences in accordance with section 3.24(5) of the Act and that the remaining clauses of this Agreement are effective and binding on the parties from the date that this Agreement is executed.

5.3 This Agreement will remain in force and effect until the earlier of:

5.3.1 provision of all of the Material Public Benefits by the Developer;

5.3.2 an effective Court declaration or order that the Instrument Change is invalid; or

5.3.3 termination pursuant to the terms hereof or by agreement.

6 Termination if Minister Decides not to make Instrument Change

6.1 In the event that the Minister decides at any time not to make the Instrument Change under section 3.36(2)(b) of the Act and informs a party in writing of that decision, then either party may terminate this Agreement by not less than 28 days’ notice to the other.

7 Material Public Benefits

7.1 The Developer must, at its own cost and risk, provide the Material Public Benefits set out in Schedule 1 to the Council in accordance with this document.

8 Assignment and Dealing with the Land

8.1 Subject to clauses 8.2, 8.3 and 27.3, the Developer must not have any Dealings (except the subdivision of the Land in accordance with this Agreement) with the Land unless the proposed assignee, purchaser or other Party (the Incoming Party) accepts such of the obligations of this Agreement as may be reasonably required.

8.2 For the purpose of giving effect to clause 8.1 the Council, the Developer and the Incoming Party must enter into a deed of novation whereby the Incoming Party agrees to carry out the obligations of the Developer under the Agreement and the Developer is released, from the date of the deed of novation from the obligations contained in this Planning Agreement to the extent that they:

8.2.1 are novated to the Incoming Party, and
8.2.2 remain to be performed.

8.3 If the Incoming Party is acquiring an interest in the Land as a purchaser of one or more lots in a community scheme or a strata scheme, (whether or not the scheme has, at the date of exchange, been registered at NSW Land Registry Services), then the Developer may create that interest without requiring that party to enter into an Agreement with the Council and the interest so created will not be in breach of this clause.

8.4 A deed of novation may be amended as agreed from time to time by the parties acting reasonably.

8.5 The parties acknowledge and agree that the rights of the Council under clause 9.2 are not diminished by the provisions of this clause 4.

9 Dedication

9.1 The Developer must, at its own cost, Dedicate to Council the various Dedication Lands in accordance with the times listed in Schedule 1.

9.2 Encumbrances

9.2.1 Prior to transfer to the Council of the Dedication Land, the Developer may not, without the prior consent of the Council (which must not be unreasonably withheld), grant any lease or licence or create any easement, covenant or restriction burdening the Dedication Land which interest or right would subsist on the title at the date of transfer to the Council, other than:

(a) subject to clause 9.3, those easements, covenants and restrictions that exist at the date of this Agreement;

(b) interallotment easements for utilities, drainage and services, whether benefitting or burdening the Dedication Lands or other parts of the Land; and

(c) covenants, easements and restrictions required to comply with any development consent applicable to the Land;

provided that (other than the beneficiaries’ rights of installation, repair and maintenance) such interests do not, in the reasonable opinion of Council interfere with the intended use of the Dedication Land by Council.

9.3 Extinguishment of interests on Dedication Lands prior to transfer

9.3.1 The Developer agrees that prior to the transfer of the Dedication Lands it will extinguish all redundant encumbrances and those that, in Council’s opinion, would unreasonably impede the intended use of the Dedication Lands by Council in respect of all or part of the Dedication Lands.

9.3.2 The parties acknowledge and agree that:

(a) the Developer will not be required to extinguish the registered easement for electricity purposes (G379897, S429274) (Specified Easement); and

(b) the Council will accept Dedication of the relevant Dedication Lands with the Specified Easement remaining on the relevant Certificate of Title(s),
provided the Specified Easement is not within the field alignment of the Synthetic Soccer Field.

9.4 The Dedication will be effected when:

9.4.1 a plan of subdivision Dedicating the relevant Dedication Lands to Council is registered with NSW Land Registry Services; or

9.4.2 Council has in its possession everything necessary (including an executed transfer in registrable form for the Dedication Lands, the original certificate of title for the Dedication Lands and any document in registrable form which, when registered, and subject to the terms of this Agreement, will remove any encumbrances registered on the title of that land) for it to become the registered proprietor of the Dedication Lands.

9.5 Where an existing lot forming part of the Dedication Lands is to be transferred to Council,

9.5.1 the Developer will deliver to Council the following:
   (a) transfer in registrable form signed by the registered proprietor of the lot,
   (b) the Certificate of Title for the lot, and
   (c) a discharge of mortgage, surrender of lease or other document to release the lot from any Encumbrance.

9.5.2 Council will on receipt of these documents arrange for the following:
   (a) stamping of the transfer, and
   (b) lodgement of the transfer and other documents at the office of NSW land Registry Services for registration.

9.6 Council must provide the Developer with a tax invoice for its reasonable expenses incurred in relation to the Dedication of the Dedication Lands including its legal costs and disbursements on an indemnity basis (including any registration fees).

9.7 The Developers must pay to Council the amount invoiced for expenses under clause 9.6 within 14 days of receipt of the invoice.

9.8 The Developer must pay Council on reasonable notice the stamp duty (if any) on the Dedication of the Dedication Lands. The Parties acknowledge that section 277 of the Duties Act 1997 (NSW) provides generally that duty under that Act is not chargeable on dutiable transactions where Council is liable to pay the duty.

10 Works

10.1 Obligation to Carry Out Works

10.1.1 The Developer is to carry out and complete the Works listed in Schedule 1.

10.1.2 The Developer’s obligations under clause 10 exists irrespective of whether the Developer:
   (a) carries out the Works itself, or
(b) enters into an agreement with another person under which the other person carries out the Works on the Developer’s behalf.

10.2 Plans and Specifications of Works

10.2.1 Before the Developer commences the Works, the Developer, at its own cost, is to prepare and submit to the Council or a person specified by the Council for approval, detailed plans and specifications in relation to the item.

10.2.2 The Council will, within 20 Business Days, give the Developer written notice:

(a) whether or not the design and description of the Works is satisfactory, and

(b) if the detailed design is not satisfactory, identifying the further information or modifications (as the case may be) required, including the reason for that modification.

10.2.3 Where Council requires modifications under clause 10.2.2, the Developer must resubmit the modified plans and specifications for approval by Council under this clause 10.2.

10.2.4 If the Council does not provide such a notice within 20 Business Days, the Works will be deemed to be satisfactory for the purposes of clause 10.

10.3 Nature of Modifications Required

10.3.1 The parties acknowledge and agree that Council may require modification under clause 10.2.2, only if:

(a) the standard of drawings does not allow a proper assessment and understanding of the proposal (including, without limitation, that the drawings submitted have sufficient detail to allow a proper review (for example, levels and interface to public infrastructure, such as road levels, road alignments and stormwater systems are not marked or reasonably capable of being derived);

(b) the design as proposed does not comply with any relevant legislative requirement (including requirements with respect to disability access);

(c) in relation to the Synthetic Soccer Field or the Perimeter Access Road, the design does not comply with the specifications identified in Schedule 1;

(d) the design is inconsistent with the relevant development consent(s), or with the outcome agreed by the parties as part of an applicable public consultation process;

(e) the materials, finishes or other items specified in a relevant standard or policy (as the case may be) are no longer readily capable of procurement, and (if so) the representative must identify an alternative of a reasonably similar and comparable nature;

(f) the design is not consistent with any of the Material Public Benefits (and in this event, both the relevant element, and the extent of the inconsistency, must be clearly identified by Council);

(g) for reasons identified by Council in the notice, an alternative product is considered preferable. Such reasons may include:
(i) specification of a new, or improved, species or strain of grass, shrub or other planting, provided always such alternative is readily capable of procurement at no extra cost to the Developer; and

(ii) the alternative may include efficiencies which are reasonably likely to either retain or reduce the overall costs and to improve the amenity of the construction and hand over process.

10.3.2 The Developer must promptly and in good faith take into account the comments made by the Council under the preceding sub clause and either:

(a) amend the design to reflect the comments made; or

(b) to the extent the Developer declines to accommodate changes suggested under clause 10.3.1, notify Council that the Developer so declines, and provide written reasons together with any alternative which the Developer considers may address the concern (Modification Decline Notice).

10.3.3 If the Council disagrees with a Modification Decline Notice the Council must within 5 business days of receipt of the Modification Decline Notice issue a notice of Dispute which includes:

(a) the basis upon which the Council's requested modification falls within Clause 10.3.1;

(b) the reasons why Council does not agree with the Modification Decline Notice; and

(c) why any alternative contained in the Modification Decline Notice is unacceptable to Council.

10.3.4 If the Council issues a notice of Dispute under clause 10.3.3, then clause 26 (Dispute Resolution) will apply.

10.3.5 The Parties expressly acknowledge that nothing in this clause is intended or will be construed to enable the Council to materially change the design in a manner which unreasonably increases the time or the costs associated with the Works.

10.4 The Developer:

10.4.1 must not make; and

10.4.2 must not permit, authorise or consent to any other person to make, an application for the issue of (or modification of) a Construction Certificate for a Work (that is required to be carried out by the Developer under this Agreement) to any certifying authority, other than the Council.

10.5 The Developer is to carry out and complete the Works in a good and workmanlike manner having regard to the intended purpose of the Works and otherwise to the satisfaction of Council, in accordance with:

10.5.1 any relevant development consent(s), and

10.5.2 all applicable laws, including those relating to occupational health and safety, and
10.5.3 this Agreement to the extent that it is not inconsistent with the relevant development consent(s) or an applicable law, and

10.5.4 the written approval given under clause 10.2.

10.6 It is the Developer’s responsibility to ensure that everything necessary for the proper performance of its obligations under this Agreement is supplied or made available to Council.

10.7 The Works are to be Handed-Over to the Council:

10.7.1 by no later than the Hand-Over Date for the relevant Works, and

10.7.2 otherwise in accordance with this Agreement.

11 Ownership of Works

11.1 Ownership of the Works is transferred to Council on Hand-Over and nothing in, or done under, this Agreement gives the Developer, after Hand-Over any right, title or interest in the Works.

11.2 On Hand-Over the Developer must cause the legal title in the Works and all materials and component of the Works to pass to Council free of any charge or other interest. The Developer warrants that after Hand-Over the Works are not subject to any security interest (as defined in the Personal Property Securities Act 2009 (Cth) (PPSA)) and any security interest noted in the Personal Property Securities Register has been discharged. The Developer indemnifies Council for all claims, costs, losses and expense Council may suffer arising from any breach of this warranty or any claim or action taken by any person in respect of any security interest (as defined in the PPSA) in the Works.

12 Access to the Land

12.1 The Developer is to permit the Council, its officers, employees, agents and contractors to enter the Land at any time, upon giving reasonable prior notice, in order to inspect, examine or test any of the Works.

12.2 For the purposes of this clause 12, Council officers, employees, agents and contractors must comply with all HSE Requirements and any direction given by any statutory authority or by the Developer or its ‘principal contractor’ appointed under applicable WH&S Laws in relation to health, safety or the environment concerning the Land.

13 Protection of People, Property and the Environment

13.1 The Developer is to ensure in relation to the carrying out of the Works that:

13.1.1 all necessary measures are taken to protect people, property and the Environment, and

13.1.2 unnecessary interference with the passage of people and vehicles is avoided, and

13.1.3 nuisances and unreasonable noise and disturbances are prevented, and

13.1.4 all relevant laws and regulations with respect to water, air, noise and land pollution (including ‘pollution incidents’) as defined under the Protection of the Environment Operations Act 1997 (NSW).
14 Damage and Repairs to the Works

14.1 The Developer, at its own cost, is to repair and make good to the satisfaction of the Council any loss or damage to the Works from any cause whatsoever which occurs prior to the date on which the Works are Handed-Over to the Council.

15 Variation of Works

15.1 The Works are not to be varied by the Developer, unless:

15.1.1 the Parties agree in writing to the variation, and

15.1.2 any consent or approval required under the Act or any other law to the variation is first obtained, and

15.1.3 the Developer bears all of the Council’s costs of and incidental to agreeing to and approving any variation proposed by the Developer.

15.2 For the purposes of clause 15.1 a variation may relate to any matter in relation to the Works that is dealt with by this Agreement.

15.3 If Council requests a variation, or a requirement in a development consent relating to the Works amounts to a variation, to the Works after Council has given its written approval under clause 10, then the Council shall be liable to pay to the Developer an amount equal to the increase in the costs of completing the Works, which results from the variation requested by the Council.

15.4 Council shall repay the amount referred to in clause 15.3 to the Developer after the Works are complete, and within 28 days of receipt of:

15.4.1 a tax invoice for the amount claimed by the Developer, and

15.4.2 documentation which demonstrates to Council’s satisfaction the increase in costs as a result of the variation requested by the Council.

15.5 If Council requests a variation, then the Hand-Over Date will be reasonably varied to the extent of any delay caused by the variation.

16 Hand-Over of Works

16.1 When an Item of Works has, in the opinion of the Developer, reached Completion, the Developer is to give the Council not less than 20 Business Days written notice of the date on which it proposes to Hand-Over an Item of Works to the Council, being a date not later than the Hand-Over Date for the relevant Item of Works.

16.2 Upon receipt of such a notice, Council is to provide, within 10 Business Days, written confirmation to the Developer that it accepts the Item of Works has reached Completion.

16.3 Works Not Complete

16.3.1 If the Council, acting reasonably, forms the view following inspection of the Item of Works that the Item of Works has not reached Completion, the Council may, within 10 Business Days of receiving a notice under clause 16.1, direct the Developer in writing:

(a) to carry out work specified in the notice to complete the Works in accordance with clause 10 before it is Handed-Over to the Council, and
to Hand-Over the Works completed in accordance with the Council’s direction to the Council by a specified date, irrespective of whether that date is later than the Hand-Over Date.

16.3.2 The Developer may, within 10 Business Days, provide a response to a direction under clause 16.3, which contains reasons, if any, as to why the work is not required under clause 10.

16.3.3 Where Council rejects or does not accept the Developer’s response in writing within 10 Business Days, the matter may be referred as a Dispute in accordance with clause 26.

16.3.4 Where the Dispute resolution process results in the Developer being required to comply with the direction, the Developer is to promptly comply with a direction according to its terms and at the Developer’s own cost.

16.4 Before the Works are Handed-Over to the Council, the Developer is to remove from the Land:

16.4.1 any rubbish or surplus material, and

16.4.2 any temporary works, and

16.4.3 any construction plant and equipment, relating to the carrying out of the Works as the case requires.

16.5 If Council does not provide a written confirmation or direction in accordance with clauses 16.2 or 16.3 within 10 Business Days, the Item of Works will be deemed to have reached Completion.

16.6 An Item of Works is taken to be Handed-Over to the Council at the date specified in a notice under clause 16.1, subject to any dispute over whether the Item of Works has reached Completion under clause 16.3.

17 Failure to Carry out and Hand-Over Works

17.1 If the Council, acting reasonably, considers that the Developer is in breach of any obligation under this Agreement relating to the carrying out of the Works, the Council must give the Developer a notice requiring:

17.1.1 the breach to be rectified to the Council’s satisfaction, or

17.1.2 the carrying out of the Works to immediately cease, except in relation to the rectification of the breach, and the breach to be rectified to the Council’s satisfaction.

17.2 The Developer may, within 14 days, provide a response to a direction under sub-clause 16.3, which contains reasons, if any, as to why there has been no breach in relation to the carrying out of the Works.

17.3 Where Council rejects or does not accept the Developer’s response in writing within 14 days, the matter may be referred as a Dispute in accordance with clause 26.

17.4 Where the Dispute resolution process results in the Developer being required to comply with the notice, the Developer is to comply with the according to its terms and at the Developer’s own cost.
17.5 A notice given under clause 17.1 is to allow the Developer a reasonable period (and in any case not less than 28 days) to:

17.5.1 rectify the breach, or

17.5.2 pay appropriate compensation to Council in cases where it is not possible to rectify the breach.

18 Works-As-Executed-Plan

18.1 No later than 60 days after the Hand-Over Date, the Developer is to submit to the Council a full Works-As-Executed-Plan in respect of the Item of Works the subject of the notice.

18.2 The Developer shall provide with the Work-as-Executed Plan(s) all appropriate certificates to verify that the Works have been carried out in accordance with relevant standards.

19 Rectification of Defects

19.1 During the Defects Liability Period the Council may, acting reasonably, give to the Developer a Rectification Notice in relation to any purported Defect in the Works specifying:

19.1.1 the Item of Works requiring rectification,

19.1.2 the action required to be undertaken by the Developer to rectify those Works, and

19.1.3 the date on which those Works are to be rectified.

19.2 The Developer must, within 14 days, give to the Council a Rectification Response.

19.3 Where Council rejects or does not accept the Developer's Rectification Response in writing within 14 days, Council may carry out the required rectification works itself and call on the Defects Liability Security to the extent necessary to cover the costs incurred by it in doing so only if clause 26 has been engaged and the Expert determines that the purported Defects in the Works are Defects under clause 26.6.

20 Indemnity and Insurance

20.1 The Developer indemnifies the Council from and against all losses, damages, costs (including legal costs on a full indemnity basis), charges, expenses, actions, claims and demands whatsoever which may be sustained, suffered, recovered or made arising in connection with the carrying out by the Developer of the Works and any other obligation under this Agreement, except to the extent that such losses, damages, costs, charges, expenses, actions, claims and demands are caused or contributed to by Council, its employees, officers, agents and contractors.

20.2 The Developer is to take out and keep current the following insurances in relation to the Works up until the relevant date of Hand-Over to Council:

20.2.1 contract works insurance for the full replacement value of the Works (including the cost of demolition and removal of debris, consultants' fees and authorities' fees), to cover the Developer's liability in respect of damage to or destruction of the Works,

20.2.2 public liability insurance for at least $20,000,000 for a single occurrence, which covers the Developer for liability to any third party, and noting the interest of
Council. The Developer will ensure that each subcontractor effects and maintains insurance policies on terms similar to those applicable to the developer under this clause;

20.2.3 workers compensation insurance as required by law, and

20.2.4 any other insurance required by law.

20.3 If the Developer fails to comply with clause 20.2, the Council may effect and keep in force such insurances and pay such premiums as may be necessary for that purpose and the amount so paid shall be a debt due from the Developer to the Council. The Developer is not to commence to carry out the Works unless it has first provided to the Council satisfactory written evidence, in the form of a Certificate of Currency, of all the insurances specified in clause 20.2.

21 Defects Liability Period

21.1 On Hand-Over of the Works, the Developer is to provide the Defects Liability Security to Council.

21.2 The Council is to release and return the Defects Liability Security upon the expiration of the Defects Liability Period.

22 Application of Subdivision 3 in Part 7 of the Act

22.1 For the purpose of sections 7.4(3)(d) and 7.4(5) of the Act, this document wholly excludes, to the extent permitted by law, the operation of subdivision 3 in part 7 of the Act (including without limitation sections 7.11 and 7.12 of the Act) in relation to the Planning Proposal and the first six hundred (600) residential dwellings capable of separate occupation developed as part of the Proposed Development on the Land.

23 Private Certifiers

Where Council is not the certifying authority for any aspect of the Proposed Development the Developer must on the appointment of a private certifier provide a copy of this Agreement to the private certifier.

