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23 February 2018

**STATEMENT OF EFFECT
PROPOSED LAND DIVISION
AT CREST @ WOODSIDE**



Statement of Effect

Land Division at Crest @ Woodside

23 February 2018

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1.0 Introduction

1.1.1 History of the Crest @ Woodside Site

The Crest @ Woodside site is located on the outskirts of Woodside on the Nairne to Woodside Road in the Adelaide Hills Council area.

The 22.6-hectare site has all the hallmarks of a residential suburb. This includes 81 existing dwellings with substantial setbacks, that are often split-level following the contours of the land and are located in a park-like setting. There is also a community hall, day-care facility, gym and office/workshop/warehouse. Existing infrastructure across the site includes sealed and curbed streets, footpaths, water, sewer, electricity and stormwater infrastructure.

In the past, there has been as many as 129 dwellings located in addition to at least 15 vacant allotments (see the aerial photograph below).



1986 Aerial Photograph - 129 dwellings and at least 15 vacant allotments



In the 1920s the Australian government purchased land and established an Army camp known as Woodside Camp, also known as the Woodside Barracks. Throughout the interwar years, the camp was occupied by units of the Citizens Forces. During the Second World War, the camp was used to raise units of the Second Australian Imperial Force and a number of US Army units were also based there. After the Second World War, “Inverbrackie” was the site of a refugee camp before becoming home to a number of regular Army infantry units. From 1981 it was occupied by the 16th Air Defence Regiment.

In 2010, the Federal Government announced that it would house refugees again. The “Inverbrackie Alternative Place of Detention” was a low security, family orientated immigration detention centre, with the children attending local primary and high schools. The detention centre housed a maximum of 400 people until its closure in December 2014.

The land in and around the Crest @ Woodside site is well-watered, hilly and timbered with some alluvial flats which particularly lends itself to grazing. Dairy produce and pastoralism have been mainstays of the economy, as well as limited grain and market garden cropping. The district is picturesque which, in association with the growth of local wine production, has led to an increase in tourism.

1.1.2 Objectives and Outcomes for Crest @ Woodside

In 2017, Mill Hill Capital purchased the Crest @ Woodside site through a managed fund called Woodside SA Pty Ltd. Mill Hill’s objectives/proposed outcomes for Crest @ Woodside are to:

1. Re-establish a residential community, making the most of the existing well-designed and maintained housing, develop complementary infill housing that completes the community in a logical manner/layout and designate areas of public open space/recreation facilities in the short-term; and
2. Develop low intensity tourist and other accommodation in the form of cabin-style accommodation and caravan/camping facilities and, if possible, adaptively re-using some of the existing buildings on the site such as the community hall, day-care facility, gym etc, in the medium term.

The Adelaide Hills Council’s 2016 Strategic Plan is entitled “Your Adelaide Hills”. This Strategic Plan includes the following statements and goals that support Mill Hill’s objectives/proposed outcomes for Crest @ Woodside:

Trends and Considerations - Housing affordability

... The Adelaide Hills is an attractive place to live, yet development restrictions mean that housing supply is limited. The implication is that cost of housing in parts of the district is relatively high. More affordable areas tend to be isolated and poorly serviced by public transport which can create difficulty for lower income families and individuals to live there...

Goal 1 People and business prosper

...With close proximity to Adelaide, short-stay experience tourism works well for the Adelaide Hills. Affordable and unique experiences in a natural setting are highly sought after...

It can be difficult for people to buy their first house or secure affordable rental properties in the Hills. We know that many people leave the district in their later years as they look for smaller properties closer to public transport and services. For people to prosper in the Hills, we need to make it liveable for all ages...



1.3 We will work towards making the Adelaide Hills the favoured tourism destination in the State.

1.10 We will use the amended Development Plan to encourage more housing opportunities for first home buyers and those wishing to age in our community.

Goal 3 Places for People and Nature

What makes the Adelaide Hills special is its unique landscape and places. From native vegetation and productive farming land to village townships and community facilities, the region comprises a blend of land use which allows people and nature to thrive...

The native flora and fauna of our region contribute to the character of the Adelaide Hills and are essential to our productivity, economy, health and sense of wellbeing...

3.5 We will take a proactive approach, and a long term view, to infrastructure maintenance and renewal.

Mill Hill Capital contends that the proposed development of Crest @ Woodside responds specifically to the strategic intent of the Adelaide Hills Council Strategic Plan by providing:

- High quality housing and land at an attractive price for a variety of residents, creating a vibrant and diverse community that shares the relatively low-density characteristics of many of the townships throughout the Adelaide Hills;
- Opportunity for the establishment of tourist accommodation and supporting facilities that capitalise on/support the Adelaide Hills' reputation as the favoured tourism destination in the State; and
- The retention of significant native vegetation across the site in large areas of designated public open space, as well as within road reserves and on housing allotments, as well as providing carefully designed stormwater management that protects and enhances the natural environment; and
- The upgrade of existing infrastructure to a modern standard (which would otherwise be too expensive), and for it to be maintained properly over the long-run. Water and sewer leakage will also be eliminated. There will also be improved traffic outcomes internally and along Nairne Road.



2.0 Subject Land and Locality

2.1 Subject Land

The subject land is located at 300 Nairne Road, Woodside (CT 6174/409). It is a large parcel of land of some 22.6 hectares. It has an irregular shape with a frontage to Nairne Road in the order of 800 metres. The land rises up and away from Nairne Road.

There are 81 existing dwellings on the land, together with a community hall, day-care facility, gym, office/workshop/warehouse and other associated small-scale, non-residential activities.

The land contains an existing internal road network with 4 access points to and from Nairne Road. There are a range of different sized eucalyptus and other trees scattered across the land. The site is depicted in the photographs on the following pages.

2.2 Locality

The locality surrounding the subject land includes primary production/grazing, viticulture and animal keeping (horses) activities.

Directly to the west and south of the site is the Woodside Barracks, a site that is still owned and operated by the Federal Department of Defence. This site contains a range of buildings such as dwellings/dormitories, warehouses/storage sheds, administration buildings and recreation facilities such as tennis courts and ovals.



Photo 1: Looking north from the subject along Alamein Avenue towards nearby primary production land.



Photo 2: Looking north along Nairne Road across a portion of the subject land and the Council verge.



Photo 3: One of the 81 existing dwellings on the subject land to be reactivated.



Photo 4: One of the existing community buildings to be retained on proposed allotment 202.



Photo 5: The existing building on proposed Lot 80 for potential commercial use.



Photo 6: Looking across proposed Lot 201 which is designated as public open space.



3.0 Proposal

3.1 Land Division

The proposed development involves the division of one allotment into a total of 145 allotments. This includes:

Allotment Nature	Size	Number of Allotments
Existing Residential Dwellings	500m ² – 1300m ²	81
Vacant Infill for future Residential Dwellings	550m ² – 1400m ²	56
Sub – Total of Residential Allotments		137
Existing Office/ Warehouse/ Workshop building	2,343m ²	1 ('Lot 80')
Public Open Space	50,100m ²	2 (Lots 200 - 201)
Future Tourism and Other Accommodation (eg. cabins and camping)	33,395m ²	1 (Lot 202)
Public Access and Infrastructure – for sight lines, SA Water and access.		5 (Lots 203 – 207)
Sub- Total of Non-residential Allotments		9
TOTAL OF ALL ALLOTMENTS		146
NOTE: Areas are approximate		

3.2 Infrastructure Provision

3.2.1 Roads/Streets

The proposed land division takes advantage of the existing road/street network on the subject site with some minor adjustments including:

- the closure of the intersection of Innes Court (formerly Balaklava Avenue) and Nairne Road and the slight extension of Balaklava Avenue in a westerly direction to provide vehicle access to the rear of allotments that also have frontage to Nairne Road
- the closure of the intersection of Inverbrackie Close (formerly Dargie Avenue) and Nairne Road, and
- the extension of Crest Place (formerly Balmoral Place) to provide a turnaround area at its southern end.

This means that there will be only two streets connected to Nairne Road (Alamein Avenue and Lucknow Avenue), where there are currently four.



3.2.2 Water and Sewer

Importantly given that the subject site is located within the Watershed (Primary Production) Zone, the subject site is currently connected to water and sewer infrastructure provided by SA Water. Costs associated with any upgrade of this infrastructure that is necessary for the proposed development will be borne by Mill Hill Capital.

3.2.3 Electricity and Telecommunications

SA Power Networks own all of the existing above and below ground electricity infrastructure that runs along existing road/streets. Mill Hill Capital will negotiate with SA Power Networks regarding any potential upgrade of this electricity infrastructure that may be necessary to support the proposed development of the site.

It is understood that the subject site is well serviced in terms of access to the telecommunications network.

3.2.4 Public Open Space

The proposed land division includes a large parcel of land for public open space (proposed lots 200 and 201 at 5.01ha).

Lot 201 has previously performed as shared open space for residents and is located relatively centrally within the subject land. It slopes from a high point in the south to a low point in the north and contains a variety of trees, walking paths and grassed areas for recreation. This parcel of land also enjoys longer range views to surrounding land.

Lot 201 encompasses a proposed wetland and path around the southern boundary of the subject land that could serve as a bike or walking track. The wetlands located within Lot 200 will both add to the amenity and appeal of the subject land and may form part of the integrated stormwater plan.

3.2.5 Staging

Section 39(8) of the Development Act 1993 anticipates the staging of consents and approvals, stating:

39—Application and provision of information

- (8) An application, or a consent, may provide for, or envisage the undertaking of development in stages, with separate consents or approvals for the various stages.**

Section 51(1) and (5) of the Development Act 1993 also state:

51—Certificate in respect of the division of land

- (1) Subject to any exclusion prescribed by the regulations, the following certificate is required in relation to a development that involves the division of land under this Act, namely a certificate from the Development Assessment Commission that it is satisfied that the prescribed conditions as to development have been satisfied, or that the applicant has, by virtue of an entitlement under the regulations, entered into a binding agreement, supported by adequate security and, if the regulations so require, in a form prescribed by the regulations, for the satisfaction of any such condition.**



(5) The Development Assessment Commission may give a certificate under subsection (1) in relation to a particular stage of a development constituted by the division of land.

The proposed land division is proposed to be undertaken in stages so as to stagger some of the infrastructure works, the fees/and charges associated with land division and the release of dwellings/allotments from north-to-south and west-to-east across the site. A plan showing the intended staging of the land division accompanies this development application.

The proposed staging has no negative impact from a development assessment perspective.



4.0 Procedural Considerations

4.1 Zoning

The subject land is located within the Watershed (Primary Production) Zone under the Adelaide Hills Development Plan (consolidated 24 October 2017). It is also located within the Onkaparinga Valley Policy Area 10.

Within the Watershed (Primary Production) Zone all kinds of development are non-complying unless expressly exempted. Land division is exempted in some cases (e.g. boundary realignments in specific cases). However, any land division that creates new allotments within the Zone is non-complying.

This application is therefore non-complying.

4.2 Public Notification/Stakeholder Engagement

Land division that is non-complying and creates additional allotments is a Category 3 matter for the purpose of public notification.

Mill Hill Capital understands the unusual circumstances of the proposed land division and the complexities of how this sits within the South Australian planning system. In this context, Mill Hill Capital has undertaken extensive stakeholder engagement from the initiation of this project to the lodgement of this development application (beyond the legislative requirements of the Category 3 notification process), as detailed below.

Adelaide Hills Council

Two meetings have been held with the Adelaide Hills Council Mayor, CEO and Director Strategy & Development to keep them informed of the plans. They have indicated in principal support for the project. Numerous other meetings with Council staff have been conducted in relation to matters of detail such as engineering, infrastructure and other logistic issues relating to the site.

Schools and Education Providers

Mill Hill Capital has met with senior management at the Oakbank Area School. The School has been very supportive and would welcome additional students resulting from the proposed development into their schools. Additionally, Mill Hill Capital has contacted the Woodside Primary School, the Oakbank Kindergarten and Goodstart Early Learning Centre in Woodside who have all expressed their support. They have also provided promotional information that they would like provided to prospective residents.

Local Businesses

A meeting has been held at Bird in Hand Winery with owners and managers of local wineries (Bird in Hand, Art Wine, Simon Tolley Wines etc), given the potential workforce the project will provide them and positive impact of the tourist accommodation near their wineries. They were generally supportive of the proposal provided that it complements existing nearby vineyards and will not be low quality/cost housing.



Woodside Commerce Association

Shortly after settling on the property in February 2017 Mill Hill Capital was contacted by the local Commerce Association which represents local businesses. Mill Hill Capital subsequently joined this organisation and wrote to its members requesting interest in working on the redevelopment of the subject site. Where possible, Mill Hill Capital will endeavour to include businesses that contacted them to deliver on the development of the site and a number have already been used on the initial work (**eg.** landscaping and garden maintenance, locksmiths, security, electrical and plumbing).

Local Media

Mill Hill Capital has prompted several articles about the site this year by the Mt Barker Courier and The Weekender Herald (local Adelaide Hills newspapers). These articles have been supportive and broadly outlined the intentions for the site.

4.3 Relevant Authority

The State Commission Assessment Panel (SCAP) is the relevant authority for a Land division within the Mount Lofty Ranges Water Protection Area that creates allotments for more than 2 existing habitable detached dwellings.

As the proposed land division involves the creation of allotments for more than 2 existing habitable detached dwellings, and for new residential allotments, the SCAP is the relevant authority.

4.4 Referrals

As the SCAP is the relevant authority, the development application will be referred to the Adelaide Hills Council for comment in accordance with Regulation 38(2) of the *Development Regulations 2008*. The Adelaide Hills Council is also required to concur with the SCAP if it considers that the application should be granted Development Plan Consent.

On the basis that the application proposes a non-complying form of development and the subject land is located within the Mount Lofty Ranges Water Protection Area, referral to the Environment Protection Authority is required in accordance with Schedule 8 of the *Development Regulations 2008*.

On the basis that the proposed land division takes place on land abutting an arterial road, referral to the Commissioner of Highways is also required in accordance with Schedule 8 of the *Development Regulations 2008*.



5.0 Development Assessment

5.1 The Unique Circumstances of this Land Division Where Many Dwellings Already Exist

The Watershed (Primary Production) Zone is focused on the protection of the watershed, the sustainability of agriculture and the protection of its rural and natural character attributes, as indicated in the Objectives of the Zone quoted below:

Watershed (Primary Production) Zone

- Objective 1** The maintenance and enhancement of the natural resources of the south Mount Lofty Ranges.
- Objective 2** The enhancement of the Mount Lofty Ranges Watershed as a source of high quality water.
- Objective 3** The long-term sustainability of rural production in the south Mount Lofty Ranges.
- Objective 4** The preservation and restoration of remnant native vegetation in the south Mount Lofty Ranges.
- Objective 5** The enhancement of the amenity and landscape of the south Mount Lofty Ranges for the enjoyment of residents and visitors.

The Onkaparinga Valley Policy Area also discourages land uses that would require land division as follows:

Onkaparinga Valley Policy Area

- Objective 1** The retention of the existing rural character by ensuring the continuation of farming and horticultural activities and excluding rural living or other uses which would require division of land into smaller holdings. (underlining added)

At first view, there appears to be little policy support in the Development Plan for the division of the subject land.

This ignores the fact that the subject land is a long established residential community. The land, while under ownership of the Commonwealth Government, has been a functional suburb since some of the existing dwellings were erected in the 1960s. Over time, the land has been developed with dwellings and other services/facilities/infrastructure that have given the suburb and its residents a level of independence. The dwellings and other buildings that remain on the land have been designed, built and maintained to a high standard.

Given that it has been controlled by the Federal Government for much of the past 100 years, the local council has little or no control over what has occurred on the subject land. Therefore, the Adelaide Hills Development Plan and the associated Watershed (Primary Production) Zone has had 'no work to do' in terms of the development of the site and there has been no reason to change the Development Plan policy as it relates to the land.

In fact, the existing zoning is inappropriate for a site that has clearly been functioning as a residential community for many years.



In this context, it is contended that the assessment of this application should rest primarily on the perceived impact of the proposed land division on key objectives of the Zone as expressed previously. These are the protection of water quality in the watershed, the sustainability of surrounding agriculture and the protection of existing desirable character attributes.

5.2 The Creation of Allotments to Fill the Gaps Between Housing

As explained in the background section of this Statement of Effect, the number of dwellings across the subject land has varied over the past 100 years. In total, there has been at least 129 dwellings on the subject land over time.

When inspecting the subject land, it is apparent that there are many 'gaps in the streets' where it appears that dwellings should exist to complete the streetscape. These allotments are highlighted in pink on the attached plan of division.

Historically, there have been many more dwellings located on the Nairne Road frontage (on proposed lot 202), that have since been demolished. Controlling/limiting the number of dwellings with direct access to Nairne Road is desirable to ensure the safety and efficiency of vehicle movements along this road.

Council Wide Principle of Development Control 16 states:

Form of Development

Principle 16 New housing and other urban development should:

- (a) be limited to infilling of existing built-up areas and compact extensions within defined boundaries;
- (b) be located so as to achieve economy in the provision of public services; and
- (c) create a safe, convenient and pleasant environment in which to live. (underlining added)

The proposed vacant allotments (55 in total), are of a design and proportions (albeit slightly larger), similar to the allotments proposed for the existing dwellings (between 500m² to 1,400m²). In this way, they are entirely complementary to the existing layout of this residential suburb and are "limited to infilling of existing built-up areas".

The proposed vacant allotments are able to be serviced in the same way as the proposed allotments for the existing dwellings. This is discussed in detail in later sections of this Statement of Effect.

5.3 The Creation of an Allotment for Commercial/Mixed Use

The former "Inverbrackie Alternative Place of Detention" included a workshop/warehouse/office building where detainees were received and initially processed, and some of their 'goods and chattles' were stored.

The proposed land division creates an allotment of 2,343m² surrounding this existing building. The intention is to adaptively re-use the existing building as a potential café/food processing establishment that is linked to local and regional food production. This proposed land use may be the subject of a future development application that will be subject to the non-complying assessment process in accordance with



the non-complying trigger in the Watershed (Primary Production) Zone, depending upon the establishment of any existing use rights and the details of the new land use.

It is contended that the shape and proportions of this allotment are such that it provides reasonable separation from nearby residential development and sufficient space for potential on-site parking associated with the future anticipated land use.

5.4 The Creation of an Allotment for Future Tourism Development

On top of the protection of the watershed, the sustainability of agriculture and the protection of its rural and natural character attributes, the Watershed (Primary Production) Zone also anticipates the development of a sustainable tourism industry that includes accommodation:

Watershed (Primary Production) Zone

Objective 6 The development of a sustainable tourism industry with accommodation, attractions and facilities which relate to and interpret the natural and cultural resources of the south Mount Lofty Ranges, and increase the opportunities for visitors to stay overnight. (underlining added)

The proposed land division incorporates a 3.395 hectare allotment adjacent to Nairne Road that is intended to accommodate tourist and other accommodation (cabins, camping sites and associated facilities e.g. amenities blocks, tennis court).

The future development application for this tourist and other accommodation will likely be subject to the non-complying assessment process in accordance with the non-complying trigger in the Watershed (Primary Production) Zone. Given that the only other existing cabin/camping facility in the Adelaide Hills Council Area is at Cudlee Creek, the subject site has sewer/water/power connection and the location of the proposed allotment for this land use contains minimal native vegetation (it has previously contained dwellings and outdoor recreation area for sports such as soccer), I contend that such a land use is generally appropriate for the subject site, as is the allotment that will support it which forms part of the current development application.

5.5 Land Division Design and Impacts

Council Wide Principle of Development Control 32 in the section entitled “Land Division” anticipates:

Principle 32 Land division should only occur where the land is suitable for its intended or particular use.

The following sections of this Statement of Effect prove that the proposed land division is suitable for the continuing use of the subject site for residential, as well as tourist/other accommodation and small-scale commercial purposes.

5.5.1 Impact on Primary Production

There are provisions in the Adelaide Hills Development Plan that anticipate development supporting or at least minimising impact on primary production activities in the Watershed (Primary Production) Zone and Onkaparinga Valley Policy Area, including:

Watershed (Primary Production) Zone



Objective 3 The long-term sustainability of rural production in the south Mount Lofty Ranges.

Principle 19 Land division in rural areas should not occur where the proposed or potential use is liable to:

- (a) result in the pollution of water resources; or
- (b) cause the loss of productive primary production land.

Onkaparinga Valley Policy Area

Objective 1 The retention of the existing rural character by ensuring the continuation of farming and horticultural activities and excluding rural living or other uses which would require division of land into smaller holdings. (underlining added)

The subject land is a long established residential community currently containing 81 dwellings. It has been used by the Federal Government for different types of residential accommodation for over 100 years.

The proposed land division does not introduce residential use to the subject land – it simply acknowledges its existence and provides opportunity for it to continue in an economically sustainable way (given that the Federal Government has recently sold the land). It is considered that the proposed allotments that will provide for anticipated tourism/other accommodation and small scale commercial use will also have negligible and acceptable impact on existing surrounding agricultural activities.

Therefore, the proposed land division does not cause the loss of productive primary production land (PDC 19(c), nor does it introduce rural living (Obj 1). The ongoing, economically sustainable use of the subject land as a residential community also provides opportunity for workers associated with nearby primary production to live close to work, enhancing the long-term sustainability of rural production and cellar doors in the area (Obj 3).

5.5.2 Public Open Space

The Council Wide section of the Adelaide Hills Development Plan entitled “Land Division” includes the following provisions relevant to the provision of public open space:

Objective 10 Land in appropriate localities divided into allotments in an orderly and economic manner.

...The selection of areas for expansion is influenced by a number of factors. These include physical restrictions, the need to preserve resources such as water, minerals and scenic features, and the lack of public services in certain areas, and the need to retain buffer areas and open spaces.

Principle 29 When land is divided:...

- (c) for urban purposes, provision should be made for suitable land to be set aside for usable local open space; ... (underlining added)

The proposed land division includes a large parcel of land for public open space (proposed lot 201 at 3.75ha). This piece of land has previously performed as shared open space for residents and is located relatively centrally within the subject land. It slopes from a high point in the south to a low point in the north and contains a variety of trees, walking paths and grassed areas for recreation. This parcel of land also enjoys longer range views to surrounding land.



Given that the subject land is 22.6ha in total area, the proposed 5.01ha within lots 200 and 201 for public open space represents 22.2% of the subject land, well in excess of the 12.5% requirement in section 50 of the Development Act 1993. Proposed Lot 200 also service an important function as a fire break and additional access around the site.

5.5.3 Stormwater Management and Watershed Impact

There are a number of provisions in the Adelaide Hills Development Plan that guide stormwater management and watershed impact as follows:

Watershed (Primary Production) Zone

Objective 2 The enhancement of the Mount Lofty Ranges Watershed as a source of high quality water.

Principle 19 Land division in rural areas should not occur where the proposed or potential use is liable to:

- (a) result in the pollution of water resources; or
- (b) cause the loss of productive primary production land.

Principle 21 Land division may be undertaken provided that the development of the resulting allotments would not result in a loss of primary production land or in a greater risk of pollution of surface or underground waters than would occur through development of the existing allotments.

Council Wide - Land Division

Principle 28 Land should not be divided: ...

- (e) if the proposed use, or the establishment of the proposed use, is likely to lead to erosion of the land in the vicinity thereof;
- (f) unless wastes produced by the proposed use of the land can be managed so as to prevent pollution of a public water supply or any surface or underground water resources; ...
- (i) if any part of the land is likely to be inundated by floodwaters and risk of flooding is inappropriate to the intended use of the land;
- (j) without due regard being given to the surface drainage of each allotment created; ...

Principle 30 Allotment boundaries should be located where interference with native vegetation and drainage lines will be minimal and in locations which enhance the management of the natural features.

Principle 31 No land division should take place where the subsequent development of the land may lead to or result in the exploitation or pollution of a water resource.

