WSUD

water sensitive urban design

Water Sensitive Urban Design Site Development Guidelines and Practice Notes

Appendix

HOBART CITY COUNCIL

Appendix A *Site Planning*

Water sensitive developments involve simple design and management practices that take natural site features and minimise impacts on the water cycle. It is part of the contemporary trend towards more sustainable solutions that protect the environment.

This Appendix explains how to prepare an integrated site plan that responds positively to site constraints and opportunities.

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Before you start…

At the earliest stage in deciding where to place buildings, driveways and other structures, always look at opportunities and constraints of the site and integrate them into a 'whole site' approach.

Consider the existing natural features as a resource to be used to advantage, to be retained where possible and to be self-sustaining in the long term.

Analyse the Site

The first rule is understand the site!

Collate information on all its natural, constructed and other features. This will help you utilise the site's attributes to best advantage, deal with existing or potential problems and design in tune with the site's soil, vegetation and rainfall.

The best way to take a 'whole site' approach is to prepare a Site Analysis. This can be submitted to support a development application.

A Site Analysis is essential input to:

- Managing stormwater during the construction stage, as summarised in a Soil and Water Management Plan.
- Optimising ongoing water management for the site, as summarised in a Water Management Statement.

The following information gives a general guide to the wide range of factors that influence the design, layout, construction and on-going use and maintenance of a development site. Not all these matters may be relevant to each individual site. Commonly much of the information will ordinarily be part of the design and construct package for residential development (eg, survey information for heights and tree location, location of underground services). Preparing a Site Analysis brings the information together earlier in the design process for the greatest benefit.

Consider these factors

Site Analysis should indicate how each of the following constraints and opportunities (where applicable) affect the site:

Landform

- Topography is critical to the design and layout of buildings, stormwater controls and drainage. Show contours (1 metre intervals), survey benchmarks, and areas of steep slopes (at or greater than 10 degrees / 18%).
- Existing natural features (eg, cliffs, rock outcrops, vegetated areas, potential groundwater recharge areas).
- Orientation of the site (eg, northpoint).

Water

- Sources of water flowing onto the site and general quality of that water.
- Drainage patterns, areas of concentrated run-off, ponding, flood prone land.
- Adjoining riparian zone, if within 40 metres of waterway.
- Characteristics of the site's downstream catchment (eg, bushland creek, sensitive potential groundwater recharge area, constructed stormwater drainage channel).

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Soils

- Depth of soil / regolith.
- Soil pH to indicate affects of soil micro-organisms and nutrient availability for plants.
- Soil condition, fertility, whether it has been compacted, cut or filled.
- Erosion problems, contamination potential

Plants

- Undertake a vegetation survey.
- Existing individual trees, stands of trees and shrubs – s
  how height, spread, condition and species name
  (common and scientific - if known).
- Trees listed as 'significant' in Council's Planning Schemes.
- Existing ground levels around the base of trees.
- Weed species present and extent of weed infestation.
- Plants that grow well on the site, or that are characteristic of the local area.
- Any threatened species or ecological communities present on the site or nearby land. Consult Council's GIS.
- Trees and vegetation proposed to be removed.

Wildlife

- Habitats present on the site or nearby land.
- Potential to provide fauna habitat, such as niches in rockeries, ponds for frogs, habitat plants
  (nectar-bearing shrubs for small birds).

Climate

- Direction of summer and winter winds.
- Windbreaks and their likely permanence.
- Frost pockets.
- Areas of full or partial shade in summer and winter at 9am, midday and 3pm.
- Direction and extremity of bushfire threat.

Views

- Good and unsightly views from the site.
- Views into the site, privacy and security problems.
- Qualities of the site that are important in the view to and from the site (eg, major trees).

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Existing Site Features

- Location and uses of any existing buildings and structures on the site showing those to be removed and retained.
- Location and height of walls and fences built to the boundary.
- Heavily shaded areas from existing structures, mature trees or dominant landforms.
- Archaeological and heritage (Aboriginal and European) sites.
- Any easements, rights-of-way and their restrictions.

Services

- Location of existing overhead and underground utility services (electricity, gas, telephone, water, sewer and stormwater drainage lines, inlets and collection points).