24 Notices

24.1 Any notice to or by a party under this document must be in writing and signed by the sender or, if a corporate party, an authorised officer of the sender.

24.2 Any notice may be served by:

   (a) delivery in person, or

   (b) post, or

   (c) transmission by facsimile (in the case of service on Council), or

   (d) email provided that it is sent to all recipient(s) specified in Summary Sheet,

to the address(es) or number(s) of the recipient(s) specified in the Summary Sheet or most recently notified by the recipient to the sender.

24.3 Any notice is effective for the purposes of this document upon:
(a) delivery to the recipient or production to the sender of a facsimile transmittal confirmation report before 4.00pm local time on a day in the place in or to which the written notice is delivered or sent or otherwise at 9.00am on the next day following delivery or receipt; or

(b) in the case of service by email if, and only if, it is sent to all recipient(s) specified in Summary Sheet and the sender does not receive an out of office message or bounce back from any recipient.

25 Breach Notice and Rectification

25.1 If the Developer is, in the reasonable opinion of Council, in breach of a material obligation under this document, Council may provide written notice of the breach to the Developer and require rectification of that breach within a reasonable period of time (Breach Notice).

25.2 The Developer commits an Event of Default if it fails to comply with a Breach Notice.

25.3 Where the Developer commits an Event of Default Council may call on any security provided under this Agreement to the extent of any reasonable compensation claimed in a Breach Notice and not paid by the Developer (or otherwise remedied), or rectify the breach as the agent of the Developer and at the risk of the Developer (in which case the Developer must pay all reasonable costs incurred by the Council in remedying the breach).

26 Dispute resolution

26.1 Dispute

If any Dispute arises, that Dispute must be referred for determination under this clause.

26.2 No legal proceedings

The Parties must not bring or maintain any action on any Dispute (except for urgent injunctive relief to keep a particular position) until it has been referred and determined as provided in this clause.

26.3 Notice of disputes

A Party referring a Dispute for determination must do so by written notice to the other parties which must specify the nature of the Dispute.

26.4 Negotiated resolution and selection of expert

26.4.1 On referral of a Dispute, the Senior Managers must meet at least once and use reasonable endeavours to resolve the Dispute by negotiation within 10 Business Days of service of the Dispute Notice. Any resolution must be recorded in writing and signed by each Senior Manager.

26.4.2 If the Senior Managers are unable to resolve the Dispute within 10 Business Days of service of the Dispute Notice they must endeavour within the following 10 Business Day-period to appoint an expert by agreement. That appointment must be recorded in writing and signed by each Senior Manager.

26.4.3 If the Senior Managers do not record the appointment of an expert within that second 10 Business Day period, the expert must be appointed, at the request of
any Party, by the President for the time being (or if none, the senior elected member) of the Law Society of New South Wales.

26.5 Assistance to the Expert

26.5.1 Once the Expert has been appointed (the Expert), the Parties must:

(a) each use their best endeavours to make available to the Expert all information the Expert requires to settle or determine the Dispute, and

(b) ensure that their employees, agents or consultants are available to appear at any hearing or enquiry called by the Expert.

26.5.2 The Parties may give written submissions to the Expert but must provide copies to the other Parties at the same time.

26.6 Expert's decision

26.6.1 The decision of the Expert must:

(a) be in writing and give reasons, and

(b) be made and delivered to the parties within one month from the date of submission of the dispute to the Expert or the date of completion of the last hearing or enquiry called by the Expert, if later.

26.6.2 The Expert may conduct the determination of the Dispute in any way it considers appropriate but the Expert may, at its discretion, have regard to the Australian Commercial Disputes Centre’s guidelines for expert determination of disputes or such other guidelines as it considers appropriate.

26.6.3 The Expert's decision is final and binding on the parties, except as to matters of law or in respect of Disputes the total value of which exceeds $1 million.

26.6.4 The Expert must act as an expert and not as an arbitrator.

26.7 Expert's costs

26.7.1 The Expert must also determine how the expenses relating to the reference of the Dispute (including the Expert's remuneration) should be apportioned between the parties and in default of a decision by the Expert those expenses must be borne by the parties equally.

26.7.2 In determining the apportionment of costs the Expert may have regard to what the Expert, in its reasonable opinion, considers to be a lack of good faith or a failure to use reasonable endeavours by any party in assisting the Expert or resolving the dispute between the parties' nominated officers as required by this clause.

26.8 Continual performance

Each Party must continue to perform its obligations under this document while any dispute is being determined under this clause.

27 Registration of document on Title

27.1 Acknowledgement
27.1.1 The Developer acknowledges that this document is to be registered under section 7.6 of the Act on the title of the Land and on registration by the Registrar-General the document will be binding on and enforceable against the owners of the Land from time to time as if each owner for the time being had entered into this document.

27.2 Consents to Registration

This document must be registered on the title of the Land by the Developer within sixty (60) days after the later of the date it is entered into between the Parties or the Instrument Change is made. Each Party must promptly execute any document and perform any action necessary to affect the registration of this document on the title of the Land.

27.3 Release from Registration

27.3.1 Council will at the request of the Developer release the Land from registration of this document where the Material Public Benefits have been provided and the Developer is not in breach of its obligations under this document. The obligations of the Council are satisfied when Council provides the Developer with a signed Request in registrable form for the release of registration of this document.

27.3.2 The parties acknowledge and agree that this document applies to the Forest Area, and Council will not be required to release this document from the Forest Area unless and until the Forest Area is transferred to an appropriate government Authority.

27.3.3 If Council is required by a third party to compulsorily acquire any E2 Environmental Conservation zoned land the provisions of 29.1.3 apply as if that area was Dedication Land.

27.3.4 The Developer agrees not to seek or request the Council compulsorily acquire any part of the Land zoned E2 Environmental Conservation.

27.4 Registration Expenses

The Developer must pay Council's reasonable expenses including registration fees, any stamp duty, legal costs and disbursements, for the registration of this document and the subsequent removal of registration.

27.5 Registration of Caveat by Council

27.5.1 Subject to subclause 27.5.2, until such time as registration of this Agreement on the Certificates of Title to the Land, the Developer agrees that Council may lodge a caveat reasonably necessary to prevent any dealing with the Land or any part of it in a manner which is inconsistent with this Agreement.

27.5.2 If Council lodges a caveat in accordance with this clause, then the Council will do all things reasonably required to ensure that the caveat does not prevent or delay either the registration of this Agreement or any related Dealing with the Land. The Council will promptly, following registration of this Agreement, do all things reasonably required to remove the caveat from the title to the Land.

28 Costs

28.1 The Developer must pay to the Council the Council’s legal costs incurred in respect of the preparation, negotiation, finalisation and enforcement of this Agreement up to a
maximum of $15,000 (exclusive of GST) within 14 days of a written demand by the Council for such payment.

29 Compulsory Acquisition of Dedication Lands

29.1.1 The Developer consents to the compulsory acquisition of the Dedication Lands:

(a) in accordance with the Land Acquisition (Just Terms Compensation) Act 1991 (NSW) (Acquisition Act); and

(b) on the terms set out in this clause 29.

29.1.2 Council may only acquire the Dedication Lands compulsorily in accordance with the Acquisition Act if the Developer has committed an Event of Default with respect to the dedication of that land under this document.

29.1.3 If Council acquires the Dedication Lands compulsorily in accordance with the Acquisition Act:

(a) the Developer agrees that the compensation payable to it on account of that acquisition under the Acquisition Act is $1.00; and

(b) Council must complete that acquisition within twelve (12) months of the relevant Event of Default.

29.1.4 The parties agree that the provisions of this clause 29 are an agreement with respect to the compulsory acquisition of the Dedication Lands for the purpose of section 30 of the Acquisition Act.

29.1.5 If Council:

(a) acquires the Dedication Lands under paragraph 29.1.3; and

(b) is required to pay any compensation to a third party as a result of that acquisition,

then the Developer must pay Council the amount of that compensation as a monetary contribution:

(c) within ten (10) business days of demand for payment being made by Council; and

(d) prior to the issue of the then next Occupation Certificate or Subdivision Certificate with respect to the Proposed Development.

30 Council may withhold Subdivision Certificate

30.1.1 The Developer may only make, or cause, suffer or permit the making of, an application for a Subdivision Certificate or Occupation Certificate in respect of the Proposed Development if, at the date of the application, the Developer is not in breach of its obligation to make any Material Public Benefits under this document.

30.1.2 Council may withhold the issue of a Subdivision Certificate or Occupation Certificate if, at the relevant time, the Developer is in breach of any obligation to make any Material Public Benefit under this document until such time as:

(a) the breach is rectified; or
(b) Council calls upon any security provided by the Developer in respect of the Material Public Benefit to which the breach relates.

31 GST

31.1 Interpretation

31.1.1 In this agreement:

(a) words or expressions that are defined in *A New Tax System (Goods and Services Tax) Act 1999 (GST Act)* have the same meaning,

(b) consideration includes non-monetary consideration, in respect of which the parties must agree on a market value, acting reasonably, and

(c) in addition to the meaning given in the GST Act, the term "GST" includes a notional liability for GST.

31.2 Divisions 81 and 82 exemptions

31.2.1 Subject to clause 31.2, the parties intend that Divisions 81 and 82 of the GST Act apply to any supplies or payments made under this document with effect that:

(a) no additional amount will be payable by a party on account of GST; and

(b) no tax invoices will be issued by any party.

31.3 Supply subject to GST

31.3.1 To the extent that clause 31.2 does not apply to a supply made under this document, this clause 31.3 will apply.

31.3.2 If one party (Supplying Party) makes a taxable supply and the consideration for that supply does not expressly include GST, the party that is liable to provide the consideration (Receiving Party) must also pay an amount (GST Amount) equal to the GST payable in respect of that supply.

31.3.3 Subject to first receiving a tax invoice or adjustment note as appropriate, the receiving party must pay the GST Amount when it is liable to provide the consideration.

31.3.4 If one party must indemnify or reimburse another party (Payee) for any loss or expense incurred by the Payee, the required payment does not include any amount which the Payee (or an entity that is in the same GST group as the Payee) is entitled to claim as an input tax credit, but will be increased under clause 31.3.2 if the payment is consideration for a taxable supply.

31.3.5 If an adjustment event arises in respect of a taxable supply made by a Supplying Party, the GST Amount payable by the Receiving Party under clause 31.3.2 will be recalculated to reflect the adjustment event and a payment will be made by the Receiving Party to the Supplying Party, or by the Supplying Party to the Receiving Party, as the case requires.

32 General

32.1 Governing law and jurisdiction
32.1.1 This document is governed by and construed under the law in the State of New South Wales.

32.1.2 Any legal action in relation to this document against any party or its property may be brought in any court of competent jurisdiction in the State of New South Wales.

32.1.3 Each party by execution of this document irrevocably, generally and unconditionally submits to the non-exclusive jurisdiction of any court specified in this provision in relation to both itself and its property.

32.2 Amendments

Any amendment to this document has no force or effect, unless effected by a document executed by the parties.

32.3 Third parties

This document confers rights only upon a person expressed to be a party, and not upon any other person.

32.4 Pre-contractual negotiation

This document:

32.4.1 expresses and incorporates the entire agreement between the parties in relation to its subject matter, and all the terms of that agreement, and

32.4.2 supersedes and excludes any prior or collateral negotiation, understanding, communication or agreement by or between the parties in relation to that subject matter or any term of that agreement.

32.5 Further assurance

Each party must execute any document and perform any action necessary to give full effect to this document, whether before or after performance of this document.

32.6 Continuing performance

32.6.1 Any representation in this document survives the execution of any document for the purposes of, and continues after, performance of this document.

32.6.2 Any indemnity agreed by any party under this document constitutes a liability of that party separate and independent from any other liability of that party under this document or any other agreement.

32.7 Waivers

Any failure by any party to exercise any right under this document does not operate as a waiver and the single or partial exercise of any right by that party does not preclude any other or further exercise of that or any other right by that party.

32.8 Remedies

The rights of a party under this document are cumulative and not exclusive of any rights provided by law.

32.9 Counterparts
This document may be executed in any number of counterparts, all of which taken together are deemed to constitute one and the same document.

32.10 Developer as Trustee and Limitation of Trustee Liability

32.10.1 The Trustee enters into the Agreement only in its capacity as trustee of the Mirvac Pennant Hills Residential Trust (Trust) constituted under the Trust Deed dated 6 November 2015 (Trust Deed) and in no other capacity. A liability arising under or in connection with this Agreement is limited to and can be enforced against the Trustee only to the extent to which it can be and is in fact satisfied out of property of the Trust from which the Trustee is actually indemnified for the liability. Subject to subclause 32.10.3, this limitation of the Trustee liability applies despite any other provision of this Agreement and extends to all liabilities and obligations of the Trustee in any way connected with any representation, warranty, conduct, omission, agreement or transaction related to this Agreement.

32.10.2 No party to this Agreement may sue the Trustee in any capacity other than as the Trustee of the Trust, including seeking the appointment of a receiver (except in relation to property of the Trust), a liquidator, an administrator or any similar person to the Trustee or proving in any liquidation, administration or arrangement of or affecting the Trustee (except in relation to property of the Trust).

32.10.3 The provisions of this clause 32.10 shall not apply to any obligation or liability of the Trustee to the extent that it is not satisfied because, under this Agreement or by operation of law, there is a reduction in the extent of the Trustee’s indemnification out of the assets of the Trust as a result of the Trustee’s failure to properly perform its duties as Trustee of the Trust.

32.10.4 The Trustee is not obliged to do or refrain from doing anything under this Agreement (including incur any liability) unless its liability is limited in the same manner as set out in subclauses 32.10.1 to 32.10.3.

32.10.5 Subject to subclauses 32.10.1 to 32.10.4, the Trustee has authority under the Trust Deed to enter into this Agreement.

32.10.6 The Trustee warrants that at the date of entering into this Agreement, the Land is an asset of the Trust.

32.10.7 In this clause, Trustee means the Developer.

32.11 Representations and warranties

The Parties represent and warrant that they have power to enter into this document and comply with their obligations under the document and that entry into this document will not result in the breach of any law.

32.12 Severability

If a clause or part of a clause of this document can be read in a way that makes it illegal, unenforceable or invalid, but can also be read in a way that makes it legal, enforceable and valid, it must be read in the latter way. If any clause or part of a clause is illegal, unenforceable or invalid, that clause or part is to be treated as removed from this document, but the rest of this document is not affected.

33 Definitions and interpretation

In this document unless the context otherwise requires:
**Act** means the *Environmental Planning and Assessment Act 1979* (NSW)

**Authority** means any:

1. government, government department, government agency or government authority;
2. governmental, semi-governmental, municipal, judicial, quasi-judicial, administrative or fiscal entity or person carrying out any statutory authority or function; or
3. other entity or person (whether autonomous or not) having powers or jurisdiction under any statute, regulation, ordinance, by-law, order or proclamation, or the common law.

**Agreement** means this document.

**Bank Guarantee** means a written guarantee without a time limit acceptable to Council issued by an Australian bank approved by Council.

**Bond** means a documentary performance bond denominated in Australian dollars which:

1. is an unconditional undertaking;
2. is signed and issued by an Australian Prudential Regulation Authority [APRA] regulated authorised deposit taking institution or an insurer authorised by APRA to conduct new or renewal insurance business in Australia which has at all times an investment grade security rating from an industry recognised rating agency of at least:
   (i) BBB + [Standard & Poors and Fitch]; or
   (ii) Baa 1 [Moodys]; or
   (iii) bbb [Bests];
3. is issued on behalf of the Developer;
4. has no expiry or end date;
5. has the beneficiary as Council;
6. state either individually, or in total with other lodged compliant forms of security, the relevant minimum amount required to be lodged as security; and
7. state the purpose of the deposit required in accordance with this document.

**Business Day** means a day that is not a Saturday, Sunday, public holiday or bank holiday in New South Wales.

**Breach Notice** has the meaning ascribed to it in clause 25.1.

**Completion** means the point at which the Works are complete to Council’s satisfaction (acting reasonably) except for minor defects which do not adversely affect the ordinary use and/or enjoyment of the relevant Works.

**Construction Certificate** has the same meaning as in the Act.

**Contribution Value** means the amount specified in column 3 of Schedule 1.

**Dealing** means selling, transferring, assigning, subdividing, mortgaging, charging or encumbering.
Dedication means the creation or transfer of an estate in fee simple free of any mortgage, lease or other Encumbrance of a lot registered under the *Real Property Act 1900* (NSW).

Dedication Lands means the parts of the Land specifically identified for Dedication to Council in items 2, 3 and 4 of the table in Schedule 1.

Defect means any error, omission, defect, non-conformity, discrepancy, shrinkage, blemish in appearance or other fault in the Works or any other matter which prevents the Works from complying with the terms of this document.

Defects Liability Period means in relation to the Works the period of 12 months from the date on which each Item of Works reaches Completion.

Defects Liability Security means a Bank Guarantee or Bond in favour of the Council equivalent to 10% of the total Contribution Value for the Works.

Development Consent means any development consent(s) for the Proposed Development.

Dispute means a dispute, difference of opinion or failure to agree relating to or arising from this document, including, but not limited to, those that arise under clauses 16, 17, 19 and 25.

Dispute Notice means written notice provided by a Party referring a dispute for determination under clause 26.3, specifying the nature of the dispute and a nominated officer of the referring party with sufficient authority to determine the dispute.

Encumbrance includes any mortgage or charge, lease, (or other right of occupancy) or profit a prendre.

Environment has the same meaning as set out in the Dictionary to the *Protection of the Environment Operations Act 1997* (NSW).

Event of Default has the meaning ascribed to it in clause 25.2.

Expert means the expert appointed under clause 26.

Forest Area means any part of the Land which is zoned E2 Environmental Conservation under any environmental planning instrument. **GST** means any tax, levy, charge or impost implemented under the *A New Tax System (Goods and Services Tax) Act 1999* (Cth) (*GST Act*) or an Act of the Parliament of the Commonwealth of Australia substantially in the form of, or which has a similar effect to, the *GST Act*.

Hand-Over means the hand-over to the Council of the Works in accordance with this Agreement.

Hand-Over Date means the date specified in Column 2 of Schedule 1 in relation to the Works specified in Column 1 of that Schedule corresponding to that date.

Hand-Over Notice means a notice issued by the Council under clause 16.

House means any attached or detached house that is not a Residential Flat Building.

HSE Requirements include any work, health, safety and welfare and environmental requirements of the Developer (as notified by the Developer to the Council from time to time), including but not limited to all work, health, safety and welfare and environmental requirements attached to or referred to in this Agreement.
**Instrument Change** means the instrument change referred to in the Summary Sheet.

**Insolvency Event** means the happening of any of the following events:

(8) A party is insolvent within the meaning of section 95A of the *Corporations Act 2001* (Cth) (*Corporations Act*).

(9) Application which is not withdrawn or dismissed within fourteen (14) days is made to a court for an order or an order is made that a body corporate be wound up.

(10) An application which is not withdrawn or dismissed within fourteen (14) days is made to a court for an order appointing a liquidator or provisional liquidator in respect of a body corporate or one of them is appointed, whether or not under an order.

(11) Except to reconstruct or amalgamate while solvent, a body corporate enters into, or resolves to enter into, a scheme of arrangement, agreement of company arrangement or composition with, or assignment for the benefit of, all or any class of its creditors, or it proposes a reorganisation, moratorium or other administration involving any of them.

