

11f Soil & water management

Explanatory outline

Section 11f outlines assessment criteria relating to soil and water management on development sites. The following matters are covered:

- requirements for soil and water management plans
- guidelines for earthworks and land cut and fill
- erosion and sediment control measures
- stormwater management measures

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11f.1 Application of this section

This section applies to development described in Column 1 when carried out on land described in Column 2.

Column 1:	Type of development	Column 2:	Applicable land
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Development that involves the carrying out of:		Any land	
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| <ul style="list-style-type: none"> • earthworks • excavation • disturbance to soil material. • drainage of stormwater | | | |
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Does not apply to activities that are necessary during an emergency (such as emergency flood mitigation or activities authorised under the <i>Rural Fires Act</i>).			
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Note: after an emergency situation has passed, remedial measures should be undertaken to address any erosion hazard and to rehabilitate the site in a manner consistent with this section.

11f.2 Relevant planning instruments & legislation

The following environmental planning instruments or other legislation are relevant to development to which this section applies:

- *Upper Hunter Local Environmental Plan 2013, specifically the requirements of clause 6.1 Earthworks*
- *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008*
- *State Environmental Planning Policy (Sustainable Buildings) 2022*
- *Water Management Act 2000*
- BASIX (*Building Sustainability Index*) applies to residential development and is implemented under the EP&A Act - <https://www.planningportal.nsw.gov.au/basix>
- *Local Government Act 1993*
- *Soil Conservation Act 1938*

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Further planning instruments and legislation may also be relevant. In the event of any inconsistency, the above listed instruments will prevail over requirements or criteria contained in this section.

11f.3 Definitions

There may be words used in this Part that are defined in the *Environmental Planning and Assessment Act, 1979*, as amended, or within *Upper Hunter Local Environmental Plan 2013*, as amended. The **Dictionary** to this DCP provides additional definitions that are relevant to this Part, including:

- drainage
- earthworks
- environmentally sensitive area
- excavation
- fill
- landscaped area
- watercourse
- waterway
- wetland

11f.4 Objectives

The objectives of this section are to:

1. ensure soil and water issues are appropriately considered in the preparation and determination of development applications, including providing easements over existing and proposed drainage systems on private property
2. apply measures to minimise soil erosion, land instability and adverse impacts on water quality resulting from land development
3. apply measures to manage, and at least maintain pre-development water quality and quantity
4. identify additional references and guidelines outlining acceptable soil and water management practice
5. ensure an appropriate level of drainage design and assessment that is relevant to the applicable stages of development
6. ensure that development has a legal right to drain and that the drainage concept is sound and applicable to the type and scale of development proposed

11f.5 Supporting plans & documentation

Development applications that are subject to this section should be supported by the following plans and documentation.

The degree of detail required at the development application stage will depend on:

- the scale of the activity.
- the area of potential disturbance.
- the complexity of the site characteristics e.g. slope, soil type.
- the sensitivity of the adjoining environment.

Table 1 Requirements for types of soil and water management plans shows the type of plans / reports that are to be submitted for different activities and areas of disturbance. These types of plans are specified on the following pages.

Detailed engineering specifications will be required later as conditions of development consent.

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Table 1 Requirements for types of soil and water management plans

Disturbance area	Activity type	Type of plans / reports to be submitted
<250 m ²	House extensions, small driveways, garages, retaining walls	<p>Cut & fill details will be required, where cut and fill is proposed</p> <p>No Erosion and Sediment Control Plan required, except for an environmentally sensitive area (such as that within 100 m of a water course) and very steep sites (gradient greater than 20 degrees)</p> <p>Proponents are expected to follow the general principles of this section of the DCP</p>
250 to 1000 m ²	Houses, small commercial development, long driveways, small subdivisions	Erosion and Sediment Control Plan and schedule of works for implementation
1000 to 2500 m ²	Houses, medium/high density houses, small civil infrastructure / commercial / industrial development, small subdivisions, etc	Erosion and Sediment Control Plan and a Landscape Plan with their associated schedule of works for implementation required.
>2500 m ²	Extensive medium/high density houses, large civil infrastructure / commercial / industrial development, subdivisions, etc	<p>Erosion and Sediment Control Plan and a Soil and Water Management Plan and a Landscape Plan with their associated schedule of works implementation required</p> <p>A staged Erosion and Sediment Control Strategy is required for developments which are proposed for extended periods (longer than 12 months) or those that will be staged over time.</p> <p>Most developments will require the preparation of a Comprehensive Water Cycle Strategy.</p>

All plans are to be prepared in accordance with current best practice, particularly:

- Landcom (2004) *Managing Urban Stormwater, 4th Edition* or its relevant update
- Queensland Department of Energy and Water Supply - *Queensland Urban Drainage Manual – 2013 Provisional edition* (or its relevant update)
- *Australian Rainfall Runoff 2019* or its relevant update

Item	When required	Plans or information to be provided
A. General requirements	All applications	Refer to Part 2 Preparing & lodging a development application .
B. Cut & fill details	Applications that involve cut and fill	<p>Details of the extent of the proposed cut and fill and methods of retaining and draining the cut and fill area are to be submitted with the development application, and include:</p> <ul style="list-style-type: none"> • Contour levels identified on the land by a registered surveyor or engineer and within twenty metres (20 m) of any dwelling or structure or to the lot boundary.