Principle 36 The design of a land division should be capable of or provide for:

- (a) minimised impact on landform and drainage systems;
- (b) land affected by a 1:100 ARI flood event being kept free from development;
- (c) a stormwater drainage system that:
 - (i) does not increase the flow rate downstream; and/or
 - (ii) where practicable, stormwater flows to be retained and detained for re-use close to its source including possible aquifer storage and re-use;
- (d) maximised interception, retention and removal of water-borne pollutants (including sediment, litter, nutrients, microbial contaminants and other potential toxic materials) prior to their discharge to receiving water;
- (e) the continuation of or assisting in the establishment or restoration of healthy and diverse wetland environments;
- (f) preventing the potential for sewage overflows to enter the system;



- (g) **maximising opportunities for aquifer recharge; and**
- (h) **utilisation of opportunities for storing, treating and retrieving stormwater run-off for subsequent use.**

Principle 37 The arrangement of roads, allotments, reserves and open space should enable the provision of a stormwater drainage system that:

- (a) **retains and protects natural watercourses, drainage lines and vegetation;**
- (b) **incorporates detention and/or retention basins necessary to maintain the peak volume and rate of peak flow run-off from newly developed areas at levels as near as possible to those which existed prior to urban development;**
- (c) **provides, where feasible, for aquifer recharge;**
- (d) **enhances residential amenity;**
- (e) **integrates with the open space system and surrounding area; and**
- (f) **directs stormwater generated from roads and car parks through natural stormwater treatment and devices such as swales, bio-retention systems and wetlands. (underlining added)**

The subject site contains 81 existing dwellings, other non-domestic buildings and roads across 22.6 hectares. This established development has an existing impact on stormwater. Therefore, the focus of assessment for the current land division application is on any additional stormwater impact created by the potential for 50+ additional dwellings and tourist/other accommodation.

The proposed land division reflects the existing pattern of development across the site, creating Torrens Titled allotments for vacant sites predominantly where dwellings existed in the past. This means that many existing stormwater management systems (e.g. existing internal streets, reserves) can be used as part of the stormwater management system.

It appears that stormwater is currently directed towards Woodside-Nairne Road and not retained on the site at all. There appears to be no existing infrastructure that cleans stormwater before it leaves the site.

There is a drainage swale along the southern side of the Woodside-Nairne Road that directs stormwater in a north-westerly direction towards an inlet pit on the eastern side of Coral Avenue approximately 140m from the subject site, before being directed into a pipe culvert under the Woodside-Nairne Road and then into a watercourse on the northern side of this road.

The detail of stormwater management system associated with the proposed land division is provided in the Stormwater Management Plan prepared by WGA and provided as an Appendix to this report.

The proposed stormwater management plan achieves the following key objectives and thereby satisfies the relevant provisions of the Development Plan quoted above in the following key ways:

- Reduced flows from the site compared to existing in all circumstances and significant reductions for major rain events (100 year rainfall events)
- Significantly improved stormwater runoff quality compared to the existing situation
- Environmentally and visually aesthetic measures to attenuate flow and detain stormwater, and
- Low maintenance stormwater measures to reduce the burden on Adelaide Hills Council.



5.5.4 Roads

There are a number of provisions in the Adelaide Hills Development Plan that guide road design as follows:

Council Wide - Land Division

Principle 29 When land is divided: ...

- (b) proposed roads should be graded, or be capable of being graded to connect safely and conveniently with an existing road or thoroughfare; ...
- (e) each allotment resulting from the division should be provided with safe and convenient access to the carriageway of an existing or proposed road or thoroughfare. No allotment should be solely dependant upon a private road, or right of way, for access; ...

Principle 33 Allotments adjacent to roads shown as being required for road widening on the Plan deposited under the provisions of the Metropolitan Adelaide Road Widening Plan Act 1972 shall allow for the road widening proposed in that Plan.

Principle 34 Roads should be designed to enhance the safety and convenience of all users (motorists, cyclists and pedestrians).

As described previously, the proposed land division takes advantage of the existing road/street network on the subject site with some minor adjustments including:

- the closure of the intersection of Innes Court (formerly Balaklava Avenue) and Nairne Road and the slight extension of Innes Court in a westerly direction to provide vehicle access to the rear of allotments that also have frontage to Nairne Road
- the closure of the intersection of Inverbrackie Close (formerly Dargie Avenue) and Nairne Road, and
- the extension of Crest Place (formerly Balmoral Place) to provide a turnaround area at its southern end.

There are two main positive planning outcomes resulting from these proposed street network alterations:

1. There will be only two streets connected to Nairne Road (Balmoral Road (formerly Alamein Avenue) and Caledonia Avenue (formerly Lucknow Avenue), where there are currently four, improving safety and efficiency for vehicles along Nairne Road (an Arterial Road in the Adelaide Hills Development Plan), and
2. There will be no further dwellings with direct vehicle access to Nairne Road. Those currently with direct access will be provided with alternate rear access as well. Accordingly, safety and efficiency for vehicles along this arterial road will improve.

MFY Traffic and Parking Consultants have prepared a report regarding the traffic implications of the proposed land division (copy attached).

MFY recommend relatively minor modifications to the alignment of Lucknow Avenue and the creation of an easement to the east of Alamein Avenue which will ensure that appropriate sight lines are maintained for drivers exiting to Woodside-Nairne Road. DPTI has indicated satisfaction with this approach and with the proposed closure of the two other existing roads to Woodside-Nairne Road.



The forecast traffic volumes associated with anticipated future development of the site will be low and will have minimal impact on the operation of Woodside-Nairne Road. Internal traffic volumes associated with the proposed development will be well within those anticipated for residential streets and will be adequately accommodated on the existing road network.

I contend that the proposed road/street network associated with the proposed land division satisfies the relevant Development Plan provisions identified in the following ways:

- All roads/street will have an appropriate grade (PDC 29(b))
- None of the proposed allotments will require access via a private road or right of way (PDC 29(e)), acknowledging that proposed allotments 136-138 have rear access via a right of way as an alternative access option to Woodside-Nairne Road (as is the case for these allotments now)
- The reduction in the number of streets and allotments accessing Nairne Road will enhance the safety and convenience of this arterial road (PDC 34)
- Relatively minor modifications to the alignment of Lucknow Avenue and the creation of an easement to the east of Alamein Avenue which will ensure that appropriate sight lines are maintained for drivers exiting to Woodside-Nairne Road (PDC 34).

5.5.5 Water Supply and Waste Water

The Council Wide section of the Adelaide Hills Development Plan entitled “Land Division” includes the following provision relevant to the provision of water supply and sewer:

Principle 29 When land is divided: ...

- (f) a water supply sufficient for the purpose for which the allotment is to be used should be made available to each allotment;
- (g) provision should be made for the disposal of waste waters, sewage and other effluent on each allotment without risk to health. (underlining added)

As indicated previously, the subject site already contains water and sewer infrastructure provided by SA Water. This means that the proposed land division readily satisfies Principle of Development Control 29(f) and (g) as quoted above.

Importantly, it also means negligible and acceptable risk of pollution in the Mount Lofty Ranges Watershed from sewerage associated with development on the subject site.

5.5.6 Electricity and Telecommunications

The Council Wide section of the Adelaide Hills Development Plan entitled “Land Division” includes the following provision relevant to electricity and telecommunications:

Principle 29 When land is divided:

- (a) any reserves or easements necessary for the provision of public utility services should be provided; ... (underlining added)

As also indicated previously, the subject site already contains electricity infrastructure owned by SA Power Networks above and below ground within the existing on-site street network. This means that the proposed land division readily satisfies the Principle of Development Control 29(a) as quoted above.



Telstra has confirmed that there is existing infrastructure on the site to support phone lines and ADSL internet connections to the properties. A desktop review of the NBN Co website identifies that the NBN will be available in the area from January 2018 via the Fixed Wireless method where the transmission is via a wireless signal to an installed antenna on the roof.

5.5.7 Future Dwelling Design

The Watershed (Primary Production) Zone also contains the following provision which links land division to future dwelling design:

Principle 18 Land Division should only occur where a suitable site for a detached dwelling is available which complies with the criteria detailed in Table AdHi/5. (underlining added)

TABLE AdHi/5

Non-complying Exemptions

- (a) Is not located on land subject to flooding as shown on Figures AdHiFPA/1 to 19 or other areas subject to flooding or inundation by a 1 in 100 year average return interval flood event or situated on land fill which would interfere with the flow of flood waters.
- (b) Is connected to an approved sewerage or common effluent disposal scheme or has an existing, or approved, on-site waste water treatment and disposal method which complies with the Standard for the Installation and Operation of Septic Tank Systems in South Australia (including Supplements A & B) as prepared by the South Australian Health Commission;
- (c) Does not have any part of a septic tank effluent drainage field or any other waste water disposal area (eg irrigation area) located within 50 metres of a watercourse identified on a current series 1:50 000 Government standard topographic map and when locating tourist accommodation for eleven guests or more any effluent generated is not disposed onto land:
 - (i) In a high rainfall zone (>900 mm/year);
 - (ii) Within 200 metres of a major watercourse (3rd or higher order);
- (d) Does not have a waste water disposal area located on any land with a slope greater than 20 percent (1 in 5), or depth to bedrock or seasonal or permanent watertable less than 1.2 metres;
- (e) Does not have a septic tank or any other waste water treatment facility located on land likely to be inundated by a 10 year return period flood event;
- (f) Is sited at least 25 metres from any watercourse identified on a current series 1:50 000 Government standard topographic map;
- (g) In the case of tourist accommodation, has a secure, potable water supply that can provide at least 125 litres per person per day (including staff) that meets the South Australian Health Commission standards. (underlining added)

Any new dwelling, tourist accommodation or small scale commercial development that may be proposed on the subject land can readily comply with these guidelines.

5.5.8 Native Vegetation

The following Principle of Development Control in the Land Division section of the Development Plan relates to native vegetation:

Principle 30 Allotment boundaries should be located where interference with native vegetation and drainage lines will be minimal and in locations which enhance the management of the natural features. (underlining added)



The following provisions in the Conservation section of the Development Plan relate to native vegetation:

Objective 70: The retention of remaining native vegetation.

Although South Australia has a reasonably comprehensive National Parks reserve system, there is a considerable amount of native vegetation on private and public land which it is impractical to incorporate into the reserve system.

Because the loss of native vegetation since settlement has reached a stage where any further losses could lead to unacceptable species extinctions, it is now necessary to conserve this off-park vegetation wherever possible.

The retention of native vegetation also has benefits in respect of landscape amenity, water quality and soil stability.

Objective 72: The retention of native vegetation for amenity purposes, for livestock shade and shelter, for the movement of native wildlife and for seeds.

Objective 76: Conservation and retention of flora and fauna including significant stands of vegetation.

The retention of large bushland areas, roadside vegetation, and clumps of trees on hilltops, and elsewhere, is important, not only to preserve scenic beauty, but also for wildlife habitats, ecological study, recreation areas, and for the control of soil erosion and water quality.

Steps should be taken to conserve as much of the remaining vegetation as possible and to encourage land owners to set aside, fence and manage, areas of native vegetation. Encouragement should be given to the replanting of indigenous species as a means of restoring native vegetation to parts of the area. If it is necessary to fell trees of visual significance, replanting should be undertaken.

Objective 79: Land division, including boundary re-arrangement, which retains areas of native vegetation on single or the least number of allotments.

Principle 203 Natural vegetation should be preserved and replanting should take place.

Principle 209 Native vegetation should not be cleared if it:

- (a) provides important habitat for wildlife;
- (b) has a high plant species diversion or has rare or endangered plant species and plant associations;
- (c) has high amenity value;
- (d) contributes to the landscape quality of an area;
- (e) has high value as a remnant of vegetation associations characteristic of a district or region prior to extensive clearance for agriculture;
- (f) is associated with sites of scientific, archaeological, historic, or cultural significance; or
- (g) is growing in, or is characteristically associated with, a wetland environment.

Principle 210 When clearance is proposed, consideration should be given to:

- (a) retention of native vegetation for, or as:
 - (i) corridors or wildlife refuges;
 - (ii) amenity purposes;



- (iii) **livestock shade and shelter; or**
- (iv) **protection from erosion along watercourses and the filtering of suspended solids and nutrients from runoff;**
- (b) **the effects of retention on farm management; and**
- (c) **the implications of retention or clearance on fire control. (underlining added)**

As acknowledged earlier in the Statement of Effect, the existing native vegetation on the subject site is one of its key attributes. The proposed land division seeks to capitalise on this natural advantage by ensuring the retention of native vegetation, particularly large eucalyptus trees.

The proposed new allotments have been carefully aligned so that existing native vegetation can be retained on each of the allotments where future dwellings and other buildings are anticipated. The subdivision pattern also largely follows the alignment of previous dwelling locations, thereby also minimising impact on native vegetation. This means that the proposed land division satisfies the relevant provisions of the Development Plan quoted above in relation to the preservation of native vegetation.

The open space lot within 201 will be subject to detailed design in consultation with Adelaide Hills Council, balancing the existing trees and potential for improved public amenity and greater activation of this space.

Mill Hill Capital have now engaged with the Native Vegetation Council (NVC) and are in discussions to develop a plan with the NVC that maximises the retention of native vegetation while providing maximum public and private utility of the subject site. Any limited removal of native vegetation will need to go through the off-set process via the NVC.

5.5.9 Economic, Social and Environmental Impact

Economic Impact

Mill Hill Capital have prepared a report on the broad economic and social impact of the proposed development of this site (copy attached in Appendices). This report has been reviewed and acknowledged by Adelaide Hills Council staff.

The report outlines the positive impacts the proposed subdivision and subsequent development of the property would have on the local community. Some of the important points to note from this report are as follows:

- \$20 million in construction activity on the site as part of the residential improvement and expansion. This would lead to 320 construction job and 480 other jobs across the rest of the economy.
- There would be a further 360 people (approx.) into the local community contributing a further \$9.6m in household incomes into the community.
- The approval of the Tourism component of the site would allow for a further \$7m in construction activity and provide important short-term tourist accommodation to the region.



- It is estimated that guests utilising the tourism facility would contribute \$4.2m to the economy annually.
- Local and State Government authorities and utility providers would be the direct beneficiaries of the approval of this subdivision application through increased rates and charges applicable to multiple individual titles.

Social Impact

The proposed land division will have a positive social impact by facilitating:

- High quality housing and land at an attractive price for a variety of residents, creating a vibrant and diverse community that shares the relatively low-density characteristics of many of the townships throughout the Adelaide Hills. It makes the most of the existing well-designed and maintained housing, provides for the development of complementary infill housing that completes the community in a logical manner/layout and designates areas of public open space/recreation facilities that will enhance the amenity of residents.
- Opportunity for the establishment of tourist accommodation in the form of cabins and caravan/camping facilities and adaptively re-using some of the existing buildings on the site such as the community hall, day-care facility, gym where possible, capitalising on/supporting the Adelaide Hills' reputation as a favoured tourism destination in South Australia.

Environmental Impact

The environmental impact of the proposed development has been considered in detail in the various sections of this report in terms of wastewater management, stormwater management and native vegetation. In summary, the site is connected to sewer, stormwater management will be improved from what exists and there will be negligible impact on native vegetation. The proposed land division will also facilitate the upgrade of existing infrastructure to a modern standard (which would otherwise be too expensive), and for it to be maintained properly over the long-run. Water and sewer leakage will also be eliminated. There will also be improved traffic safety and efficiency internally and along Nairne Road.

5.5.10 Not Seriously At Variance

Section 35 (2) of the Development Act 1993 states:

“Subject to subsection (1), a development that is assessed by a relevant authority as being seriously at variance with the relevant Development Plan must not be granted consent.”

Neither the Development Act 1993 nor the Development Regulations 2008 define or provide guidance to what is meant by seriously at variance. The following ERD Court rulings are, however, instructive in the determination of whether the proposed land division application is seriously at variance with the Development Plan:

- (a) Judgement of Justice DeBelle in *Joy Hayes & Ors v Development Assessment Commission, Corporation of the City of West Torrens and Prizac Developments Pty Ltd (No. 4) [1997] SAS 6155*, in which the following was noted:

“58. What is meant by the expression ‘seriously at variance’? In this context ‘seriously’ is the adverb reflecting the fourth of the meanings by which the epithet ‘serious’ is defined in the Macquarie



English Dictionary, namely “weighty or important”. Thus, the expression ‘seriously at variance with the Development Plan’ refers to that which is an important or grave departure in either quantity or degree from the Development Plan. It denotes something which is plainly not slight or trifling ... It is not enough that the proposal might conflict with the Development Plan; it must be seriously at variance with it.”

- (b) Judgement of Judge Costello in *Terra Group P/L v City of Port Adelaide Enfield & ANOR* [2015] SAERDC 26 (10 July 2015), in which the following was noted:

“86. The concept of seriously at variance has also been described as referring to ‘an important or grave departure in either quantity or degree from the Development Plan.’”

It is contended that the proposed land division is not seriously at variance with the Adelaide Hills Council Development Plan (consolidated 24 October 2017) on the basis that there is no significant departure from Development Plan policy given that it is largely based on existing residential and ancillary development with associated urban infrastructure on the subject site.

5.5.11 Consideration of Unintended Negative Consequences

While not a requirement for non-complying development applications under the Development Act or Regulations, nor is it referred to in the provisions of the Adelaide Hills Development Plan, consideration has been given to the potential for unintended negative consequences resulting from the proposed land division.

The primary unintended negative consequences and how the proposed development avoids them is described below:

- Pollution of the watershed area – this has been addressed by the fact that the site is serviced by SA Water in terms of water and sewer infrastructure, and the proposed land division includes carefully designed stormwater management to minimise any erosion and ensure high water quality in the watershed area.
- Reduction/stifling of primary production – no land will be removed from agricultural production given the 100 years of use of the site for residential and ancillary use. The long-term residential use of the land also proves that it can satisfactorily co-exist with surrounding agricultural development.
- Reduction in safety and efficiency of vehicle movement along Nairne Road – the number of streets and driveways accessing Nairne Road will be reduced without a significant increase in the overall number of vehicles using the site in historical terms.

It is also noted that Principle of Development Control 70 of the Watershed (Primary Production) Zone states (in part) that:

- 70 All kinds of development are non-complying in the Watershed (Primary Production) Zone except for the following:**

Additions and alterations to an existing building, and extensions to an existing use or activity on the land, which is being lawfully undertaken, where the total floor area or site area of the extension does not exceed 25 percent of the total floor area or site area of that building or use as at 25 May 2006

Alterations or additions to an existing dwelling where;

- (a) the extension does not exceed 50 percent of the floor area of an existing dwelling; or**



(b) the extension does exceed 50 percent of the floor area of an existing dwelling, and which comply with the criteria in Table AdHi/5

Cabin within a Caravan Park in the Caravan and Tourist Park Policy Area

Camping ground in association with and ancillary to tourist accommodation in the Caravan and Tourist Park Policy Area

Caravan Park including alterations and additions to existing facilities in the Caravan and Tourist Park Policy Area

Caravan permanently fixed to land in the Caravan and Tourist Park Policy Area 40

Carport

Dwelling where the dwelling is to be erected on an existing allotment and where a habitable dwelling or tourist accommodation for up to ten guests does not already exist on the allotment, unless the dwelling is to replace an existing dwelling, and where:

- (a) no valid planning authorisation to erect a dwelling on that allotment exists; and**
- (b) no other application for planning authorisation is being made or has been made and is not yet determined for a dwelling on that allotment; and**
- (c) where the detached dwelling and allotment complies with the criteria in Table AdHi/5**

Domestic Outbuilding

Garage

Retaining Wall

Swimming Pool associated with a dwelling and intended primarily for use by occupants of that dwelling

Tourist Park in the Caravan and Tourist Park Policy Area

Verandah

Water Tank

This means that most types of development associated with dwellings will be subject to the on-merit assessment process rather than the non-complying assessment process.

While there are a limited number of Development Plan provisions relating to residential development in the Watershed (Primary Production) Zone, there are numerous Council Wide provisions that are relevant to the assessment of future applications of dwellings and dwelling additions across the subject site. This provides security that for the future assessing authority that it will be able to guide appropriate development outcomes on the site. These relevant provisions relate to the following topic areas listed in the Adelaide Hills Development Plan (in alphabetical order):

- Design and Appearance
- Energy Efficiency
- Interface Between Land Uses
- Landscaping, Fences and Walls
- Residential Development
- Siting and Visibility
- Sloping Land
- Transportation and Access



In addition, there is a raft of relevant provisions at the Council Wide level of the Adelaide Hills Development Plan that relate to non-complying development which may be proposed on the site in future including (but not limited to):

- Short-Term Workers Accommodation
- Tourism Development
- Waste

5.5.12 Implications of Refusal of Proposed Subdivision

Currently, the only available option for dwellings on the site is to be retained as rental properties. While this would provide for much needed activation of the site, it is considered to be less desirable than having a mixture of rental and owner-occupied housing stock.

Mill Hill Capital has a much broader vision for the site that contemplates a mixture of owner/ occupiers and rental properties, both new and existing, that will provide a vibrant community that mirrors other parts of the Woodside and Adelaide Hills region. In order to achieve this, subdivision approval is required so that individual dwellings and lots can be sold and/or built on.



6.0 Summary and Conclusion

The subject 22.6 hectare site has all the hallmarks of a residential suburb. This includes 81 existing dwellings located in a park-like setting. There is also a community hall, day-care facility, gym and office/workshop/ warehouse. Existing infrastructure across the site includes sealed and curbed streets, footpaths, water, sewer, electricity and stormwater infrastructure.

In the past, there has been as many as 129 dwellings located in addition to at least 15 vacant allotments.

The proposed land division has two main objectives:

1. Re-establish a residential community, making the most of the existing well-designed and maintained housing, develop complementary infill housing that completes the community in a logical manner/layout and designate areas of public open space/recreation facilities in the short-term; and
2. Develop low intensity tourist and other accommodation in the form of cabin-style accommodation and caravan/camping facilities and, if possible, adaptively re-using some of the existing buildings on the site such as the community hall, day-care facility, gym etc, in the medium term.

The subject land is located within the Watershed (Primary Production) Zone under the Adelaide Hills Development Plan. It is also located within the Onkaparinga Valley Policy Area 10. At first view, there appears to be little policy support in the Development Plan for the division of the subject land. This, however, ignores the fact that the subject land is a long established residential community.

Given that it has been controlled by the Federal Government for much of the past 100 years, the local council has little or no control over what has occurred on the subject land. Therefore, the Adelaide Hills Development Plan and the associated Watershed (Primary Production) Zone has had 'no work to do' in terms of the development of the site and there has been no reason to change the Development Plan policy as it relates to the land.

In fact, the existing zoning is inappropriate for a site that has clearly been functioning as a residential community for many years.

In this context, it is contended that the assessment of this application should rest primarily on the perceived impact of the proposed land division on key objectives of the Zone. These are the protection of water quality in the watershed, the sustainability of surrounding agriculture and the protection of existing desirable character attributes.

In this regard, it is contended that the proposed land division performs very well and warrants approval.



Appendix A

MFY Traffic and Access Report



MILL HILL CAPITAL

**PROPOSED LAND DIVISION
300 WOODSIDE-NAIRNE ROAD**

LAND DIVISION REPORT

December 2017

17-0075

Traffic • Parking • Transport

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1.0 INTRODUCTION

This report relates to the proposed land division of the existing Inverbrackie Detention Centre located at 300 Woodside-Nairne Road. The detention facility, which was previously defence force housing currently includes 81 dwellings. The land division comprise of 138 residential allotments plus other facilities. As such, there is a potential to add an additional 57 residential dwellings to the site.

Discussions with Department of Planning, Transport and Infrastructure (DPTI) were undertaken in regards to the access arrangements to/from the site. Specifically, the discussions were aimed at reducing the number of access points to Woodside-Nairne Road without compromising the safety of the access.

A review of existing traffic control within the development has also been conducted to identify areas of non-compliance or where traffic control would need to be upgraded to meet current legislative requirements.

A traffic assessment of the proposed land division and its impact on the existing road internal road network and Woodside-Nairne Road has been presented in this report. Consideration has been given to the previous land use of the site when assessing the impact on the road network.

The assessment has been based on Fyfe Pty Ltd Drawing No. 25894SU1-R11 dated 10 October 2017.

2.0 EXISTING SITUATION

The subject site is bound by Nairne Road to the north and east, Australian Defence Force barracks to the west and undeveloped land to the south. The 22.6 hectare site comprises of 81 residential dwellings plus other community facilities. Figure 1 identifies the subject site

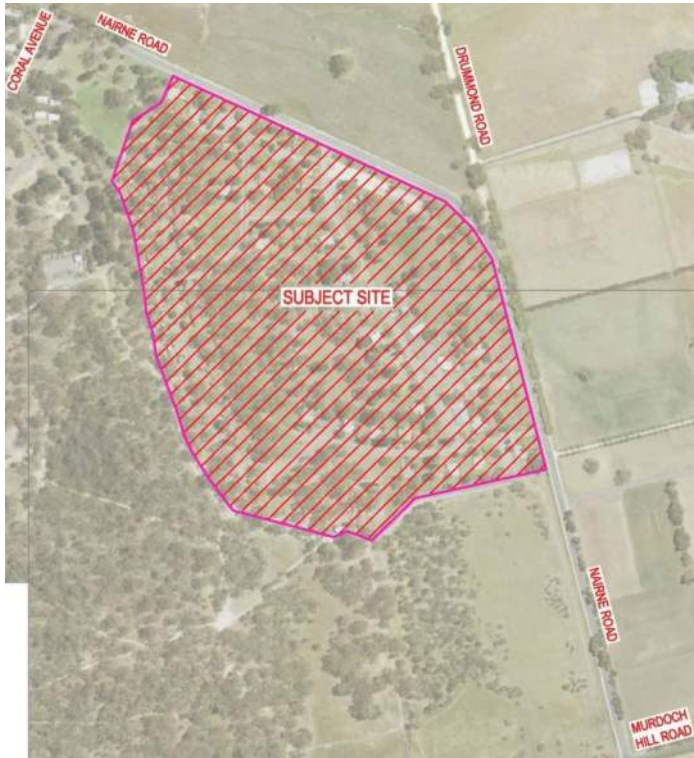


Figure 1: Locality of site

Access to the subject site is provided to/from Woodside Nairne Road via four access roads which service the subject site via an established internal road network that serviced the previous development. Balaklava Avenue and Alamein Avenue are located along the northern boundary while Dargie Avenue and Lucknow Avenue are located on the eastern boundary of the subject site.