(12) A body corporate resolves to wind itself up, or otherwise dissolve itself, or gives notice of intention to do so, except to reconstruct or amalgamate while solvent or is otherwise wound up or dissolved.

(13) A body corporate is or states that it is insolvent.

(14) As a result of the operation of section 459F(1) of the *Corporations Act*, a body corporate is taken to have failed to comply with a statutory demand.

(15) A body corporate is or makes a statement from which it may be reasonably deduced that the body corporate is, the subject of an event described in section 459C(2)(b) or section 585 of the *Corporations Act*.

(16) A body corporate takes any step to obtain protection or is granted protection from its creditors, under any applicable legislation or an administrator is appointed to a body corporate.

(17) A person becomes an insolvent under administration as defined in section 9 of the *Corporations Act* or action is taken which could result in that event.

(18) A receiver, manager or receiver and manager is appointed to the Company.

(19) A claim is filed in a court against a person that is not defended, released or otherwise settled within twenty eight (28) days of the date of its filing at the court.

(20) Anything analogous or having a substantially similar effect to any of the events specified above happens under the law of any applicable jurisdiction.

**Item of Works** means an item of the Works.

**Land** means the ‘Land’ as specified in the Summary Sheet.

**Location Plan** means the plan contained in Schedule 2.

**Material Public Benefits** mean the items listed in the first column of the table in Schedule 1.

**Minister** means the NSW State government minister responsible for the Act.

**Occupation Certificate** has the same meaning as in the Act.

**Party** means a party to this document, including their successors and assigns.
Planning Proposal means the planning proposal referred to in the Summary Sheet.

Perimeter Access Road means Perimeter Access Road as specified in Schedule 1.

Proposed Development means any development on the Land generally in accordance with the Planning Proposal and the subject of a development consent under the Act.

Rectification Certificate means a compliance certificate within the meaning of section 6.4(e)(iv) of the Act to the effect that work the subject of a Rectification Notice has been completed in accordance with the notice.

Rectification Notice means a notice in writing that identifies a defect in a work and requires rectification of the Defect within a specified period of time.

Rectification Response means a response in writing that provides reasons, if any, as to why a matter identified in a Rectification Notice is not a Defect.

Regulation means the Environmental Planning and Assessment Regulation 2000 (NSW).

Representatives means the Council Representative and the Developer Representative, as specified in the Summary Sheet.

Residential Flat Building means a building containing 3 or more dwellings.

Senior Managers means the Council Senior Manager and the Developer Senior Manager, as specified in the Summary Sheet.

Subdivision Certificate has the same meaning as in the Act.

Summary Sheet means the summary sheet set out at the start of this document.

Synthetic Soccer Field means Synthetic Soccer Field as specified in Schedule 3.

WH&S Laws means any law regulating or otherwise relating to work health and safety including, without limitation where the relevant site is in NSW - the Work Health and Safety Act 2011 (NSW) and the Work Health and Safety Regulation 2011 (NSW).

Works means the Synthetic Soccer Field and Perimeter Access Road as specified in Schedule 1.

Works-As-Executed-Plan means detailed plans and specifications of the completed Works.

33.1 Interpretation

In this document unless the context otherwise requires:

(a) clause and sub-clause headings are for reference purposes only,

(b) the singular includes the plural and vice versa,

(c) words denoting any gender include all genders,

(d) reference to a person includes any other entity recognised by law and vice versa,

(e) where a word or phrase is defined its other grammatical forms have a corresponding meaning,
(f) any reference to a party to this document includes its successors and permitted assigns,

(g) any reference to a provision of an Act or Regulation is a reference to that provision as at the date of this document,

(h) any reference to any agreement or document includes that agreement or document as amended at any time,

(i) the use of the word includes or including is not to be taken as limiting the meaning of the words preceding it,

(j) the expression at any time includes reference to past, present and future time and the performance of any action from time to time,

(k) an agreement, representation or warranty on the part of two or more persons binds them jointly and severally,

(l) an agreement, representation or warranty on the part of two or more persons is for the benefit of them jointly and severally,

(m) reference to an exhibit, annexure, attachment or schedule is a reference to the corresponding exhibit, annexure, attachment or schedule in this document,

(n) reference to a provision described, prefaced or qualified by the name, heading or caption of a clause, subclause, paragraph, schedule, item, annexure, exhibit or attachment in this document means a cross reference to that clause, subclause, paragraph, schedule, item, annexure, exhibit or attachment,

(o) when a thing is required to be done or money required to be paid under this document on a day which is not a Business Day, the thing must be done and the money paid on the immediately following Business Day, and

(p) reference to a statute includes all regulations and amendments to that statute and any statute passed in substitution for that statute or incorporating any of its provisions to the extent that they are incorporated.
Schedule 1 – Material Public Benefits (Clause 7)

The Developer must provide the Material Public Benefits in accordance with Schedule 1 and this document.

<table>
<thead>
<tr>
<th>Material Public Benefit</th>
<th>Hand-Over/ dedication Date</th>
<th>Contribution Value</th>
<th>Additional Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Dedication of Public Open Space, Car Park and Access Road</td>
<td>Prior to: (a) the issue of any Occupation Certificate for the 400th lot within the Proposed Development upon which a dwelling is intended to be constructed without further subdivision; or (b) the issue of any Occupation Certificate for the 150th House of the Proposed Development, whichever occurs earlier.</td>
<td>$25 Million</td>
<td>An area of not less than 2.493 hectares as public open space and associated on grade car parking and access road, all in the condition existing as at the date of this Agreement (subject to wear and tear), as identified on the Location Plan.</td>
</tr>
</tbody>
</table>
| 2. Synthetic Soccer Field | Prior to: (a) the issue of any Occupation Certificate for the 400th lot within the Proposed Development upon which a dwelling is intended to be constructed without further subdivision; or (b) the issue of any Occupation Certificate for the 150th House of the Proposed Development, whichever occurs earlier. | $2.2 Million | **The Synthetic field**  
- The field is to be designed to meet FIFA Certification to a ‘FIFA Quality’ level (which is the 2nd level aimed at local community based sport).  
- Dimensions of at least 64m x 100m + overruns of 3m at either end, 3 metres on one side and 5m on the other side for officials use.  
- Atlantis Drainage Cell, or Council approved equivalent, to form the base drainage layer. |
3. Perimeter Access Road

<table>
<thead>
<tr>
<th>Priority</th>
<th>Details</th>
</tr>
</thead>
</table>
| Fencing to the synthetic field | - Infill to synthetic turf to be either the Thermo Plastic Elastomer or an Organic option, to be approved by Council. Design resolution of permanent control measures to ensure infill does now wash away.  
- Perimeter fencing to the field, 1.1m high.  
- Ball stop fencing at either end of the field, 5.1m high, black PVC coated field fencing.  
- Pedestrian gates at desirable locations and service access gates. |

$19.3 Million (comprising land - $16.6 Million and capital costs for road construction - $2.7 million)

Staged construction and dedication of public road as identified on the Location Plan. Configuration and width of the road as specified in Schedule 4 Perimeter Access Road design to be generally in accordance with Council's Design Guidelines for Subdivision and Developments dated September 2011 (as updated by Council from time to time) which is contained in Schedule 6, assuming:
- Residential;
- Local/access road type; and
- Asphalt.
Schedule 5 – Requirements under the Act and the Environmental Planning and Assessment Regulation 2000

The parties acknowledge and agree that the table set out below provides for certain terms, conditions and procedures for the purpose of this deed complying with the Act.

Table 1 – Requirements under section 7.4 of the Act

<table>
<thead>
<tr>
<th>Requirement under the Act</th>
<th>This Deed</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Planning instrument and/or development application</strong> – (section 7.4(1))</td>
<td></td>
</tr>
<tr>
<td>(a) sought a change to an environmental planning instrument.</td>
<td>(a) Yes</td>
</tr>
<tr>
<td>(b) made, or proposes to make, a Development Application.</td>
<td>(b) Yes</td>
</tr>
<tr>
<td>(c) entered into an agreement with, or is otherwise associated with, a person, to whom paragraph (a) or (b) applies.</td>
<td>(c) N/A</td>
</tr>
<tr>
<td><strong>Description of land to which this Deed applies</strong> – (section 7.4(3)(a))</td>
<td>Lot 61 in DP 737386</td>
</tr>
<tr>
<td><strong>Description of development to which this Deed applies</strong> – (section 7.4(3)(b))</td>
<td>The Proposed Development as defined in Clause 33.</td>
</tr>
<tr>
<td><strong>The scope, timing and manner of delivery of contribution required by this Deed</strong> – (section 7.4F(3)(c))</td>
<td>See Schedule 1.</td>
</tr>
<tr>
<td><strong>Applicability of sections 7.11 and 7.12 of the Act</strong> – (section 7.4(3)(d))</td>
<td>The application of sections 7.11 and 7.12 of the Act are excluded in respect of the Planning Proposal and the first six hundred (600) residential dwellings. See clause 22.</td>
</tr>
<tr>
<td><strong>Applicability of section 7.24 of the Act</strong> – (section 7.4(3)(d))</td>
<td>The application of section 7.24 of the Act is excluded in respect of the Proposed Development.</td>
</tr>
<tr>
<td><strong>Consideration of benefits under this Deed if section 7.11 applies</strong> – (section 7.4(3)(e))</td>
<td>The Material Public Benefits to be provided by Mirvac under this Deed are to be taken into consideration in determining a development contribution in respect of the Proposed Development under section 7.11 of the Act.</td>
</tr>
<tr>
<td><strong>Mechanism for Dispute Resolution</strong> – (section 7.4(3)(f))</td>
<td>See clause 26.</td>
</tr>
<tr>
<td><strong>Enforcement of this Deed</strong> – (section 7.4(3)(g))</td>
<td>See clauses 17, 19 and 25</td>
</tr>
<tr>
<td>Requirement under the Act</td>
<td>This Deed</td>
</tr>
<tr>
<td>------------------------------------------------------------------------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>No obligation to grant consent or exercise functions – (section 7.4(10))</td>
<td>See clause 4</td>
</tr>
</tbody>
</table>

**Table 2 – Other Matters**

<table>
<thead>
<tr>
<th>Requirement under the Act or Regulation</th>
<th>This Deed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registration of the Planning Agreement – (section 7.6 of the Act)</td>
<td>Yes (see clause 27)</td>
</tr>
<tr>
<td>Whether the Planning Agreement specifies that certain requirements of the agreement must be complied with before a construction certificate is issued – (clause 25E(2)(g) of the Regulation)</td>
<td>No</td>
</tr>
<tr>
<td>Whether the Planning Agreement specifies that certain requirements of the agreement must be complied with before an occupation certificate is issued – (clause 25E(2)(g) of the Regulation)</td>
<td>Yes</td>
</tr>
<tr>
<td>Whether the Planning Agreement specifies that certain requirements of the agreement must be complied with before a subdivision certificate is issued – (clause 25E(2)(g) of the Regulation)</td>
<td>No</td>
</tr>
</tbody>
</table>
FORWORD

This design manual has been prepared to provide engineering guidelines for the subdivision and development of land and to facilitate the efficient processing of engineering plan submissions for subdivisions and developments. Applicants should be aware that each development is required to be treated on its merits and that approval is dependant on the overall impact of the development and not solely on compliance with minimal engineering standards.

The manual aims to set standards in order that infrastructure associated with any development is designed to be serviceable, maintainable and meet community expectations.

Nothing in this manual is to be construed as limiting, in any way, Council’s rights to impose differing conditions when approving development proposals, nor limiting the discretion of Council’s Manager - Subdivision and Development Certification or their nominated representative to vary any necessary engineering requirements in respect of a particular development, having regard to good engineering practice.

Section 1 of this manual outlines Council’s general engineering procedures in regard to the subdivision and development of land. The remaining sections contain detailed engineering requirements in regard to engineering drawings, road and drainage designs, and miscellaneous details.
<table>
<thead>
<tr>
<th>Glossary Entry</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Council</td>
<td>The Hills Shire Council as represented by its employees</td>
</tr>
<tr>
<td>Manager</td>
<td>Manager - Subdivision and Development Certification</td>
</tr>
<tr>
<td>Consent</td>
<td>Notice of Determination giving Subdivision, Development or Building Approvals</td>
</tr>
<tr>
<td>Council's Engineer</td>
<td>Person carrying out inspections or checking engineering details for Council</td>
</tr>
<tr>
<td>Applicant</td>
<td>Any person/s, company or entity representing the Developer for the purpose of carrying out works in association with a Subdivision, Development or Building</td>
</tr>
<tr>
<td>Surveyor</td>
<td>Registered Surveyor</td>
</tr>
<tr>
<td>Site</td>
<td>Area of land being developed by Subdivision, Development or Building Approvals</td>
</tr>
<tr>
<td>RTA</td>
<td>Roads and Traffic Authority, NSW</td>
</tr>
<tr>
<td>E.P.A.</td>
<td>Environmental Protection Authority</td>
</tr>
<tr>
<td>N.A.T.A.</td>
<td>National Association of Accredited Testing Authorities</td>
</tr>
<tr>
<td>W.A.E.</td>
<td>Works as Executed Plan</td>
</tr>
<tr>
<td>ARI</td>
<td>Average Recurrence Interval</td>
</tr>
<tr>
<td>UPVC</td>
<td>Unplasticized polyvinyl chloride compounds (referring to pipe)</td>
</tr>
<tr>
<td>VCP</td>
<td>Vitrefied Clay Pipe</td>
</tr>
<tr>
<td>RHS</td>
<td>Rectangular Hollow Section</td>
</tr>
<tr>
<td>FRC</td>
<td>Fibre Reinforced Cement</td>
</tr>
<tr>
<td>RCP</td>
<td>Reinforced Concrete Pipe</td>
</tr>
<tr>
<td>PSD</td>
<td>Permissible Site Discharge</td>
</tr>
<tr>
<td>SSR</td>
<td>Site Storage Requirement</td>
</tr>
<tr>
<td>1:6 (V:H)</td>
<td>Slope of 1 vertical to 6 horizontal</td>
</tr>
<tr>
<td>AS</td>
<td>Australian Standards published by the Standards Association of Australia and being current at time of application</td>
</tr>
<tr>
<td>EP&amp;A Act</td>
<td>Environmental Planning and Assessment Act 1979, as amended</td>
</tr>
<tr>
<td>OH&amp;S</td>
<td>Occupational Health &amp; Safety</td>
</tr>
<tr>
<td>DWE</td>
<td>Department of Water and Energy</td>
</tr>
<tr>
<td>OSD</td>
<td>On-site Stormwater Detention</td>
</tr>
<tr>
<td>WSUD</td>
<td>Water Sensitive Urban Design</td>
</tr>
</tbody>
</table>
DESIGN GUIDELINES FOR SUBDIVISIONS/DEVELOPMENTS

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GENERAL PROCEDURES

1.1 Scope

This section of the Engineering Guidelines sets out Council's general procedures and practices in respect of engineering requirements for subdivision and development of land within the shire.

1.2 Aim

To provide the Applicant with an outline of Council's engineering procedures for subdivisions and developments.

1.3 Process for the Applicant

When development consent has been granted the Applicant should:

- **Read the consent** – where you are unsure of the meaning or extent of any condition contact Council and seek clarification (Development Application No. will assist in your enquiries).
  
  **Note:** Construction Certificates cannot be issued until all Pre-Construction Certificate requirements / conditions of the Development Consent have been satisfied.

- **Engage an Engineering Consultant/Project Manager** – satisfy yourself that the client has the required expertise.

- **Give the Consultant a copy of the whole consent**, together with any approved plans or other documents.

- **Let the Consultant work for you** – Council’s Engineer will have only one contact with whom correspondence relating to the technical aspect of the development will be exchanged.

- **Engineering plans are prepared by the Consultant** – the consultant is to arrange survey and engineering designs that will fulfil the conditions of the consent. These plans, when approved, will be used by the contractor to construct works.

- **Lodge the Engineering Plans and Assessment Fee**, together with any other fees / documents / information required to satisfy the conditions of the consent. Council’s Engineer will check the engineering plans to ensure compliance with conditions of consent and other Council requirements.

- **Engineering plans returned to the Consultant for amendment (if required)** – the Consultant will be advised if any amendments are required to the Engineering Plans, and if any other outstanding items are required prior to the release of approved Engineering Plans.

- **Engineering plans re-lodged with Council** – the Consultant should have carried out all the amendments required by Council. If the Consultant needs clarification of any requirements, Council’s Engineers are available for discussion. The Consultant must ensure that Council’s “Red Mark Up” Plan (showing required corrections) is

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returned to Council with the amended plans. This will expedite their assessment.

- **Approval of the Engineering Plans** – when Council is satisfied that the engineering plans will enable work to be constructed, the plans are approved and released in accordance with the consent conditions.

- **Construction** – The Consultant will engage a contractor to carry out the works in accordance with the approved plans, conditions consent and Council’s Works Specification – Subdivisions/Developments.

- **Inspecting the works** – Council’s Engineer will inspect the work to ensure the Contractor carries the work out in accordance with the approved plans and with Council’s “Works Specification – Subdivisions/Developments”.

- **Lodge the Works-As-Executed**, together with any compliance certificates, prior to requesting the final inspection.

- **Preliminary Final Inspection** – Council’s Engineer is to be requested to inspect the works when the Applicant believes that all works are complete. The Applicant will be advised of any defects required to be rectified. Council’s Engineer is to be advised when all the defects have been rectified to carry out the final inspection.

- **Check the Conditions of Consent** – Before requesting the issue of a Subdivision Certificate (in the case of subdivisions) or in the other cases prior to the issue of an Occupation Certificate for the development, the development consent must be checked in detail. The Consultant/Applicant must ensure all conditions have been satisfied including, but not limited to:
  - Compliance with all engineering conditions required by the Development Consent;
  - Payment of fees and contributions;
  - Lodgement of certificates required by the Works Specification;
  - Lodgement of a Works-As-Executed Plan, and
  - Lodgement of Hydraulic & Structural certificates.

- **Issue of Subdivision Certificate/Occupation Certificate** – When all conditions have been complied with, including payment of all fees and contributions, Council’s Engineer will recommend the release of the final plan of subdivision and have the documents prepared for Council’s signature. The documents will then be sent for signature and the Applicant will be contacted when they are ready to be picked up.

- **Liability Period** – The liability period shall be in accordance with Chapter 13 of Council’s Works Specification – Subdivisions / Developments for all civil works becoming (or existing as) a Council asset.
1.4 Engineering Survey

The engineering survey shall be carried out using the ISG co-ordinate reference system and all levels shall be on Australian Height Datum (A.H.D.). The Manager’s approval shall be obtained if another datum is to be adopted.

The survey shall accurately show the landform to facilitate the best possible design and construction of roadworks and drainage consistent with minimum interference to the existing amenity of the area.

Bench Marks shall be established at intervals not greater than 600 metres and are to be placed where they will not be disturbed. This requirement may be waived by the Manager where State Survey Marks exist.

1.5 Engineering Construction Certificate

Engineering plans are to be submitted to Council for approval together with an application form and the appropriate fee. Initially one (1) set of plans is to be submitted for checking by Council’s Engineer, followed by a further three (3) sets on completion of any amendments required by Council. Two (2) sets of approved plans will be returned to the applicant with a letter of approval.