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Item	When required	Plans or information to be provided
C. Erosion & sediment control plan (ESCP)	Applications that involve: <ul style="list-style-type: none"> • an environmentally sensitive area; or • Very steep sites (gradient greater than 20 degrees); or • disturbance to an area of between 250 to 2500 m² (refer to Table 1 Requirements for types of soil and water management plans).	<ul style="list-style-type: none"> • Finished ground levels relative to road level at the property boundary, with all levels to be indicated in Australian Height Datum • The finished floor level of any dwelling or structure above the finished ground level. • A surveyor's report may be required to clarify that retaining walls and drainage areas are located within the lot subject to the development. • A report certifying that fill materials can legally be used in that location as per the <i>Protection of the Environment Operations Act</i> <p><i>Note: this information may be submitted as part of the 'erosion and sediment control' plans below.</i></p> <p>A plan and report prepared by a suitably qualified person. The detail is dependent on the potential for impacts.</p> <p>ESCPs must be submitted with all necessary supporting information and should be prepared in accordance with the broad structure below:</p> <p>Site characteristics – including:</p> <ul style="list-style-type: none"> • locality plan (1:1000 scale). • existing contour data. • principal geographic features. • natural water flow patterns. • critical natural areas (for example, river, wetlands). • location and limitations of major soil types. • location, nature and condition of existing vegetation. • soil subsidence. • climatic data including rainfall and storm events. <p>Clearing and disturbance of site – including:</p> <ul style="list-style-type: none"> • nature and extent of vegetation to be cleared, including area and depth of clearing. • scheduling and time of proposed disturbance. • methods of site clearance. • final site contours data. • areas of cut and fill, location of stockpiles and spoil/vegetation dumping proposals. <p>Existing and proposed drainage patterns – including:</p> <ul style="list-style-type: none"> • catchment boundaries. • existing watercourses or drainage patterns flowing through or adjacent to the site. • location and extent of impervious surfaces. • location and capacity of the proposed temporary and permanent site drainage or stormwater system. <p>Erosion control practices – including:</p> <ul style="list-style-type: none"> • location, design criteria and construction details of temporary control measures to be implemented. • location, design criteria and construction details of permanent control measures to be implemented.



Item	When required	Plans or information to be provided
D. Erosion & sediment control strategy (ESCS)	For staged developments only. Refer to Table 1 Requirements for types of soil and water management plans.	<ul style="list-style-type: none"> • scheduling details of works to be undertaken. • monitoring and maintenance details. <p>Sediment control practices – including:</p> <ul style="list-style-type: none"> • location, construction details and design criteria of temporary and permanent control measures. • scheduling details of works to be undertaken. • monitoring and maintenance details. <p>Rehabilitation program – including:</p> <ul style="list-style-type: none"> • location of temporary and permanent revegetation sites. • materials and species selection. • application and planting methods. • types and rates of fertilisers and other soil ameliorants. • mulching details. • scheduling details of planting and maintenance works. • monitoring and maintenance details. <p>The ESCS must include an ESCP(s) as described above and also show staging plans and schedules of implementation.</p>
E. Soil & water management plan (SWMP)	<p>Applications that involve:</p> <ul style="list-style-type: none"> • an environmentally sensitive area • disturbance to an area exceeding 2500 m² <p>(Refer to specific details related to development types at Table 1 Requirements for types of soil and water management plans).</p>	<p>The SWMP should illustrate how soils and water will be managed on the site.</p> <p>The SWMP must:</p> <ul style="list-style-type: none"> • include an Erosion & sediment control plan (ESCP) as described above or an erosion and an sediment control strategy (ESCS) as described above, where appropriate to the development • address all relevant parts of sections M to Q (Stormwater management) including preliminary storm water design details demonstrating the ability to comply with these requirements <p>site characteristics (including existing and proposed ground levels, contours within 20 metres of the land, drainage lines, and proposed building locations and levels)</p> <ul style="list-style-type: none"> • stormwater planning proposals (including infiltration measures, water discharge points, overland flow paths, flood liable areas, location and levels of stormwater pipes and drainage pits, on site detention facilities, existing or proposed drainage easements • plan and calculations prepared by a qualified and practising civil engineer <p>Proposals to create drainage easements over downstream properties are to be accompanied by a letter of consent from <i>relevant property owners</i>.</p>