The existing dwellings on the land have frontage to one of the internal roads with the exception of four residential properties that have frontage to Woodside Nairne Road. These dwellings are accessed via this road, crossover from Woodside Nairne Road.

An assessment of the existing road network was completed in relation to traffic engineering requirements. The results of this assessment are included in Appendix A.

Woodside-Nairne Road is a rural road under the care and control of the Commissioner of Highways. The section of Woodside Nairne Road adjacent the site has an annual average daily traffic in the order of 3,400 vehicles and a posted speed limit of 80 km/h.

3.0 PROPOSAL

It is proposed to divide the existing land into residential allotments as illustrated on Fyfe Pty Ltd Drawing No. 25894SU1-R8 (Revision 8) dated 05 July 2017. The proposal will create 138 allotments which, when developed, will result in an additional 57 dwellings on the land. A number of other existing buildings will also be retained which could be redeveloped for community uses. Figure 2 illustrates the proposed land development.

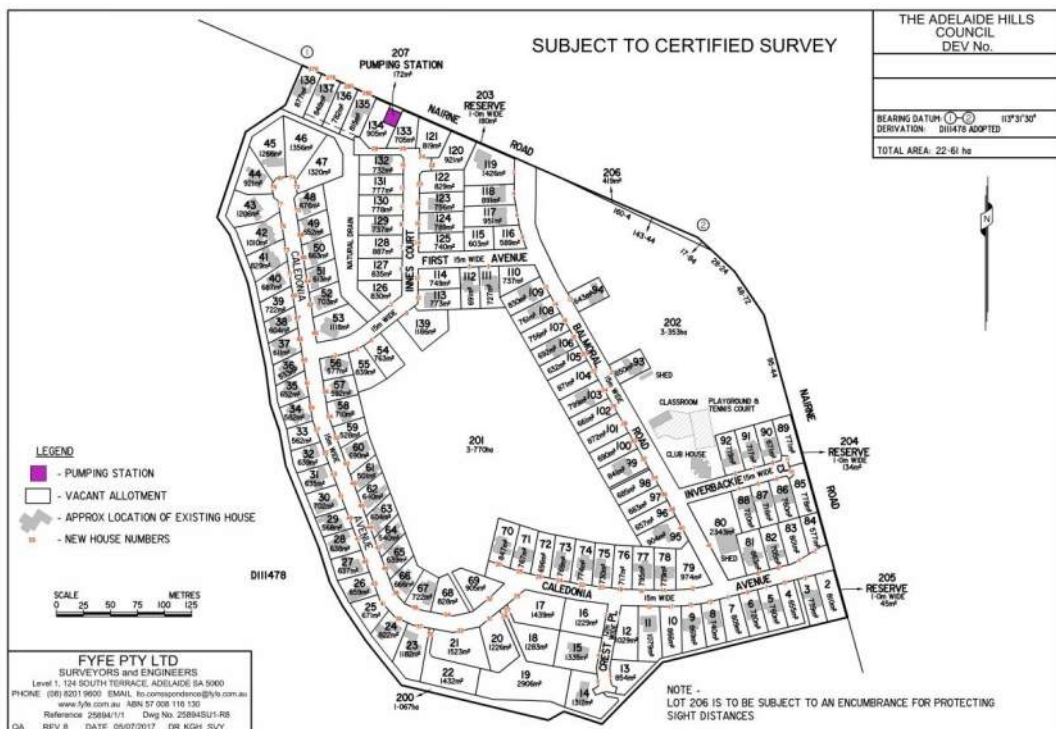


Figure 2: Proposed land development (source: Fyfe Pty Ltd)

It is proposed that the subject site will be subdivided to create public roads, with the road infrastructure transferred to Council. In relation to the traffic assessment, the road safety and accessibility standards adopted for the assessment.

It is identified the existing roads will be renamed as part of the proposed development. Table 1 identifies the existing and proposed road name changes. However, for the purpose of this assessment, the existing road names have been used.

Table 1: Road Schedule

Existing Road Name	Proposed Road Name
Lucknow Avenue	Caledonia Avenue
Balaklava Avenue	Innes Court
First Avenue	First Avenue
Alamein Avenue	Balmoral Road
Dargie Avenue	Inverbackie Close
Balmoral Place	Crest Place

3.1 ACCESS ROADS

It was identified on-site that with the exception of Balaklava Avenue, all existing intersections of road servicing the site with Woodside Nairne Road have sightline restrictions. These are created horizontally by the bend in the road and vertically by a hill, east of the site.

The proposal seeks to reduce the number of intersections with Woodside - Nairne Road from four to two. Adjacent the northern frontage, Alamein Avenue is preferred as it has a wider pavement than Balaklava Avenue and acts as a collector road for the site.

A sightline assessment at Alamein Avenue identified that Safe Intersection Sight Distance (SISD) could be achieved by ensuring a small portion of the site was maintained clear of vegetation. This area is identified in the plan (Allotment 206) as an encumbrance for protecting sight lines. Figure 3 illustrates the sightline assessment for the Alamein Road/ Woodside - Nairne Road intersection.

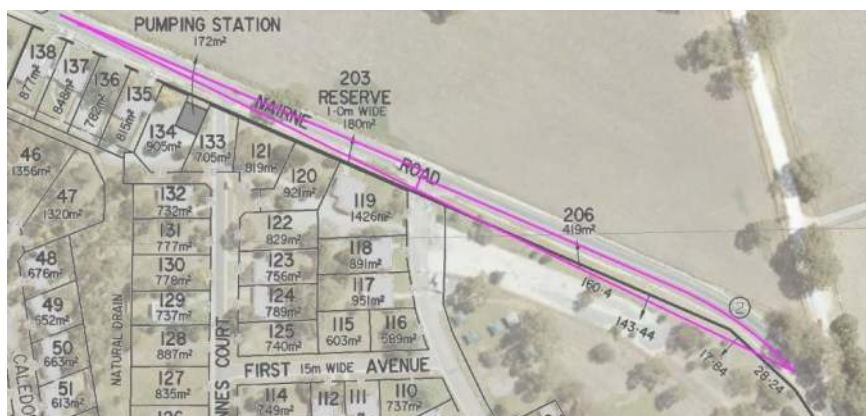


Figure 3: Sightline assessment for Alamein Road access

Lucknow Avenue provides a more direct internal road connection and, therefore, has been adopted as the connection to the eastern frontage. The sight distance restriction to the east relates to the vertical profile of the road. Sight distance for drivers accessing the site to/from Lucknow Avenue will be met if the intersection is realigned to the west as illustrated in Figure 4.

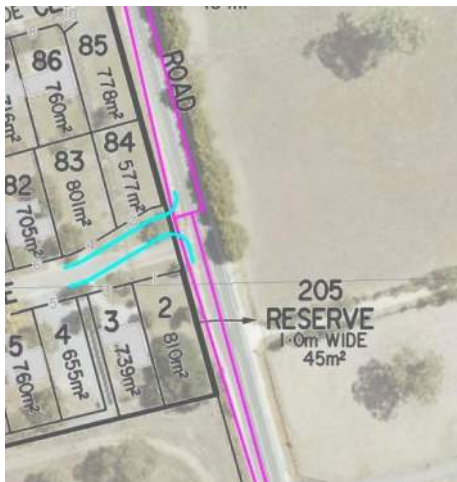


Figure 4: Proposed realignment of Lucknow Avenue intersection with Woodside – Nairne Road.

3.2 INTERNAL ROAD NETWORK

Internal road network will comprise of the existing roads with minor upgrades. A 15 metre wide road reserve is proposed for each road (except for Balmoral Place which has a 12 metre road reserve) which will enable the roads to be transferred to the care and control of Council. Existing issues identified in the assessment of the road network can be addressed during the upgrade of the road network.

The existing road network has previously accommodated access for a bus route and refuse vehicles. Accordingly, the existing network will satisfactorily cater for these vehicles.

3.3 ACCESS TO ALLOTMENTS

Access to all vacant allotments will have access via the internal road network, as will the majority of existing dwellings.

However, due to the orientation of existing dwellings fronting Woodside – Nairne Road, existing crossovers to service these allotments will be maintained. This has been identified during preliminary negotiations with DPTI. While understanding the need to maintain access for existing dwellings, DPTI has requested that, in the event that the dwelling be demolished, that any new development be able to access the allotment via the internal road network, thus enabling the access to Woodside – Nairne Road be closed.

Accordingly, a right-of-way will be created from Innes Court to provide for future access for these allotments, as illustrated in Figure 5.



Figure 5: Proposed right of way which will service allotments fronting Woodside – Nairne Road

4.0 TRAFFIC ASSESSMENT

The subject site would have previously generated traffic when the dwellings were occupied. The generation rate associated with the internal use as defence homing would have been comparable with what will be generated when the existing houses are refurbished and occupied.

The subject proposal will include the creation of additional allotments and, therefore, will generate traffic on the Woodside – Nairne Road. It will also create a larger balance allotment which will be developed at a future stage. For the purpose of this assessment it has been assumed that the larger allotment could generate traffic volumes akin to a tourist park type facility, albeit no actual development is currently being proposed for this site.

This assessment has considered traffic which will be generated by the entire site, notwithstanding that there is an existing volume which could be applied to the road network.

4.1 TRAFFIC GENERATION

It is expected that the residential allotments within the subject development will generate traffic at a rate of eight trips per dwelling per day. This is consistent with results of traffic surveys of residential land divisions completed in Littlehampton and Mt Barker and has been utilised as the generation rate for numerous residential development assessments in recent years. On this basis, the proposed development of 138 allotments would generate approximately 1,105 trips per day or 110 trips during the peak hour.

In addition, if the larger allotment was to be developed as a tourist park facility (should the site be rezoned) it would also generate some traffic during peak commuter periods. These volumes would, however, be relatively low. For the purpose of this assessment, it has been assumed that this site could generate up to 30 trips during the peak hour, albeit this is likely to be higher than will be realised.

4.2 TRAFFIC DISTRIBUTION

Local service facilities for residents of the subject land will be in Woodside but the Regional Centre is Mt. Barker which is accessible via Nairne. This route is also more convenient for commuters who travel on the South Eastern Freeway to/from Adelaide.

In order to understand the likely distribution between these two routes, reference was made to the vehicle movement turning survey completed by DPTI at the Nairne Road/Riverview Road/Pfeiffer Road intersection. The results of these turning counts, completed in February 2015, identified that approximately 88% of trips turned at the intersection to/from the south-east (Nairne direction), with the balance turning

to/from Woodside. Accordingly, a distribution of 85% of traffic travelling to/from Nairne and 15% of traffic travelling to/from Woodside was adopted for this assessment.

In addition to the above the following assumptions were made:

- 20% of trips will be entering the site and 80% will be exiting the site during the am peak hour;
- 70% of trips will be entering the site and 30% will be exiting the site during the pm peak hour;
- 55% of the trips will use Alamein Avenue; and
- 45% of the trips will use Lucknow Avenue.

4.3 FORECAST VOLUMES

Based on the above rates and distribution, anticipated volumes have been forecast at the Alamein Avenue and Lucknow Avenue intersections for the morning and afternoon peak periods, as illustrated in Figure 6.

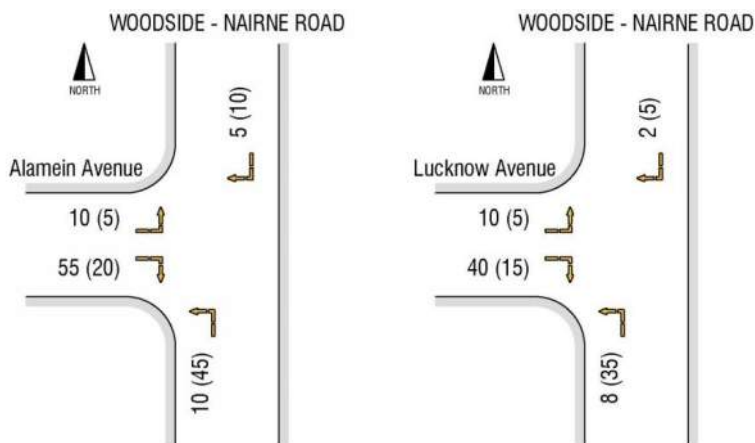


Figure 6: Forecast peak hour turning volumes [am(pm)]

Note that the above turning movements are total anticipated movements during the peak hour periods and not additional movements, given that there are existing dwellings on the site.

4.4 TRAFFIC IMPACT

4.4.1 WOODSIDE-NAIRNE ROAD

The forecast additional traffic volume associated with the subject development will be readily accommodated on the Woodside – Nairne Road. In order to understand if the

additional traffic will impact the operation or safety of the intersection, consideration was given to whether the warrant for an intersection treatment would be realised following completion of the development. Figure A10 (b) of Austroads Guide to Road Design Part 4, Intersections and Crossings General provides guidance in respect to the requirements of intersections. Based on the forecast turning volumes, there will not be a warrant for a channelised right turn treatment to be provided at the intersections.

4.4.2 INTERNAL ROAD NETWORK

The general layout of the allotments and the roads will result in the most of the streets experiencing traffic less than 500 vpd which is typical of a lower order local residential street. Alamein Avenue and Lucknow Avenue will experience marginally larger traffic flows, at the intersections with Woodside-Nairne Road, albeit the volumes would still be well within that anticipated on a residential street.

Figure 7 identifies the internal roads and the anticipated daily volumes.



Figure 7: Anticipated daily volumes on the road network

5.0 SUMMARY

The proposed land division of the former Inverbrackie detention facility will result in the creation of 138 residential allotments, a number of which have existing dwellings. Separate land parcels with existing infrastructure will also be created.

Access to the site will be provided via two existing intersections, namely, Alamein Avenue and Lucknow Avenue. The remaining two intersections which service the existing site will be closed.

Minor modifications to the alignment of Lucknow Avenue and creation of an easement to the east of Alamein Avenue will ensure that appropriate sight lines are maintained for drivers exiting the intersection to Woodside-Nairne Road. Discussions with DPTI have indicated that such an arrangement will be acceptable, acknowledging that the closure of two access points will provide safety benefits to the arterial road.

A review of forecast traffic volumes identified that the increased traffic will be low and will have minimal impact on the operation of Woodside-Nairne Road. Further, the proposal would not generate the warrant for channelised right turn treatments to be constructed at the intersections.

Internal traffic volumes associated with the proposed development will be well within those anticipated on a residential street and will be adequately accommodated on the existing road network, particularly given that the infrastructure will be upgraded as part of the subject proposal.

In summary, therefore, the traffic requirements associated with a residential land division can be accommodated with minor amendments to the existing network, as proposed in the subject application and detailed in this report.



APPENDIX A

SITE ASSESSMENT



Appendix B

Fyfe Infrastructure Assessment



CREST @ WOODSIDE
CONCEPT PLAN OF DIVISION
SURVEY CONSULTANCY
INFRASTRUCTURE ASSESSMENT

PREPARED FOR | Mill Hill Capital / Woodside (SA) Pty Ltd

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EXECUTIVE SUMMARY

INFRASTRUCTURE ASSESSMENT – CREST @ WOODSIDE

Woodside (SA) Pty Ltd has recently purchased the CREST @ Woodside from the Department of Defence. The CREST @ Woodside site is located 3 kilometres from the town centre of Woodside on Nairne Road. The site spans 22.6 hectares and has 81 existing three and four bedroom brick houses, in addition to a number of community and ancillary buildings. The Australian Defence Force traditionally housed its officers at the site and more recently it was a low security, family oriented immigration centre.

An investigation was undertaken in order to assess the current condition of various infrastructure for the purposes of future site development. General findings were as follows:

- The site encompassed three (3) distinctive types of kerbing. The 'Type 1' and 'Type 2' kerbing, whilst slightly cracked/chipped in some areas, was overall in reasonable condition. The 'Type 3' kerbing was extensively damaged and had an inconsistent profile.
- Concrete footpaths were generally in good condition, with slight cracking and/or deformation. The maximum recorded footpath crack widths were 10mm, with an average crack width of approximately 2mm.
- Street signs were, overall, in reasonable condition; only a few street signs were bent, damaged or had been subjected to vehicle impact. Signs for which the sign post has been bent or deformed will require replacement in order to achieve adequacy.
- Street lights were in acceptable condition, however the luminosity or condition of light globes could not be determined at the time of inspection. Street light locations have been recorded in Appendix C.
- Street-side electrical poles were largely in acceptable condition, with the exception of a couple which were significantly slanted. Cracks to the concrete portion of the Stobie poles were generally hairline, with a maximum recorded crack width of approximately 2mm.
- Steel framed bus shelters remained largely intact, however some steel members were significantly rusted. Timber fascia members were also significantly rotted.
- The communal playground and barbeque area was generally in good condition. One of the canopy supporting members above the playground, however, has buckled and will subsequently need to be replaced.



1. BRIEF

Woodside (SA) Pty Ltd has recently purchased the CREST @ Woodside from the Department of Defence. The company is a fund managed by Mill Hill Capital (MHC), a Sydney based private equity group.

The CREST @ Woodside is located 3 kilometres from the town centre of Woodside on Nairne Road. The site spans 22.6 hectares and has 81 existing three and four bedroom brick houses, in addition to a number of community and ancillary buildings. The Australian Defence Force traditionally housed its officers at the site and more recently it was a low security, family oriented immigration centre.

As a part of Woodside (SA) Pty Ltd's future plans for the site, they require a survey concept plan to be completed as a part of a subdivision and potential re-zoning of the site. The aim of this particular report is to establish the existing condition of civil infrastructure throughout the CREST @ Woodside site.

1.1 Scope

The scope of this infrastructure assessment report includes, but is not limited to, the following items:

- Visual assessment of all roadside kerbing and footpaths, including driveway cross-overs and disability access ramps
- Visual assessment of street-side furniture, including street signs, light posts, bus shelters and electrical Stobie poles.
- CCTV investigation of the stormwater drainage networks to assess the existing condition of the pipe network, as well as determine the location of any significant blockages.
- Documentation of findings, in relation to the visual assessment, as to the existing condition of all inspected infrastructure.
- Preparation of a written report detailing findings from the visual inspection, including plans and photographs as necessary.

1.2 Exclusions

The infrastructure assessment report specifically excludes the following:

- Assessment of established asphalt roads or other items not specifically listed within the previously outlined scope of works.
- Assessment of existing private houses and/or community buildings within the CREST @ Woodside Site
- Survey works, assessment or investigation into other civil infrastructure (asphalt roads, etc.) not specifically related to the previously outlined scope of works
- Reporting on items which cannot be assessed on a visual basis, other than providing an opinion where we deem it appropriate
- Recommendations or assessment regarding the structural adequacy of items inspected.



2. REPORT

The following infrastructure assessment report outlines the existing condition of all inspected items within the CREST @ Woodside site. Brief descriptions have been provided as to the severity of cracks/defects inspected, where appropriate. Comments and findings should be read in conjunction with the photos and relevant items provided within the Appendices if this report.

2.1 Site Background & General Condition

An additional 40 to 50 (600 – 800m²) housing lots have been planned across the CREST @ Woodside site; some of the lots are already established with existing domestic structures, whilst the others will be subdivided into lots of land. The approximate site layout can be seen below in Figure 2.1:

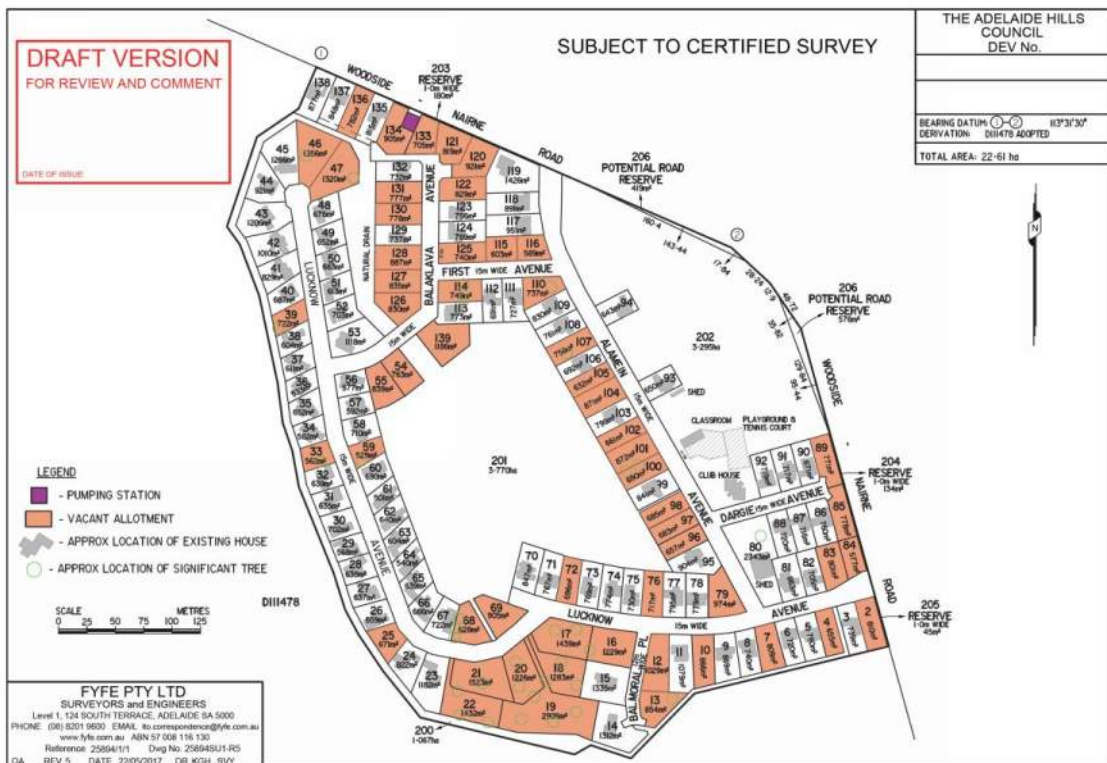


Figure 2.1 - CREST @ Woodside Site Overview

Photos have been provided in Appendix A, outlining the general existing condition of the CREST @ Woodside site. The photos were taken along the existing, unmodified asphalt roads.

2.2 Kerbs & Footpaths

The CREST @ Woodside site incorporates 3 (three) distinctive types of kerbing, each with varying degrees of damage, cracking and degradation. The accompanying adjacent footpaths were measured to be 1.0m or 1.2m in width, with fairly consistent conditions throughout the site. An overview of the locations of each kerb type and adjacent footpaths have been outlined in Appendix F. An extensive overview and accumulation of inspection photos of the kerbing/footpaths throughout the site have been included in Appendix B.

'Type 1' Kerbing:

Kerb 'Type 1' is reminiscent of a typical modern domestic kerb, with a 150mm kerb face and 300mm gutter. The condition of this particular kerb type is good, overall, with some slight cracking and/or chipped sections throughout the site. A typical 'Type 1' kerb has been shown below in Figure 2.2.



Figure 2.2 – Typical 'Type 1' Kerb Condition & Geometry (Appendix B, Photo 12)

The cracking observed throughout the 'Type 1' kerbing was generally no more than approximately 10mm in width; most observed cracks and defects had a crack width of approximately 2mm. The overall kerb geometry and relative level to the adjacent asphalt road is very consistent throughout the site.

'Type 2' Kerbing:

The 'Type 2' kerbing is very similar to the 'Type 1' kerb, however the 300mm gutter has been omitted. The overall condition of the kerbing is consistent with that of 'Type 1', in that slight cracking was observed (generally no greater 10mm in width), as well as moderate chipping, particularly around driveway entrances.



Figure 2.3 – 'Type 2' Kerb Condition & Geometry (Appendix B, Photo 20)

The 'Type 2' kerbing has been depicted in Figure 2.3, above. The face of the kerb remained fairly consistent throughout, at approximately 150mm above the finished surface level of the adjacent asphalt.