The preparation of engineering drawings for developments and subdivision shall be carried out in accordance with Section 2 - Engineering Drawings.

The civil engineering drawings will be checked by Council’s Engineers for compliance with these guidelines. It is the responsibility of the Consultant to ensure that the designs, calculations and specifications comply with Consent Conditions, Engineering Guidelines, relevant Australian Standards and other Council documents. Approval of the drawings does not relieve the Applicant from rectifying any errors or omissions which become evident during construction or the liability period.

The Applicant is required to comply with the Council’s current standards and if works have not substantially commenced within two (2) years of the date of the endorsed approval, the Manager may require that revised engineering drawings, calculations and specifications be submitted for a renewed approval.

1.6 Persons Qualified

Council requires that design plans be prepared to Council’s standards by a person, either holding qualifications acceptable for Corporate Membership of the Institution of Engineers, Australia, or approved by the Manager and/or who has proven experience in the preparation of plans and specifications for land development.
1.7 Consultation

Designers are encouraged to consult with Council and other relevant authorities during the preparation of design plans.

1.8 Inspection of Works

The whole of the road and drainage works and any other works that will become Council's Asset, which the Developer is required to carry out in respect of a development, are to be inspected by Council's Engineers in accordance with Council's Work Specification - Subdivisions / Developments.

Internal civil engineering works for a development (apart from subdivisions) are the responsibility of the Developer who is to ensure compliance with Council's requirements.

A separate application shall be submitted to Council in respect of gutter and footpath crossings and inspections will be arranged with Council's Engineer.

1.9 Tree Preservation

Applicants are advised that NO trees shall be removed without Council's permission. The Applicant shall provide a tree survey plan detailing the trees to be retained and clearly defining any trees proposed for removal.

The following Tree Management provision applies to the Shire:

The Hills Shire Council Tree and Bushland Management provision is covered by Cause 27 of The Hills Shire Council Local Environmental Plan 2005.

Council may require Applicants to lodge a Tree Bond to ensure trees are not damaged or removed during the construction of works.

All trees to be retained are to be protected by paraweb fencing, firmly staked four (4) metres from the trunk of the tree. This fencing is to be erected prior to the commencement of any site works and is to be maintained in position for the duration of the works. The area within the dripline of the tree should not be used for the stockpiling of new or demolition material nor for vehicular or pedestrian convenience or uses that would compact the soil in the area.

1.10 Street Trees

Street Trees and tree guards are to be provided to all developments, where new road construction is required, in accordance with Council's Development Control Plan for Landscaping and Council’s Tree Management Guidelines.

1.11 Erosion and Sedimentation Control

All developments, where the site is disturbed, shall provide Erosion and Sedimentation Control in accordance with the requirements of the
Department of Water and Energy, the Environment Protection Authority and Council.


1.12 Road Safety Audit and OH&S Requirements

Consultants preparing Engineering Plans must carry out a road safety audit of the site, drawings and associated documents to ensure that all the requirements as set out in Austroad's "Road Safety Audit" Manual, Second Edition 2002, have been satisfied.

1.13 Engineering Fees

Tables 1.1 and 1.2 show typical engineering fees applicable to developments:

<table>
<thead>
<tr>
<th>Engineering Fees for Subdivisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering Certificate fee and Construction Long Service Levy payment (where applicable)</td>
</tr>
<tr>
<td>Inspection fee for Road &amp; Drainage Works</td>
</tr>
<tr>
<td>Bond assessment fee</td>
</tr>
<tr>
<td>Final release of plan of subdivision fee</td>
</tr>
</tbody>
</table>

Table 1.1 - Engineering Fees for Subdivisions

<table>
<thead>
<tr>
<th>Engineering Fees for Developments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering plan assessment fee</td>
</tr>
<tr>
<td>Inspection Fee for Road &amp; Drainage</td>
</tr>
<tr>
<td>Bond assessment fee</td>
</tr>
</tbody>
</table>

Table 1.2 - Engineering Fees for Developments

All fees are reviewed regularly and the amount payable will be at the rate applicable at the date of assessment of engineering drawings, or the release of the final plan of subdivision, which shall be in accordance with Council's Schedule of Fees and Charges.

1.14 Works-As-Executed (W.A.E) Plans

Following the completion of engineering works of a subdivision or development, "Work-As-Executed" plans are required to be prepared by a Registered Surveyor or "Persons Qualified" (See Section 1.6) and forwarded to Council prior to the final inspection.
The WAE plans must show the matters as detailed in Section 2.21 - Engineering Drawings, of this guide.

1.15 Certificates

Prior to issue of a Subdivision Certificate, Occupation Certificate or upon completion of works, the following Certificates and Plans must be lodged:

Compaction Certificates

The final submission requires lodgement of the road pavement compaction certificates for all stages of the road pavement construction, lot filling and lot classification which have been prepared by a N.A.T.A. laboratory.

Compaction certificates and a lot fill diagram, an example of which can be found in Appendix "G", must also be provided where lots have been filled. The diagram will apply to all lots that have been filled in excess of 250mm. Two (2) copies shall be provided.

Easement Certificates

The final submission requires lodgement of the Surveyor’s Certificate. This is to certify that all pipes and drainage structures are located within the proposed drainage easements.

Material Compliance Certificates

Material Compliance Certificates for all road pavement materials will be required to be submitted prior to issue of the Subdivision Certificate or upon completion of the works.

Engineers Certificate

Where structural work has been undertaken on a project a certificate from a Registered Engineer must be lodged certifying the adequacy of the structure for the imposed loads.

For OSD systems, a Hydraulic Certificate from "Persons Qualified" (See Section 1.6) shall be lodged with Council certifying that the system will function hydraulically as per design requirements.

Miscellaneous Certificates

The following certificates are required prior to the release of the final plan of subdivision or occupation certificate:

1. Kerb and gutter concrete core test results,
2. CCTV recording and report of the road drainage system,
3. Certification that the road pavement has been constructed in accordance with the approved design, and
4. Geotechnical reports as requires by the Subdivision / Development Consent.
1.16 Contributions

Section 94 Contributions are required in accordance with Section 94 of the Environmental Planning and Assessment Act, 1979, to provide for the increased demand for public amenities and services resulting from developments. Where a Section 94 Contribution is required to be paid, the amount payable will be at the rate applicable at the time of payment prior to release of the final plan of subdivision in accordance with advice issued with the consent.

For developments, Section 94 Contributions are payable prior to issue of the Construction Certificate at the rate applicable of the time of payment.

In lieu of the provision of Street Trees, council may accept a contribution based on one (1) tree per seven (7) metres of road frontage to be paid prior to assessment of the final plan of subdivision or prior to the final approval in the case of developments. The amount payable will be at the rate applicable at the time of payment in accordance with council’s Schedule of Fees and Charges.

1.17 Bonds

All developments requiring infrastructure works shall provide a Maintenance Bond to Council, in the form of a cash bond or an unconditional bank guarantee, in the amount of 5.0% of the whole of the infrastructure works, with a minimum period of twelve (12) months from the date of release of the final plan of subdivision or the date of final clearance of the works for other developments. Any failure of the works within this period will lead to the call-up of all or part of the security to enable remedial works to be undertaken by Council.

For developments, other than subdivisions, Council also requires the submission of a cash bond or unconditional bank guarantee for outstanding works. The amount of such bond will be assessed upon submission of satisfactory engineering plans.

Council may also give favourable consideration to accept a suitable cash bond or unconditional bank guarantee from the Applicant where it is impractical to complete certain aspects of the infrastructure work or where it is necessary to defer construction until building activities have been substantially completed.

Upon written request from the Applicant and satisfactory completion of the maintenance period, or the works (whichever the case), the bond, or any amount remaining, will be released by Council.
ENGINEERING DRAWINGS

2.1 Scope

This section of the Design Guidelines sets out Council's general requirements for the preparation of Engineering Drawings.

2.2 Aim

To provide comprehensive details to facilitate the assessment of plans and construction of works in a safe, efficient and effective manner.

Also to ensure that Engineering Drawings provide sufficient information in a consistent format to allow Council to maintain a permanent record of subdivision and development works.

2.3 General Requirements

All engineering drawings are to ensure that all relevant conditions of consent have been addressed by the details shown. Drawings are to be submitted on standard size drawing sheets.

Four (4) sets of the engineering drawings are to be submitted, two (2) sets, endorsed with Council's approval, will be returned to the Applicant.

2.4 Title Blocks

All Engineering Drawings submitted to Council for approval are to have a title block showing the following:

- Applicants Name
- Consultants Name, Address, Phone Number and Contact Name
- Drawing Number, Sheet Number and Amendment Number
- Schedule showing Date and Nature of Amendments
- Site Address, Including Lot and Deposited Plan (DP) Number
- Council's Application Number
- Stage Number
- Drawing Title
- Scale with Scale Bar
- Signature of Authorized Person (see Section 1.6)

2.5 Road and Drainage Drawings

Plans for Road and Drainage works shall be presented to Council generally in the following format:

- Title Sheet
- Detailed Plan(s)
- Road Longitudinal Section(s)
- Road Cross Sections
- Typical Road Cross Section(s)
- Kerb Return Details
- Traffic Calming Devices, Pathways, Cycleways and Other Miscellaneous Road Details
2.6 On-site Storage Detention Drawings

Engineering drawings showing on-site stormwater detention details for developments shall generally include the following:

- Catchment Plan showing contours, area of site affected and area of site not collected.
- Drainage design summary in format of that shown in the Upper Parramatta River Catchment Trust’s On-site Stormwater Detention Handbook.
- Calculations to confirm volumes and pipe sizes.
- Detail Plan and sections (see Section 2.17)
- Design Levels for top water/overflow; inverts of all drainage pits, pipelines and storage areas; overflow weir; centreline of orifice; surface of all drainage pits; and surfaces designed to detail and direct stormwater.
- Dimensions of storage areas, drainage pits, overflow weirs, maximum head, high early discharge head and depth of storage.

2.7 Title Sheet

The location of the Development shall be identified by lot, DP, street name and suburb and by clearly marking the site on a Locality Plan.

A layout plan shall be provided showing the layout of roads, road numbers, allotment layout (with lot numbers as per the approved plan of subdivision) and Bench Marks (to A.H.D.). The origin, nature and value of the datum used to establish the bench marks to be indicated, e.g. Permanent Mark or State Survey Mark and number. Where the plan shows layouts for the past or future stages, a bold and clearly defined stage border is to be shown. For small developments, where all of these details can be shown on the detail plan, the layout plan may be omitted.

The title sheet should also include construction notes and an index of the sheets provided in the set of drawings.

2.8 Detail Plan

Detail plans should include the following:

- North point.
- Lot details, including numbers, easements and any road widening.
- Existing contours extending beyond the boundary of the site for a distance sufficient to show any constraints.
- Existing natural features including trees, water courses, ditches, dams, mounds, etc. – these details are not to be limited to the site and are to include any feature which has an impact on the development.
• Existing constructed features including fences, kerb and gutter, pipes, pits, headwalls, road pavements, buildings, road furniture, etc. – these details are not to be limited to the site and are to include any feature which has an impact on the development.
• Existing services including sewer, water, telephone, gas, electricity, etc., together with all associated pits, poles and other structures.
• Road centrelines showing chainages, bearings, and intersection points.
• Pavement and footpath widths.
• Curve information including tangent point chainages, radii, arc and chord lengths, superelevation (if applicable).
• Edge of pavement where no kerb is constructed.
• Kerb return numbers.
• Location of proposed gutter crossings, footpaving, cycleways, pedestrian ramps and any required access driveways.
• Drainage pits including chainage, length and pit number.
• Pipeline locations including pipe size, type and class.
• Cut and fill areas clearly identifying depths.
• Extent of proposed works.
• Subsoil Drains.

2.9 Road Long Sections

Road long sections should include the following:

• Road Number.
• Centreline chainage.
• Existing centreline surface level.
• Design centreline level (seal level).
• Design grades.
• Length of vertical curves.
• Chainage and levels at grade intersection points and vertical curve tangent points.
• Extended levels and grading to depict future works and / or match to existing roads (min 60m).

2.10 Road Cross Sections

A cross section for each centreline chainage (typically 15 metre intervals), with additional cross sections as required, should include the following:

• Road number.
• Centreline Chainage.
• Existing surface levels, extending beyond any proposed batters.
• Design surface levels.
• Offset distances to centreline.
• Crossfalls, batter slopes and dimensions, where these differ to that shown on the typical section.
2.11 Typical Road Cross Sections

A typical cross section shall be provided for each road as additional detail on at least one cross section on each sheet of road cross sections OR alternatively, may be provided separately as a set of typical cross sections. Where typical cross sections are provided separately to the road cross sections, general details shall comply with section 2.10. The additional detail for a typical road cross section should include the following:

- Road reserve width (existing and proposed).
- Road width between face of kerbs, or where no kerb is constructed, pavement and shoulder widths.
- Location and width of any proposed concrete footpaving or cycle paths.
- Kerb and gutter type.
- Grades/slopes of pavements, footpaths and batters, with offsets to changes of grade.
- Type and thickness of surfacing.
- Thickness of pavement, using Council’s minimum pavement thickness and a note advertising that pavement thicknesses are to be designed in accordance with Council’s Works Specification – Subdivision/Developments by a N.A.T.A. registered geotechnical consultant.

2.12 Kerb Return Details

Plans showing kerb returns at intersections, junctions and turning heads should include the following:

- Design kerb levels at tangent points, quarter points, high and low points, and wherever necessary to ensure accurate construction.
- Contours for pavement design.
- Kerb radius.
- Vertical curve design.
- Kerb return numbers.
- Kerb chainage and where appropriate centreline chainage.
- High and Low points.

Cul-de-sac head details shall be provided generally in accordance with the abovementioned requirements.

2.13 Traffic Calming Devices, Pathways, Cycleways and Other Miscellaneous Details

Plans showing traffic calming devices should show design levels, design contours, signposting and line marking. Pathways, cycleways and other miscellaneous road details should be shown clearly on typical sections.
2.14 Drainage Catchment Plan

A plan showing all internal and external catchments effecting the development and their breakdown into sub-catchments should include the following:

- Road Numbers.
- Existing and proposed property and road boundaries.
- All catchments / sub-catchments labelled according to the drainage calculation sheet.
- Catchment / sub-catchment boundaries indicated by a bold line.
- Proposed / existing contours at a suitable interval.
- Direction of water flow along the flow paths of the longest times of concentration.
- Any features that may effect catchment boundaries.
- Drainage lines and pit numbers.
- Areas of all catchment / sub-catchments.

2.15 Drainage Calculations

A comprehensive drainage calculation table is to be provided complete with all hydrological and hydraulic data in the format shown in Section 4 – Drainage Design or other format approved by the Manager.

2.16 Drainage Longitudinal Sections

A longitudinal section of each drainage pipeline is to be shown including the following information on each:

- Chainages.
- Existing and finished surface levels.
- Design invert levels.
- Drainage pits (including numbering).
- Drainage line numbers.
- Grade, diameter, class and material of each pipe section.
- Hydraulic grade lines and levels.
- Pipe flows and capacities.

2.17 Other Drainage Details

Details of the following are to be provided on a drainage detail plan where not shown on the roadworks detailed plan:

- Details of the pipe junctions.
- Full details, including reinforcing, of non standard structures.
- Invert levels, surface levels and locations of all drainage structures.
- Pipe details.
- Length of lintels.
- Pit Schedule.

Where open drains are designed additional details shall be provided including the following:
• Cross sections (usually 15 metre intervals)
• Details of drop structures, energy dissipators, gross pollutant traps, etc. (plan and sectional view).
• All natural creeks are to be retained and any works must comply with the requirements of DWE.

Where detention basins are required, full construction details shall be provided including the following:

• Plan view.
• Sectional views.
• Details of basin wall construction.
• Details of outlet structures.
• Extent of storage.
• Maximum storage level.
• Extent and nature of any landscaping.

2.18 Erosion and Sedimentation Control Measures

A plan shall be provided showing relevant site characteristics and design criteria of erosion and sediment controls and should include the following:

• Existing and design contours.
• Existing site drainage and vegetation.
• Limit of clearing, grading and filling.
• Grades / slopes of site.
• Critical natural areas (natural watercourses, swamps, cliffs, etc.)
• Location of topsoil stockpiles, roads and all impervious surfaces.
• Distance to nearest natural watercourse or drainage line.
• Catchment area boundaries.
• Sediment basin calculations.
• Erosion and sediment controls, including diversions.
• Construction / revegetation notes.
• Outline of program for maintenance of erosion and sediment controls.
• Temporary construction exits.

2.19 Traffic Control Measures

A plan shall be provided showing traffic control measures for each stage of a proposed development and should include the following:

• Diversion of Pedestrians
• Delineation of temporary traffic paths.
• Position of warning devices.
• After hours traffic arrangements.
• Instructions for the installation, operation, between stage rearrangements, and removal of traffic control devices.

Temporary road closures requiring detour onto an alternate route must make a separate formal application to Council's Traffic and Transport...
Team for approval by the General Manager. Further information regarding this process is available from Council’s website.

2.20 Traffic Regulation (Permanent)
A plan shall be prepared and submitted to Council for approval showing all permanent traffic regulatory and warning devices including but not limited to linemarking (edge lines, centre lines and holding lines), painted line arrows, school zone signs and pavement markings, curve warning signs, keep left signs, parking restrictions, speed limit signs, bus zones and any other warning signs as required by the development consent or relevant Australian Standard.

2.21 Work-As-Executed Plans
Following the completion of engineering works in a subdivision or development, Work-As-Executed plans are required to be prepared by a Registered Surveyor or "Persons Qualified" (see Section 1.6) and forwarded to Council prior to the final inspection. The plans should include the following:

- Certification that all works have been completed generally in accordance with the approved plans.
- Any departures from the approved plans.
- Any additional work that has been undertaken.
- Stripped and finished levels (see Section 2.21)
- Length of lintels and pit types shown on plan and long sections.
- Location of water and electricity conduits.
- Location of flushing points and subsoil drains.
- Location of start and end of construction.
- Top of kerb levels shown in cross sections and kerb return details.
- Footpath levels at boundary shown on cross sections.
- Road centreline levels shown on long and cross sections.
- Invert of pipes at pits.
- Location of gutter crossings.
- Width of road and footpath at 100 metre intervals.
- Location and details of Permanent Marks (PM’s) and State Survey Marks (SSM’s).
- Flood levels

2.22 Lot Filling
Council requires all areas of the site, subject to filling, to be identified on the engineering plans, submitted for approval and should include the following:

- Road numbers and road names.
- Road reserve boundaries.
- Allotment layout, including easements and lots numbered in accordance with the final plan of subdivision.
- Extent of fill.
- Fill area hatched, and hatching shown in a legend as filled area.
- Stripped and finished levels.
- Contours.
- Certification of the plan by Registered Surveyor.

THE HILLS SHIRE COUNCIL
September 2011
All imported fill material to be used must be tested and certified to be Excavated Natural Material (ENM).

Compaction shall be in accordance with Section 4.9 of Council's Works Specifications Subdivision / Developments – Placement and Compaction of Fill.

Each Residential Lot, whether filled or not, shall be classified in terms of Australian Standard for Residential Slabs and Footings (AS 2870). The lot classification shall be prepared by a N.A.T.A. registered geotechnical consultant.