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Item	When required	Plans or information to be provided
F. Comprehensive water cycle strategy (CWCS)	Applications for large-scale development (refer to Table 1 Requirements for types of soil and water management plans).	<p data-bbox="792 359 1373 443"><i>Note: Where a development requires creation of a drainage easement, a deferred commencement condition will normally be required.</i></p> <p data-bbox="792 472 1373 583">A report and plans, prepared by a suitably qualified professional, documenting the investigation of hydrological issues affecting the development, and design and management principles for water issues.</p> <p data-bbox="792 594 1373 678">It will consider issues affecting the feasibility, performance, sustainability and implementation of development, and must consider or identify the following:</p> <ul data-bbox="792 688 1373 1581" style="list-style-type: none"> <li data-bbox="792 688 1373 831">▪ Relevant goals for water quality, natural water balance, water efficiency, vegetation conservation, flood risk management and erosion and sedimentation control (these should be consistent with goals contained in the other plans above) <li data-bbox="792 842 1373 1581">▪ Design principles and management measures that are to be applied so as to meet relevant performance goals, including: <ul style="list-style-type: none"> <li data-bbox="841 905 1373 989">○ Proposed measures to manage site constraints and hazards such as flooding, slope stability, reactive soils, erosion hazard, salinity, and land contamination <li data-bbox="841 999 1373 1083">○ Proposed measures to manage vegetation cover and dependent ecosystems such as wetlands and riparian corridors <li data-bbox="841 1094 1373 1146">○ Proposed measures relating to water sensitive urban design principles <li data-bbox="841 1157 1373 1241">○ Proposed measures to manage water quality, flooding, stream flow, groundwater, soil salinity and water consumption <li data-bbox="841 1251 1373 1394">○ A development strategy and infrastructure program that integrates water supply, sewerage, drainage, wastewater treatment and reuse, water quality control, flood risk management, open space provision and ecological protection issues <li data-bbox="841 1404 1195 1436">○ Developer contribution arrangements <li data-bbox="841 1446 1373 1499">○ A program for monitoring achievement of performance goals <li data-bbox="841 1509 1373 1581">○ A maintenance schedule for stormwater source controls, with details of responsibilities and proposed enforcement mechanisms (such as covenants) <p data-bbox="792 1591 1373 1650">Proposed educational, economic and community initiatives to minimise adverse impacts on the water cycle</p>

11f.6 Assessment criteria

A performance-based approach will be adopted in the assessment of development applications. Applications will be assessed according to the extent to which the outcomes specified in the left-hand column of the following table will be satisfied or achieved by the design, construction or operation of the proposal.

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The design guidelines specified in the right-hand column indicate design and best practice solutions by which the required outcomes can be met. They do not preclude other solutions that may be suitable under particular local circumstances. All proposals will be considered on merit.

This section is structured in the following way:

1. Earthworks, land cut & fill	
A	Impacts from earthworks
B	Site compatibility
C	Structural stability including terracing or retaining walls
D	Standards for cut & fill
E	Filling
2. Erosion & sediment control	
F	Erosion, sediment & dust control
G	Runoff water control
H	Groundcover
I	Access
J	Topsoil & stockpile management
K	Rehabilitation & landscaping
L	Erosion & sediment control maintenance
3. Stormwater management	
M	Stormwater design - general
N	Stormwater drainage design – residential
O	Stormwater drainage design – non-residential
P	Flooding, runoff regimes & stormwater collection
Q	Pollutant management
4. Preparation of soil & water management plans	
R	Compliance with plans
S	Implementation & completion of plan

Outcomes to be achieved

Design guidelines

1. Earthworks, land cut & fill

A. Impacts from earthworks

- Impacts from earthworks are assessed and considered.

Note: Upper Hunter LEP 2013 clause 6.1 Earthworks seeks to ensure that earthworks will not have a detrimental impact on environmental functions and

- Measures to avoid, minimise and mitigate the impacts of earthworks are to be incorporated in the development and documented.
- Matters outlined in clause 6.1(3) in *Upper Hunter LEP 2013* are identified and considered.

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Outcomes to be achieved

processes, neighbouring uses, cultural or heritage items or features of the surrounding land

B. Site compatibility

- Building & site design are sympathetic to the natural slope and characteristics of the development site.
- Development complies with Part 11b Biodiversity and the *Biodiversity Conservation Act* and *SEPP (Biodiversity and Conservation) 2021* where relevant

C. Structural stability including terracing or retaining walls

- A properly constructed retaining wall designed by a qualified structural engineer is to be provided where cut and fill is along the boundary of a property.

For all retaining walls/terracing:

- The integrity of the development and adjoining buildings and lands is protected.
- Cut and fill does not adversely affect adjoining land.
- Retaining walls are to be structurally sound and stable. The walls must be designed and certified as complying with *AS4678 Earth Retaining Structures* by a practising structural engineer where the design includes dead and live loads expected to arise from the intended use of the retaining wall in its location including but not limited to the installation of fencing, filling, plantings, parking of vehicles or the installation of typical light weight buildings that are ancillary to the primary use of the land.
- Retaining walls must be wholly within the confines of the allotment and a surveyor's report may be required to clarify that retaining walls and drainage area are located within the allotment.
- Slopes between retaining walls or terracing are landscaped and have a gradient of less than 25% (1 in 4).
- Retaining walls must be constructed of materials that are durable and resilient, with a minimum design life of at least 60 years such as masonry, concrete or stone. Treated pine is not permitted.
- In R1, R5 and RU5 zones, the structure must be in accordance with **the specifications in Part 4b Ancillary residential structures and activities –**

Design guidelines

- Any application for earthworks shall be accompanied by plans indicating the levels existing and proposed and indicating any necessary retaining walls or drainage works.
- Existing vegetation must not be cleared in areas not directly impacted by the development.
- Vegetation must not be cleared prior to development approval being granted or before erosion and sediment controls are fully installed;

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Outcomes to be achieved

Design guidelines

section D Cut and fill works including terracing or retaining walls.