Use of adjacent land

- Location and use of adjacent buildings.
- Rooftop ridge levels and floor levels of adjacent buildings.
- Potential for overlooking into and from window openings in walls adjacent to the development site.
- Potential for shading adjacent properties.
- The form and character of adjacent and nearby development, including characteristic styles of buildings and landscaping, and bulk and scale of buildings.
- Street frontage features, such as street trees, poles, kerb crossovers, and bus stops.
- Potential sources of nuisance, dust and noise, such as main roads.

Planning Controls

- Planning objectives, zoning, design criteria, lot size, site coverage, density controls and other provisions in State Policies or other State legislation.
- Restrictions on development due to hazards (such as flooding, landslip land contamination).
- Controls on removing vegetation or trees or on earthworks.
- Building setbacks, envelopes, height restrictions, view corridors.

Design rules

There are a number of basic rules to consider when preparing an integrated site plan. The emphasis is on minimising the impacts of development, managing construction activities and considering the on-going use and dynamics of the proposed development and the landscape it sits within. Each aspect is interrelated with the others. Adherence to the following principles will make a considerable contribution to reducing impacts on the natural water cycle:

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Minimise disruption to landforms & drainage patterns

By minimising disruption to landforms and drainage patterns, you can avoid related impacts on vegetation, weed growth and loss of habitat, both on and off the site. Soil surface disturbance creates an immediate potential for:

- Loss of topsoil by wind and water erosion.
- Sediment to be carried away and deposited downstream.
- Changes to nutrient and moisture conditions in deposition zones, which may make existing plants unsuitable for the conditions, causing native plants to die or not regenerate and create conditions for weeds to establish and dominate.
- Long-term effects on the pattern of runoff and infiltration for established areas of vegetation, damp spots, creeks and watercourses, thereby causing irreversible changes to natural systems.

Minimise disruption to existing vegetation

Maintaining existing vegetation avoids many soil and weed management problems, and helps conserve biodiversity:

- Minimise removal of plants and root systems as this makes the site prone to erosion and can alter water table levels, causing potential flooding problems or vegetation decline.
- Avoid increased light levels on bare soils as this encourages weed growth.
- Maintain the area's full ecological spectrum of plants as this helps to conserve habitats for all sizes of fauna, including insects, lizards, fogs and insectivorous birds. Their disappearance from gardens and their natural ability to help control pests can lead to the reliance on chemical control and detrimental impacts on other natural elements such as soil ecology.

Minimise impacts on neighbouring areas

This includes adjoining lots as well as nearby natural areas (eg, bushland areas, waterways, swamps, groundwater recharge areas, foreshores):

- Consider your site as one part of the whole landscape. For instance, planting large trees to provide shade in summer may be unpleasant for neighbours by providing unwanted shade in winter.
- Avoid impacts on adjoining sensitive environments due to construction works, gradual accumulation of sediment or exotic plants that become weeds and displace other plants.
- Manage construction works so as to minimise environmental impacts on soil, water, vegetation and air. Limit nuisances such as noise and waste. Make detailed plans to:
- protect the site and adjoining properties prior to commencement of work. This will provide long-term benefits for on-going site use and management.
- Prevent sedimentation in waterways and drainage lines, as this can reduce flow capacity, increase localised flooding and cause property damage.

Prevent or repair ongoing problems

Some sites are already disturbed or experience problems caused by external activities. These may include soil loss, sediment deposits, weed invasion, or risk from bushfire, landslip or other hazards. These must be factored into decisions affecting layout, construction materials and ongoing management:

- Carry out measures to reverse existing damage and control / prevent further damage (eg, soil conditions or weed invasion).
- Choose building materials and planting species to suit conditions (eg, bushfire hazard).
- Place pavement areas so as to redirect or reduce impact of large stormwater flows.
- Reduce reliance on supplementary garden watering by species selection and placement, grouping species with similar water needs, creating and utilising micro-climates to advantage, changing maintenance and watering regimes, or other horticultural practices.
  For further details, refer Practice Note 6.