No allotment filling is to be placed against existing allotment boundaries. Where approval is obtained to extend fill into adjoining properties (written consent required), satisfactory arrangements must be made for the grading of the fill onto the land without ponding.

Revegetation must be applied immediately on completion of the site filling – regrading works.

The minimum lot grading shall be 1% and 100mm of topsoil must be placed over all filled land and graded to ensure no ponding of water.

2.23 Sheet Sizes

Sheet sizes should not be mixed within the same set of plans and shall be limited to the following:

- A1 - 841 x 594 - Road and Drainage Works
- A2 - 594 x 420 - Minor Engineering Details
- A3 - 420 x 297 - Minor Engineering Details
- A4 - 297 x 210 - Minor Engineering Details

2.24 Scales

Scales used for all plans should be those recommended by the Standards Association and Austroads as follows:

- 1:1, 1:2 and 1:5 and multiples of 10 of these scales.
- 1:25 and 1:125 and multiples of 10 are not preferred but may be accepted.

The following scales are suggested for particular uses but may be varied as appropriate to the works concerned:

- Engineering Detail Plan - 1:1000 or 1:500
- Longitudinal Section - 1:1000 or 1:500 (Horizontal)
  1:100 or 1:50 (vertical)
- Cross Section - 1:100
- Intersection Details - 1:1250, 1:200 or 1:100
- Layout Plan - 1:500, 1:1000, 1:2000 or 1:4000
- Catchment Plan - 1:500, 1:1000, 1:2000 or 1:4000
- Locality Plan - 1:500, 1:1000, 1:2000 or 1:4000
2.25  Dimensions

Linear dimensions on all engineering plans shall be in metres, with the exception of detail plans which may be in millimeters. Methods of dimensioning will be in accordance with the current Australian Standard.

Chainages shall be expressed to the nearest 0.01m, levels shall be reduced to Australian Height Datum (AMD) and expressed to the nearest 0.005m (except Bench Marks, PM's and SSM's which will be expressed to the nearest 0.001m).
ROAD DESIGN

3.1 Scope

This section of the manual sets out Council’s requirements for the design of urban and rural roads. It is in no way a comprehensive manual and it is intended to be read in conjunction with and as supplement to:

- AUSTROADS – Guide to Traffic Engineering Practice, Parts 1-15;
- AUSTROADS – Rural Road Design, Guide to the Geometric Design of Rural Roads;
- AUSTROADS – Pavement Design, Guide to the Structural Design of Road Pavements;
- ARRB, Transport Research Sealed Local Roads Manual – Guidelines to Good Practice for the Construction, Maintenance and Rehabilitation of Pavements;
- AMCORD – A National Resource Document for Residential Development;
- Department of Housing Road Manual;
- Roads and Traffic Authority Road design Guide; and
- Council’s relevant Development Control Plans.
- Infrastructure, Planning and Natural Resources – Roads and Salinity

3.2 Aim

The design and construction of a road system that provides the following:

- a high level of safety for all users;
- acceptable levels of amenity and protection from the impact of traffic;
- a reasonable level of convenience for all users; and
- economy of construction and maintenance.

3.3 Planning Standards

The road layout and width must conform to that shown on any relevant Development Control Plan. The precise location of any proposed roads are subject to the detailed site assessment carried out during the subdivision application process. In areas not covered by a Development Control Plan the layout and width will be determined by Council on their merits.

3.4 Design Speed

Design speed is the speed applied to the design of a road’s geometric elements to create and maintain a speed environment for 85% of drivers.

Generally the following design speeds should be adopted:

<table>
<thead>
<tr>
<th>Road Type</th>
<th>Speed (km/h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cul-de-sac, Access Streets and Community Title Roads</td>
<td>30</td>
</tr>
<tr>
<td>Local Streets</td>
<td>50</td>
</tr>
<tr>
<td>Collector and Sub-Arterial Roads</td>
<td>60</td>
</tr>
</tbody>
</table>
A speed limit of 60 km/h should be used for calculating design values which depend on speed. Vehicular speeds are limited by road intersections as well as changes in vertical and horizontal alignment. The adopted design speed may be reduced with Council approval.

### 3.5 Sight Distance

Refer to the RTA Design Guide Section 2.1.

The Absolute Minimum sight distance is that required for a driver to observe an object on the road surface ahead, and to stop the vehicle before reaching the object. This sight distance shall be available at every point on every road and at intersections to provide sufficient distance for an approaching vehicle to stop before an obstruction in the roadway at the intersection, using the approved design speed. Table 3.1 gives the appropriate value of sight distance for various speeds.

<table>
<thead>
<tr>
<th>Target Speed (km/h)</th>
<th>Sight Distance (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>30</td>
<td>20</td>
</tr>
<tr>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td>50</td>
<td>40</td>
</tr>
<tr>
<td>60</td>
<td>55</td>
</tr>
</tbody>
</table>

**Table 3.1 – Absolute Minimum Sight Distances (AMCORD)**

The Desirable Minimum sight distance for two-way roads is that required for the drivers of two opposing vehicles to see each other in time to stop before collision. Table 3.2 gives the appropriate value of sight distance for various vehicle speeds. This distance shall be provided at the intersections to provide sufficient distance for a vehicle stopped in the side road, at the alignment of the through road, to start and turn safely onto the through road, and wherever else possible.

<table>
<thead>
<tr>
<th>Target Speed (km/h)</th>
<th>Sight Distance (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>30</td>
<td>40</td>
</tr>
<tr>
<td>40</td>
<td>60</td>
</tr>
<tr>
<td>50</td>
<td>80</td>
</tr>
<tr>
<td>60</td>
<td>110</td>
</tr>
</tbody>
</table>

**Table 3.2 – Desirable Minimum Sight Distances**

Where sight distance available on a two way rural road is less than the Desirable Minimum, pavement markings restricting overtaking shall be provided, together with appropriate widening of the shoulder if considered necessary by Council’s Engineer.
3.6 Horizontal Alignment

Drivers react to restrictive horizontal alignment by slowing to an appropriate speed, hence the desired maximum Design Speed is maintained by deliberately designing a restrictive horizontal alignment.

The horizontal alignment of a road is to be generally in accordance with Council’s relevant Development Control Plan.

The minimum horizontal deflection angle for which a curve is needed is 1.0 degree. Where possible the radii of the curve shall be maximized to reduced the necessity for centreline shift and widening of the carriageway. The minimum radii for various deflection angles shall be in accordance with Table 3.3.

<table>
<thead>
<tr>
<th>Deflection Angle (Degrees)</th>
<th>Minimum Radius (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>75°</td>
<td>20</td>
</tr>
<tr>
<td>60°</td>
<td>33</td>
</tr>
<tr>
<td>40°</td>
<td>65</td>
</tr>
<tr>
<td>30°</td>
<td>75</td>
</tr>
<tr>
<td>20°</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 3.3 – Minimum Curve Radii

3.7 Transitions and Widening on Curves

All curves of less than 180 metres radius shall be widened and provided with plan transition at the junctions with the tangents. This applies particularly to curves which tend to reduce the speed of traffic flow and those with crests within their length.

3.8 Longitudinal Gradient

Longitudinal grades shall generally be in accordance with Table 3.4.

<table>
<thead>
<tr>
<th>Road Type</th>
<th>Desirable Minimum (%)</th>
<th>Absolute Minimum (%)</th>
<th>Desirable Maximum (%)</th>
<th>*Absolute Maximum (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub-arterial</td>
<td>1.0</td>
<td>0.7</td>
<td>6.0</td>
<td>8.0</td>
</tr>
<tr>
<td>Collector/Industrial</td>
<td>1.0</td>
<td>0.7</td>
<td>6.0</td>
<td>10.0</td>
</tr>
<tr>
<td>Access/Local</td>
<td>1.0</td>
<td>0.7</td>
<td>12.0</td>
<td>16.0</td>
</tr>
<tr>
<td>Rural</td>
<td>1.0</td>
<td>0.7</td>
<td>12.0</td>
<td>16.0</td>
</tr>
</tbody>
</table>

* Absolute maximum of 6% where water sensitive urban design swales are proposed.

Table 3.4 – Minimal / Maximum Longitudinal Grades

At intersections, the longitudinal grade of the side road, within 6.0 metres of the through road, should not exceed 5.0%. The longitudinal grade at the head of cul-de-sacs should also not exceed 5.0%.
Where the topography makes it difficult to provide a road location to conform to the required grades, the lengths over which these grades apply will then become a consideration, and any variations will be at the discretion of the Manager.

3.9 Vertical Curves

Vertical Curves of the form of simple parabolas shall be provided at all changes of grade exceeding the following:

- Access, Local and Collector 1.0%
- Rural and Sub-arterial 0.6%

Where the change of grade is less than that shown above, the centerline grading shall be “eased” over a symmetrically located distance of 10 metres. This distance may be reduced to 5 metres for cul-de-sacs, access streets and community title roads.

Every effort should be made to provide vertical curves as long as possible for improved appearance, however, surface drainage should be maintained in proximity to sag points. The design of vertical curves shall be in accordance with the RTA Design Guide and the following:

- A minimum design speed of 60 km/h shall be adopted even if the horizontal alignment is not satisfactory for that speed.
- The minimum length of a crest vertical curve is governed by sight distance requirements.
- The desirable minimum length of a sag vertical curve is that providing minimum headlight sight distance and this length should be provided wherever possible.
- The absolute minimum length of a sag vertical curve is based on the consideration of riding comfortably and shall be such that the maximum vertical acceleration is 0.1G.
- In addition to the minimum length requirements mentioned above, from a consideration of appearance the minimum length of a vertical curve in urban areas shall not be less than that shown in Table 3.5.

<table>
<thead>
<tr>
<th>Road Type</th>
<th>General Minimum Curve Length (m)</th>
<th>Minimum Length at Road Junctions (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access/Local Streets</td>
<td>25</td>
<td>6</td>
</tr>
<tr>
<td>Collector Streets</td>
<td>32</td>
<td>12</td>
</tr>
<tr>
<td>Sub-arterial/Rural</td>
<td>50</td>
<td>20</td>
</tr>
</tbody>
</table>

Table 3.5 – Minimal Vertical Curve Lengths

- The use of short sections of straight grade between vertical curves is undesirable for appearance and should be avoided.
- The tangent point of a vertical curve in the side road should be located at, or behind, the kerb line through the road.
- Vertical Curves on kerb returns must be treated in such a manner as to make construction practical.
3.10 Super-Elevation

Where super-elevation is considered necessary, the design shall be carried out in accordance with the R.T.A Road Design Guide adopting maximum values of 4.0% in urban areas and 7.0% in rural areas.

3.11 Carriageway Crossfall

The normal cross-fall of pavement and shoulders on a straight alignment shall be in accordance with Table 3.6.

<table>
<thead>
<tr>
<th>Surface Type</th>
<th>Road Cross-fall (%)</th>
<th>Shoulder Cross-fall (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>2.0-3.0</td>
<td>2.0-3.0</td>
</tr>
<tr>
<td>Asphaltic Concrete</td>
<td>2.5-3.0</td>
<td>2.5-3.0</td>
</tr>
<tr>
<td>Sprayed Seal</td>
<td>3.0-4.0</td>
<td>3.0-4.0</td>
</tr>
<tr>
<td>Unsealed</td>
<td>-</td>
<td>4.0-5.0</td>
</tr>
</tbody>
</table>

Table 3.6 – Normal Cross-fall

There are many controls in urban areas which may force departures from the above values, should it be necessary to increase or decrease crossfalls the variances should be within 1.0% of the above values.

3.12 Pavement Design

A formal pavement design shall be prepared by a registered N.A.T.A. laboratory based on sampling and testing of the subgrade materials from the site. Details of the pavement design and results of sub-grade testing (including 4 day soaked CBR’s) are to be submitted to Council for approval prior to commencement of pavement construction. The Design shall be based on Traffic Loading Criteria specified in the Consent for the proposed works, which is based on the Design Traffic Loadings shown in Table 3.7.

<table>
<thead>
<tr>
<th>Road Type</th>
<th>Design Traffic Loading</th>
<th>AADT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access/Local</td>
<td>$5 \times 10^5$</td>
<td>500 - 2000</td>
</tr>
<tr>
<td>Collector</td>
<td>$1 \times 10^6$</td>
<td>2000 - 4000</td>
</tr>
<tr>
<td>Sub-Arterial/Enhanced</td>
<td>$5 \times 10^6$</td>
<td>4000 - 10000</td>
</tr>
<tr>
<td>Collector</td>
<td>$1 \times 10^7$</td>
<td></td>
</tr>
<tr>
<td>Commercial/Light</td>
<td>$5 \times 10^7$</td>
<td></td>
</tr>
<tr>
<td>Industrial</td>
<td>$5 \times 10^5$</td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>$5 \times 10^5$</td>
<td></td>
</tr>
<tr>
<td>Cul-de-sacs/Private</td>
<td>$2 \times 10^5$</td>
<td>0-500</td>
</tr>
<tr>
<td>Community Title</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3.7 – Design Traffic Loadings

The minimum unbound granular pavement thickness for urban and rural roads shall be 300 mm, consisting of 150 mm thick sub-base and 150 mm thick base. A two coat hot bitumen seal (10mm & 14mm aggregate)
shall be provided with a 40mm minimum thick asphaltic concrete wearing course for urban roads.

The pavement for roundabouts shall consist of deeplift asphaltic concrete placed on 150 mm rolled concrete (5 MPa) to the requirements of the Manager.

Rural cul-de-sacs shall be provided with a 25 mm minimum thick asphaltic concrete wearing course at the head of cul-de-sac to the tangent points.

3.13 Kerb and Gutter

Concrete kerb and gutter shall be provided on both sides of urban roads and other roads at the discretion of the Manager. Concrete kerb and gutter shall be provided in accordance with Table 3.8 or the relevant Development Control Plan.

<table>
<thead>
<tr>
<th>Road Type/Location</th>
<th>Kerb and Gutter Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local/Access</td>
<td>Roll Kerb and Gutter</td>
</tr>
<tr>
<td>Collector</td>
<td>Roll Kerb and Gutter</td>
</tr>
<tr>
<td>Sub-Arterial</td>
<td>150 mm Integral Kerb and Gutter</td>
</tr>
<tr>
<td>Commercial/Industrial</td>
<td>150 mm Integral Kerb and Gutter</td>
</tr>
<tr>
<td>Adjacent to Public Open Space</td>
<td>150 mm Integral Kerb and Gutter</td>
</tr>
<tr>
<td>Roundabout Kerb Returns</td>
<td>150 mm Integral Kerb and Gutter</td>
</tr>
</tbody>
</table>

Table 3.8 – Kerb and Gutter Types

For infill development, or where new kerb and gutter joins existing works, the kerb and gutter type shall match the existing unless otherwise specified.

Pedestrian ramps shall be provided at intersections to Council’s Engineers requirements in accordance with Council’s Works Specification – Subdivisions/Developments.

3.14 Footpath Crossfall

Footpath areas shall be sloped towards the road so that water does not drain into adjoining properties. A desirable grade of 3.0% shall be provided, with a maximum grade of 4.0% and a minimum grade of 2.0%. Where properties bound sub-arterial / arterial roads, additional mounding may be required within the footpath area for sound attenuation purposes.

3.15 Berms

Berms shall extend 0.5 metres in cut or fill beyond the property boundary at the same grade as the footpath.

3.16 Batters

Batters shall be designed at stable slopes at the edge of the bern in accordance with Table 3.9.
<table>
<thead>
<tr>
<th>Batter Type</th>
<th>Desirable Maximum Slope (V:H)</th>
<th>Absolute Maximum Slope (V:H)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth</td>
<td>1:4</td>
<td>1:2</td>
</tr>
<tr>
<td>Rock</td>
<td>1:0.5</td>
<td>1:0.25</td>
</tr>
</tbody>
</table>

Table 3.9 – Maximum Batter Slopes

The abovementioned slopes for rock batters refer only to cut batters in solid rock with a few clay bands.

Where the abovementioned slopes cannot be reasonably attained, variances may be permitted subject to approval being obtained from the Manager.

The need for constructing retaining walls should be avoided wherever possible. Should a retaining wall be necessary the Developer must provide full engineering details of the proposed structure, including elevation, typical cross-section and structural certification.

3.17 Intersections

The design of intersections or junctions shall be in accordance with AUSTROADS – guide to Traffic Engineering Practice, PART 5, Intersections at Grade; R.T.A. Road Design Guide; and/or the requirements of the Manager.

Intersections should generally be located so that streets intersect at right angles and at not less than 70°. Adequate stopping and sight distances should be provided on each of the approach legs of an intersection and for any horizontal or vertical curves.

- Splay corners shall be provided at all intersections.
  - 4m x 4m – Access Streets to Collector Roads
  - 5m x 5m – Enhanced Collector to Heavy Industrial Roads and Rural Roads.

Turning movements shall be accommodated by using AUSTROADS Design Vehicles and Turning Templates as follows:

- For turning movements involving collector streets, the "design semi-trailer" with turning path radius 12.5 metres shall be used to enable turns to be made in a single forward movement.
- For turning movements involving access streets and collector streets, the "design single unit" truck with turning path radius 12.0 metres shall be used to enable turns to be made in a single forward movement.
- For turning movements on access streets, the "design car" with turning path radius 7.5 metres shall be used.
3.18 Kerb Returns

The general design of a kerb return shall be by dividing the kerb return into quarters between tangent points and using two vertical curves to achieve a smooth profile. The radii for kerb returns shall generally be in accordance with Table 3.10.

<table>
<thead>
<tr>
<th>Road Type</th>
<th>Minimum Kerb Return Radii (m)</th>
<th>Minimum Cul-De-Sac Kerb Radii (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>7.5</td>
<td>9.5</td>
</tr>
<tr>
<td>Industrial</td>
<td>12</td>
<td>13.5</td>
</tr>
</tbody>
</table>

Table 3.10 – Minimum Radii of Kerb Returns

Any variation to the above radii shall be approved by the Manager and should accommodate the intended vehicular movement using AUSTROADS Design Vehicles and Turning Templates.

On bus routes the geometry of kerb returns may be varied to allow for the turning circle of larger vehicles.

Generally the profile shall be designed by adopting the grades of the approach and exit kerbs to the return, by quartering the length of the return and by computing kerb levels adopting two vertical curves as required.

As far as practicable low points within the kerb return shall be avoided to eliminate the use of pits with curved lintels.

3.19 Cul-De-Sac Head Kerb Grading

The design kerb levels at the head of a cul-de-sac shall also be detailed in plan using a scale of 1:200.

The longitudinal profile of the kerb and gutter of the cul-de-sac head shall be based on the adoption, as far as practicable of the standard 3% carriageway crossfall at critical points in the arc length with easing of changes in grade by designed vertical curves as required.

The minimum acceptable crossfall is 1.5% while the maximum allowable crossfall is 8%.

It will be necessary to give special consideration to the design of kerb longitudinal profiles for a cul-de-sac draining to the head. Drainage of the low point in the head shall be provided via pipelines within pathways. It is essential that provision be made for overland flow for events which exceed pipeline capacity or to allow for blockages of the downstream line.