For any retaining wall proposed to be constructed within 1 metre of a property boundary:

- Suitable easement(s) for support are to be registered on land within a minimum distance of 1.0m of any retaining wall. The easements for support are to enable the protection of the structural integrity of the wall. Where the certifying Structural Engineer determines that a wider easement is required for the structural integrity of the wall, then such width shall be registered.
- Restrictions as to user are not permitted that are aimed at overcoming a limitation in the structural capacity of a retaining wall, due to the design not including dead and live loads expected to arise from the intended use of the retaining wall in its location, including but not limited to the installation of fencing, filling, plantings, parking of vehicles or the installation of typical light weight buildings that are ancillary to the primary use of the land.

D. Standards for cut & fill

- Cut and fill should be consistent with:
 - Where cut or fill heights are in excess of one metre (1 metre), provide drainage design, engineering, stabilisation and landscaping details to address visual and the amenity for adjoining land.
 - Prior to commencement of cut and fill, the position and depth of the existing sewer mains and junction location is to be identified and adequate fall determined to connect the house services at the required grade.
 - The location of Council's utilities, mains and services, and minimum footpath levels is to be determined prior to earthworks and positioning of access driveways.

Note: Excess fill may only be taken off site to a site with a development approval allowing such fill and in accordance with that consent and relevant legislation

E. Filling

- Filling of land will not obstruct, divert or alter or interfere with the flow of surface water across the land to be filled.
- Fill is not to cause adverse site or off-site impacts
 - Fill is not to be placed in a natural watercourse without adequate piping being installed of sufficient size to carry water discharge expected in a 1 in 20 year flood event.
 - Fill placed on the land must be clean soil, bricks, stone and similar material and no organic matter, rubbish, contaminated material, timber, etc is permitted.
 - Fill is to be placed and compacted and battered at edges at a slope less than the angle of repose of

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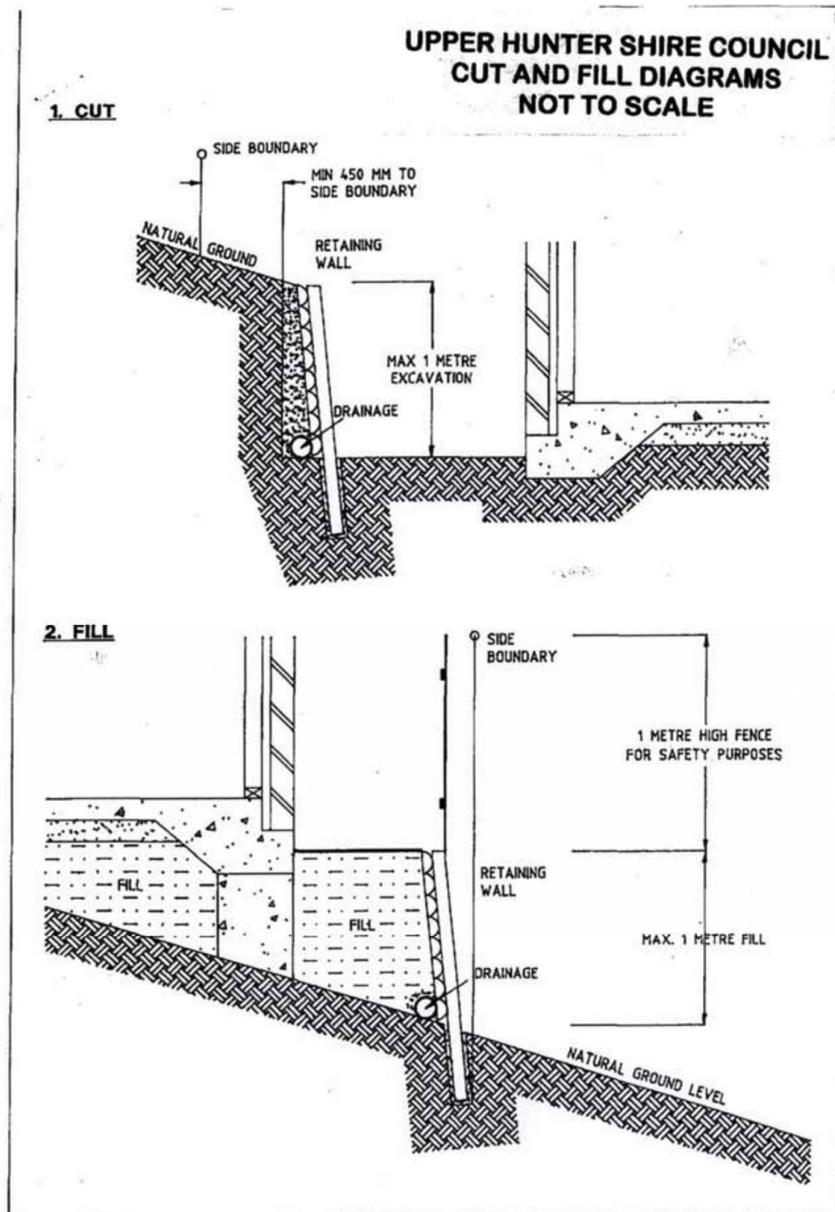
Outcomes to be achieved