'Type 3' Kerbing:

As shown in Figure 2.4, the 'Type 3' kerbing is largely mismatched and inconsistent compared to 'Type 1' and 'Type 2'. The recorded cracks reached crack widths of approximately 50mm, and kerb chips were increasingly severe. The 'Type 3' kerbing exhibited varied heights between the finished surface level of the adjacent asphalt and the top of the kerb; typical heights ranged between 0mm and 100mm.



Figure 2.4 – ‘Type 3’ Kerb Condition & Geometry (Appendix B, Photo 365)

The ‘Type 3’ kerbing has also, in the majority of locations, started to ‘fall’ or ‘twist’ toward the adjacent asphalt roads. As can be seen in Figure 2.4, the kerb has also begun to settle into the underlying soil.

Areas Without Kerbing:

As shown within the site inspection photos (Appendix B), Balmoral Place does not have kerbing on either side. Road-side drainage is achieved through a compacted earth spoon drain, flowing toward Lucknow Avenue. Kerbing has also not been provided along the CREST @ Woodside site boundary, along the rural Woodside-Nairne Road. Road-side drainage also consists of a makeshift compacted earth spoon drain, which has eroded over time to form deep road-side chasms.

Footpaths and Driveway Cross-overs:

The footpath and driveway cross-over conditions throughout the CREST @ Woodside site are largely consistent, with a maximum observed crack width of approximately 10mm. The footpaths and driveway crossovers are generally in good condition, with minor or little cracking/chipping. Some of the larger and more severe cracks and defects have been outlined in Figure 2.5.



Figure 2.5 - Typical Footpath Defects

Where footpaths have been constructed immediately adjacent large trees, the roots may have displaced some of the concrete 'panels' vertically, as shown above in Figure 2.5; this has subsequently created a tripping hazard. The observed vertical displacements of the footpath concrete 'panels' were measured to be no more than approximately 15mm.

2.3 Signs & Street Lighting

The signs and street lights throughout the CREST @ Woodside site were visually assessed for damage and defects; an accumulation of inspection photos, as well as a layout depicting the location of each street sign and street light, have been included within Appendix C.

Street Signs:

There are a number of signs within the CREST @ Woodside site, which are largely in reasonable condition; the sign posts are straight, stable and show little signs of denting, scratching and/or deformation. A minority of the signs have been bent or damaged, as can be seen in Figure 2.6 below.



Figure 2.6 – Damaged Street Signs

Signs for which the actual sign post have been bent and damaged will require complete replacement, in order to achieve adequacy. It was observed that some of the 10km/hr street-site speed signs had also been fixed to the road-side Stobie poles, in lieu of a stand-alone sign post.

Street Lighting:

There are two distinctive types of street lighting present throughout the CREST @ Woodside site; those attached to electrical poles, and stand-alone light posts. In general, the condition of both types of street lighting is reasonable; it could not be determined from visual inspection whether the globes in each street light were functional or not. No significant damage could be seen, at the time of inspection.



Figure 2.7 – Street Lighting Fixed to Stobie Poles

As shown in Figure 2.7 above, the street lighting attached to the electrical poles use different types of fixtures, with varying eccentricities from the electrical pole itself. The globes/heads of the lights, however, are fairly consistent and incorporate similar light bulbs.



Figure 2.8 – Street Lighting Fixed to Stand-alone Poles

As can be seen from Figure 2.8 above, the stand-alone street lighting all use very similar poles, but have varied globes/heads. The locations of these stand-alone street lights are consistent with regard to their distance from the adjacent asphalt road.

2.4 Electrical Poles

Stobie poles are prominent throughout the CREST @ Woodside site. A sample of Stobie poles throughout the site were visually inspected; photos of the inspected Stobie poles can be seen in Appendix D. The condition of the Stobie poles within the CREST @ Woodside site are largely consistent, with cracking to the concrete portion of the pole not exceeding approximately 1mm in width. Significant degradation of the steel elements or electrical infrastructure was not noticeable from visual inspection.



Figure 2.9 - Leaning/Slanting Stobie Pole (Appendix D, Photo 41)

Whilst the poles themselves seemed to be in acceptable condition, some poles were leaning/slanting slightly; it is unclear, from visual inspection, whether this has been caused by vehicle impact (or similar) or whether underlying soil/footing conditions have caused the pole(s) to shift. It could not be determined, without further investigation, whether the poles are in a 'stable' condition or not.

2.5 Stormwater Drainage Network

An investigation into the condition of the stormwater drainage network was undertaken to assess the current condition of the concrete drainage pipes, as well as to locate any existing blockages. Plans, photos and further findings have been included within Appendix G.



Figure 2.10 - Various Blockages and Cracks Found Through Investigation

The condition of the stormwater drainage pipe network was, overall, reasonable; only a small number of structural cracks had formed in some of the concrete pipe systems. The largest structural crack (shown in Figure 2.12 above) was recorded to have a maximum crack width of approximately 3mm.

Blockages within the system were prominent due to an accumulation of vegetation, dirt and other natural debris; pipes which were blocked could not be surveyed further. The severity of the blockages varied between pipe systems and have been further documented within Appendix G. It is subsequently recommended that the pipe systems be thoroughly cleaned and all blockages cleared, to allow free water flow.



Appendix C

WGA Stormwater Mangement Plan

WGA

WALLBRIDGE GILBERT
AZTEC

WOODSIDE (SA) PTY LTD

CREST @

Woodside

STORMWATER MANAGEMENT PLAN

Doc No. 171185rp001 Rev B

Job No. WAD171185

22 February 2018

WGA

Revision History

Rev	Date	Issue	Originator	Checker	Approver
A	14/02/2018	Draft for Client Comment	MOF	SMc	
B	22/02/2018	Preliminary Issue	MOF	JL	JL

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EXECUTIVE SUMMARY

Wallbridge Gilbert Aztec (WGA) has been engaged by Woodside (SA) Pty Ltd to prepare a Stormwater Management Plan (SMP) for the proposed residential re-development (CREST at Woodside) of the existing Inverbrackie site in Woodside, South Australia. The site is largely developed and consists of 81 existing serviced dwellings in addition to a school and a number of community buildings. The site is to be further developed by Woodside (SA) Pty Ltd to divide the single allotment in its current form to approximately 130 individual allotments ranging in sizes generally from 500–1500m². The 4 hectares of reserve area located on the eastern side of the site is proposed to be transformed into a tourism precinct, consisting of camp-sites and a caravan park.

There are currently two main stormwater outlets from the site, both of which consist of 300mm diameter reinforced concrete pipes. One outlet is located in the northeast corner of the site near Coral Avenue and the other is located in the northwest corner near Drummond Road. The capacity of these existing culverts is estimated to be in the order of 220 L/s each.

The peak flows from the site for each of the outlets are summarised in Table 1 for a range of ARI storms for both the pre-development (existing) scenario and the post-development scenario. It can be seen from the table that the existing outlets are considerably undersized for the current flows. On-site detention has been designed to restrict flows to the existing outlet culvert capacity as per Adelaide Hills Council requirements.

Table 1: Stormwater capacity, runoff rates for various frequencies

Contributing Catchments	Outlet Location	Existing Outlet Culvert Capacity	5 Year ARI			100 Year ARI		
			Existing Peak Flow	Post Dev Peak Flow	Post Dev Detention Outflow	Existing Peak Flow	Post Dev Peak Flow	Post Dev Detention Outflow
A	Drummond Rd Outlet	220 L/s	150 L/s	170 L/s	150 L/s	490 L/s	550 L/s	220 L/s
B + C	Nairne Rd Outlet	220 L/s	620 L/s	750 L/s	220 L/s	1970 L/s	2480 L/s	220 L/s

The stormwater management strategy has been developed to restrict post development flow rates, up to the 100 Year ARI critical storm event, to the capacity of the existing culvert outlets (permissible site discharge rate). To this end, the site constraints dictate that a range of measures are required to attenuate the peak flows to meet the permissible site discharge rate (PSD). A range of WSUD measures have been adopted to contribute the total required detention storage of 3700 m³ for the site, as summarised in Table 2.

Table 2: Detention Storages

Contributing Catchments	Approximate Detention Storage Volume Required	Detention Outlet Flow Rate
A + B	2500 m ³	70 L/s
C	1200 m ³	150 L/s
Site Total	3700 m³	220 L/s

The stormwater runoff quality has been assessed for both the pre and post development cases and summarised below along with the treatment targets from WSUD Guidelines for the Greater Adelaide Region (2013). These are summarised in Table 3.

Table 3: Stormwater quality summary

Pollutant Type		TP	TN	TSS	Gross Pollutants
Target percentage reduction (%)	<i>WSUD Guidelines</i>	60	45	80	90
Site reductions achieved (%)	Pre-Development	29.2	10.9	44.9	52.5
	Post-Development	67.2	47.5	89.7	100

Measures selected on the development include:

- Pool and riffles
- Detention basin
- Infiltration wells

These measures are also devised to contribute to improving the quality of stormwater runoff.

1

INTRODUCTION

1.1 BACKGROUND

Wallbridge Gilbert Aztec (WGA) has been engaged by Woodside (SA) Pty Ltd to prepare a Stormwater Management Plan (SMP) for the proposed residential re-development of the Inverbrackie site in Woodside, South Australia. The proposed CREST at Woodside Development (Development) site covers a 22.6 Hectare parcel of land located on Woodside-Nairne Road; approximately 2km southeast of Woodside (refer to Figure 1.1). The site was previously owned by the Department of Defence and was used as a low security, family oriented immigration detention centre from 2010 until its eventual closure in 2014. The site is largely developed and consists of 81 existing serviced dwellings in addition to a school and a number of community buildings. The site is to be further developed by Woodside (SA) Pty Ltd to divide the single allotment in its current form to approximately 130 individual allotments ranging in sizes generally from 500– 1500m². The 4 hectares of reserve area located on the eastern side of the site is proposed to be transformed into a tourism precinct, consisting of camp-sites and a caravan park.

The land has a steep gradient and flow path towards the northwest where it discharges into a small channel that flows into the Inverbrackie Creek. Various site visits have been undertaken as part of WGA's involvement with the Development to define a responsive strategy that considers the constraints and opportunities and one that addresses identified risks.

It is proposed that stormwater runoff quality and flows will be managed through a series of pools and riffles through the existing creek line. The steep topography of the site reduces the effectiveness of a detention basin or a constructed wetland. It is therefore proposed that the required detention and treatment is achieved via a series of at-source mechanisms. Treated and managed stormwater flows will be released to the Inverbrackie Creek (Creek). The design approach, basis and preliminary design calculations are presented in this report to demonstrate the functional performance of the stormwater system.

This report presents the general stormwater strategy for the Development as well as the preliminary design, function and approach for the Stormwater System. This report incorporates the feedback and requirements resulting from engagement with key stakeholders; including the Adelaide Hills Council.

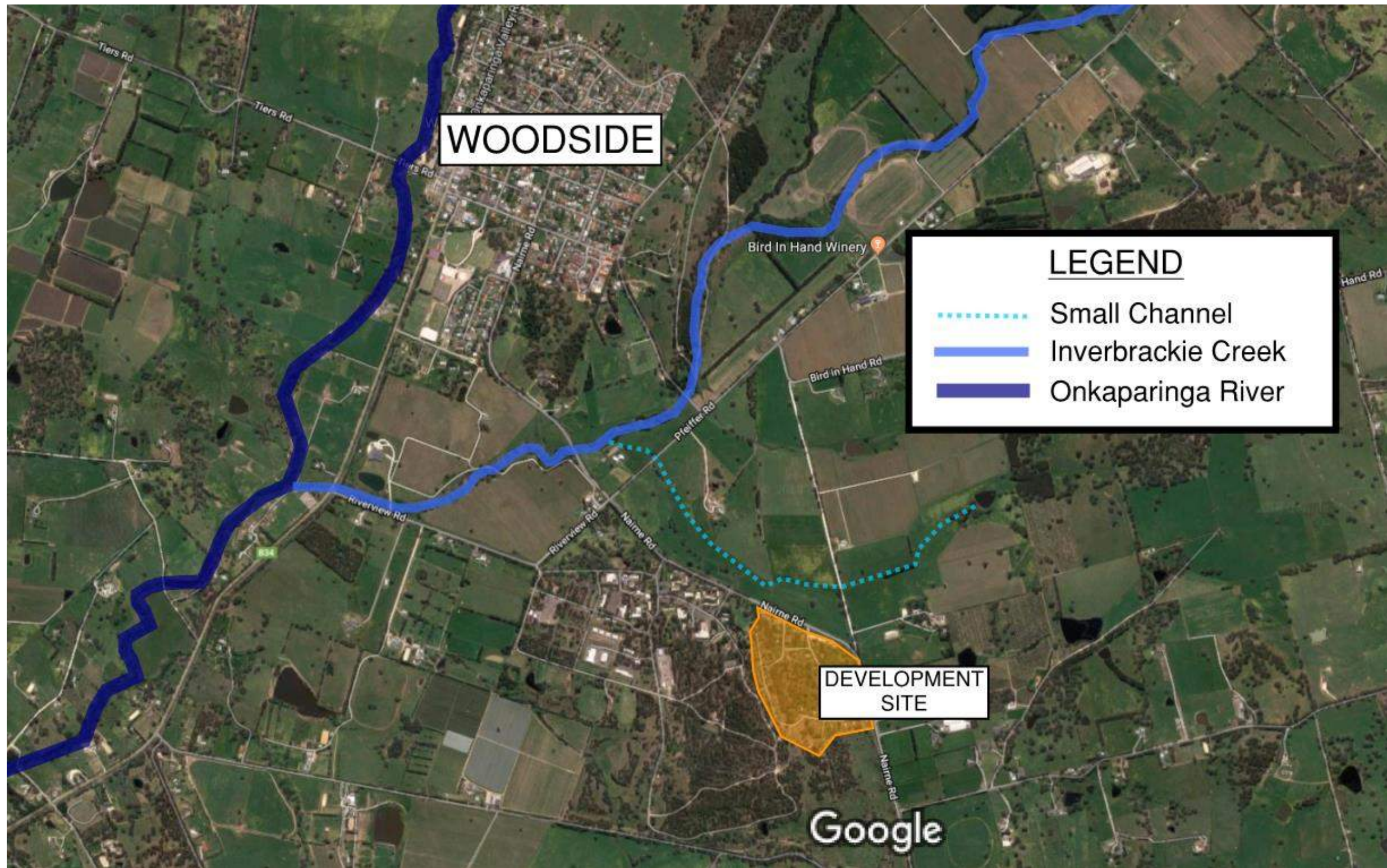


Figure 1: Site Location

1.2 SCOPE

The stormwater management plan aims to develop methodologies that embody the principles of Water Sensitive Urban Design (WSUD). This strategy addresses the stormwater management requirements defined by Adelaide Hills Council (Council) and by the Environmental Protection Authority (EPA). These requirements apply to:

- Stormwater runoff volume and flow management;
- Quality of stormwater discharged; and
- The environmental aspects associated with stormwater and the receiving environment.

General stormwater requirements have been defined through an engagement process with Council and are therefore specific to the Development. In this regard some of these requirements may encapsulate the standard requirements for water quality as defined by the EPA's Environmental Protection Act and its associated water quality criteria.

The intent of this report is to provide the design basis for the multi-objective management of stormwater on the development based on the following:

- A general overview of the stormwater Internal network drainage design
- A general overview of WSUD and opportunities within the Development
- The management of stormwater within an overall risk management framework
- Implementation of the stormwater strategy.

The stormwater management strategy presented in this report is intended to demonstrate responsive performance outcomes. This is supported by calculations, modelling and a concept design layout.

1.3 STORMWATER MANAGEMENT REQUIREMENTS AND REFERENCES

The following listed Authorities have their own guideline and requirements as relevant to stormwater management. Through an engagement process, additional requirements have been advised that are specific to the Development. These have been outlined below.

1.3.1 Environment Protection Authority

The EPA adopts the WSUD management approach that essentially defines their requirements, which relate to management of both stormwater quantity and quality.

The EPA's minimum requirements are as follows:

- Run-off rates should not exceed the rate of discharge from the site that existed pre-development.
- Water quality treatment reduction targets of the typical urban average annual load as follows;
 - Total Suspended Solids (TSS) 80%,
 - Total Phosphorus (TP) 60%,
 - Total Nitrogen (TN) 45%,
 - Retention of litter greater than 50mm for flows up to a 3 month Average Recurrence Interval (ARI) peak flow,
 - No visible oils for flows up to a 3-month ARI peak flow.

1.3.2 Adelaide Hills Council

Further to the EPA requirements outlined above, there are a number of general Council requirements and detailed requirements. These technical requirements are contained in Council's Stormwater Management Design Guide (August 2017). These guidelines cover the full scope of stormwater management including network design standards, quantity and quality management, WSUD and also wetland design. These requirements are not listed below, however have been considered in the preparation of this overall Strategy.

Following an email correspondence with Council staff (24th January 2018) the following specific and relevant requirements are listed below. These include:

Existing Stormwater Drainage System Study

Minor flows- Underground Pipe Network, Pits and Outfalls Capacity:

- Existing pipe capacities to determine the adequacy and required standards (ARR - HGL analysis);
- Existing pits inlet capacities to be assessed as % capture to determine the adequacy of inlet capacity; and
- Functional capacity of the outfalls also to be assessed.

Major flows- Overland Flow Capacity:

Roadway and open drains, swales\buffer system capacities to be assessed and compare with major flows (100ARI) in order to confirm the adequate capacity of the system to accept major flows.

Designer is required to use the available data for existing roads; grades, profiles, cross falls and Kerb & gutter details and invert levels etc. to estimate the roadway and pipe systems available capacities.

Proposed Stormwater Management Requirements and Upgrading Works to Existing Stormwater Infrastructure

Overall drainage system standards to be determined and upgraded where necessary to required standards as outlined in Section 3.

- All the underground pipe stormwater systems;
- Side entry pits, junction pits and road culverts etc.
- Identify systems with under capacity, ponding and flooding areas with minor flows(5ARI) and propose necessary upgrading works as necessary;
- Identify flooding and ponding areas for an event of major floods (100ARI event) and propose upgrading works as necessary;
- Identify and propose stormwater drainage easement requirements to the existing drainage system;
- Propose appropriate detention systems where possible to control the flows within the site to reduce possible flooding at the downstream systems;
- Propose appropriate stormwater retention systems to reduce the stormwater flows from the site and maximise the reuse etc.;
- Propose WSUD principals to achieve water quality targets as outlined in EPA water quality policy; and
- Propose upgrading works to existing outfalls to achieve required outfall design standards and to be followed with confirming adequate capacity of the downstream open swales (existing creek) to accept design flows.

Detention Requirements

Council has confirmed that the detention requirements for the 100-year ARI is dependent on the capacity of the existing storm water system. If the existing system (e.g. roadway and gutter flow capacity) is inadequate to accept major flows then appropriate detention is to be proposed to control the major flows up to the available capacity of the downstream system.

Minor flows (5-year ARI) are to be controlled so that the post-development flows do not exceed the pre-development flows as per Section 2.3.1 of the Council guidelines.

1.3.3 Design Standards

Stormwater Drainage design to be minimum of in accordance with

- Australian Rainfall and Runoff (IEAust, current version)
- Drainage Design Guide lines – Adelaide Hills Council (attached)
- Drainage Design guide lines (DPTI)
- EPA water quality policy 2015
- WSUD guidelines(EPA)
- AS/NZ 3500 (Plumbing & Drainage code)

Existing roadway overland flow safety criteria to be met:

$V \times D < 0.4\text{m}^2/\text{s}$ for pedestrians

$V \times D < 0.6\text{m}^2/\text{s}$ for vehicles

References

The stormwater management strategy is developed to encompass the design criteria in accordance with the following recognised references:

- EPA Environment Protection Act 1993, (Water Quality) Policy 2015 (WQ EPP 2015)
- Adelaide Hills Council Stormwater Management Design Guide (August 2017)
- WSUD Engineering Procedures – Stormwater (2005)
- Australian Runoff Quality, Engineers Australia (2006)
- Water Sensitive Urban Design - Greater Adelaide Region Technical Manual (Dec 2010)

These handbooks and guidelines are considered as Australian and South Australian standards and cover all aspects of stormwater management. This includes the design for major and minor storm flow, and stormwater quality improvement. The Stormwater Management Strategy adopts the design standards, principles and practices covered by the handbooks.

1.4 DESIGN PHILOSOPHY

The aim of this project is to develop a storm water management system that embraces the concepts behind Water Sensitive Urban Design (WSUD). This involves designing a system that encourages strong sustainability practices within the public areas of the project site to promote enhanced liveability, greening and water reuse.

One of the main features of the project that promotes WSUD is the installation of a pool and riffle system within the existing creek line. This pool and riffle system reduces flow velocity of overland flow by reducing the effective grade of the channel. Furthermore, it increases the travel flow time through the catchment and therefore its responsiveness. By reducing flow velocity, the risk of scour occurring is minimised. The pool and riffle system also functions as a series of small detention ponds.

Additional runoff will be managed via infiltration wells and a new detention basin in the northeast corner of the site. The detention basin will assist with managing frequent low flow events and also flood management for the larger rainfall events.

2 CATCHMENT OVERVIEW

2.1 EXISTING SITE AND CATCHMENTS

The development site is located on Woodside-Nairne Road. The site is largely developed with a mixture of dwellings, vacant lots and community buildings. There is an existing drainage channel in a reserve area that bisects the site (Figure 3). There are a significant number of both large and small trees on the site, with a large proportion of Eucalyptus trees located within the reserve area.

Figure 2 shows a typical photo of a built-up area of the site and its features.



Figure 2: Site photo looking south up Caledonia Avenue (formerly Lucknow Ave).



Figure 3: Site photo looking north towards reserve and creek area.

The topography of the site falls towards the northwest with a steep average gradient in the order of 10%. Levels at the highest point of the southern boundary are approximately at RL 417.5m AHD to RL 377.5m AHD at the border with Nairne-Woodside Road to the northwest of the site. The site can be divided into three main catchments, as shown in Figure 4; the creek catchment (C), the central catchment (B), and the eastern catchment (A) with areas of 9.7 hectares, 10.1 hectares and 3.07 hectares, respectively.

The creek catchment flows through the site via a defined channel and discharges to a roadside swale via a headwall outlet located in the northwest of the site (shown in Figure 5).

The central catchment is directed towards a roadside swale on Woodside-Nairne Road (Figure 6) where it flows longitudinally along the road via a series of driveway culverts towards the northwest corner of the site where it joins the creek catchment and eventually discharges into a headwall inlet (Figure 7) and is directed towards the existing channel.

The eastern catchment is directed via a roadside swale to an existing headwall where it discharges to the Drummond Road outlet.