3.20 Roundabouts

The design of roundabouts shall be in accordance with AUSTROADS – Guide to Traffic Engineering Practice, PART 6, Roundabouts and shall be approved by the Council and / or the Roads and Traffic Authority.
3.21 Traffic Calming Devices

The design of traffic calming devices shall be in accordance with AUSTROADS – Guide to Traffic Engineering Practice, PART 10, Local Area Traffic Management and shall be approved by the Council.
DRAINAGE DESIGN

4.1 Scope

This section of the manual sets out Council's requirements for the design of stormwater drainage for urban and rural areas. It is in no way a comprehensive design manual and it is intended to be read in conjunction with and as a supplement to the 1998 edition of Australian Rainfall and Run-off (AR&R), Australian Runoff Quality (ARQ) 2006, Water Sensitive Urban Design (WSUD) Technical Guidelines for Western Sydney and On-Site Stormwater Detention Handbook (latest edition). Many of the principles have been adopted from the Queensland Urban Drainage Manual.

4.2 Aim

The design and construction of a drainage system that provides the following:
- a high level of safety for all users;
- acceptable levels of amenity and protection from the impact of flooding;
- economy of construction and maintenance.
- the protection of downstream environments.

4.3 General Requirements

All drainage, whether internal or external to the site, relevant or reasonably required in respect of the proposed development shall be provided to Council’s requirements at the Applicant's cost.

A stormwater drainage system shall be provided in accordance with the "major/minor" system concept set out in Chapter 14 of the AR&R (1998); that is, the "major" system shall provide safe, well-defined overland flow paths for rare and extreme storm run-off events while "minor" system shall be capable of carrying and controlling flows from frequent storm run-off events.

In general, drainage works will be constructed by the Applicant in accordance with the following:

Drainage in Urban Areas

Minor System

- Kerb and gutter shall be provided on both sides of all roads except where the relevant Development Control Plan advises otherwise.
- Kerb inlets shall be provided at locations such that the flow in the gutter does not exceed the specified limits.
- Inter-allotment drainage shall be provided at the lowest point of all allotments together with the creation of an easement over all downstream pipework to the legal point of discharge.
- Full piped drainage from all kerb inlets and other inlets shall be provided to the boundary of the subdivision, or approved point of discharge, unless otherwise approved by the Manager.
Major System

- An overland flow system shall be provided for run-off in excess of the capacity of the pipe system, such that the design flow is carried through the subdivision or development clear of, and with the required freeboard to allotments.
- Overland flow paths will not be permitted within urban allotments, unless otherwise approved by the Manager.

Drainage in Rural Areas

Minor System

- Pipe or concrete box culverts, bridges or concrete causeways shall be provided at road crossings over natural watercourses to the limits of the road formation. Where services are underground then these services shall be carried over the structure in a services corridor approved by the Manager. Cross drainage design shall take into account the possible blockage caused by debris load from the catchment.
- Table drains and surface inlet pits shall be provided on the cut side of roads, within the road reserve, together with stone pitching or concrete lining where required for scour protection.

Major System

- An overland flow system shall be provided for run-off in excess of the capacity of the pipe system, such that the design flow is carried through the subdivision or development clear of, and with the required freeboard, to building platforms.

4.4 Lawful Point of Discharge

Urban development generally modifies the naturally occurring drainage regime by increasing the volume and rate of run-off, sometimes diverting flow between natural catchments, modifying existing flow paths and concentrating flow along drainage paths and at outlets. These changes may affect the safety, amenity and enjoyments of persons and property and may result in legal disputes.

Legal problems arising from the planning and proposed construction of the drainage works need to be negotiated and resolved with adjoining owners, and any other landowners who could be detrimentally affected, before approval of the works can be granted by Council. In this regard, Council will require that a lawful point of discharge exists prior to approval of development.

In order to determine whether a lawful point of discharge exists at a particular location the following two points must be satisfied:

a) That the location of the discharge is under the lawful control of Council or other statutory authority from whose permission to discharge has been received. This will include drainage reserve, road reserve, or stormwater drainage easements; and

b) That in discharging in that location, the discharge will not cause an actionable nuisance (i.e. a nuisance for which the current or some future
neighboring proprietor may bring an action or claim for damages arising out of the nuisance).

Where the conditions of the first test have not been satisfied prior to development, it will be necessary to obtain a lawful point of discharge. This will usually be achieved by the creation of a drainage reserve, or where approved by the Manager, acquisition of a drainage easement over one or more downstream properties until the conditions of the second test have been met.

It should be noted that a natural watercourse may not necessarily constitute a lawful point of discharge, unless the requirements of the above two tests can be satisfied.

4.5 Flood Studies

Council may require the submission of a flood study in the following circumstances:

- To determine whether the proposed method of stormwater discharge would have a detrimental effect upon neighboring lands.
- To determine whether the existing or proposed stormwater discharge will have the potential to cause overland flood inundation problems on the property.

Where Council considers necessary, the Developer will be required to submit a flood study that calculates the 1:100 year Average Recurrence Interval flood level. The study shall be carried out by a qualified Civil Engineer or Surveyor with documented experience in hydraulic analysis. Design calculations submitted shall be accompanied by a catchment plan, showing contours, at the scale of 1:2000 or 1:4000, together with survey cross sections of the overland flow path.

The method of calculating flood/flow levels shall be to the requirements of the Manager. For minor flood studies Council prefers that the calculations be submitted on Council’s form “A Simple Method for Estimation of Flow and Flood Levels in Easements” (See Appendix B)

4.6 Drainage Reserves/Easements

Where a natural open channel or similar overland flowpath exists in a proposed development, a drainage reserve shall be provided to contain the design flow within the actual drainage reserve area. The design and construction of the drainage reserve shall be in accordance with the relevant Development Control Plan and the minimum width shall be 5.0 metres.

Where stormwater drainage has been approved within allotments, a drainage easement shall be created or acquired. The width of easements benefiting Council shall be in accordance with Table 4.1 and the width of the inter-allotment drainage shall be in accordance with Table 4.2.
<table>
<thead>
<tr>
<th>Drainage Width</th>
<th>Easement Width (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stormwater system ≤ 1350</td>
<td>3.0</td>
</tr>
<tr>
<td>Stormwater system &gt; 1350</td>
<td>Width of the system plus 2.0 metres</td>
</tr>
</tbody>
</table>

Table 4.1 - Minimum Easement Width for Council Drainage

<table>
<thead>
<tr>
<th>Drainage Width</th>
<th>Easement Width (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stormwater system ≤ 150</td>
<td>1.0</td>
</tr>
<tr>
<td>Stormwater system &gt; 150</td>
<td>1.5</td>
</tr>
</tbody>
</table>

Table 4.2 - Minimum Easement Width for Inter-allotment Drainage

4.7 Hydrology

A number of methods are available for the determination of the flow rate, run-off, volume and catchment response. The following commonly used hydrological methods are acceptable to Council:

- The Rational Method – This method has been the most commonly used method for drainage design. It provides simple means for the assessment of design peak flow rate (peak discharge). The rational method is not recommended for the design of detention basins.

- Time-Area Run-off Routing, eg. ILSAX – ILSAX is a computer based model which involves the routing of the time-area relationship developed for the sub-catchments under consideration. It is suitable for use in urban catchments but requires calibration with available flow data. The Technical Note 7 in Chapter 14 of the AR&R (1998) provides an example of the use of ILSAX.

- RAFTS – This is a proprietary computer model based upon the Regional Stormwater Model (RSWH). It includes separate routing of impervious and pervious areas; sophisticated loss models; urban run-off modelling and detention basin design; and provision for river basin analysis.

Other hydrological models may be used as long as the requirements of AR&R (1998) are met. Council will require the submission of calculations in the format of that shown on Council’s summary sheet for hydrological calculations (See Appendix C), together with details of all program inputs and outputs.

4.8 Design Average Recurrence Intervals (ARI)

For drainage design under the “major/minor” concept theARI’s shall be in accordance Table 4.3

<table>
<thead>
<tr>
<th>Location</th>
<th>Minor (Years)</th>
<th>System</th>
<th>Major (Years)</th>
<th>System</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>10</td>
<td></td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Sag</td>
<td>20</td>
<td></td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

THE HILLS SHIRE COUNCIL
September 2011
Table 4.3 - Design Average Recurrence Intervals

An overland flow path will be provided for drainage systems even where the 100 year ARI flows can be maintained within the pipe system.

4.9 Time of Concentration

The time of concentration \( t_c \) of a catchment is defined as the time required for the stormwater run-off to flow from the most remote part (relative to time) of the catchment to its outlet.

In determining the time of concentration, the designer should assume that the catchments under construction are fully developed in accordance with the land use shown on the relevant Zoning Maps.

In a typical urban drainage system a designer will need to calculate the time of concentration for inlet location and pipe sizing. Regardless of the purpose of the time of concentration calculation, it will include one or a number of the following components:

- Overland or ‘sheet’ flow time.
- Roof to drainage system flow time.
- Gutter or channel flow time.
- Pipe flow time.

Where the flow path is through areas having different flow characteristics, the flow time of each portion of the flow path shall be calculated separately.

The minimum time of concentration should not be less than 5 minutes for the total flow travel time from any catchment to its point of entry into the drainage network. The maximum time of concentration in urban areas shall be 20 minutes unless sufficient evidence is provided to justify a greater time.

4.10 Rainfall Intensities

The Design Intensity-Frequency-Duration (IFD) Rainfall is required as input to the hydrological model used for the drainage design.

Table 4.4 provides the intensities for the Parramatta catchment area and Table 4.5 provides the intensities for the Hawkesbury catchment area.

Alternatively, the IFD Rainfall for the catchment under consideration may be derived in accordance with Chapter 2 (Volume 1) of AR&R (1998). The nine basic parameters read from the Maps in Volume 2 of AR&R (1998) shall be shown in the calculations submitted to Council unless the Bureau of Meteorology provides a polynomial relationship for the catchment.
<table>
<thead>
<tr>
<th>Duration (min)</th>
<th>Average Storm Recurrence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 Year (mm/hr)</td>
</tr>
<tr>
<td>1</td>
<td>83.63</td>
</tr>
<tr>
<td>2</td>
<td>78.36</td>
</tr>
<tr>
<td>3</td>
<td>73.97</td>
</tr>
<tr>
<td>4</td>
<td>70.23</td>
</tr>
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<td>5</td>
<td>66.97</td>
</tr>
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<td>6</td>
<td>64.11</td>
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<td>53.57</td>
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<td>24</td>
<td>22.77</td>
</tr>
<tr>
<td>25</td>
<td>20.52</td>
</tr>
</tbody>
</table>

Table 4.4 - Rainfall Intensity for the Parramatta Catchment
<table>
<thead>
<tr>
<th>Duration (hr)</th>
<th>Average Storm Recurrence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 Year (mm/hr)</td>
</tr>
<tr>
<td>2</td>
<td>17.27</td>
</tr>
<tr>
<td>3</td>
<td>13.70</td>
</tr>
<tr>
<td>4</td>
<td>11.57</td>
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<tr>
<td>4.5</td>
<td>10.79</td>
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<td>5</td>
<td>10.15</td>
</tr>
<tr>
<td>6</td>
<td>9.12</td>
</tr>
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<td>8</td>
<td>7.70</td>
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<tr>
<td>10</td>
<td>6.76</td>
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<td>14</td>
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<td>2.16</td>
</tr>
<tr>
<td>72</td>
<td>1.89</td>
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</tbody>
</table>

*Table 4.4 Continued – Rainfall Intensity for the Parramatta Catchment*
<table>
<thead>
<tr>
<th>Duration (min)</th>
<th>Average Storm Recurrence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 Year (mm/hr)</td>
</tr>
<tr>
<td>5</td>
<td>79.76</td>
</tr>
<tr>
<td>6</td>
<td>74.73</td>
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<tr>
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</tr>
<tr>
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</tr>
<tr>
<td>9</td>
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</tr>
<tr>
<td>10</td>
<td>61.12</td>
</tr>
<tr>
<td>11</td>
<td>56.49</td>
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<td>80</td>
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</table>

Table 4.5 – Rainfall Intensity for the Hawkesbury Catchment
<table>
<thead>
<tr>
<th>Duration (hr)</th>
<th>Average Storm Recurrence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 Year (mm/hr)</td>
</tr>
<tr>
<td>2</td>
<td>16.25</td>
</tr>
<tr>
<td>3</td>
<td>12.60</td>
</tr>
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<td>4</td>
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<td>4.5</td>
<td>9.88</td>
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</tr>
<tr>
<td>6</td>
<td>8.28</td>
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<td>26</td>
<td>2.91</td>
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<tr>
<td>36</td>
<td>2.56</td>
</tr>
<tr>
<td>48</td>
<td>2.08</td>
</tr>
<tr>
<td>60</td>
<td>1.51</td>
</tr>
</tbody>
</table>

*Table 4.5 Continued – Rainfall Intensity for the Hawkesbury Catchment*
4.11 Run-off Coefficient

The coefficient of run-off (C) is the coefficient used in the Rational Method and is the ratio of the peak rate of run-off to the average rainfall intensity during the critical rainfall period for the catchment area under consideration. The value of C is a statistical composite not only for the infiltration and other losses, but also the effects of channel storage and initial loss.

The coefficient of run-off adopted shall account for the future development of the catchment in accordance with the land use shown on the relevant Zoning Maps.

Fraction impervious values shown in Table 4.6 have been adopted by Council from unpublished research by the Upper Parramatta River Catchment Trust. The coefficient of run-off values shown in Table 4.6 have been adopted by Council from the method presented in Section 14.5 of AR&R (1998).

<table>
<thead>
<tr>
<th>Zoning</th>
<th>Example of Land Use</th>
<th>Impervious Fraction (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural (1a, 1b, 1c &amp; 1d)</td>
<td>2, 10 &amp; 40 hectare allotments</td>
<td>5</td>
</tr>
<tr>
<td>Residential (2a)</td>
<td>Medium density housing</td>
<td>80</td>
</tr>
<tr>
<td>Residential (2b)</td>
<td>Detached housing</td>
<td>80</td>
</tr>
<tr>
<td>Residential (2c)</td>
<td>Tourist villages</td>
<td>65</td>
</tr>
<tr>
<td>Residential (2d)</td>
<td>Residential with environmental protection</td>
<td>30</td>
</tr>
<tr>
<td>General &amp; Special Business (3a &amp; 3b)</td>
<td>Shops and offices</td>
<td>100</td>
</tr>
<tr>
<td>Light Industry (4b)</td>
<td>Factory units, warehouses</td>
<td>90</td>
</tr>
<tr>
<td>Extractive Industry</td>
<td>Quarry</td>
<td>80</td>
</tr>
<tr>
<td>Special Uses (5a)</td>
<td>Schools, hospitals</td>
<td>50 (measure)</td>
</tr>
<tr>
<td>Public Open Space (6a)</td>
<td>Reserves, bushland</td>
<td>5</td>
</tr>
<tr>
<td>Private Open Space (8a)</td>
<td>Golf or bowling club</td>
<td>5 (measure)</td>
</tr>
<tr>
<td>National Parks &amp; Reserves (8a)</td>
<td>Bushland</td>
<td>5</td>
</tr>
<tr>
<td>Business Park (10a)</td>
<td>Business Park Estate</td>
<td>70</td>
</tr>
</tbody>
</table>

Table 4.6 – Fraction Impervious Values
### Table 4.7 - ‘C’ Values for the Parramatta Catchment Area

<table>
<thead>
<tr>
<th>Zoning</th>
<th>C1</th>
<th>C2</th>
<th>C5</th>
<th>C10</th>
<th>C20</th>
<th>C50</th>
<th>C100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural (1a, 1b, 1c &amp; 1d)</td>
<td>0.36</td>
<td>0.38</td>
<td>0.43</td>
<td>0.45</td>
<td>0.47</td>
<td>0.52</td>
<td>0.54</td>
</tr>
<tr>
<td>Residential (2a)</td>
<td>0.64</td>
<td>0.68</td>
<td>0.77</td>
<td>0.81</td>
<td>0.85</td>
<td>0.93</td>
<td>0.97</td>
</tr>
<tr>
<td>Residential (2b)</td>
<td>0.37</td>
<td>0.39</td>
<td>0.44</td>
<td>0.46</td>
<td>0.49</td>
<td>0.53</td>
<td>0.56</td>
</tr>
<tr>
<td>Residential (2c)</td>
<td>0.37</td>
<td>0.39</td>
<td>0.44</td>
<td>0.46</td>
<td>0.48</td>
<td>0.53</td>
<td>0.55</td>
</tr>
<tr>
<td>Residential (2d)</td>
<td>0.42</td>
<td>0.44</td>
<td>0.50</td>
<td>0.52</td>
<td>0.55</td>
<td>0.60</td>
<td>0.63</td>
</tr>
<tr>
<td>General Business (3a)</td>
<td>0.72</td>
<td>0.77</td>
<td>0.86</td>
<td>0.90</td>
<td>0.95</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Special Business (3b)</td>
<td>0.72</td>
<td>0.77</td>
<td>0.86</td>
<td>0.90</td>
<td>0.95</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>General &amp; Light Industry (4a &amp; 4b)</td>
<td>0.68</td>
<td>0.72</td>
<td>0.81</td>
<td>0.85</td>
<td>0.90</td>
<td>0.99</td>
<td>1.0</td>
</tr>
<tr>
<td>Extractive Industry (4d)</td>
<td>0.64</td>
<td>0.68</td>
<td>0.77</td>
<td>0.81</td>
<td>0.85</td>
<td>0.93</td>
<td>0.97</td>
</tr>
<tr>
<td>Special Uses (5a)</td>
<td>0.53</td>
<td>0.56</td>
<td>0.63</td>
<td>0.66</td>
<td>0.70</td>
<td>0.76</td>
<td>0.80</td>
</tr>
<tr>
<td>Public Open Space (6a)</td>
<td>0.36</td>
<td>0.38</td>
<td>0.43</td>
<td>0.45</td>
<td>0.47</td>
<td>0.52</td>
<td>0.54</td>
</tr>
<tr>
<td>Private Open Space (6b)</td>
<td>0.36</td>
<td>0.38</td>
<td>0.42</td>
<td>0.45</td>
<td>0.47</td>
<td>0.52</td>
<td>0.54</td>
</tr>
<tr>
<td>National Parks &amp; Reserves (6c)</td>
<td>0.36</td>
<td>0.38</td>
<td>0.42</td>
<td>0.45</td>
<td>0.47</td>
<td>0.52</td>
<td>0.54</td>
</tr>
<tr>
<td>Business park (10a)</td>
<td>0.61</td>
<td>0.64</td>
<td>0.72</td>
<td>0.76</td>
<td>0.80</td>
<td>0.87</td>
<td>0.91</td>
</tr>
</tbody>
</table>