Design guidelines

the material used in the fill and, where the flow of surface water or, because of flooding, the battered surface is likely to be eroded, the surface to be protected to Council's satisfaction by stone flagging or similar.

Note that approval from NSW Office of Water may be required

Figure 1: Cut and fill requirements



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Outcomes to be achieved

Design guidelines

2. Erosion & sediment control

F. Erosion, sediment & dust control

- Principles to be applied to planning are:
 - erosion and sediment control measures are planned concurrently with engineering design
 - minimise the area of soil exposure
 - conserve the topsoil
 - control water flow from the top of the site, through the works and out the bottom of the site
 - rehabilitate disturbed lands quickly
 - maintain soil and water management measures at a level to ensure the finally developed site releases water of a quantity and quality equal to, or better than the predevelopment condition.
- Apply adequate erosion, sediment and dust controls to development sites

Apply measures and practices outlined in *Managing Urban Stormwater: Soils and Construction* that are appropriate to the site. Suitable measures would include:

- Divert clean runoff above denuded areas.
- Minimise slope gradient and length.
- Keep runoff at non-erodible velocities.
- Trap soil and water pollutants.
- Install sediment fences and traps to provide a temporary barrier or filter structure to capture sediment.
- Use of water runoff detention and sediment interception measures, where required.
- Calculations and modelling of runoff and peak flows undertaken by a suitably qualified person.
- Installation of sediment detention basins if total sediment volume calculated for the proposal catchment exceeds 150 cubic metres in the design Annual Recurrence Interval (ARI) 5 year storm event. These basins must be maintained until consent conditions are fulfilled.
- Wind erosion mitigating practices and associated sediment interception structures must be applied to the land to reduce wind erosion and dust nuisance where required.
- Appropriate water and wind erosion control measures will be in place before land is disturbed and maintained until effective land stabilisation is completed.

G. Runoff water control

- Sediment is retained on the development site.

The following principles and practices shall be applied:

- Intercept and divert all uncontaminated runoff around all areas to be disturbed. Alternatively runoff can be directed through these areas in a controlled manner.
- Control all runoff from the proposed development which is likely to cause flooding or erosion of downstream watercourses with appropriate drainage, channel or detention works. These works can be located above, within or below the approved development site provided that these measures are located on private land with the approval of the property owner.
- Ensure all drainage conduits and related structures are completed before they are commissioned.

Roof guttering and downpipes (temporary downpipes are acceptable) shall be installed and connected to Council's drainage system immediately after roof material fixing. Where roof and downpipe connections to Council's drainage system cannot be made immediately, additional onsite sediment control devices must be installed to receive and mitigate roof water.

Where no Council drainage system is provided, the roof stormwater shall be discharged away from the building site onto a stable vegetated area within the property boundary with sediment control devices installed.

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Outcomes to be achieved

Design guidelines

H. Groundcover

- Minimise the area of disturbance and maintain suitable groundcover to control erosion

The following principles and practices shall be applied:

- Installation and maintenance of a turf filter strip along the road nature strip/footpath area adjacent to street kerbs (or along the downslope boundary to act as a final filter for the runoff leaving the property. Exposed soil on the footpath and allotment shall be seeded or otherwise revegetated to limit runoff water and sediment. Existing groundcover may also be retained during clearing works.
- Adjacent to bushland, care is needed to prevent the spread of turf grasses or hydromulch material beyond the rehabilitated area. Use of tree mulch or sterile seed/grass stock or native seed/seedling is preferable to pasture species or couch turf in such locations.

I. Access

- Vehicular access to construction sites is controlled to prevent sediment being tracked onto adjoining lands and roads.

The following principles and practices shall be applied:

- Where possible, a single access (3 to 5 metres width per lane) is provided to the building facade.
- A layer of 30 mm to 60 mm aggregate at a depth of 200 mm must be applied to the access for stabilisation and maintained.
- Aggregate and any construction site sediment on sealed roads must be swept and removed to prevent this material entering the drainage system.

Refer to *Managing Urban Stormwater, 4th Edition* Volume 1 known ('The Blue Book') and other relevant best practice publications.