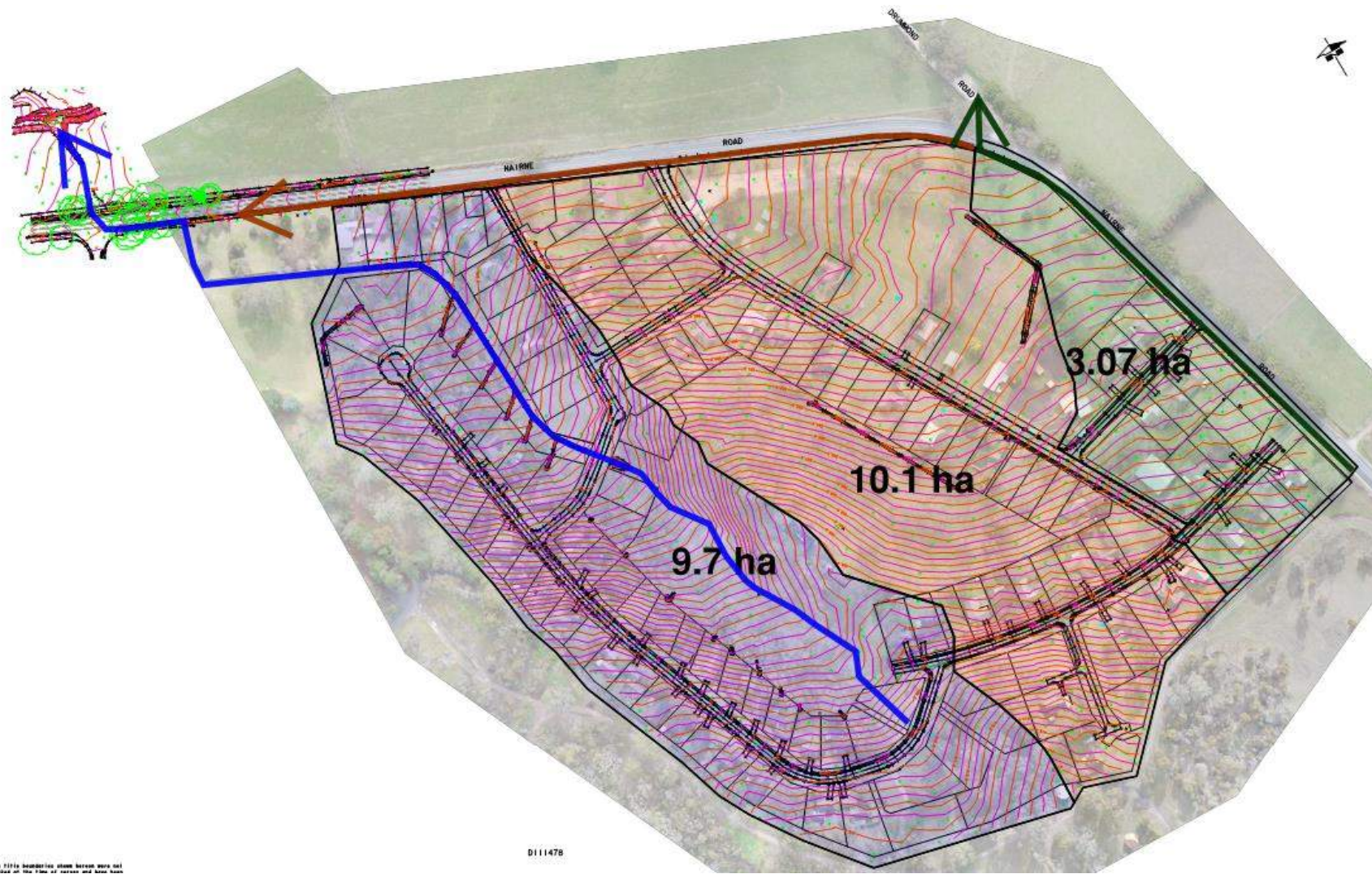


Figure 4: Existing Catchment Overview and Drainage Paths



Figure 5: Headwall Outlet from Creek Catchment to Roadside Swale (looking south from road)



Figure 6: Roadside Swale (looking southeast)



Figure 7: Headwall Inlet from Roadside Swale (looking northwest)

2.2 DEVELOPMENT

The site is to be further developed by Woodside (SA) Pty Ltd to increase the number of allotments from 81 to 150 ranging in sizes generally from 500– 1500m². The 4 hectares of reserve area located on the eastern side of the site is proposed to be transformed into a tourism precinct, consisting of camp-sites and a caravan park.

Figure 8 below depicts a preliminary site plan, it is provided as a guide only, however it should be noted that it is subject to change.

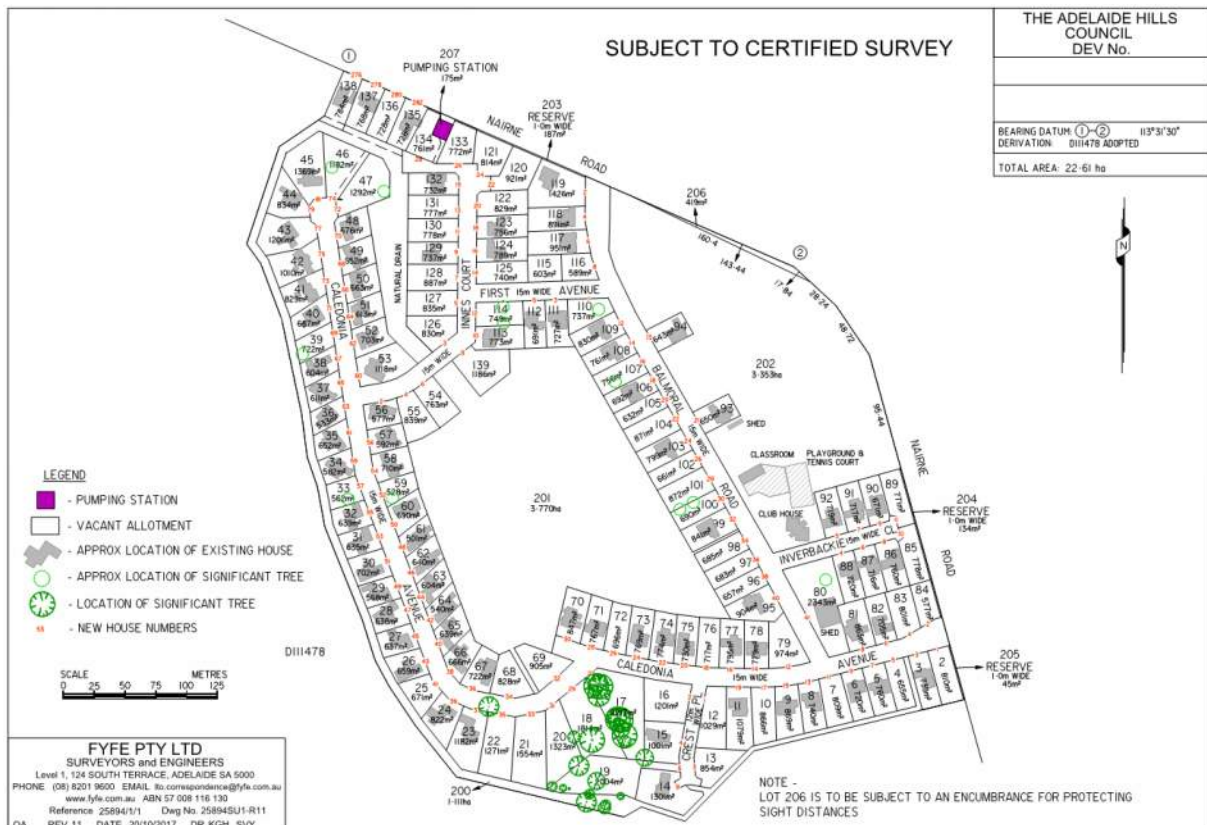


Figure 8: Preliminary allotment layout

2.3 EXISTING KNOWN ASSETS AND RECEIVING ENVIRONMENT

On the northern side of the site, at the intersection of Nairne Road and Innes Crescent there is a pump station for the CWMS works as part of new development around the site.

There are two main stormwater outlet culverts for this site. They are located at Coral Avenue and Drummond Road. Both culvert outlets eventually discharge into Inverbrackie Creek, which subsequently discharges into the Onkaparinga River.

3 IDENTIFICATION OF RISKS AND OPPORTUNITIES

3.1 RISK MANAGEMENT

This risk management process aims to determine the potential nature, scale and likelihood of any impacts on water quality, erosion and degradation within the site during the design, construction and operational phases of the development. This process is undertaken to assist in identifying appropriate management strategies to manage the project impacts, and / or determine if intervention is required to manage risks. The main steps in the risk management process are:

- Identify risks – as determined by the site and its characteristics;
- Analyse risks – how likely is it to happen, what are the likely consequences;
- Evaluate risks – against the likelihood and consequence matrix; and
- Treat risks – prioritise, address and mitigate identified risks through the adoption of mitigating strategies.

This Risk Management process covers the proposed development, with more detail focussed on using the proposed wetland to management risks.

Following a review of the site and relevant studies, the risk assessment has been prepared for the design, construction and operational phases of the project. This is presented in Tables 2 to 4. The likelihood and consequence matrix is provided in Table 1 for reference.

Table 1: *Likelihood and Consequence matrix*

CONSEQUENCE			
LIKELIHOOD	Low Minor adverse social or environmental impact	Medium Measurable adverse environmental or social impact. Will result in annoyance or nuisance to community	High Significant damage or impact on environmental systems and local community
Low The event could occur only rarely, or is unlikely to occur	Low Risk	Low Risk	Medium Risk (could be high)
Medium The event will occur occasionally or could occur	Low Risk	Medium Risk	High Risk
High The event will occur often or is most likely to occur	Medium Risk	High Risk	High Risk

Table 2: Design phase risk management process

ID	Issue	Potential Impact	Likelihood	Consequence	Level of Risk	Response / Management Measure	Notes
A	Flooding - local urban catchments	Increased flooding potential due to increase in impervious areas and flat gradients	Low	High	Medium	Drainage systems (including culverts, drainage networks, kerb and channel and open drains) shall cater for 1 in 5 Average Recurrence Interval (ARI) storm events, with a 1 in 100 year ARI storm event checked for overland flooding through flow paths. The system shall have sufficient capacity to accommodate the design drainage flow in accordance with Council's drainage requirements and without causing damage or nuisance to surrounding landowners and properties. All design shall be in accordance with Adelaide Hills Council Stormwater Design Guide (2017)	Drainage network designed in accordance with Council standards Network drainage design is not in the scope of this report. It will be undertaken as each development stage is developed.
B	Erosion of the Basin	Scouring and erosion associated with increase velocities, peak, volume of water	Medium	High	High	Drainage outlets to incorporate rock pitching, energy dissipation and vegetation. Discharge points to be designed with WSUD principles. Basin to include appropriate measures to control velocity in both low and high flows. Velocities to be assessed as part of design process to determine appropriate treatments.	Limits in velocity <ul style="list-style-type: none"> • 1m/s low flow swales • 0.5m/s for high flow through wetland system
C	Erosion at the outlet of the basin system	Decrease in waterway function due to changes to hydrological regimes, sedimentation, erosion, water quality	High	Medium	High	The design and layout for basin system will follow the rationale and design features associated with naturalistic waterway design.	Incorporate low flow trickle flows for frequent flow management. Frequent flows (I.e. < 1 – 2 year ARI) pose the greatest risk of erosion.
D	Water Sensitive Urban Design	Runoff quality leads to long term water quality impacts to receiving environments.	Medium	Medium	Medium	Project based treatment design using treatment train approach using WSUD measures along the main open space corridors proposed in the Development. The WSUD strategy is also supported by the proposed end of line wetland system. Treatment will achieve reductions in total pollutant load from the contributing urban catchment. Treatment standards to comply with WSUD urban design standards and EPP (Water Quality 2015	MUSIC modelling used to verify treatment systems adopted in design. Design demonstrates meets targets as specified Using best practice criteria for pollutant reduction targets and checked against EPA Water Quality Policy (2015)

Table 3: Construction phase risk management process

ID	Issue	Potential Impact	Likelihood	Consequence	Level of Risk	Response / Management Measure	Notes
A	Sedimentation	Sedimentation impacts on receiving water quality. Increase in turbidity / total suspended solids / total dissolved solids to aquatic ecosystems by reducing light and smothering organisms	High	Low	Medium	SEDMP	
B	Vegetative matter	Increase in natural organic matter impacts on receiving water quality including, increase in Nitrogen / Phosphorus and reduced oxygen levels - algae outbreaks and eutrophication - visual / surface scum	Low	Medium	Medium	CEMP and SEDMP	Incorporate screen to trap vegetative matter and reduce the risk of mobilisation into flows during construction
C	Gross pollution (litter)	Impacts on receiving waters: - visual / aesthetics - decreased water quality	Medium	Low	Medium	CEMP Waste recycling and reuse	
D	Accidental spills (including hazardous materials)	Impacts on receiving water quality: - increased toxicity - aquatic flora death / breakdown and increases in organic matter - aquatic fauna death / breakdown and increases in organic matter	Low	High	High	CEMP	
E	Hydrocarbons	Impacts to water quality including: - increased toxicity - algae outbreaks and eutrophication - visual / surface scum	Low	High	High	CEMP	
F	Interception of groundwater	Impacts on receiving water quality (associated with dewatering activities)	Low	Low	Medium	CEMP	
G	Accidental spills and/or release of contaminated soil into groundwater systems	Contamination of groundwater	Low	High	Medium	CEMP	
H	Temporary changes in direction and flow of surface water and groundwater	Pooling in undesirable areas, including excavations.	Medium	Low	Low	CEMP	
I	Increased volume of surface water flow	Increased turbidity levels in receiving channels for excessive sediment accumulation within the bed of channel	Medium	Medium	Medium	CEMP Temporary drainage systems required during the construction of the works. Sedimentation basin to intercept all flows.	

Table 4: Operations (post construction) phase risk management process

ID	Issue	Potential Impact	Likelihood	Consequence	Level of Risk	Response / Management Measure	Notes
A	Urban stormwater pollution	Impacts to water quality including: - increased toxicity - accumulation in aquatic sediments	High	Medium	High	Project based treatment design e.g. WSUD, wetland system, treatment train approach. Maintenance and monitoring of system to achieve design outcomes.	
B	Hydrocarbons	Impacts to water quality including: - increased toxicity - algae outbreaks and eutrophication - visual / surface scum	High	Medium	High	No runoff from any part of the project shall be discharged out of the development boundary unless it is intercepted by the WSUD measure and or the treatment wetland prior to entering the wetland system in the Park	
C	Sediment	Impacts on receiving water quality: - increase in turbidity / total suspended solids / total dissolved solids - to aquatic ecosystems by reducing light and smothering organisms - release of associated metals and nutrients.	High	Medium	High	Project based treatment design Vegetated swale and WSUD measures	
D	Nutrients	Impacts on receiving water quality: - increase in Nitrogen / Phosphorus and reduced oxygen levels - aquatic flora death / breakdown and increases in organic matter - aquatic fauna death / breakdown and increases in organic matter	Low	Medium	Low	Project based treatment design e.g. WSUD, treatment train approach. Maintenance and monitoring of system to achieve design outcomes.	
E	Gross pollution (litter)	Impacts on receiving waters: - visual / aesthetics - decreased water quality	Medium	Low	Low	Maintenance Provision of vegetative filter trap at stormwater outlets into swale and wetland inlet pond.	
F	Increased runoff volumes due to increased impermeable surfaces	Impact to flow regimes and function of receiving waters	High	Medium	High	Design response- Using WSUD techniques to slow rate of runoff through swales, Incorporate frequent flow management approach to accommodate storage volume in basin to allow for infiltration and trickle flow release via the lateral discharge system. Refer Sections 4.3 and 5 for further details. Revegetate proposed wetland system with indigenous plant species to slow surface water flow, protect from erosion, and restore habitat and environmental values.	Incorporate frequent flow management into the wetland system design

3.2 STRATEGIES TO MANAGE RISK

The response measures are outlined in the Risk Management Tables 3.2 to 3.4 inclusive for the overall development is describe in more detail below. In addition to these management measures, the Construction Contractor will be required to prepare a Construction Environmental Management Plan (CEMP) including a Soil Erosion and Drainage Management Plan (SEDMP). These are further discussed in Sections 3.3 and 3.4.

Water Sensitive Urban Design (WSUD)

A design framework that uses the principles of WSUD to manage risks is a widely accepted approach to manage stormwater in an environmentally sensitive manner. In this regard the design of distributed WSUD elements throughout the development would incorporate a multi-objective approach to stormwater management. Such benefits will provide a robust a multi-barrier strategy centering on achieving higher levels of stormwater treatment and attenuation.

Principles within the WSUD framework are proposed for:

- Improving quality of stormwater runoff, and along the stormwater conveyance network;
- Managing the rates of runoff for regular rainfall events through attenuation via green systems;
- Managing the volume of runoff for < 3month ARI;
- Protection of existing downstream areas designated as high biological significance by creating opportunities for these values within the development's green corridors; and
- Enhancement in amenity, environmental values, habitat and biodiversity.

3.3 CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

The CEMP is expected to be developed to mitigate the risks associated with construction and to address risk appropriate avoid impacts to the Park. The CEMP is expected to have contents similar to that listed as follows:

OVERVIEW

- INTRODUCTION
- Project Scope
- Purpose
- ROLES AND RESPONSIBILITIES
- PROJECT ENVIRONMENTAL PROCESS
- Environmental Management System
- Induction and Training
- Contractor and Subcontractor Management
- Communication
- Feedback and Enquiries
- Document Control
- Monitoring, Inspection and Audits
- Emergency Preparedness and Response
- Incidents/non-Compliance Reporting

- Reporting and Review
- Environmental Control Planning
- PROJECT ENVIRONMENTAL OBJECTIVES
- KEY ENVIRONMENTAL RISKS AND CONTROLS
- Noise and Vibration
- Air Quality
- Water Quality – Sediment, Erosion and Drainage Management
- Waste Management
- Dangerous Goods Storage
- Energy Use and Greenhouse Gas Emission/Sustainability
- CONCLUSION

The Construction Environment Management Plan will be prepared by the Construction Contractor (for each stage of the development) and will be submitted to Council for approval prior to construction. The CEMP will incorporate a SEDMP, which will form an important part of the site management during the construction phase. It is expected that the SEDMP will be developed using a risk-based approach that considers all contributing site physical factors that contribute soil erosion. The CEMP will be prepared by the Construction Contractor and therefore not covered in this report.

3.4 SOIL EROSION AND DRAINAGE MANAGEMENT PLAN (SEDMP)

Overview and Context Setting

During the construction phase of the development a SEDMP shall be implemented in accordance with the Environment Protection Act 1993. A plan will be prepared to meet the requirements in accordance with the Code of Practice for the Construction and Building Industry (1999) as part of the construction documentation for each development stage as they are implemented. This plan will be submitted as part of the Engineering approval process.

The SEDMP encompasses surface stormwater management practices that shall be implemented during the construction phase by the constructor. The SEDMP provides a guide to the constructor to plan site management measures that should be implemented in order to prevent the mobilisation of sediment and pollutant exports into the site during the construction stages. Whilst the site's conditions will change as the construction progresses, it is the environmental duty of the constructor to ensure that the site SEDMP is progressively maintained and upgraded to suit changing site conditions and stages of construction.

The SEDMP will be prepared to include several techniques to be implemented during the land division construction phase. Typical techniques include (but are not limited to), sediment traps / basins, silt fences, diversion swales to control site flow, single site access point with shaker pad and other measures as deemed necessary. It is noted that the SEDMP will not be limited to the adoption of sediment basins within development area, the SEDMP will require a sequence of management techniques to work collectively.

The Contractor shall consider other techniques that form part of the SEDMP strategy to address the following principal outcomes such as:

- The minimisation of cleared land to minimise exposure to wind and rain;
- Focussing efforts on minimising soil loss resulting from surface erosion;

- Minimise the generation of airborne dust and other potential nuisances to the environment and nearby residences; and
- Trap debris and vegetative matter and sediment at source and prevent its mobilisation downstream.

It should be noted that the proposed detention basin and pool riffle systems could be constructed during the early phase of construction and can function as sediment capture basins during the major earthworks and roadwork construction phases. In this regard these basins will ensure that all site-generated runoff will pass through sediment interception system prior to discharge into the downstream outlets. Upon completion of the construction works, these sediment intercepts / basins will be reinstated, completed and landscaped in accordance with the design documentation to meet their ultimate operational function of stormwater treatment. This approach provides a fundamental SEDMP strategy that uses operational phase treatment systems, which would be adapted and used to facilitate construction phase sediment interception.

The SEDMP will form a key component of the CEMP that will be developed prior to construction.

Development of the SEDMP during the design phase

During the design phase for each development stage, the SEDMP would be developed to consider the following key points:

- Site and area characteristics;
- Soil types (in particular if dispersive characteristics have been identified);
- Land slope, and topography;
- Flow paths – to be considered as this needs to be managed on site;
- Sensitivity of receiving environments
- Use where possible the design phase WSUD systems during construction phase. Upon completion of the construction these systems are completed to address operational phase stormwater treatment;
- Slope lengths – to minimise the potential for rill erosion
- Environmental assets and areas that may require specific protection

General management approach

The SEDMP would include, but not be limited to the implementation of the following techniques such as:

- Perimeter site fencing to compound;
- Flagging areas of the site that may be sensitive, need to be protected, or where vegetation (grass) should not be stripped;
- Bunting around trees and their root zones (tree protection zones) to be protected;
- Location of soil stockpiles at an appropriate location, away from flow paths, and protected to minimise mobilisation of airborne dust;
- Sediment traps, and incorporate debris traps;
- Silt fences and hay bales;
- Diversion swales to control site flow around work sites;
- Single site access point with shaker pad and other measures as deemed necessary to prevent sediment entering Council roadways, and

- Dust management techniques, including:
 - cover stockpiles with mulch if they are to remain over the long term;
 - maintain adequate moisture levels to all site access tracks and earthworks areas;
 - adoption of a proactive approach to dust control by remaining informed of forecast weather conditions; and
 - Hydro seeding and or hydro mulching areas left exposed for periods of time.

These elements will be considered, and where appropriate they would be included as part of the design of the SEDMP. This would be undertaken as part of the detailed design phase of each development stage and is therefore not part of this report.

Dust Control

During the land division construction phase of the development, an Environmental Management Plan (EMP) will be prepared by the constructor, and implemented in accordance with the Environment Protection Act 1993 and its associated regulations (2009). The plan shall also be prepared to meet the requirements in accordance with the Code of Practice for the Construction and Building Industry (1999).

The contractor shall implement measures to minimise and manage nuisance issues associated with the mobilisation of dust resulting from earthworks and construction activities undertaken on the development site as part of the land division construction phase. Measures to control dust shall be implemented and maintained at all times. Measures will include but not be limited to the following:

- Minimise the area of land that is cleared and exposed to wind at any given time during the construction phase;
- Perimeter dust filter screen attached to fencing;
- Covering stockpiles with mulch;
- Maintain adequate moisture levels to all site access tracks and earthworks areas;
- Adopting a proactive approach to dust control by remaining informed of forecast weather conditions and preparing strategies in advance of high-risk days; and
- Hydro seeding areas left exposed for periods of time.

4 CATCHMENT HYDROLOGY

The site can be generally divided into three main catchments, as discussed in Section 3. These catchments are shown again in Figure 9 below.

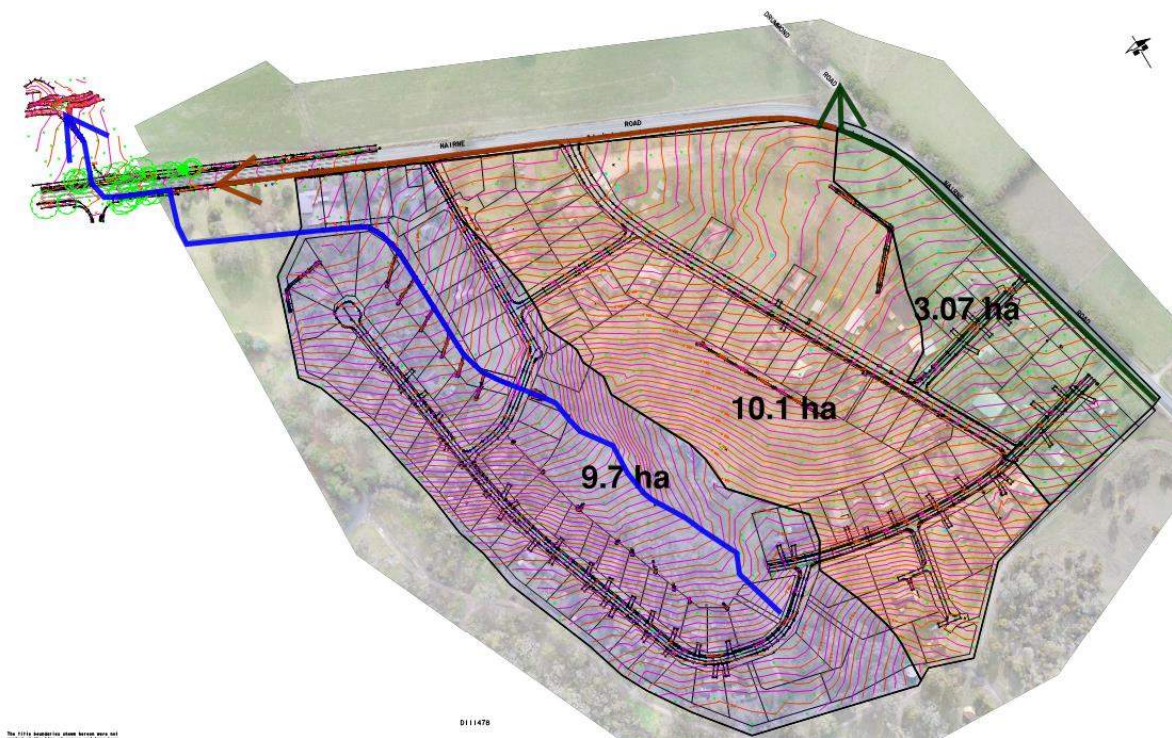


Figure 9: Catchment Plan

4.1 CAPACITY OF EXISTING CULVERT OUTLETS

The current site location consists of two main outlets located at the intersections of Nairne Road and Coral Avenue and Nairne Road and Drummond Road. Culverts are located at both of these outlet locations, which consist of 300mm reinforced concrete pipes. The culvert capacities have been estimated based on the *Humes Concrete Pipe Reference Manual for Full Flow Conditions* and summarised in Table 5 below. It is noted that the culvert near Coral Avenue is a 225x450 box culvert, which then discharges into a 300mm RCP. The 300mm RCP has a smaller capacity than the box culvert and has therefore been taken to be the capacity of the outlet.