### Table 4.8 - ‘C’ Values for the Hawkesbury Catchment Area

<table>
<thead>
<tr>
<th>Zoning</th>
<th>C1</th>
<th>C2</th>
<th>C5</th>
<th>C10</th>
<th>C20</th>
<th>C50</th>
<th>C100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural (1a, 1b, 1c &amp; 1d)</td>
<td>0.31</td>
<td>0.33</td>
<td>0.37</td>
<td>0.39</td>
<td>0.41</td>
<td>0.45</td>
<td>0.47</td>
</tr>
<tr>
<td>Residential (2a)</td>
<td>0.63</td>
<td>0.67</td>
<td>0.75</td>
<td>0.79</td>
<td>0.83</td>
<td>0.91</td>
<td>0.95</td>
</tr>
<tr>
<td>Residential (2b)</td>
<td>0.32</td>
<td>0.35</td>
<td>0.39</td>
<td>0.41</td>
<td>0.43</td>
<td>0.47</td>
<td>0.49</td>
</tr>
<tr>
<td>Residential (2c)</td>
<td>0.32</td>
<td>0.34</td>
<td>0.38</td>
<td>0.40</td>
<td>0.42</td>
<td>0.46</td>
<td>0.48</td>
</tr>
<tr>
<td>Residential (2d)</td>
<td>0.38</td>
<td>0.40</td>
<td>0.45</td>
<td>0.47</td>
<td>0.50</td>
<td>0.54</td>
<td>0.57</td>
</tr>
<tr>
<td>General Business (3a)</td>
<td>0.72</td>
<td>0.77</td>
<td>0.86</td>
<td>0.90</td>
<td>0.95</td>
<td>1.04</td>
<td>1.08</td>
</tr>
<tr>
<td>Special Business (3b)</td>
<td>0.72</td>
<td>0.77</td>
<td>0.86</td>
<td>0.90</td>
<td>0.95</td>
<td>1.04</td>
<td>1.08</td>
</tr>
<tr>
<td>General &amp; Light Industry (4a &amp; 4b)</td>
<td>0.68</td>
<td>0.72</td>
<td>0.80</td>
<td>0.85</td>
<td>0.89</td>
<td>0.97</td>
<td>1.02</td>
</tr>
<tr>
<td>Extractive Industry (4d)</td>
<td>0.63</td>
<td>0.67</td>
<td>0.75</td>
<td>0.79</td>
<td>0.83</td>
<td>0.91</td>
<td>0.95</td>
</tr>
<tr>
<td>Special Uses (5a)</td>
<td>0.51</td>
<td>0.54</td>
<td>0.60</td>
<td>0.63</td>
<td>0.66</td>
<td>0.73</td>
<td>0.76</td>
</tr>
<tr>
<td>Public Open Space (6a)</td>
<td>0.31</td>
<td>0.33</td>
<td>0.37</td>
<td>0.39</td>
<td>0.41</td>
<td>0.45</td>
<td>0.47</td>
</tr>
<tr>
<td>Private Open Space (6b)</td>
<td>0.31</td>
<td>0.33</td>
<td>0.37</td>
<td>0.39</td>
<td>0.41</td>
<td>0.45</td>
<td>0.47</td>
</tr>
<tr>
<td>National Parks &amp; Reserves (6c)</td>
<td>0.31</td>
<td>0.33</td>
<td>0.37</td>
<td>0.39</td>
<td>0.41</td>
<td>0.45</td>
<td>0.47</td>
</tr>
<tr>
<td>Business park (10a)</td>
<td>0.59</td>
<td>0.63</td>
<td>0.70</td>
<td>0.74</td>
<td>0.78</td>
<td>0.85</td>
<td>0.89</td>
</tr>
</tbody>
</table>

### 4.12 Catchment Area

The catchment area of any point may be determined from contour plans obtained from the detailed survey of the site. Where no detailed survey
is available, 1:4000 orthophoto maps may be used to determine catchment boundaries and areas.

The determination of sub-catchments within urban subdivisions requires accurate contour information and a catchment plan shall be provided with the calculations.

The design should take into account realistic future road patterns where the contributing catchment includes areas subject to future development.

4.13 Hydraulics

Hydraulic calculations shall generally be carried out in accordance with Australian Rainfall and Run-off (1998). The detailed hydraulic grade line method is recommended for the analysis of stormwater pipe systems based on an analysis proceeding from downstream to upstream through the system. Calculations shall substantiate the hydraulic grade line adopted for the system and shown on the drawings.

The downstream water surface level shall be in accordance with the following:

- The hydraulic grade line level from downstream calculations including pit losses at the starting pit in the design storm event; or
- A level of 0.15 metres below the invert of the pit inlet in the downstream pit where the downstream starting point is a pit and the hydraulic grade line level is unknown; or
- The top of the outlet pipe for the minor event where the outlet is an open channel; or
- The top of the outlet pipe for the major event where the outlet is an open channel and the flood levels are not known; or
- The 1:100 year flood level for the major event where the outlet is an open channel and the downstream flood levels are known.

Council will require the submission of the calculations in the format of that shown on Council’s summary sheet for hydraulic calculations (See Appendix C), together with details of all program inputs and outputs.

4.14 Minor Drainage System Criteria

The minor drainage system shall be capable of controlling flows from frequent run-off events up to and including the ARI’s shown in Section 4.8.

The roadway flow width shall not exceed 0.45 metres at bus stops, pedestrian ramps and kerb returns; and 2.5 metres at other locations. The widths mentioned above shall be measured from invert of the kerb and gutter.

The product of depth ($d_g$) and velocity ($V_{ave}$) in the kerb and gutter should not exceed 0.6 m$^2$/s (ARR&I, 1998) to reduce hazard for pedestrians within the roadway. However, where there is an obvious danger of injury or loss of life, the $d_gV_{ave}$ product should be limited to 0.4 m$^2$/s.
The water surface level for inlet pits shall be 0.15 metres below the invert of gutter or 0.15 metres below the under side of the lid for junction pits.

4.15 Major Drainage System Criteria

The major drainage system in the form of overland flow paths shall be capable of controlling flows which exceed the capacity of the minor drainage system from run-off events up to and including the ARI’s shown in Section 4.08. Minor system blockages shall be assessed when designing for the major event.

The product of depth ($d_2$) and velocity ($V_{ave}$) in the kerb and gutter should not exceed 0.6 m$^2$/s (ARRR, 1998) to reduce hazard for pedestrians within the roadway. However, where there is an obvious danger of injury or loss of life, the $d_2 V_{ave}$ product should be limited to 0.4 m$^2$/s.

The following requirements shall be provided in open channels, roadways and stormwater surcharge paths:

**Generally:**

- Overland flow paths shall not be located in private property.

**Roadways:**

- Total flow shall be contained within the road reserve.
- Flow depths in roadways shall not exceed 200 mm.
- A minimum freeboard of 500 mm shall be provided between the 100 year flood level and habitable floor levels.
- Where a road is in fill, a freeboard of 100 mm shall be provided between the 100 year flood level and the lowest point in the footpath.

**Open Channels:**

- A minimum freeboard of 500 mm shall be provided between the 100 year flood level and floor levels.

Where the above requirements can not be met for “in-fill” type subdivisions, Council may vary the requirements subject to approval being obtained from the Manager.

4.16 Roadway Flow Capacity

Roadway flow capacity shall be calculated by the method presented by Technical Note 4 in Chapter 14 of AR&R (1998). Table 4.9 provides the recommended values for Manning’s Roughness Coefficient ($n$) and Flow Correction Factor ($F$).
**Table 4.9 – Manning’s Roughness Coefficient (n) and Flow Concentration Factor (F)**

<table>
<thead>
<tr>
<th>Roadway Surface Type</th>
<th>n</th>
<th>Kerb and Gutter Type</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>0.013</td>
<td>Roll</td>
<td>0.9</td>
</tr>
<tr>
<td>Asphalitic Concrete</td>
<td>0.015</td>
<td>150 mm Integral</td>
<td>0.9</td>
</tr>
<tr>
<td>Sprayed Seal</td>
<td>0.018</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4.17 Pits

i. Non-standard drainage structures for pipes larger than 750mm diameter shall be designed and certified by a Registered Structural Engineer by way of an accompanying letter or by statement on the engineering plans.

ii. Drainage pits shall be designed wherever possible such that the inlet and outlet walls are perpendicular to the centerline of inlet and outlet pipes.

iii. Wherever possible, drainage pits shall be designed so that the pipe centerlines intersect on the downstream pit face.

iv. All drainage structures deeper than 1.8m shall be reinforced with appropriate Fabric to Engineer’s (structural) requirement and pits deeper than 3.0m shall be structurally designed and certified.

v. Drainage pits shall be designed and constructed in accordance with Section 6.16 of Council’s Works Specification – Subdivisions / Developments.

Pits should be located at junctions; kerb returns; seg points; and changes in grade, level, direction, pipe size or pipe class. Kerb inlet pits shall be located so that the gutter flow width is in accordance with the requirements of Section 4.14 and at a maximum spacing of 90 metres where flow widths are not critical. Surface Inlet pits shall be located in drainage reserves, overflow paths and parks.

The theoretical inflow capacity of the drainage pits shall be read off the appropriate charts (Refer Appendix D). A blockage factor should be applied to the theoretical inflow capacity obtained in accordance with Table 4.10.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Pit Type</th>
<th>Theoretical Allowed</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous Grade</td>
<td>Kerb Inlet Pit</td>
<td>90 %</td>
<td></td>
</tr>
<tr>
<td>Seg</td>
<td>Kerb Seg Pit</td>
<td>80 %</td>
<td></td>
</tr>
<tr>
<td>Surface Inlet Pit Cover</td>
<td>Surface Inlet Pit</td>
<td>50 %</td>
<td></td>
</tr>
<tr>
<td>Surface Inlet Pit Cover with IFS</td>
<td>Surface Inlet Pit</td>
<td>80 %</td>
<td></td>
</tr>
</tbody>
</table>

*Table 4.10 – Provision for Blockage in Drainage Pits*
Pit sizes shall be in accordance with the following:

- A minimum opening of 1.8 metres for pits on grade and 2.4 metres for sag pits shall be provided for kerb inlet pits.
- Other drainage pits shall be 600 mm x 600 mm for depths up to 800 mm; 600 mm x 900 mm for depths up to 1500 mm; and 900 mm x 900 mm for depths greater than 1500 mm.
- The minimum dimensions of surface inlet pits for use within development sites shall be 300 mm x 300 mm.

4.18 Pipes and Culverts

Piped and box culverts shall be constructed in accordance with Council’s Work Specification – Subdivisions/Developments and should be designed in accordance with the following:

- As an overall gravity system with due regard to the upstream and downstream system.
- Pipes shall be determined using the Colebrook-White formula with the recommended roughness coefficients referred to in Table 4.11.

<table>
<thead>
<tr>
<th>Pipe Material</th>
<th>Recommended K value (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>UPVC</td>
<td>0.03</td>
</tr>
<tr>
<td>VCP</td>
<td>0.04</td>
</tr>
<tr>
<td>RHS</td>
<td>0.046</td>
</tr>
<tr>
<td>FRC</td>
<td>0.06</td>
</tr>
<tr>
<td>RCP</td>
<td>0.3</td>
</tr>
</tbody>
</table>

Table 4.11 – Recommended Roughness Coefficients (K)

- Minimum pipe culvert size in Council property of 300 mm diameter.
- Minimum box culvert size in Council property of 600 mm wide by 300 mm high.
- A minimum grade of 1.0% shall be provided for self cleansing purposes under low flow velocities.
- A maximum grade of pipelines shall be in accordance with Table 4.12.

However, where pipe grades necessitate drop pits, these grades may be varied pending approval from Council’s Manager – Subdivision and Development Certification.
<table>
<thead>
<tr>
<th>Pipe Diameter (mm)</th>
<th>Maximum Grade (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>20.0</td>
</tr>
<tr>
<td>450</td>
<td>11.0</td>
</tr>
<tr>
<td>525</td>
<td>9.0</td>
</tr>
<tr>
<td>600</td>
<td>7.5</td>
</tr>
<tr>
<td>675</td>
<td>6.5</td>
</tr>
<tr>
<td>750</td>
<td>5.5</td>
</tr>
<tr>
<td>825</td>
<td>5.0</td>
</tr>
<tr>
<td>900</td>
<td>4.5</td>
</tr>
<tr>
<td>1050</td>
<td>3.5</td>
</tr>
<tr>
<td>1200</td>
<td>3.0</td>
</tr>
<tr>
<td>1350</td>
<td>2.5</td>
</tr>
<tr>
<td>1500</td>
<td>2.2</td>
</tr>
<tr>
<td>1650</td>
<td>2.0</td>
</tr>
<tr>
<td>1800</td>
<td>1.7</td>
</tr>
<tr>
<td>1950</td>
<td>1.5</td>
</tr>
<tr>
<td>2100</td>
<td>1.4</td>
</tr>
<tr>
<td>2250</td>
<td>1.3</td>
</tr>
<tr>
<td>2400</td>
<td>1.2</td>
</tr>
</tbody>
</table>

Table 4.12 - Table of acceptable maximum pipe grades

- Grades in variation to the above may be approved by the Manager, however, where grades exceed 15.0% bulkheads shall be provided in accordance with Council's Works Specification - Subdivision/Developments.
- The minimum velocity in the pipe and box culverts shall be 0.6 m/s for self cleansing purposes.
- A maximum velocity of 6 m/s for scouring protection.
- Pipelines within roadways shall be generally located under the kerb.
- A downstream pipeline of smaller diameter than the upstream shall generally not be permitted.
- Curved pipelines shall be permitted in accordance with the Manufacturer's recommended minimum radii.
- All pipe inlets should enter the main pipe system at junction pits and shall be cut flush and grouted into the pit wall.
- Council's Engineer may approve direct connection to the main pipe system for, up to and including, 225 mm diameter pipes. Where these connections are approved the pipe shall be cut flush and grouted into the main pipe wall.
- Pits shall be designed with benching to improve hydraulic efficiency and reduce water ponding.
4.19 **Hydraulic Losses**

Hydraulic losses shall be determined from the appropriate charts in Appendix E for the following:

- The pressure change coefficient (Ke) for pit losses.
- Where approval from the Manager has been obtained for the use of bends, the appropriate values of pit pressure change.
- The energy loss coefficient for expansion and contraction (where approval from the Manager has been obtained for the use of smaller downstream pipe sizes).
- Obstruction or penetration losses.

Pipe friction losses shall be determined using the Colebrook-White formula with the acceptable roughness coefficients mentioned in table 4.11.

4.20 **Open Channels**

Open channels shall be provided to convey flows from the major storm event from a development site to the receiving water body in accordance with the following:

- The design will be generally in accordance with Chapter 14 of AR&R (1998).
- Friction losses shall be determined using the recommended Manning’s “n” values referred to in Table 4.13.

<table>
<thead>
<tr>
<th>Surface Type</th>
<th>Roughness Coefficient (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>0.013</td>
</tr>
<tr>
<td>Asphalitic concrete</td>
<td>0.013</td>
</tr>
<tr>
<td>Flush seal</td>
<td>0.014</td>
</tr>
<tr>
<td>Rough Texture surfaces – eg. Pavers</td>
<td>0.018</td>
</tr>
<tr>
<td>Gravel</td>
<td>0.02</td>
</tr>
<tr>
<td>Bare Clay – Loam earth</td>
<td>0.022</td>
</tr>
<tr>
<td>Lawns</td>
<td>0.05</td>
</tr>
<tr>
<td>Short grass</td>
<td>0.06</td>
</tr>
<tr>
<td>Long grass</td>
<td>0.1</td>
</tr>
<tr>
<td>Natural channel with earth bed</td>
<td>0.04</td>
</tr>
<tr>
<td>Natural channel with rock bed</td>
<td>0.045</td>
</tr>
<tr>
<td>Natural channel with coarse gravel bed</td>
<td>0.05</td>
</tr>
</tbody>
</table>

*Table 4.13 – Recommended Mannings “n” Values*

- The design will specifically provide for the safety of persons who may enter the channel where the product of depth (d_p) and velocity (V_{ave}) is greater than 0.4 m^2/s.
The desirable maximum side slopes shall be 1:6, the absolute maximum should be 1:4 and cross slopes for the channel floor should be 1:20.

Low flow provisions shall be provided in man-made or altered channels by the provision of pipelines, concrete lining or sub-soil drainage.

Vegetated creek lines shall be retained in their natural state with enhancements to prevent scour due to increased frequency of bankfull flows and urbanization.

Low flow invert of creeks shall be designed as a wet invert and planted with suitable riparian vegetation.

Pipe outlets discharging to watercourses are to join the watercourse at mean dry water level, angled at 45 degrees downstream and protected by gabions or rock filled mattress to Council's requirements. Discharges to existing rock outcrops will be considered on individual merits.

4.21 Bridges and Culverts

Bridges and major culverts shall be designed for the major storm event generally without afflux in urban areas. A minimum clearance of 0.3 metres should be provided between the major flow level and the underside of a major structure to allow for passage of storm debris.

4.22 On-Site Stormwater Detention

The Local Government Area of The Hills Shire drains two main catchments, these being the Upper Parramatta River Catchment and the Hawkesbury River Catchment. The on-site stormwater detention (OSD) requirements are different for each catchment.

- **Upper Parramatta River Catchment** – For those areas draining to the Upper Parramatta River Catchment on-site stormwater detention (OSD) shall be provided in accordance with the requirements of the Upper Parramatta River Catchment Trust (UPRCT). Details of these requirements can be found in the publication "On-site Stormwater Detention Handbook" by the UPRCT. This publication can be purchased directly from UPRCT or is available on the internet at [www.uprct.nsw.gov.au](http://www.uprct.nsw.gov.au).

- **Hawkesbury River Catchments** – Using the same principles as above, where a proposed development drains to the Hawkesbury River Catchment OSD will be required.

The Permissible Site Discharge (PSD) and Site Storage Volume (SSV) requirements shall be derived from Table 4.14 for that portion of the Hawkesbury River Catchment area that falls within the Shire.

<table>
<thead>
<tr>
<th>Site Slope</th>
<th>PSD (l/s/ha)</th>
<th>SSV (m³/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greater than 15%</td>
<td>136</td>
<td>298</td>
</tr>
<tr>
<td>Between 10% and 15%</td>
<td>115</td>
<td>336</td>
</tr>
<tr>
<td>Between 6% and 10%</td>
<td>104</td>
<td>362</td>
</tr>
<tr>
<td>Between 3% and 6%</td>
<td>92</td>
<td>396</td>
</tr>
<tr>
<td>Between 0% and 3%</td>
<td>87</td>
<td>412</td>
</tr>
</tbody>
</table>
Table 4.14 - PSD and SSV Requirements for the Hawkesbury River Catchment

On-site stormwater detention shall not be provided in catchment areas that drain to an approved detention system. This generally includes new release areas. Council’s Subdivision & Development Certification section can advise which catchment applies to the proposed development and the requirement for on-site detention.

The design of detention basins shall be in accordance with the principles of the Upper Parramatta River Catchment Trust policy and the following:

- Maximum depth of 600 mm in above ground systems, 200 mm depth in driveways, car parking areas and walkways.
- Desirable maximum side slopes of 1:6 for above ground basins, the absolute maximum should be 1:4 and minimum slope of floor should be 1:50.
- Provision of a grated access lid for each chamber of an underground system.
- Discharge control pits and grated access pits shall be 600 mm x 600 mm for depths up to 800 mm; 600 mm x 900 mm for depths up to 1500 mm; and 900 mm x 900 mm for depths greater than 1500 mm.

4.23 Inter-allotment Drainage

Inter-allotment drainage shall be provided to every allotment which does not drain directly to the street or to a lawful point of discharge.