J. Topsoil & stockpile management

- The erosion of topsoil and stockpiles is prevented

The following principles and practices shall be applied:

- Topsoil will only be stripped from approved areas to a predetermined depth. It must be stockpiled separately from subsoil for re-use during site rehabilitation and landscaping, or removal if there is an excess. Subsoil spoil not required may be removed or placed on-site, in approved areas, shaped to appropriate land contours, topsoiled and stabilised by the proponent.
- Stockpiles of topsoil, sand, aggregate, spoil, building products or other material shall be stored within the boundary of the property at least 2 metres clear of any drainage line or easement, natural watercourse, footpath, kerb, road surface or established tree.
- Stockpiles must not be greater than 2 m in height.
- Stockpiles must have measures in place to retain such materials on the stockpile. Controls shall be installed or constructed to divert stormwater flows away from stockpile areas.
- Stockpiles must not be placed so as to encroach on erosion and sediment controls which have been installed, stabilised accesses or the nature strip.
- The land adjoining the stockpile shall be protected from degradation by the implementation of erosion and sediment control measures such as a diversion drain, sediment fence, geotextile or other approved devices.

K. Rehabilitation & landscaping

- Rehabilitation and landscaping must form part of the development proposal

The proponent will carry out progressive land surface stabilisation on all disturbed areas until the site is satisfactorily rehabilitated to ensure that soil erosion and sediment discharge is unlikely.

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Outcomes to be achieved

- In the case of extractive industry proposals, the development meets all rehabilitation and landscaping requirements of Part 8d
Extractive industry

Design guidelines

Appropriate landscaping must be completed in accordance with approved landscaping plans and with adequate rehabilitation and soil erosion control measures.

L. Erosion & sediment control maintenance

- Erosion and sediment controls are applied and maintained over the full construction period

The following principles and practices shall be applied:

- All erosion and sediment control measures must be maintained at workable capacity or condition until permanent rehabilitation measures are fully operational.
- All erosion and sediment control measures, including permanent sediment traps, shall be maintained as per the schedule of works within the approved Erosion and Sediment Control Plan or Strategy (or as required). At least 70% of their design capacity is to be operational until they are decommissioned.
- All material removed from erosion and sediment devices must be either stabilised in situ or removed to an approved disposal site.
- Decommissioning of erosion and sediment control measures must comply with the schedule of works within the approved Erosion and Sediment Control Plan, Strategy or associated develop/activity conditions of consent. Material held in sediment control measures during decommissioning shall be either stabilised in situ or removed to an approved disposal site. All structural materials used to construct temporary erosion and sediment control measures are to be dismantled and removed from site on decommissioning.
- All site debris and unused construction material must be removed from the site or protected from erosion before the site is vacated.

3. Stormwater management

M. Stormwater design - general

- Stormwater is controlled in a way that minimises nuisances and damage to the adjoining properties.
- Adverse impacts on the natural water cycle are minimised.
- Natural drainage lines and water bodies are managed to sustainably protect the health of the receiving waterway.
- Mitigate pollutants from entering waterways.
- Appropriate easements are provided over existing drainage systems on private property.
- The efficient use of water is promoted and assisted.
- The principles of 'water sensitive urban design' are addressed and best practice adopted wherever feasible.

Apply the stormwater drainage approach advocated by Engineers Australia in '*Australian Rainfall and Runoff*' to design surface levels so that very large (major system) 1% AEP (100 year ARI) events can flow around buildings without relying on underground pipes and that the Major drainage system design and construction;

- retains, and where practical, restores natural water courses, native riparian vegetation, wetlands and other natural landscape features,.
- incorporates effective measures to manage and treat stormwater and maintain healthy aquatic ecosystems,.
- satisfies acceptable risk management standards for public safety and flood protection.
- within new developments local drainage shall be designed to avoid local flooding in accordance with the aims and objectives of the NSW Floodplain Development Manual. (April 2005).

Pipe (minor) systems are installed to cater for frequent surface flows up to 20% AEP (5 year ARI). This balances cost of drainage and occurrence of inundation.

Runoff from impermeable surfaces is to be managed by stormwater source controls that;

- Contain frequent, low-magnitude flows,.

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Outcomes to be achieved

- The development meets the requirements of Part 11c **Geotechnical hazards**, particularly relating to salinity.

Design guidelines

- Maintain the natural balance between runoff and infiltration, so as to promote appropriate groundwater, soil salinity and stream flow characteristics,.
- Remove some pollutants prior to discharge to receiving waters,.
- Prevent nuisance flows from affecting adjoining properties.

Ensure that appropriate long term arrangements are in place to allow for continued use and maintenance of existing drainage systems

The ultimate discharge for collected stormwater runoff shall be to a street drainage system, to an inter-allotment drainage line, or by approval, to a public area.

The system shall be "gravity" drained. Pumping of stormwater is not permitted.