Table 5: Summary of existing culverts

Location	Pipe Diameter (mm)	Full Flow Capacity (L/s)
Nairne Road and Coral Avenue	300	221.5
Drummond Road and Nairne Road	300	221.5



Figure 10: Culvert inlet Coral Avenue and Nairne Road intersection



Figure 11: Culvert outlet Drummond Road and Nairne Road intersection

From Figures 10 and 11 it is evident that these culverts will not be able to function at the full capacity given in Table 5. This is due to the amount of debris that clogs the inlet and outlets of these culverts over time.

Figure 12 also shows the state of existing roadside swales running along Nairne Road adjacent to the site.



Figure 12: Roadside swale along Nairne Road

Calculations based on Manning's equation using dimensions taken from the swale show that the swale has a flow capacity of 330 L/s and a flow velocity of 1.23m/s. A higher flow rate increases the likelihood of scour and as seen in Figure 12, there is heavy scouring of the existing roadside swale.

The existing vegetated swale (Figure 5) that runs through the Department of Defence land was also calculated to have an approximate flow capacity of 1200L/s, which was calculated using Manning's equation with the following parameters:

- Manning's roughness of 0.035 (weedy channel)
- Longitudinal grade of 5%
- Depth of 350mm, base width of 300mm with 1:4 side slopes

Further work will be required to develop individual designs of internal stormwater network systems, which will be carried out as each Development stage is released for Development Approval.

4.2 EXISTING (PRE-DEVELOPMENT) FLOWS

The existing flows have been determined using a rational method analysis for each catchment, with a weighted runoff coefficient to reflect three primary regions:

- Undeveloped Areas (reserve and vacant lots) **C = 0.2**
- Developed Areas (non-vacant lots) **C = 0.5**. *This value has been based on the Department of Planning Transport and Infrastructure Roadworks Stormwater Design DD300, which gives acceptable DRAINS parameters for different sized lots. It is recommended that a paved percentage of 60% is adopted for residential allotments between 500-700m² and 40% for allotments between 700-1000m². An equivalent rational method coefficient of 0.5 is considered reasonable to represent the average lot sizes for this development.*
- Road and Footpath Areas **C = 1.0**

Times of concentrations for each catchment have been determined using The Kinematic Wave equation, which takes into account the flow path properties including length, slope and surface roughness.

Weighted runoff coefficients were determined for a 10 year ARI and appropriate multipliers were used to obtain the 5 year and 100 year runoff coefficients to capture the effects of antecedent moisture in the soil. A 0.95 multiplier was applied the 5 year coefficient and 1.20 was applied to the 100 year coefficient as per *Australian Rainfall and Runoff Guidelines*.

The existing flows are summarised in Table 6 below.

Table 6: Summary of existing flows

Catchment	Outlet Location	Existing Capacity	Catchment Area (ha)	Weighted Runoff Coefficient (C ₁₀)	5 Year ARI (Minor Storm)	10 Year ARI	100 Year ARI (Major Storm)
A	Drummond Rd Outlet	220 L/s	3.10	0.38	150 L/s (t _c = 16 mins)	190 L/s (t _c = 15 mins)	490 L/s (t _c = 11 mins)
B	Nairne Rd Roadside Swale	220 L/s	10.1	0.31	300 L/s (t _c = 26 mins)	400 L/s (t _c = 24 mins)	1000 L/s (t _c = 18 mins)
C	Existing Creek Channel	1240 L/s	9.70	0.29	320 L/s (t _c = 20 mins)	410 L/s (t _c = 19 mins)	970 L/s (t _c = 14 mins)
B+C	Nairne Rd Outlet	220 L/s	19.8	0.30	620 L/s*	810 L/s*	1970 L/s*

*The peak flow has been derived by adding the peak flows from catchments B and C. This is a conservative assumption because the times of concentration differ between the catchments. However, this assumption is considered appropriate for the purposes of this analysis.

4.3 POST-DEVELOPMENT FLOWS

The same method has been used to determine the post-development flows as discussed in Section 5.2. The site plan shown in Figure 8 has been used to determine the areas of the new allotments. The allotment runoff coefficient has been reduced from 0.5 to 0.4 in the post-development scenario to account for the proposed infiltration wells at the new lots along the creek line.

The post development flows are summarised in Table 7 below.

Table 7: Summary of post development flows

Catchment	Outlet Location	Catchment Area (ha)	Weighted Runoff Coefficient (C ₁₀)	5 Year ARI (Minor Storm)	10 Year ARI	100 Year ARI (Major Storm)
A	Drummond Rd Outlet	3.10	0.43	170 L/s (t _c = 16 mins)	220 L/s (t _c = 15 mins)	550 L/s (t _c = 11 mins)
B	Nairne Rd Roadside Swale	10.1	0.39	380 L/s (t _c = 26 mins)	520 L/s (t _c = 24 mins)	1280 L/s (t _c = 18 mins)
C	Existing Creek Channel	9.70	0.34	370 L/s (t _c = 20 mins)	490 L/s (t _c = 19 mins)	1200 L/s (t _c = 14 mins)
B+C	Nairne Rd Outlet	19.8	0.36	750 L/s*	1010 L/s*	2480 L/s*

*The peak flow has been derived by adding the peak flows from catchments B and C. This is a conservative assumption because the times of concentration differ between the catchments. However, this assumption is considered appropriate for the purposes of this analysis.

4.4 ADDITIONAL FLOWS

The additional flows as a result of the development are shown in Table 8 below.

Table 8: *Summary of additional flows*

Catchment	5 Year ARI	10 Year ARI	100 Year ARI
A	20 L/s	30 L/s	60 L/s
B	80 L/s	120 L/s	280 L/s
C	50 L/s	80 L/s	230 L/s
B+C	130 L/s	200 L/s	510 L/s

5 DETENTION REQUIREMENTS

5.1 COUNCIL REQUIREMENTS

The Adelaide Hills Council detention requirements stipulate that the detention requirements for the 100 year ARI are to be based on the existing capacity of the downstream system. For minor storms, the detention should be sufficient such that post-development flows do not exceed pre-development flows.

The detention volumes have been designed based on the requirement that existing outlets are maintained. As such, the detention volumes have been designed to restrict the outflows to the maximum capacity of the downstream culvert outlets.

Catchment B and Catchment C discharge into the same common outlet, which is the 300mm pipe near Coral Avenue, which has an estimated flow capacity of 220 L/s. Since this flow capacity is shared between the two catchments and opportunities for detention are limited within Catchment C, it was assumed that Catchment C has a limiting flow of 150 L/s and Catchment B has a limiting flow of 70 L/s, which has been used for the following analysis. This split achieves an optimal solution given the site-constraints.

5.2 DETENTION VOLUMES

Table 7: *Detention Storage Volumes required for each catchment*

Region	5 Year ARI (Minor)	100 Year ARI (Major)
Catchment A	29 m ³ *	260 m ³
Catchment B	780 m ³	2000 m ³
Catchment C	253 m ³	1200 m ³

*This detention volume is governed by the requirement of restricting post-development flows to pre-development flows rather than the outlet capacity.

The detention basin in the northeast corner shown in Appendix C is designed to manage the flows generated by Catchments A and B only. The overall storage capacity of this detention basin has been calculated to be approximately 2500m³ for a 100ARI event.

Detention for Catchment C will be managed via a smaller detention storage within the existing creek line at the downstream end as shown in Appendix C. Site constraints limit the opportunities for a large detention basin within Catchment C, however the smaller detention storage along with a series of infiltration wells and pool and riffle systems will attenuate the peak flows generated from the site.

5.3 FREQUENT FLOW MANAGEMENT

Another aspect of the stormwater system is the management of frequent rainfall events. Consideration of these events is centred on the focus of maintaining the integrity of health of the existing environmental conditions. It would be impractical to attempt to reduce the volumetric discharge from large rainfall events, however measures have been taken to reduce the impact of frequent flows.

One measure to help manage frequent flows is the use of pool and riffle sequences along the creek line, as illustrated in Figure 14.

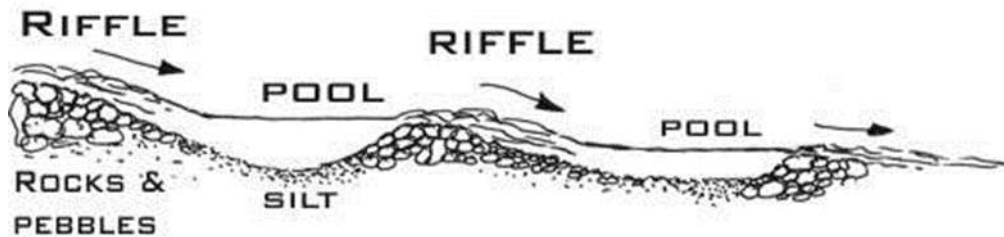


Figure 14: Pool and Riffle effect

This system aims to reduce the grade of the channel, thus lowering the potential for scour. By combining a pool and riffle system together with a longer meandering channel path, scouring to the natural habitat will be kept to a minimum.

Infiltration wells are proposed on the lots that discharge into the existing creek in order to attenuate peak flows. A typical schematic of an infiltration well is shown in Figure 15.

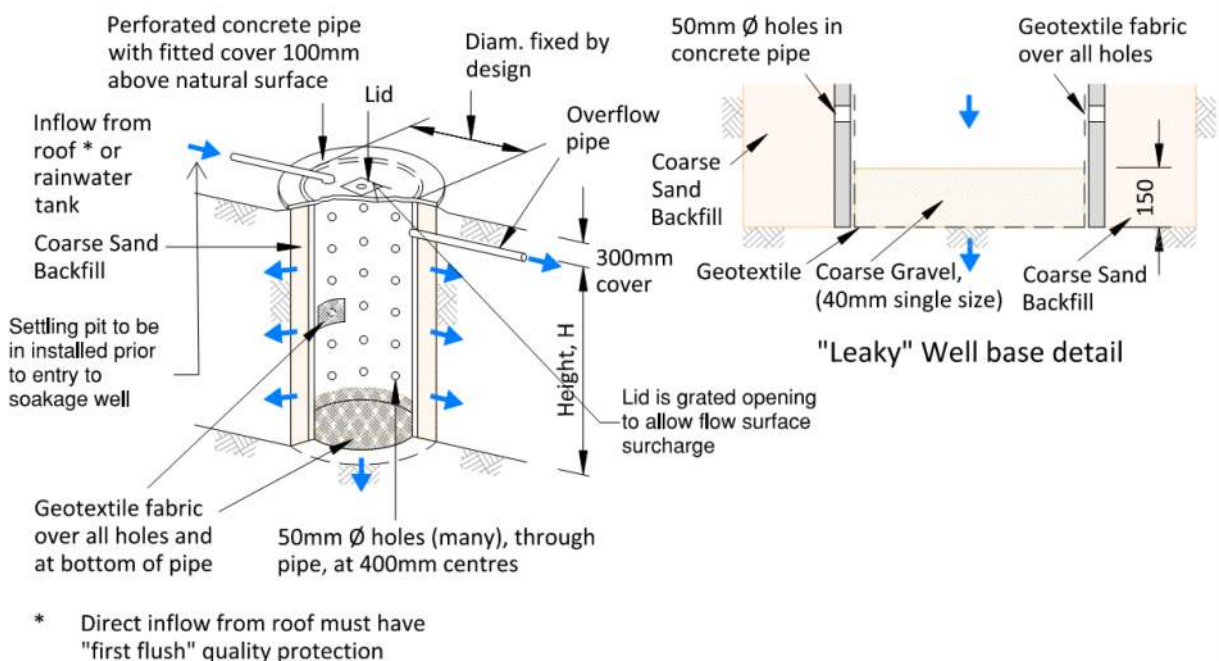


Figure 15: Typical Infiltration Well Layout

The design of the detention basin will accommodate for frequent rainfall events. A low flow outlet is installed to attenuate flows from frequent rainfall events. A high flow outlet is installed at a point higher than the low flow outlet and will only be used for major storm event attenuation.

To design these outlets and the detention basin, the frequent flow capacity required must be determined. This is done using the rational method and the parameters used are summarised in table 9 below.

Table 9: *Inputs for the rational method used to determine flow volume of frequent rainfall events*

Parameter	Value
Runoff coefficient, C	0.4
3 Month Rainfall Intensity, I	13 mm/hr
Area, A	13.17 ha
Outlet Release Rate	70 L/s

The peak volume of storage is thus determined. The time of concentration, t_c , is calculated using the Kinematic Wave Equation and together with the total flow, the peak storage volume is calculated.

Preliminary calculations indicate that there will need to be approximately 180 m³ of storage within the detention basin to manage frequent rainfall events. This volume will be incorporated into the detention basin and used to determine the location of the low flow outlet.

6 STORMWATER QUALITY MODELLING

6.1 MUSIC MODELLING

MUSIC modelling is used to confirm the required surface areas of treatment systems to ensure that treatment requirements are adequately met. MUSIC version 6.2 has been used to perform the water quality measurements.

The layout of the MUSIC model can be seen in Figure 16.

The MUSIC model replicates the post development scenario. Catchments 1 and 2 are designed to enter detention basin. For catchment 3, a pool and riffle system is employed, to simulate this on MUSIC, usage of several pond treatments are used to replicate the pooling, while secondary flow is used to replicate the riffle effect.

6.2 TREATMENT REQUIREMENTS

The design of the site treatment systems should comply with the standards as defined by the South Australian EPA Water Quality Policy [EPP Water Quality (2003)] and the WSUD best management practice pollutant reduction targets as defined in the WSUD Guidelines for the Greater Adelaide Region.

The results of the music model are shown in Table 10 below.

Table 10: Pre and post development stormwater quality modelling results

Pollutant Type		TP	TN	TSS	Gross Pollutants
Target percentage reduction (%)	<i>WSUD Guidelines</i>	60	45	80	90
Site reductions achieved (%)	Pre-Development	29.2	10.9	44.9	52.5
	Post-Development	67.2	47.5	89.7	100

Figures 16 and 17 show the MUSIC layouts for both the pre-development and post-development scenarios, respectively.

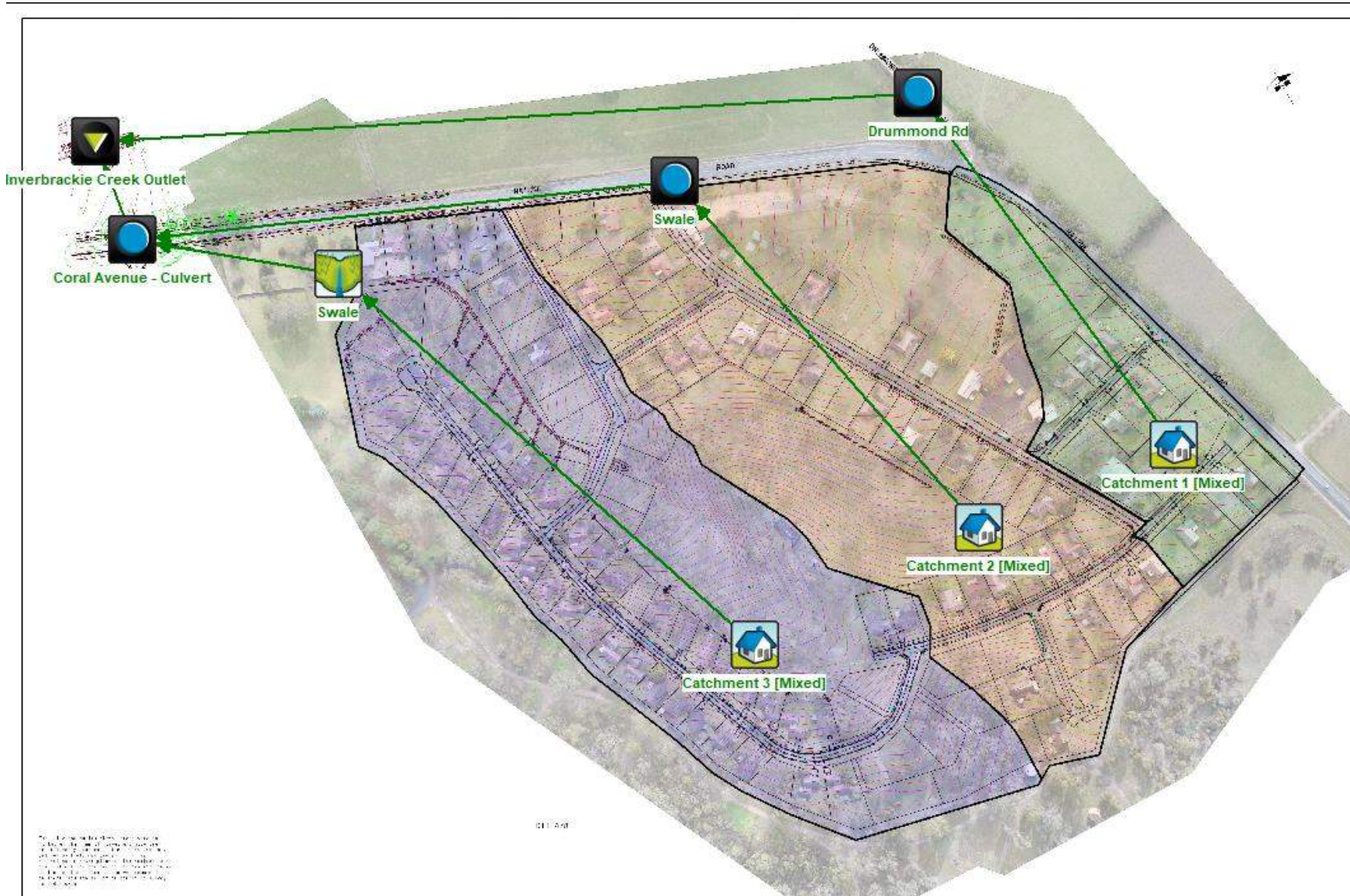


Figure 16: MUSIC Model layout (pre-development)

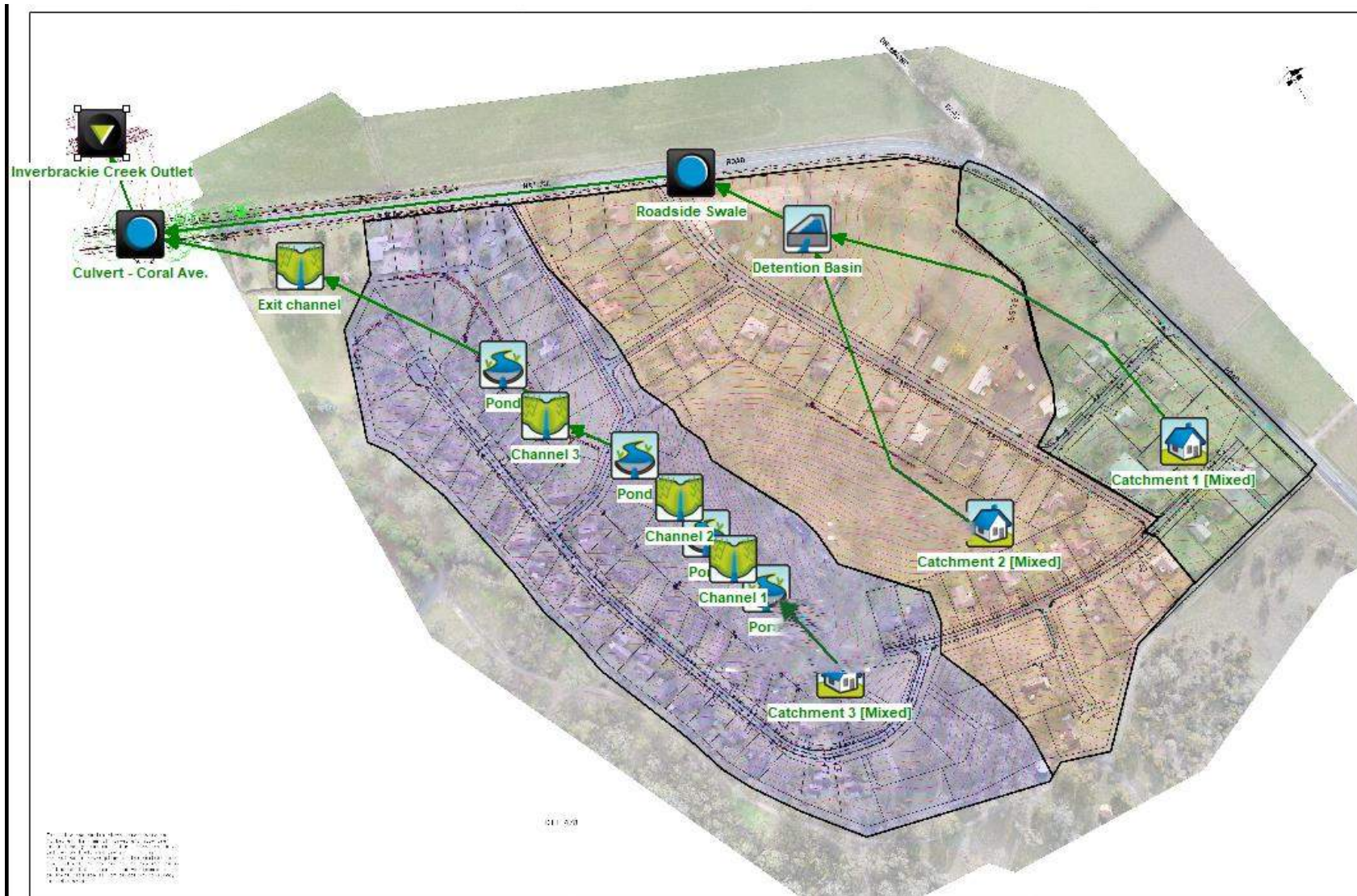


Figure 17: MUSIC Model layout (post-development)

7 WATER SENSITIVE URBAN DESIGN

7.1 OPPORTUNITIES FOR WSUD

It is recognized that Water Sensitive Urban Design (WSUD) embraces a range of measures that form part of ecologically sustainable development (ESD). WSUD can be designed into the development to create sustainable and resilient green spaces. Such principles contribute to greening within the project's public areas to enhance liveability, greening, and water reuse through the provision of site based passive irrigation approaches within the landscape.

The vision for the project seeks to consider the following key principles:

- Utilisation of stormwater runoff from the new urban area to play a key role to sustain the landscape
- Sustainable practices through the use of green infrastructure at a multitude of scales
- Creation of places for people that are comfortable and provide an element of protection and shelter from heat generated from hard surfaces as well as softening the hard-built form
- A collaborative approach to design that seeks to integrate stormwater design as part of landscape architecture to create visual interest and interactive public spaces
- Application of best practice that demonstrate sustainable outcomes to the wider community
- Utilising practices that are innovative, practical, and maintainable and that are proven to be cost effective and delivering multiple outcomes as they relate to landscaping and stormwater management.

Other project based opportunities in WSUD can be sought at multiple scales as part of the detailed design process. The best outcomes can be achieved when opportunities are explored through an integrated design process. This development can present these opportunities and outcomes which will be explored during the detailed design phase.