Consider siting requirements

Buildings, utilities and stormwater measures have particular siting requirements:

- Position and orientate buildings to take best advantage of solar access, views, microclimate and natural site features.
- Position driveways so as to minimise gradient to reduce the velocity of runoff.
- If possible, site water tanks so that water can be fed by gravity.
- Filtration / infiltration devices need to observe minimum separations from buildings. These vary according to soil conditions.
- Place porous paving in locations that will not receive significant amounts of sediment, debris or other material likely to hinder performance.
- Place landscaped areas in positions that will receive runoff from upstream areas to promote infiltration and filtering of runoff.

Special environmental conditions

The following environmental issues require specific site planning and management responses. Council can provide more detailed guidance on how to address these issues:

Steep slopes

The greater the ground slope, the greater the speed of unimpeded stormwater runoff. Use contour banks, landscape mounds, grassed swales, or other slope modifications to break the velocity and intensity of stormwater flow.

Soil surface disturbance and loss of topsoil is characterised by slow regeneration and continuing erosion on steeper land. Avoid or minimise ground disturbance and regenerate ground cover as quickly as possible (eg, reusable organic matting can be used to contain topsoil).

Depending on geological conditions, steep slopes may also be associated with geotechnical instability. This may require soil stabilisation measures. Council has guidelines on requirements to investigate for potential land instability.

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Flooding

Flooding occurs on the floodplains of minor streams and major waterways. Urban drainage systems are also subject to localised flooding. Council has a policy on how to address flooding issues including, details on siting, floor heights, flood proofing and protection.

Bushfire threat

Development within or adjacent to unmanaged bushland is at some risk of bushfire attack. Site layout, fuel reduced managed areas, access and an adequate stored water supply and other techniques can be utilized to minimise the risk to human life and property. Council has a guidance note on how to prepare effective bushfire mitigation strategies.

Design for lifestyle

It is also important to create a pleasant living environment for the occupants. Some issues are common to all residential development irrespective of density. Where possible, consider opportunities for providing:

- Outdoor entertainment or barbeque areas.
- Utility areas for clothes drying or storing waste, compost and recyclables.
- Access paths.
- Driveways, visitor vehicle parking and vehicle turning areas.
- Car washing facilities to trap nutrients and oil/grease and direct soapy water to lawns or garden areas.

Some issues that should be considered in the site plan and layout are specific to particular lifestyle, age and interests groups:

- Children's play areas (require flat grassed areas).
- Pets (may require fencing to separate from garden beds).
- Disabled access
  (requires low grade and trafficable paths around the site and benched seating to provide respite).

Common design features

Siting structures

- Place structures on sites that are already cleared to minimise ground disturbance.
- Set structures below the topmost point of a property to reduce the intensity of wind exposure. Take advantage of established windbreaks or other natural features to create a pleasant microclimate.
- Reduce driveway, paths and other pavement areas to a minimum by re-dimensioning, choosing alternative materials or rationalising the layout so that some areas become multi-purpose (and more economic to construct).

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Minimising cut and fill

- Use natural ground levels where possible for siting houses and other structures.
- Use house construction techniques to accommodate slope (eg, pole construction, split level or stepped design).
- Use pier and beam foundations rather than slab on ground construction to minimise ground and tree root disturbance.
- Design driveways to contour around slopes. Use grassed swales to direct flow towards vegetated areas at regular intervals (every 3 metres) to reduce water volume and to permit smaller depressions in the driveway profiles.

Managing stormwater

- Slow down flow rates where possible to prevent erosion, promote infiltration and reduce reliance on supplementary watering and irrigation.
- Use permeable paving, pebble paths, infiltration trenches, swales, terraced garden walls, mulched garden beds, or other landscaping elements to slow down and infiltrate runoff (where soil conditions are appropriate – eg, sandy soils).

Tree loss

- Assess the health, vigour and longevity of existing mature trees at the site planning stage. Existing trees may not tolerate construction activity in the root zone, resulting in decline in tree health, accelerated limb loss, pest and disease attack or complete demise, which can lead to injury or property damage.
- If removing trees, consider planting replacement trees that are deep rooted species to:
- Maintain or lower the water table to mitigate potential for flooding.
- Bind the soil and reduce soil erosion.
- Decrease run-off velocities.
- Filter nutrients and capture sediments.