The development site shall provide an overland flow path for the major storm event (1% AEP)

N. Stormwater drainage design – residential

- Residential subdivisions and residential dwellings are designed, constructed and maintained so that development is undertaken in a manner that achieves the general stormwater design principles at section M above, and:
 - takes into account site constraints and hazards
 - manages the impact of the development on downstream flooding and drainage
 - controls soil erosion during and after the construction phase
 - Stormwater drainage is consistent with:
 - *Upper Hunter Shire Council Engineering Guidelines for Subdivisions and Development* as amended; and
 - *Relevant Australian Standards*.
 - All urban lots must have connection to the Council's stormwater management system via direct access to the street gutter or interallotment drainage via a dedicated easement.
 - New buildings are not to be constructed over or compromise the integrity of drainage lines or easements originating from outside the site.
 - Where an existing drainage line runs under a proposed building, the drainage line and any associated easement is to be diverted around the building. Redundant easements
- Water re-use within the dwelling and for landscaping purposes is encouraged, through the installation of rainwater tanks. Installed rainwater tank capacity may exceed BASIX requirements.
 - Pits are installed to collect water from the low points in yards.
 - Down pipes and pits are to be connected to the 'discharge controls' for the site.
 - Design should consider relevant accepted standards, such as:
 - *Water Smart Practice Note No. 11*
 - *Managing Urban Stormwater: Soils and Construction*
 - *Queensland Urban Drainage Manual* as amended
 - *Australian Rainfall Runoff 2019*, as amended
 as technically appropriate

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Outcomes to be achieved

Design guidelines

are to be extinguished and new easements are to be created.

- Where an existing drainage system across the site is retained, access to the existing system is not to be affected by the proposed development. Also, the development is to be designed so as not to degrade the structural integrity of the system.

O. Stormwater drainage design – non-residential

- **Non-residential development** is designed, constructed and maintained so that development is undertaken in a manner that achieves the **general stormwater design principles at section M** above, and:
 - Takes into account site constraints and hazards.
 - Reduces downstream flooding and drainage impacts.
 - Controls soil erosion during and after the construction phase.
- Stormwater drainage is consistent with:
 - *Upper Hunter Shire Council Engineering Guidelines for Subdivisions and Development* as amended; and
 - relevant accepted standards, such as *Managing Urban Stormwater: Soils and Construction and Queensland Urban Drainage Manual and ARR 2019*, as technically appropriate
 - *Australian Standard 3500.3*.

- Stormwater drainage complies with *AS 3500.3*.
- Development proposals for this type of development are to demonstrate that the total of the site's stormwater runoff after development does not exceed the calculated run-off for the site prior to the development for all storm durations for the 5year, 20year, and 100year ARI (Average Recurrence Interval) storm event; this includes stormwater produced from the roof and other impermeable areas.
- Pits are installed to collect water from the low points in yards.
- Down pipes and pits are to be connected to the 'discharge controls' for the site.
- The site discharge indicator for the development is at least 0.5 determined under *Water Smart Practice Note No. 11 – Site Discharge Indicator*. The site discharge indicator for the development is at least 0.9 determined under *Water Smart Practice Note No. 11 – Site Discharge Indicator*, and preliminary storm water design details demonstrating ability to comply with this requirement are to be submitted with the development application.
- **Industrial** development buildings are to be provided with an onsite stormwater retention tank in accordance with the following table: (Unless a hydraulic design prepared by a Civil engineer demonstrates otherwise)

Roof area	Required tank size (litres)
Equal or less than 500 m ²	10,000
More than 500 m ²	22,500

- The stormwater retention tank is to be fitted with appropriate water purifying and hydrocarbon / pollutant separation devices to ensure that water used and entering the stormwater system is clean.
- Roofing is provided with adequate guttering and downpipes connected to the drainage systems. Downpipes should be connected to open-grated surface inlet pits and all stormwater must be disposed of in accordance with Council's adopted standards. No pump-out systems will be approved by Council.
- Council may require the upgraded/augmentation of the existing downstream drainage system. This may be in the form of actual construction work, to be carried out by the developer at the time of development or in the form of a contribution to be determined by



Outcomes to be achieved

Design guidelines

Council at development application stage for drainage schemes adopted by Council.

- All sites will be required to provide appropriate on site stormwater detention such that post development stormwater flows from the site do not exceed pre developed levels.
- All sites will also be required to provide stormwater quality devices within the internal drainage and detention design to ensure stormwater leaving the site is not polluted. In this regard all surface inlet pits will need to be fitted with a suitable pollution control device.
- Stormwater run-off from roofs and paved areas is to be collected and gravity drained to the street drainage system, drainage easement or natural drainage course or other means as determined by Council.
- Trunk drainage systems should be designed for the 10 year ARI storm event. Overland flow paths should be provided to accommodate the 100 year ARI storm event.
- An onsite stormwater detention system should be provided to ensure the stormwater discharge for a development site does not exceed pre-developed flow rates for the full range of storm events.

The following design guidelines for on site detention can be used where storage requirements are less than 100 m³. If computed storage volumes exceed 100 m³ then a recognised routing?? method should be used for calculation of storage volumes.