This strategy has employed the following WSUD measures based on an assessment of opportunities and constraints:

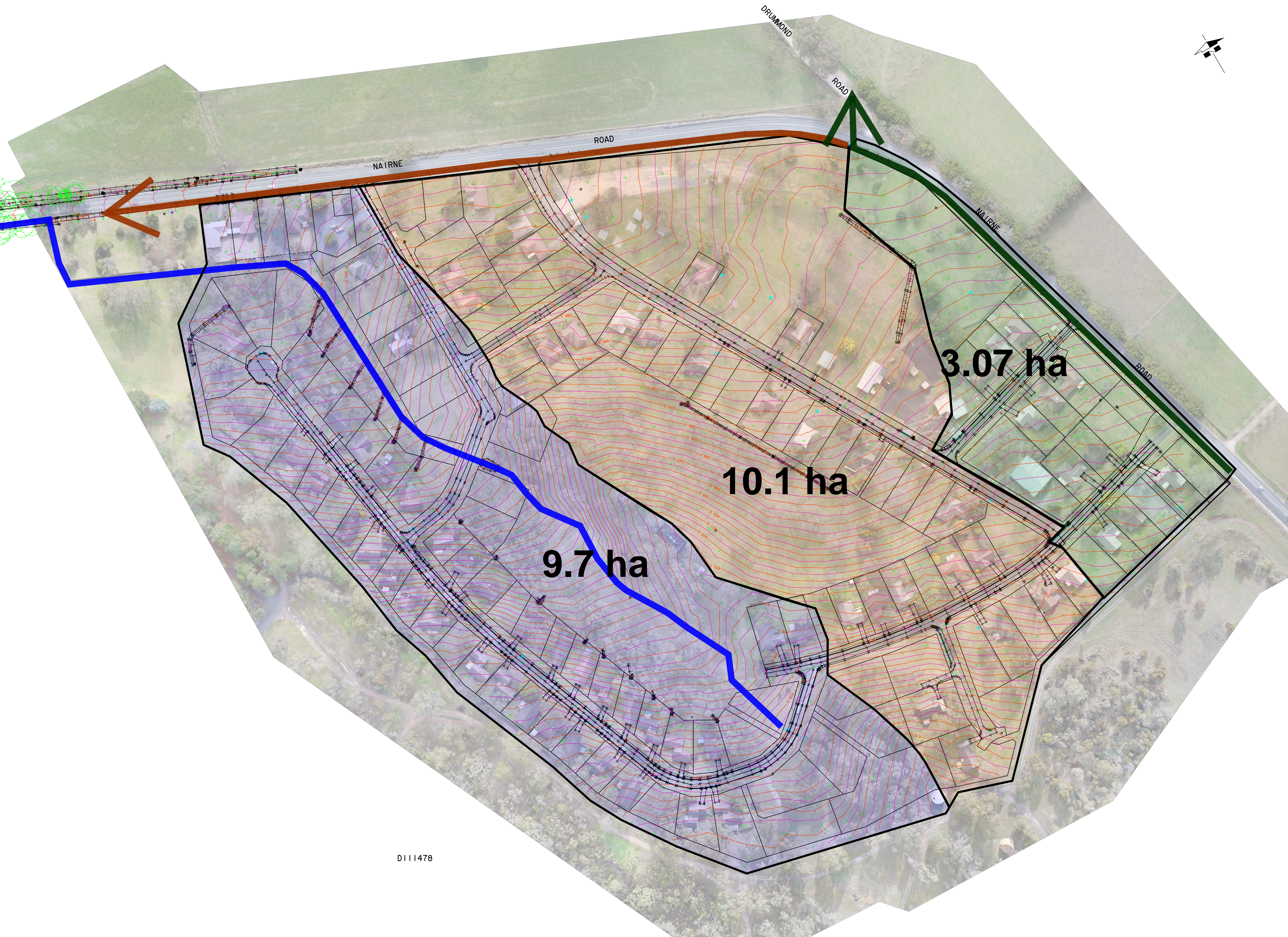
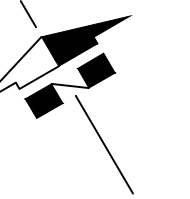
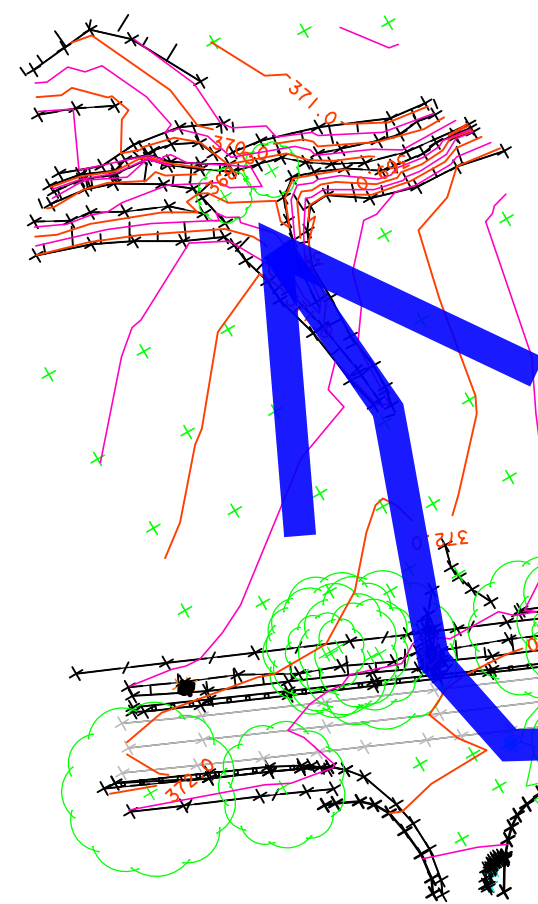
- Vegetated detention basin
- Pool and riffles
- Infiltration wells

These measures have been include on the overall strategy plan in Appendix C.

APPENDIX A

CATCHMENT PLAN



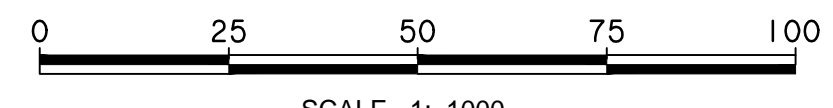


D111478

The title boundaries shown hereon were not marked at the time of survey and have been determined by plan and title dimensions only and not by field measurement. If the dimensions or description of the subject land are critical for the design of new structures or financial decisions, then we recommend that an identification survey or certified survey be undertaken.

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 Facsimile 61 8 8201 9650

PLAN DETAILS
 COUNCIL : ADELAIDE HILLS COUNCIL
 MAP SHEET : 6628-47-E & 6628-47-M
 CT REFS : CT6174/409



SCALE 1: 1000
 LEVEL DATUM : AHD DATA FILE/S : 25894-5-1.CRD
 LEVEL AUTHORITY : PSM 6628/4153 EL: 359.139m 23/07/1998 SURVEYOR: MYB, AB & HZV
 CO-ORD DATUM : MGA94 PLANE SYSTEM BASED ON PSM 6628/36445 16/08/2011

NO.	REVISION	STAFF	CHECK	DATE
0	PREPARED FOR INFORMATION	AYW	MYB	11/08/17

PATRICK MADDERN
 DETAIL & LEVEL SURVEY
 ALLOTMENT 1 in D111478 - NAIRNE ROAD
 HUNDRED OF ONKAPARINGA
 WOODSIDE

INSTRUCTION: 25894-5-1
 DATE: 11/08/2017
 SHEET: 1 OF 1
 REV: 0

APPENDIX B

CALCULATIONS



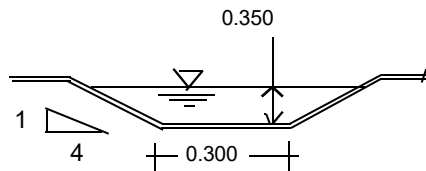
Mannings Formula for Trapezoidal Channels

n 0.035
 Channel Slope, S 0.0500
 Depth, y (m) 0.350
 Slope of side, 1: 4.000
 Base Width (m) 0.300

Area (m²) 0.595
 Wetted Perimeter 3.186

Flow, Q 1.242 m³/s

Velocity, V 2.088 m/s *



Unfinished Concrete : n = 0.014
 Earth or Rubble : n = 0.025
 Earth with stone or weeds: n = 0.035

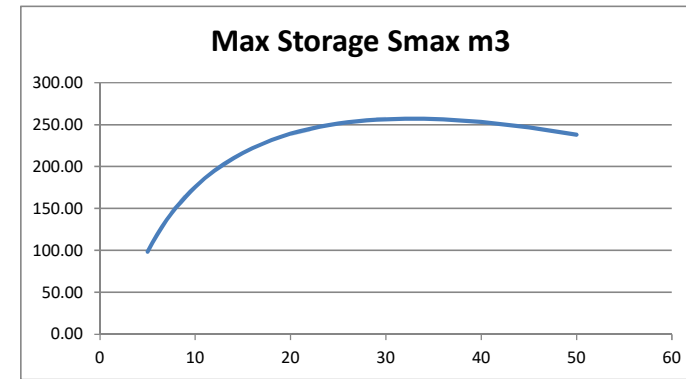
*** Maximum Recommended Velocities**

Coarse Gravel 1.3 - 1.8 m/s
 Grass Covered Surfaces 1.8
 Stiff Sandy Clay 1.3 - 1.5



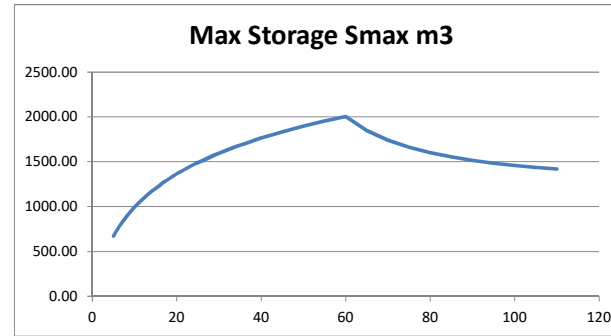
Detention Assessment for Catchment A

Area	30,700 m ²	Duration	Intensity ARI		Inflow rate	Inflow Vol Vi	Max Storage
			event	mm/hr			
Coeff Permeability	0.512138	min			l/sec	m ³	Smax m ³
Time of conc.	16 min	5	180.89	790.0	237.01	237.01	98.41
ARI Storm	100 year	5.5	174.13	760.5	250.96	250.96	109.06
Max Outflow (Pre)	220.00 l/sec	6	167.94	733.5	264.04	264.04	118.84
<i>1 in 100 year pre development peak flow</i>							
		6.5	162.26	708.7	276.37	276.37	127.87
		7	157.03	685.8	288.04	288.04	136.24
Max Storage Required	258 m ³	7.5	152.19	664.7	299.10	299.10	144.00
		8	147.70	645.1	309.64	309.64	151.24
		8.5	143.53	626.8	319.69	319.69	157.99
		9	139.63	609.8	329.31	329.31	164.31
		9.5	135.98	593.9	338.52	338.52	170.22
		10	132.56	579.0	347.37	347.37	175.77
		11	126.31	551.7	364.09	364.09	185.89
		12	120.74	527.3	379.66	379.66	194.86
		13	115.73	505.4	394.23	394.23	202.83
		14	111.19	485.6	407.93	407.93	209.93
		15	107.07	467.6	420.87	420.87	216.27
		16	103.30	451.2	433.12	433.12	221.92
		17	99.84	436.0	444.77	444.77	226.97
		18	96.65	422.1	455.87	455.87	231.47
		19	93.69	409.2	466.47	466.47	235.47
		20	90.94	397.2	476.63	476.63	239.03
		21	88.38	386.0	486.37	486.37	242.17
		22	85.99	375.6	495.73	495.73	244.93
		23	83.75	365.8	504.75	504.75	247.35
		24	81.64	356.6	513.45	513.45	249.45
		25	79.66	347.9	521.85	521.85	251.25
		26	77.79	339.7	529.97	529.97	252.77
		27	76.02	332.0	537.84	537.84	254.04
		28	74.34	324.7	545.47	545.47	255.07
		29	72.75	317.7	552.87	552.87	255.87
		30	71.24	311.1	560.06	560.06	256.46
		32	68.44	298.9	573.86	573.86	257.06
		34	65.88	287.7	586.96	586.96	256.96
		36	63.54	277.5	599.42	599.42	256.22
		38	61.39	268.1	611.32	611.32	254.92
		40	59.41	259.5	622.71	622.71	253.11
		45	55.06	240.5	649.23	649.23	246.63
		50	51.40	224.5	673.41	673.41	237.81
		55	48.27	210.8	695.66	695.66	



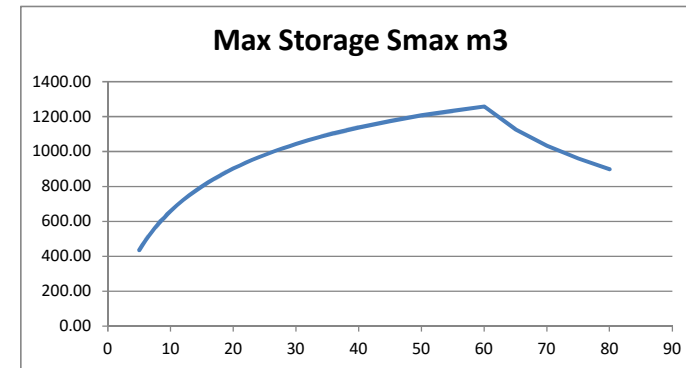
Detention Assessment for Catchment B

Area	101,000 m ²	Intensity ARI		Inflow rate	Inflow Vol Vi	Max Storage
		Duration	event			
Coeff Permeability	0.47	min	mm/hr	l/sec	m ³	Smax m ³
Time of conc.	16 min	5	180.89	2387.5	716.26	672.16
ARI Storm	100 year	5.5	174.13	2298.2	758.40	713.25
Max Outflow (Pre)	70.00 l/sec	6	167.94	2216.5	797.94	751.74
1 in 100 year pre development peak flow		6.5	162.26	2141.6	835.21	787.96
		7	157.03	2072.5	870.45	822.15
Max Storage Required	2006 m ³	7.5	152.19	2008.7	903.90	854.55
		8	147.70	1949.5	935.74	885.34
		8.5	143.53	1894.3	966.12	914.67
		9	139.63	1842.9	995.17	942.67
		9.5	135.98	1794.8	1023.02	969.47
		10	132.56	1749.6	1049.77	995.17
		11	126.31	1667.1	1100.29	1043.59
		12	120.74	1593.5	1147.33	1088.53
		13	115.73	1527.4	1191.37	1130.47
		14	111.19	1467.6	1232.78	1169.78
		15	107.07	1413.2	1271.87	1206.77
		16	103.30	1363.4	1308.91	1241.71
		17	99.84	1317.8	1344.11	1274.81
		18	96.65	1275.6	1377.65	1306.25
		19	93.69	1236.6	1409.70	1336.20
		20	90.94	1200.3	1440.38	1364.78
		21	88.38	1166.5	1469.82	1392.12
		22	85.99	1134.9	1498.12	1418.32
		23	83.75	1105.3	1525.37	1443.47
		24	81.64	1077.5	1551.66	1467.66
		25	79.66	1051.4	1577.04	1490.94
		26	77.79	1026.7	1601.59	1513.39
		27	76.02	1003.3	1625.36	1535.06
		28	74.34	981.2	1648.41	1556.01
		29	72.75	960.2	1670.78	1576.28
		30	71.24	940.3	1692.52	1595.92
		32	68.44	903.2	1734.22	1633.42
		34	65.88	869.5	1773.80	1668.80
		36	63.54	838.6	1811.47	1702.27
		38	61.39	810.3	1847.43	1734.03
		40	59.41	784.1	1881.85	1764.25
		45	55.06	726.7	1961.99	1833.89
		50	51.40	678.4	2035.05	1896.45
		55	48.27	637.1	2102.31	1953.21
		60	45.56	601.3	2164.73	2005.13
		65	39.22	517.7	2018.97	1848.87
		70	34.66	457.4	1921.05	1740.45
		75	31.19	411.6	1852.18	1661.08
		80	28.45	375.5	1802.27	1600.67
		85	26.23	346.2	1765.41	1553.31
		90	24.38	321.8	1737.88	1515.28
		95	22.83	301.3	1717.25	1484.15
		100	21.49	283.6	1701.84	1458.24
		105	20.33	268.3	1690.47	1436.37
		110	19.31	254.9	1682.28	1417.68



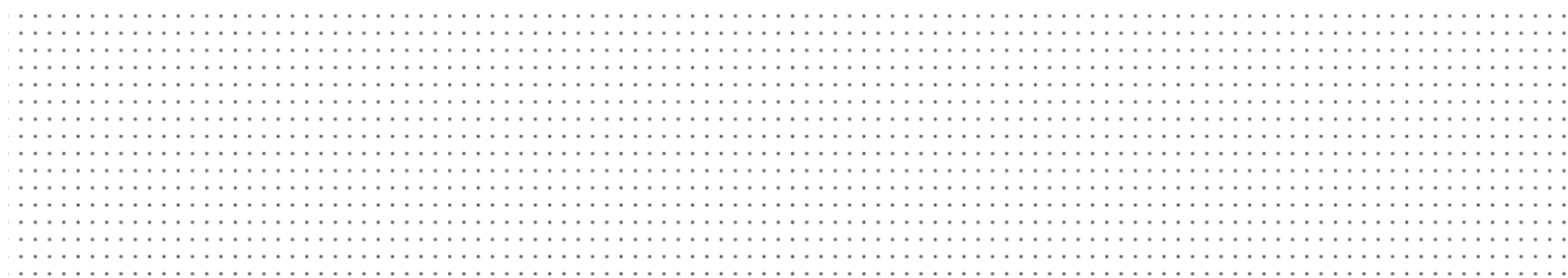
Detention Assessment for Catchment C

Area	97,000 m ²	Intensity ARI				Max Storage
		Duration	event	Inflow rate	Inflow Vol Vi	
Coeff Permeability	0.361898	min	mm/hr	l/sec	m3	Smax m3
Time of conc.	16 min	5	180.89	1763.9	529.18	434.68
ARI Storm	100 year	5.5	174.13	1697.9	560.32	463.57
Max Outflow (Pre)	150.00 l/sec	6	167.94	1637.6	589.53	490.53
<i>1 in 100 year pre development peak flow</i>						
Max Storage Required	1258 m3	6.5	162.26	1582.2	617.06	515.81
		7	157.03	1531.2	643.10	539.60
		7.5	152.19	1484.0	667.81	562.06
		8	147.70	1440.3	691.33	583.33
		8.5	143.53	1399.6	713.78	603.53
		9	139.63	1361.6	735.24	622.74
		9.5	135.98	1326.0	755.82	641.07
		10	132.56	1292.6	775.58	658.58
		11	126.31	1231.7	812.91	691.41
		12	120.74	1177.3	847.66	721.66
		13	115.73	1128.5	880.20	749.70
		14	111.19	1084.3	910.79	775.79
		15	107.07	1044.1	939.67	800.17
		16	103.30	1007.3	967.04	823.04
		17	99.84	973.6	993.04	844.54
		18	96.65	942.4	1017.82	864.82
		19	93.69	913.6	1041.50	884.00
		20	90.94	886.8	1064.17	902.17
		21	88.38	861.8	1085.92	919.42
		22	85.99	838.5	1106.83	935.83
23	83.75	816.6	1126.96	951.46		
24	81.64	796.1	1146.38	966.38		
25	79.66	776.8	1165.14	980.64		
26	77.79	758.5	1183.27	994.27		
27	76.02	741.3	1200.84	1007.34		
28	74.34	724.9	1217.87	1019.87		
29	72.75	709.4	1234.39	1031.89		
30	71.24	694.7	1250.45	1043.45		
32	68.44	667.3	1281.26	1065.26		
34	65.88	642.4	1310.50	1085.50		
36	63.54	619.6	1338.34	1104.34		
38	61.39	598.6	1364.91	1121.91		
40	59.41	579.3	1390.33	1138.33		
45	55.06	536.9	1449.54	1175.04		
50	51.40	501.2	1503.52	1206.52		
55	48.27	470.7	1553.21	1233.71		
60	45.56	444.3	1599.33	1257.33		
65	39.22	382.5	1491.64	1127.14		
70	34.66	337.9	1419.29	1032.29		
75	31.19	304.1	1368.41	958.91		
80	28.45	277.4	1331.54	899.54		



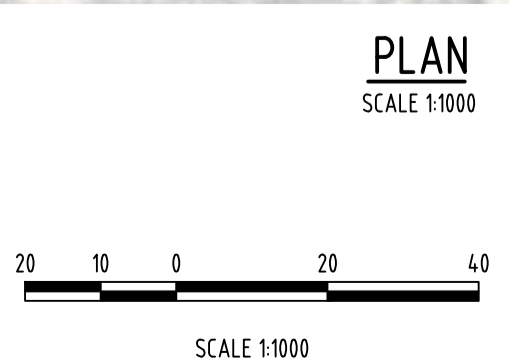
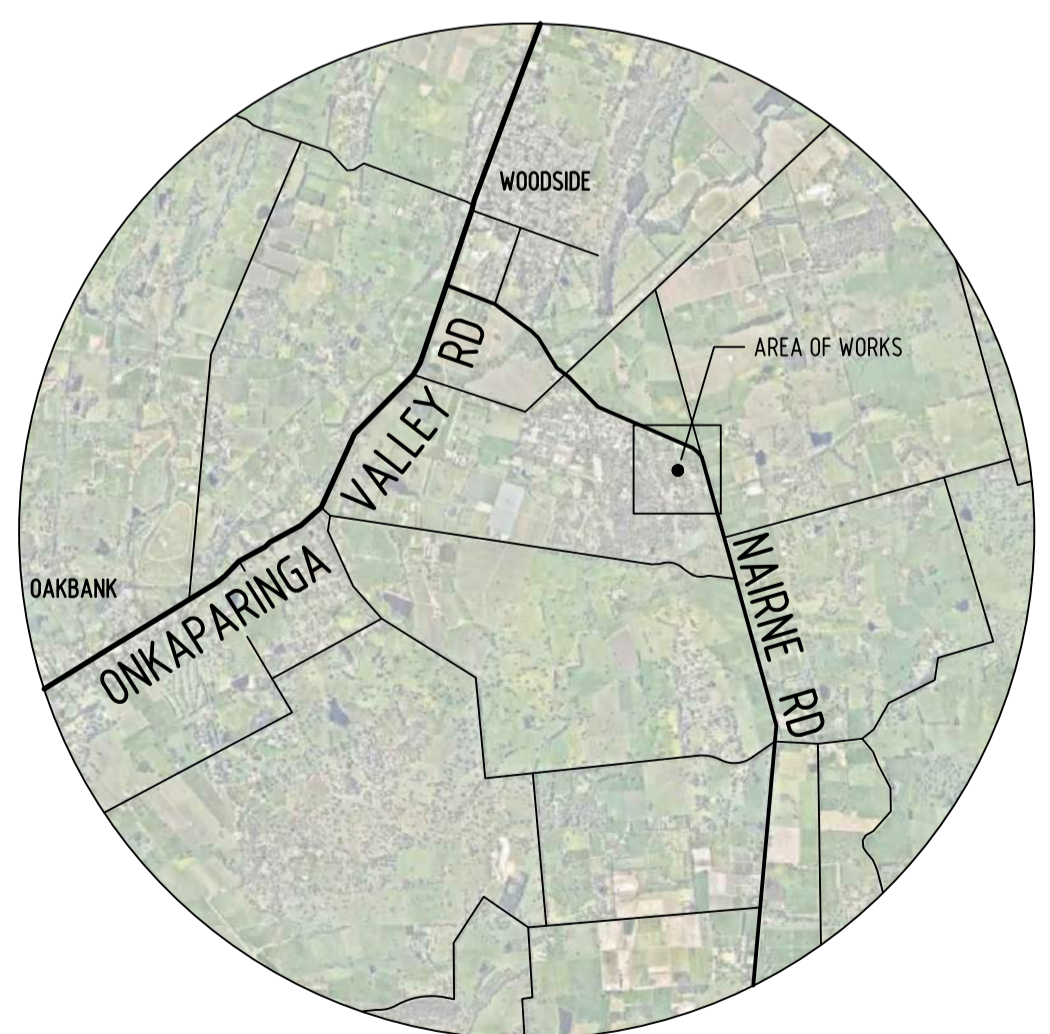
APPENDIX C

WSUD STORMWATER STRATEGY LAYOUT





- LEGEND**
- 403.0 EXISTING CONTOURS
 - SW EXISTING STORMWATER
 - EXISTING SWALE
 - EXISTING SPOON DRAIN
 - PROPOSED STORMWATER
 - PROPOSED BACK OF BLOCK STORMWATER CONNECTION
 - POTENTIAL INFILTRATION WELL (INDICATIVE)
 - PROPOSED EASEMENT
 - ALLOTMENT FLOW DIRECTION
 - FLOW DIRECTION
 - PROPOSED SWALE (LOCATION INDICATIVE)
 - PROPOSED PUMPING MAIN
 - PROPOSED STORMWATER CULVERT
 - PROPOSED GRATED INLET PIT (G)
 - PROPOSED JUNCTION BOX (JB)
 - PROPOSED SIDE ENTRY PIT
 - PROPOSED GROSS POLLUTANT TRAP/DIVERSION PIT
 - PROPOSED HEADWALL
 - ROCK RIFFLE WITH UPSTREAM VEGETATED AREA
 - ROCK WEIR POOL
 - ROCK EROSION PROTECTION PLACED ON BIDM A34 GEOTEXTILE FABRIC (LOCATION INDICATIVE)



INFORMATION ISSUE
NOT FOR CONSTRUCTION

REV.	DATE	DESCRIPTION	DRAFT	ENG.	CHKD
A	22.02.18	ISSUED FOR INFORMATION	JJW	MOF	JLS

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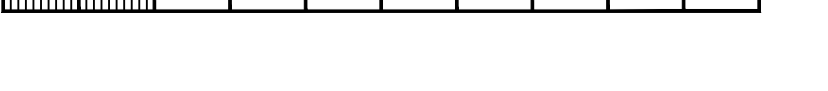
CREST @ WOODSIDE
MILL HILL CAPITAL

CONCEPT PLAN

A1 DRAWING NUMBER
Job Number: WAD171185 SK01
Sheet No. A

Design: MOF
Drawn: JJW

When sheet printed full size, the scale bar is 100mm.