The desirable minimum pipe grade shall be 1.0% and pipes shall be designed to accept concentrated drainage from OSD systems or the concentrated drainage from buildings and paved areas (imperious areas shall be obtained from Table 4.6) for flow rates having a design ARI the same as the minor street drainage system. Table 4.15 provides the general minimum pipe sizes for inter-allotment drainage.

<table>
<thead>
<tr>
<th>Number of Allotments</th>
<th>Minimum Pipe Size (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-4 lots</td>
<td>150</td>
</tr>
<tr>
<td>5-8 lots</td>
<td>225</td>
</tr>
<tr>
<td>9-15 lots</td>
<td>300</td>
</tr>
<tr>
<td>16-25 lots</td>
<td>375</td>
</tr>
</tbody>
</table>

Table 4.15 - General minimum Pipe Size Requirements for Inter-allotment Drainage

Inter-allotment drainage pits shall be located at the lowest point of each allotment to be drained, changes of grade, pipe size or direction.

Where the pipeline serves more than five (5) lots, a hydraulic grade line analysis will be required with the design submission to ensure lots are not affected by surcharge.

Minimum cover for pipelines within allotments shall be 300mm, apart from footway crossings to kerbs with galvanized steel Rectangular Hollow Sections (RHS).
Where an OSD system is to be connected to an interallotment drainage system, the IAD pipeline is to have a minimum 1.0 metre cover.

4.24 Stormwater Discharge

Outlet drains and structures shall be designed to ensure that stormwater flow is discharged into existing natural water courses, kerb and gutter or channels in a manner that:

- Flow velocities are reduced below scouring velocity.
- Scouring at the structure is prevented.
- Provides safety measures alleviating hazardous conditions at the outlet.

The discharge to kerb and gutter shall be located so that stormwater flows are maintained within the flow width requirements of Section 4.14.

Energy dissipators shall be provided to outlet structures at natural water courses and open channels in accordance with Section 8 of the RTA Road Design Guide where the permissible velocities in Table 4.16 are exceeded.

<table>
<thead>
<tr>
<th>Channel Gradient (%)</th>
<th>Permissible Velocity (m/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.1</td>
</tr>
<tr>
<td>2</td>
<td>1.9</td>
</tr>
<tr>
<td>3</td>
<td>1.8</td>
</tr>
<tr>
<td>4</td>
<td>1.7</td>
</tr>
<tr>
<td>5</td>
<td>1.6</td>
</tr>
<tr>
<td>6</td>
<td>1.6</td>
</tr>
<tr>
<td>8</td>
<td>1.5</td>
</tr>
<tr>
<td>10</td>
<td>1.5</td>
</tr>
<tr>
<td>15</td>
<td>1.4</td>
</tr>
<tr>
<td>20</td>
<td>1.3</td>
</tr>
</tbody>
</table>

Table 4.16 – Permissible Velocities for Vegetated Channels

4.25 Water Sensitive Urban Design

The objective of Water Sensitive Urban Design (WSUD) is for a post-development water cycle to replicate or improve upon the pre-development water cycle through the use of design techniques to reduce development impact on receiving waters.

WSUD aims to:
- reduce water demand;
- reduce water discharges to receiving environments;
- maximise opportunities for water harvesting and re-use; and
- reduce water pollution.
WSUD measures are to provide sustainable and integrated management of land and water resources, incorporating best practice stormwater management, water conservation and environmental protection measures. Additionally, WSUD is to take into account water quality, stream stability, flow attenuation and runoff volumes.

All proposals are to incorporate WSUD measures into a new development and shall be submitted to Council for consideration with the Development Application.

Any proposal to incorporate WSUD measures is to recognize and design for ongoing operation and maintenance requirements.

WSUD measures shall be designed and constructed to comply with the requirements of Council policies and the following publications.

- Water Sensitive Urban Design Technical Guidelines for Western Sydney (NSW Government Stormwater Trust and UPRCT, May 2004); and
- Australian Runoff Quality (Engineers Australia 2005).

WSUD infrastructure recommended for implementation includes:

- rainwater tanks;
- stormwater treatment devices;
- bio-filtration;
- bio-retention;
- detention basins;
- swales;
- porous paving / surfaces; and
- wetlands
- gross pollutant traps

4.26 Gross Pollutant Traps

Gross Pollutant Traps (GPT) serve a specific purpose to reduce litter, vegetation matter, debris and coarse sediment from discharging into downstream waterways and water sensitive treatment train measures.

Council requires that GPT’s are designed and installed in accordance with the guidelines provided within the following documents:

- Australian Runoff Quality, A Guide to Water Sensitive Urban Design, 2006 - Chapter 8 - Gross Pollutant Traps and Sediment Traps,

The following criteria are to be considered in the design and installation of an appropriate GPT.

The type of catchment that is being treated and the primary pollutants to be targeted for capture. Treatment objectives should generally consider the following:

- Gross Pollutants - litter, vegetation matter and debris larger than 5mm,
- Sediment - particles larger than 0.125mm.

The size of the catchment to be treated. This will influence treatable flow rates, operating design flows and pollutant removal rates.
• Generally the treatment of a 3 month ARI design flow from a catchment will result in the treatment of a significant portion of flow.

The type of device, whether propriety or custom built, to provide for:
• The treatment of the targeted primary pollutants with the appropriate removal efficiency.
• The size is to match the treatable discharge from the catchment.
• On-going maintenance requirements.

The location of the device and site constraints in relation to:
• Physical constraints - topography and slope, soils, groundwater and available space.
• Social constraints - health and safety, odour, aesthetics and vermin.
• Maintenance requirements - ease of device operation, appropriate all weather access tailored to the maintenance equipment and systems required, frequency of maintenance and disposal of waste.
MISCELLANEOUS REQUIREMENTS

5.1 Scope

This section of the engineering guidelines provides miscellaneous engineering requirements not covered in the previous sections.

5.2 Aim

To provide the developer with an understanding of other Council engineering requirements that may be required in the development of land.

5.3 Pathway and Cycleways

Pathways and cycleways are to be designed to provide a safe and convenient network for pedestrians and cyclists, incorporating the street network together with all-weather paths and cycleways to provide access to public transport and points of attraction within the Shire.

Pathways shall be provided in accordance with any relevant Development Control Plan and, unless otherwise directed, shall generally be provided in accordance with the following:

- At sag points to cater for any overland flow requirements.
- Maximum longitudinal grade should not exceed 1:6 (V:H). Where the maximum grade is exceeded, stairs and handrails should be provided in accordance with Council’s Works Specification – Subdivisions/Developments.

Lighting shall be provided to pathways in accordance with the Australian Standard 1158.1 and the relevant Authority’s requirements.

Street Footpaving shall be provided in accordance with any relevant Development Control Plan and to the full frontages of any medium density residential development, high density residential development, or commercial development. The design shall detail the requirements of Council’s Works Specification – Subdivision/Developments.

Cycleways shall be provided in accordance with any relevant Development Control Plan and shall be designed in accordance with AUSTRoads – Guide to Traffic Engineering Practice, PART 14, bicycles.

The location of pathways and cycleways shall consider pedestrian and cyclist safety, together with the above requirements and should preserve trees and other natural features where possible.

5.4 Battleaxe Handles

Where battleaxe shaped allotments are approved by Council, provision is to be made for the construction of suitable vehicular access within the proposed handles or rights of carriageway. The standards required by Council will generally be in accordance with Table 5.2.
<table>
<thead>
<tr>
<th></th>
<th>One Allotment</th>
<th>Two or More Allotments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>4.0 metre wide access handle with no formal pavement required (^1),</td>
<td>6.0 metre wide access handle with construction of a 5.0 metre wide (^2) medium duty driveway.</td>
</tr>
<tr>
<td>Rural</td>
<td>6.0 metre wide access handle with the construction of a 3.0 metre wide all-weather pavement (^3),</td>
<td>6.0 metre wide access handle with the construction of a 3.0 metre wide all-weather pavement (^4) and suitable passing bays.</td>
</tr>
<tr>
<td>Industrial</td>
<td>8.0 metre wide access handle with construction of a 6.0 metre wide heavy duty driveway.</td>
<td>8.0 metre wide access handle with construction of a 6.0 metre wide heavy duty driveway. (^5) and suitable passing bays.</td>
</tr>
</tbody>
</table>

Table 5.2 – Battleaxe Handle/Rights of Carriageway Standards

1. Vehicular access is to be made available to all allotments.
2. Where a reduction in pavement width is sought, provision is to be made for passing.
3. The construction of a sealed pavement and/or passing bays will be dependent upon the existing site features and consideration must be given to sight distances, existing trees, grade, drainage and length of access handle.

5.5 Access Driveways

Access driveways shall be provided in accordance with Council’s Development Control Part D Section 1 – Parking 2007.

Driveway grades should not exceed 22.0% and steep driveways for residential dwellings should be constructed to Council’s standard for maximum allowable grades (DWG No. SD16).

5.6 Disused Laybacks and/or Footpath Crossings

The removal of all disused laybacks and/or footpath crossings to the development site and their replacement with full kerb and gutter together with the restoration and turfing of the adjoining footpath verge areas.

5.7 Applications

Separate applications, together with the payment of the appropriate fees, shall be made to Council for the following:

- Construction of gutter and footpath crossings.
- Construction of concrete footpaving.
- Removal of gutter and footpath crossings.
- Road openings.
- Access across Council Reserves.
5.8 Temporary Roads

In some circumstances, Council may permit the creation and construction of temporary public roads.

Where approved, the following criteria must be considered:

- Construction must extend over a minimum of two (2) development lots;
- The temporary public road is not to be constructed upon land zoned for Business, Open Space, Trunk Drainage, Transport Corridor or Educational Establishment;
- A minimum trafficable width of 6.0m is to be provided to cater for two-way traffic with 3.5m wide verges on both sides;
- The allotment layout associated with temporary public road construction does not result in the creation of undevelopable residue allotments;
- The safety of all road users (including service and passenger vehicles, pedestrians and cyclists) is not compromised;
- The temporary public road is to be constructed to a standard in accordance with THSC Design Guidelines for Subdivisions / Developments (Section 5.7); and
- The final road configuration is consistent with the pre-planned road layout and road type from Council’s Development Control Plan (where applicable)

Any temporary public road construction proposal must be accompanied by the following:

- An engineering design for the temporary road, as well as plans demonstrating the future road configuration after the closure of such, including details of any necessary drainage and service utility provision requirements.
- A traffic safety report prepared by an appropriately experienced professional demonstrating how the partial road proposal provides for the safe usage of all road users; and
- The submission of written evidence demonstrating that an attempt to cooperate with adjacent landowners has been undertaken. Such evidence could be in the form of letters and responses (if applicable).

5.9 Partial Road Width Construction

Council does not encourage the partial construction of roads.

Should there be no alternative, partial road construction will be considered (where permitted under Council’s Development Control Plan) subject to the following criteria being satisfied:

- The site(s) adjacent to the proposed partial road are zoned for residential use and are not in public ownership or identified for acquisition;
- A minimum trafficable road width of 6.0m is provided to cater for two-way traffic;
- The development potential of all adjoining allotments is maintained;
- The safety of all road users (including service and passenger vehicles, pedestrians and cyclists) is not compromised; and
• The final road configuration is consistent with the pre-planned road layout and road type from Council’s Development Control Plan (where applicable).

Any partial road construction proposal must be accompanied by the following:
• An engineering design for the partial and full width road works including details of any necessary drainage and service utility provision requirements; and
• A traffic safety report prepared by an appropriately experienced professional demonstrating how the partial road proposal provides for the safe usage of all road users.

Any works to be carried out, or necessitate easements, over adjoining properties, shall be approved by the owner(s) of such land and suitable documentary evidence of this approval shall be submitted to Council.

5.10 Street Names

Section 162 of the Roads Act 1993 states:

1. A roads authority may name and number all public roads for which it is the roads authority.
2. The RTA may name and number all classified roads.
3. Neither a roads authority nor the RTA may name a public road, or alter the name of a public road, unless it has given the Geographical Names Board at least one months notice of the proposed name.

In this regard, road names are to be submitted to Council for approval and then the Council will follow the procedures set out in Clauses 7-10 of the Roads (General) Regulation 2008.

A brochure – “GUIDELINES FOR THE NAMING OF ROADS” – is available from Geographical Names Board (gnb@lands.nsw.gov.au search under publications).

5.11 Bridges and Culverts

The design of bridges and culverts shall be in accordance with AUSTROADS – Bridge Design Code and a structurally certified design shall be submitted to Council. Council will also require the submission of a structural certification of the constructed works by a Registered Structural Engineer.

5.12 Safety Barriers for Roads and Bridges

Safety barriers for roads and bridges shall be provided in accordance with Section 6 of the RTA Road Design Guide.

5.13 Encroachment in Council Drainage Easements

A public stormwater easement is vested in the Council and typically consists of both piped flow (minor) and an overland flowpath (major) as discussed in Section 4.3 of this document.

THE HILLS SHIRE COUNCIL

September 2011
Minor works within a Council drainage easement may be approved by Council subject to the requirements set out below.

The proposed works must not impact upon flood behavior as it passes through the site. This will require:

- Hydrological modelling, using a DRAINS model or similar, to determine the volume of stormwater that passes through the site associated with this easement.

- Hydraulic modelling, using a HEC-RAS model or similar, to examine the flow conditions as they pass through the site in both the pre-development and post development conditions.

- The pre-development and post development conditions at the upstream and downstream site boundaries must be the same, to mitigate flooding impacts off-site. Similarly, flooding on-site must be managed with respect to the potential for injury, death or property damage, in accordance with this document.

The proposed works must not interfere with the rights afforded to Council, specifically with respect to the maintenance of the pipe and other structures within the easement.

The location of the easement may need to be varied or its width increased in order to comply with the above requirements and Section 4 of this document.

Any proposed encroaching structures must be easily dismantled (free standing).

Any proposed encroaching structures must be registered on the title of the subject site via a deed with Council. The purpose of the deed is to protect Council’s rights to access the easement area, requiring the removal of the encroaching structure. A standard form deed is available from Council upon request. All costs associated with the preparation and registration of the deed shall be borne by the person seeking approval for these works.

5.14 Encroachments in Private/ Inter-allotment Drainage Easements

An inter-allotment drainage easement provides a legal point of stormwater discharge and is a constraint that must be considered in the design and construction of any structure on a burdened lot. Except for constrained land, lots are typically graded at the subdivision stage so that there should be no need for additional earthworks within an inter-allotment drainage easement at the dwelling design stage. The need to retain the existing ground surface levels should be considered early in the design of a dwelling to ensure compliance with this requirement.

Minor works within an inter-allotment drainage easement may be approved by Council subject to the requirements set out below.

Notwithstanding these requirements, any proposed works within an inter-allotment drainage easement must also be considered with respect to the associated impacts on neighbours concerning privacy, overshadowing and general amenity impacts as they are typically located adjacent to a property boundary.
The works will only be permitted within the easement if the person seeking to undertake these works obtains written consent from each and every person either burdened or benefited by the easement. This will require the following to be submitted:

- A title search showing the easement and listing the properties burdened or benefited;
- A signed letter from the owners of each property above which states that they have no objection to the proposed encroachment;

Where written consent is not able to be provided for all affected properties the encroachment will not be permitted.

The proposed works must not “substantially” interfere with the rights afforded to those persons benefiting from the easement. Primarily, this relates to the maintenance of the pipe and other structures within the easement. For example, the cost and work involved in excavating a pipeline for maintenance purposes in the pre-development and post-development condition (along its full length) could be compared and if the difference is negligible then it could be argued that the works do not impinge upon this aspect of the benefiting parties rights.

Any structures proposed within, or adjacent to, the easement as part of the works (for example, a retaining wall) must be designed such that it does not impart a load on the stormwater pipe in the easement. The design for any such structure must be accompanied by advice from a suitably qualified structural engineer confirming compliance with this requirement. Post-construction certification from a suitably qualified structural engineer must also be provided once the works are complete.

Typically, a surface inlet pit is provided in the lowest corner of each lot burdened by an inter-allotment drainage easement. Section 4.17 of this document specifies the required size of this pit, depending on the depth of the pipe. If filling is proposed within an inter-allotment drainage easement, it may be necessary to reconstruct a larger pit in order to comply.

Section 4.23 of this document requires a minimum ground cover of 300mm above a stormwater pipe within an inter-allotment drainage easement, increasing to 1m where at least 800mm where a rain garden is required. If cut is proposed within an inter-allotment drainage easement, the minimum pipe cover must be provided.

If the inter-allotment drainage easement services more than five lots, a hydraulic grade line analysis would have been carried out at the subdivision stage to address the potential for surcharge. If cut is proposed within an inter-allotment drainage easement, the impacts (if any) upon the hydraulic grade line and the potential for surcharge must be considered.

5.15 Insurance and Workers Compensation

a) Public Liability Insurance: The Applicant must ensure that Contractors, engaged on Development or Subdivisional Works, have taken out Public Liability Insurance which must include the interests of Council to at least the value of $10 million dollars.
Details of Insurance must be submitted to Council prior to work commencing.

b) **Workers Compensation:** The Applicant must ensure that Contractors engaged on Development or Subdivisional Works carry current Workers Compensation Insurance on all works as required by Statute.

5.16 **Traffic Control for Works in Public Roads**

A "Traffic Control Plan" must be prepared by a suitably qualified RTA accredited work site traffic designer for all works that are carried out in or adjacent to a public road. This Plan must satisfy all the requirements of AS 1742.3 - 2002.

It is the sole responsibility of the Applicant to have in place and maintain traffic facilities, i.e. barricades, signs, lights etc at all times, day and night, seven (7) days a week for the duration of the works in accordance with the Plan.

If it comes to the attention of Council that Traffic Control Devices are insufficient or inoperation (particularly in an after-hours situation), then Council may arrange to reinstate the Traffic Control Devices and recoup the costs from the Applicant.

Any changes to the approved Traffic Control Plan must be approved by Council prior to implementation.

5.17 **Landscaping of Roundabouts and Median Strips**

**Description**

The need for appropriate landscaping of civil infrastructure works on large collector roads should be considered to enhance the appearance of public areas and thoroughfares. The Applicant shall submit details of any proposed landscaping of roundabouts and median strips for the consideration to Council with the Development Application.

**Design Requirements**

i. In proposing the landscaping of civil works the following issues need to be considered:

- The potential damage to pavement from water and root system infiltration,
- Ensure the line of sight is maintained for vehicular and pedestrian movements,
- Ensure that tree and shrub species selection is suitable for the particular site in terms of growth height, width and vigour,
- The potential cost of maintenance and landscaping,
- Accessibility of landscaping for maintenance purposes,
- The adequate provision of services for landscaped areas including irrigation and drainage.

ii. Each site should be considered on it’s merits in terms of appropriateness for landscaping including the following:

- Sight distances,
- Turning paths of various sized vehicles,
- Pedestrian movements,
• Provision and location of services,
• Cost of installation and maintenance of the landscaping,
• Safety of maintenance crews during works.
APPENDIX B
The common seal of The Hills Shire Council was affixed under a resolution passed by council on .......................................................... in the presence of:

___________________________________  
General Manager  

___________________________________  
Print Name  

___________________________________  
Witness  

___________________________________  
Print Name  

Executed by the Developer in accordance with s127 of the Corporations Act 2001 (Cth):

___________________________________  
Secretary/Director  

___________________________________  
Director  

___________________________________  
Print name  

___________________________________  
Print name