- The 1 in 20 year Average Recurrence Interval (ARI) storm event for the developed site shall be used for inflow to the basin (Q_{20dev}). The maximum outflow from the basin shall be the 1 in 5 year ARI storm flow from the undeveloped site i.e. impervious area 0 % (Q_{5undev}).
- Detention Volume required can then be calculated as.
- Detention Volume (m³) = (Q_{20dev} - Q_{5undev}) x tc_{20dev} x 0.06.
- Where:- Q_{20dev} (litres/sec) Q_{5undev} (litres/sec) tc_{20dev} (minutes).
- The flow from the site in a 100 year ARI storm should then be checked to ensure it does not exceed pre-developed levels. The following formula can be used.
- Q_{100dev} - Q_{20dev} + detention outflow (normally = Q_{5undev}) < Q_{100undev}.

If the above equation is not satisfied then generally the detention outflow will need to be further constricted with a corresponding increase in detained volume.

P. Flooding, runoff regimes & stormwater collection

- Post development runoff reflects pre-development conditions.
- The development does not result in environmental damage within existing drainage courses and receiving waters.
- Stormwater discharges do not cause excessive nuisance to adjoining or neighbouring lands

- Development is to be designed so that runoff from low intensity, common rainfall is equivalent to the runoff from a natural catchment. This can be achieved by intercepting and storing runoff in extended storage detention basins and discharging at greatly reduced rates.
- Alternatively, existing degraded down stream streams can be sympathetically engineered to re-establish a natural riparian eco system that can cope with the changed hydrological regime.
- Developments are to be designed in accordance with *Australian Rainfall and Runoff* and the *NSW Floodplain Development Manual*.
- Development is to be designed so that overflows do not adversely affect neighbouring properties by way of intensification, concentration or

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Outcomes to be achieved

- Developments are designed in accordance with:
 - *Australian Rainfall Runoff 2019* and the *NSW Floodplain Development Manual 2005 as amended*; and
 - *Upper Hunter Shire Council Engineering Guidelines for Subdivisions and Development as amended*
- Development meets the requirement of part **10a Floodplain Management**

Design guidelines

- inappropriate disposal across property boundaries. This can be achieved by securing appropriate easements over downstream properties or discharging overflows directly to the street system where feasible.
- Overflows from paved areas adjacent to the property boundary are to be directed by a kerb or formed gutter to drain away from neighbouring properties.
- Surface levels are to be graded such that sites are generally free draining with sufficient overflow capacity to ensure that waters do not enter buildings when underground drainage systems are beyond their capacity
- Drainage pits are to be installed so that nuisance water does not collect at low points
- Gutters, down pipes and pits are to be connected to the stormwater management system for the site. *Australian Standard 3500.3* sets appropriate standards for stormwater collection and is to be followed when constructing new development.
- Public use areas satisfy relevant flood safety criteria as assessed with reference to the *NSW Floodplain Development Manual*

Q. Pollutant management

- Ensure that stormwater generated from development does not result in pollution of water courses or receiving waters

- Stormwater systems are to be designed to capture and remove all litter larger than 5 mm in size.
- The event mean concentration of specific pollutants is not to exceed that in the following table.

Pollutant	Maximum event mean concentration
Sediment	50 mg/L
Hydrocarbons	500 ug/L
Total Nitrogen	1000 ug/L
Ammonia	15 ug/L
Phosphorus	100 ug/L

Note: litter traps are not required for houses and multiple housing development comprising less than four dwellings (since people are less likely to litter on their own dwelling site).

4. Preparation of soil & water management plans

T. Compliance with plans

- The proponent is responsible for the full cost of all work required to comply with this section of the DCP, as determined by Council. Any off-site damage resulting from the activity is also the responsibility of the proponent. All erosion and sediment control measures or works and rehabilitation measures must conform to or exceed the specifications or standards set out in

11f Soil & water management

Outcomes to be achieved

Design guidelines

Managing Urban Stormwater: Soils and Construction or its update.

U. Implementation & completion of plan

- Erosion and sediment control measures and rehabilitation works are implemented and maintained

11f.7 Supplementary guidance

The following documents or reference materials provide further advice or information that is relevant to this section.

- *Upper Hunter Shire Council Engineering Guidelines for Subdivisions and Development* as amended
- Landcom (2004) *Managing Urban Stormwater, 4th Edition* (Includes Volume 1 known as ‘The Blue Book’ and other parts, including Appendix M – Model Code of Practice for Soil and Water Management on Urban Lands). Available from <http://www.environment.nsw.gov.au/stormwater/publications.htm>
- NSW Government (2005) *NSW Floodplain Development Manual* or its update
- *Managing Urban Stormwater: Soils and Construction* Volume 1, 4th Edn ‘The Blue Book’ (Landcom NSW, 2004)
- *Planning for Erosion and Sediment Control on Single Residential Allotments* (Landcom NSW, 2006)
- *Australian Rainfall and Runoff 2019* as amended
- Water Smart Practice Note No. 11 – Site Discharge Indicator http://www.clearwater.asn.au/user-data/resource-files/Site_Discharge_Index.pdf
- Queensland Department of Energy and Water Supply - *Queensland Urban Drainage Manual – 2013 Provisional edition*
- Newcastle City Council: *Stormwater and Water Efficiency for Development Technical Manual July 2017* at <http://www.newcastle.nsw.gov.au/Development/Land-Use-Planning/Development-control-plans>