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Appendix D

Mill Hill Capital – Economic and Demographic Analysis



MILL HILL
CAPITAL

CREST @ Woodside



15 February 2018

CREST

Introduction and Masterplan	3
Economic Benefits	8
Socio-Demographics	15
Appendices	22
Disclaimer	26

Section 1: CREST Introduction and Masterplan

CREST @ Woodside - History

- ❑ CREST is a 23 hectare residential site located 3kms from the Woodside town centre along Nairne Road
- ❑ Historically Officers' accommodation known as Woodside Barracks with at least 144 house and land lots in the 1980s
- ❑ Used as low security, family-oriented, immigration centre for up to 400 people until 2014
- ❑ Today 81 houses remain:
 - Mainly 1980s houses of solid brick construction
 - Very generous blocks ranging from 500-1,300sqms with established gardens
 - Communal facilities including parklands, warehouse, hall, basketball court, gym and child care centre



1986 Aerial Photograph - 129 dwellings and over 15 vacant lots

CREST Subdivision Application

- Mill Hill Capital has submitted an application to subdivide the property into the following lots:

Allotment Nature	Size	Number of Allotments
Existing Residential Dwellings	500m ² – 1300m ²	81
Vacant Infill for future Residential Dwellings	550m ² – 1400m ²	56
Sub – Total of Residential Allotments		137
Existing Office/ Warehouse/ Workshop building	2,343m ²	1 ('Lot 80')
Public Open Space	50,100m ²	2 (Lots 200 - 201)
Future Tourism and Other Accommodation (eg. cabins and camping)	33,395m ²	1 (Lot 202)
Public Access and Infrastructure – for sight lines, SA Water and access.		5 (Lots 203 – 207)
Sub- Total of Non-residential Allotments		9
TOTAL OF ALL ALLOTMENTS		146
NOTE: Areas are approximate		

CREST Masterplan



❑ Residential Precinct:

- 81 existing houses
- 56 vacant land blocks

❑ Commercial / Mixed Use Precinct:

- Existing modern warehouse
- Potential retail / light manufacturing

❑ Tourism / Other Accommodation Precinct:

- Early stage planning
- Potential for 100 Cabins / Sites
- Providing accommodation for tourists, workers (eg. seasonal fruit pickers) and others

LEGEND

- Site Boundary
- Road network
- Tourism Precinct
- Residential Precinct
- Open Space/ Reserve
- Pumping Station
- Vacant Allotment (future dwelling)
- Residential Allotment
- Commercial/ Mixed Use allotment
- Approximate location of significant tree

TYPE	SIZE
Open Space	4.873ha
Residential	11.28ha
Average Residential lot size	823m ²
Tourism	3.353ha
Mixed Use	2343m ²
Road Reserve	2.829ha



CREST – Residential (actual) and Cabin Accommodation (representative concepts)



Section 2: Economic Benefits

CREST – Summary of Economic Benefits: Residential Construction Stage

- ❑ Over \$20 million of construction and refurbishment projects over next 2-3 years - one of the largest projects in the Adelaide Hills:

- \$6m on refurbishment of 81 Existing Houses and site infrastructure already commenced
- \$14m on construction of new houses on vacant land lots (55 houses x \$250,000 inclusive of gardens and furnishings)



\$20 million in construction



320 Construction Jobs

- ❑ Economic Multipliers of \$20m of Construction Expenditure:

- Generates 740 jobs: 180 initial construction jobs (eg. carpenters, painters) plus 140 associated production jobs (eg. concrete, steel frames) plus 420 jobs over time across the rest of the economy
- \$4.3m of employee earnings plus \$4.8m of corporate and small business profits



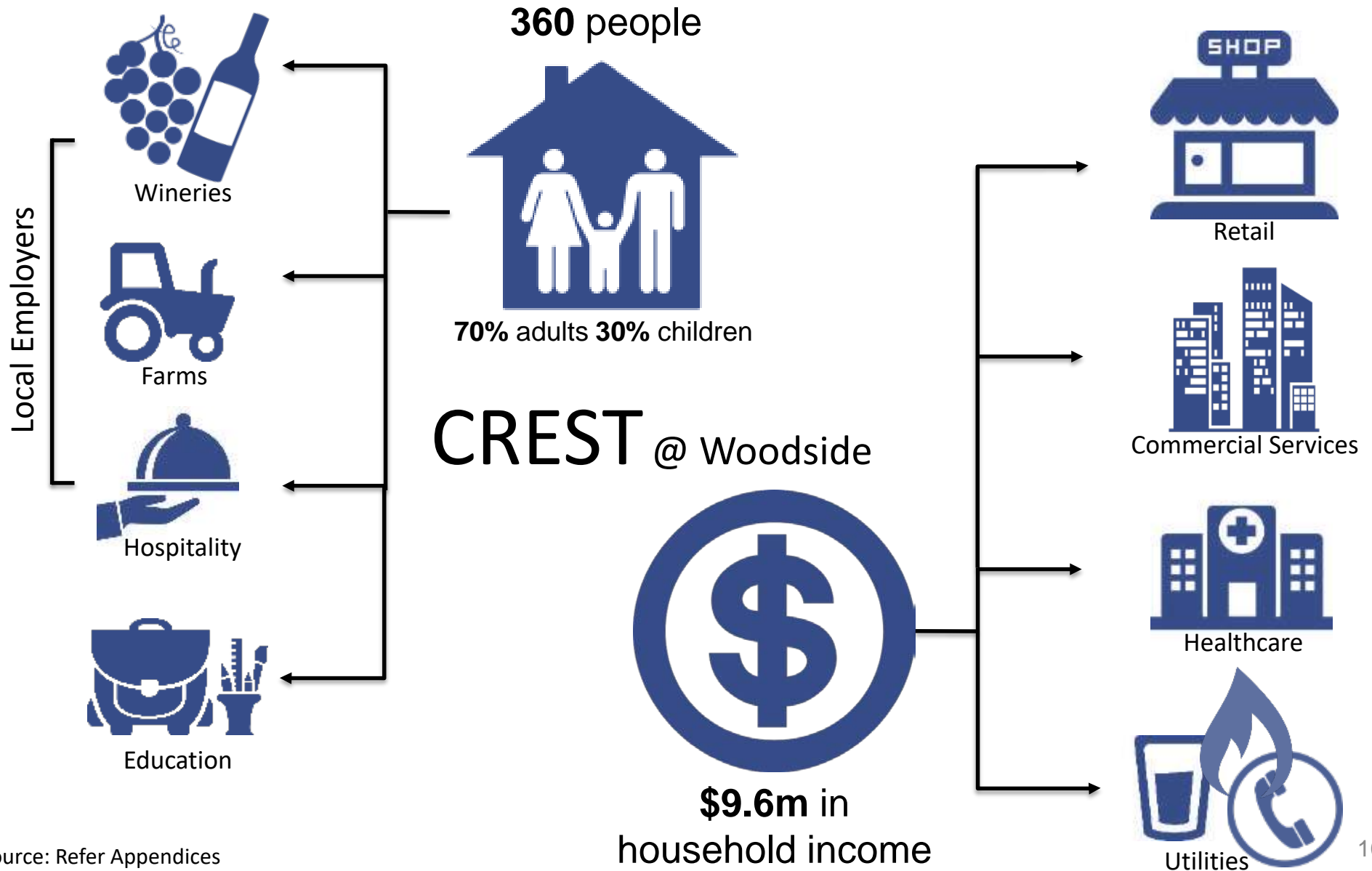
420 Other Jobs over time across the rest of the economy



\$4.3m of Employee Earnings

\$4.8m of corporate and small business profits

CREST – Summary of Economic Benefits – Residential Community on Completion



CREST – Summary of Economic Benefits – Tourism Stage

- ❑ It is expected that by 2020 the Adelaide Hills Region will bring in \$177m annually to South Australia.
- ❑ The Adelaide Hills region attracts 1.38m visitors annually but only 170k stay overnight in tourist accommodation.
- ❑ There is currently only 1 cabin / caravan style park (Cudlee Creek Caravan Park) in the Adelaide Hills Council and it is in poor condition.
- ❑ There is a shortage of quality, affordable tourist / worker accommodation in the area. Accordingly we believe that a tourist asset of this nature will increase overnight stays in the area rather than act as a substitute accommodation provider.



By 2020 the Adelaide Hills Region will contribute \$177m to tourism in SA



1.4m visitors to Adelaide Hills annually...



... But only 12% stay overnight



Current shortage of quality, affordable tourist accommodation in Adelaide Hills

CREST – Summary of Economic Benefits – Tourism Stage

- ❑ Currently day-trippers spend \$78 per day where overnight visitors spend \$394 over an average trip of just over 3 days or \$128 / day per visitor.



Day-trip tourist = \$78 / day

Overnight visitor = \$128 / day

- ❑ Every day-trip tourist that can be converted to an overnight visitor equates to at least 64% extra income for the region for a one night stay and an extra 400% per visitor to the region for an average length stay (approx. 3 days).



A day-trip tourist converted to an average overnight visitor increases income over 400%

- ❑ The supply of accommodation in Adelaide Hills, particularly of a quality, affordable nature, is limited. Accordingly, CREST expects to be able to convert a portion of these day-trippers to overnight visitors, boosting the local economy.



Only 12% of tourists stay overnight currently, providing an exciting opportunity

- ❑ CREST expects to be able to increase this even further by providing an attractive product and targeted marketing strategy.

CREST – Summary of Economic Benefits – Tourism Stage

❑ CREST Tourism / Cabin Park precinct could ultimately be around 100 cabins / sites which could generate an additional:

- \$7 million in construction activity (50 cabins x \$100k each plus \$2m for ground works)
- \$2.2 million annually in total income (50 cabins & 50 sites x \$100 per night x 60% occupancy) from short term visitors and workers to the region
 - Over 50% or \$1.1m annually paid mainly to locals in wages and service costs
- Increased accommodation capacity (22,000 room nights x 1.5 visitors / cabin or site = 33,000 visitor nights) supporting local wineries, cellar doors and local businesses with estimated \$4.2m* tourist expenditure from CREST guests.



\$7m in construction activity



\$2.2m annual income

22,000 room nights

33,000 visitor nights



\$4.2m spent by CREST guests

CREST – Summary of Direct Benefits to Governments and Utility Providers (Torrens Title)



❑ State Government of South Australia:

- \$1.1m in Stamp Duty (81 Existing Houses at \$275k each plus 55 Land Blocks at \$150k each)
- \$24k per annum increase in ESL
- Potential Land Tax from Investors in Houses



❑ Adelaide Hills Council:

- Free upgraded road, footpath, drainage and park reserve infrastructure
- \$197k per annum increase in Rates



❑ SA Water:

- Free upgraded water and sewer infrastructure
- \$88k per annum increase in Fixed Water and Sewer Charges



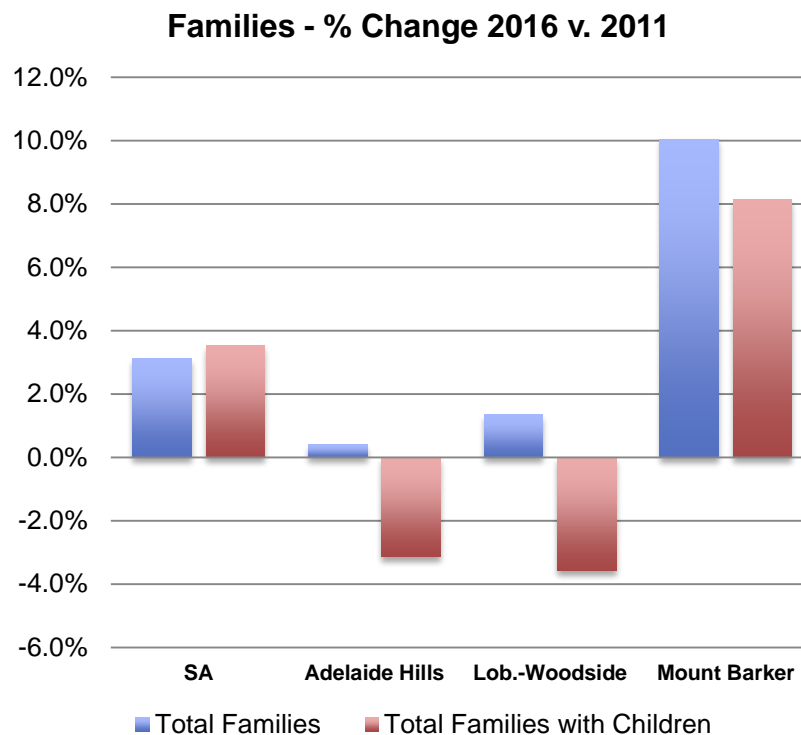
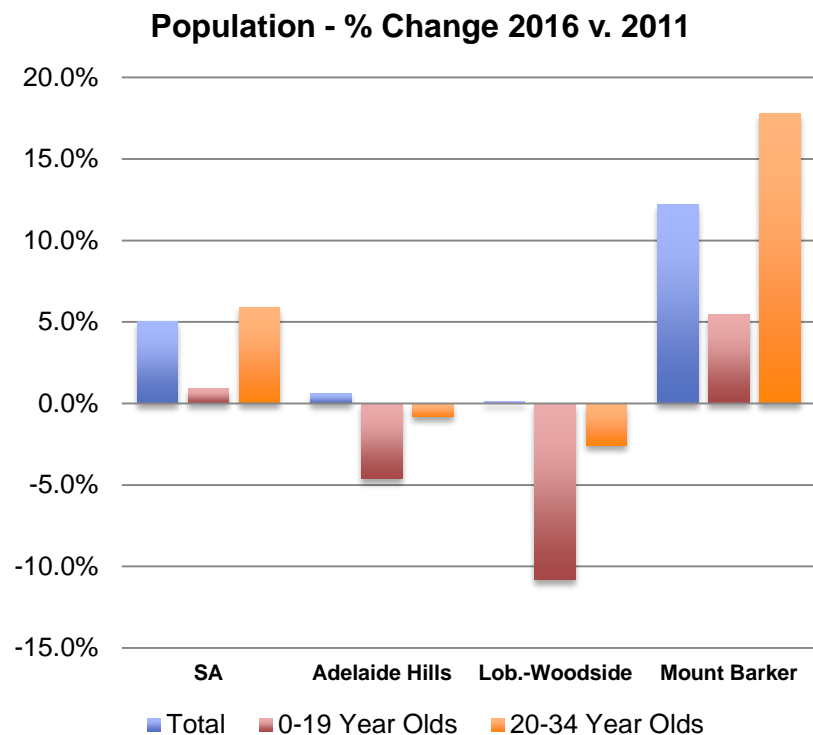
❑ SA Power Networks:

- Currently own their infrastructure
- Significant increase in wholesale electricity revenue

Section 3: Socio-Demographics

Adelaide Hills LGA is Aging (2016 v. 2011 Census)

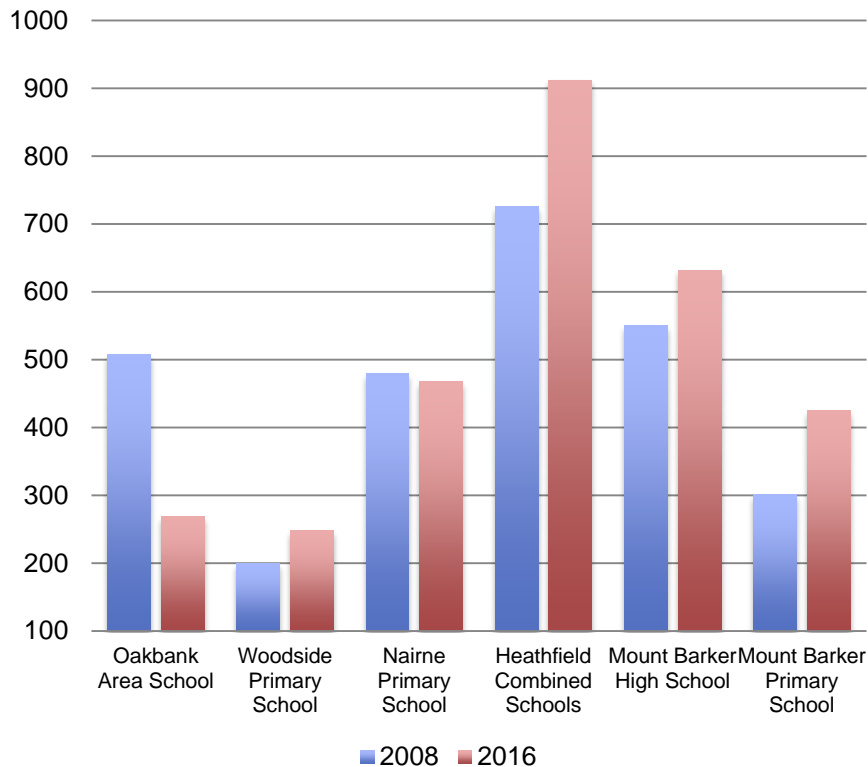
- Population has been stagnant in Adelaide Hills – Local Government Area (LGA) and Lobethal-Woodside - Statistical Area Level 2 (SA2) over the 5 years and they have both experienced a material loss in young people
- Mount Barker SA2 has grown rapidly – particularly in the highly productive 20-34 year old segment that has the highest propensity to work, start families and spend (including on new houses and furnishings)



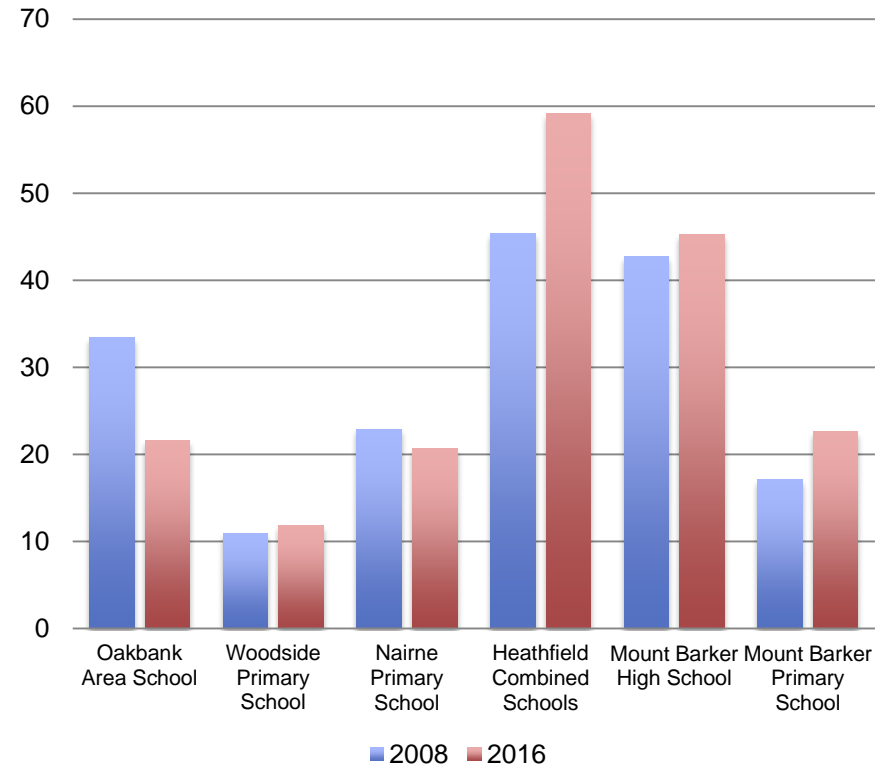
Reduction in Youth Services

- ❑ The decline in the school age population in Adelaide Hills LGA is magnified in the decline in the number of enrolments at some local schools – especially Oakbank Area School (closest to CREST) where teacher numbers and subject choice have been reduced.
- ❑ Of course, consumption of the entire range of goods and services for the young also suffers (eg. entertainment)

Schools - Student Enrollments



Teachers (FTE)



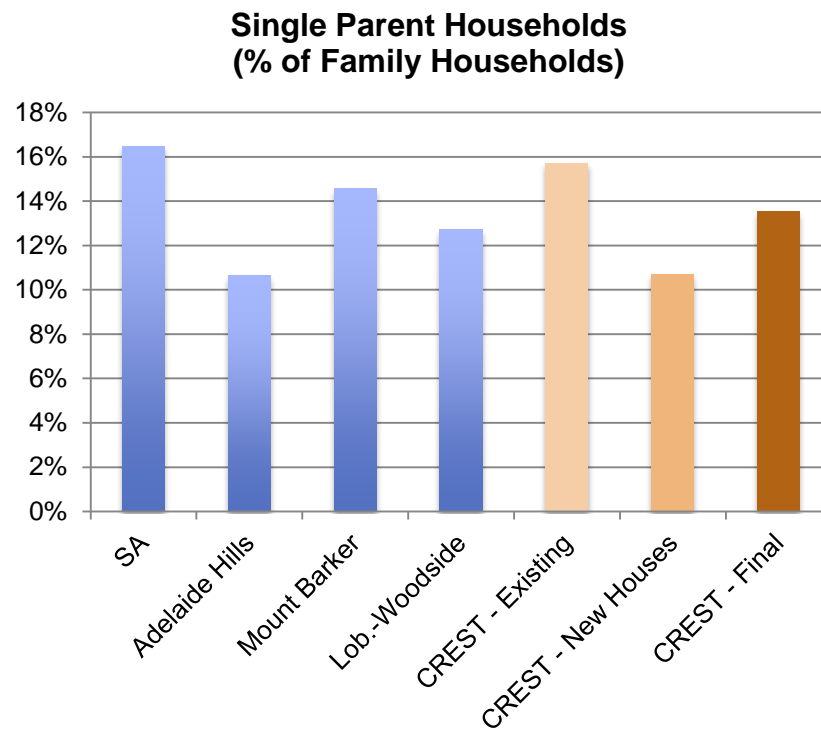
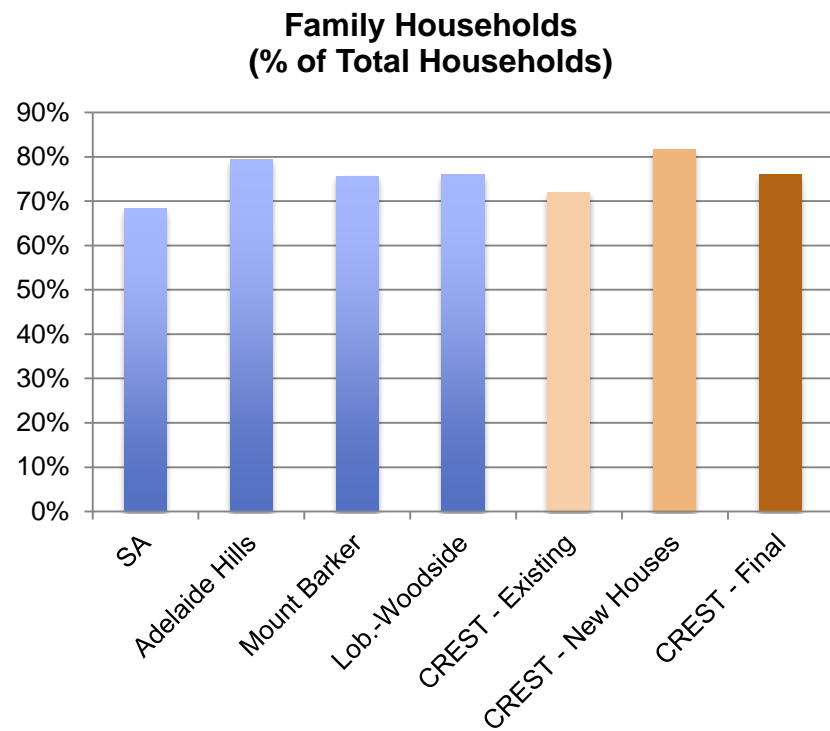
CREST - Greatest Appeal to Young Families

- ❑ CREST should have greater appeal to Young Families & Group Households than Older & Single-Person Households:
 - Not in the town centre - but only 3kms away on a main road with easy access to all facilities (including schools)
 - 100% free-standing, 3+ bedroom houses on relatively large land blocks (average of 823sqms)
 - Generous open spaces for recreation
 - Low supply of vacant land blocks to build new houses in Adelaide Hills LGA
 - Likely to be a diversified mix of owned and rented housing stock
 - Attractive and below median prices (c.\$300k) and median rents (c.\$300 per week)

- ❑ Family Households are relatively high economic contributors:
 - More people per house (more efficient use of houses and associated infrastructure)
 - Typically have higher income than other household types (particularly dual-income couples with children)
 - Greater and more diversified expenditure (eg. educating children, recreation)

Comparison – Household Structure

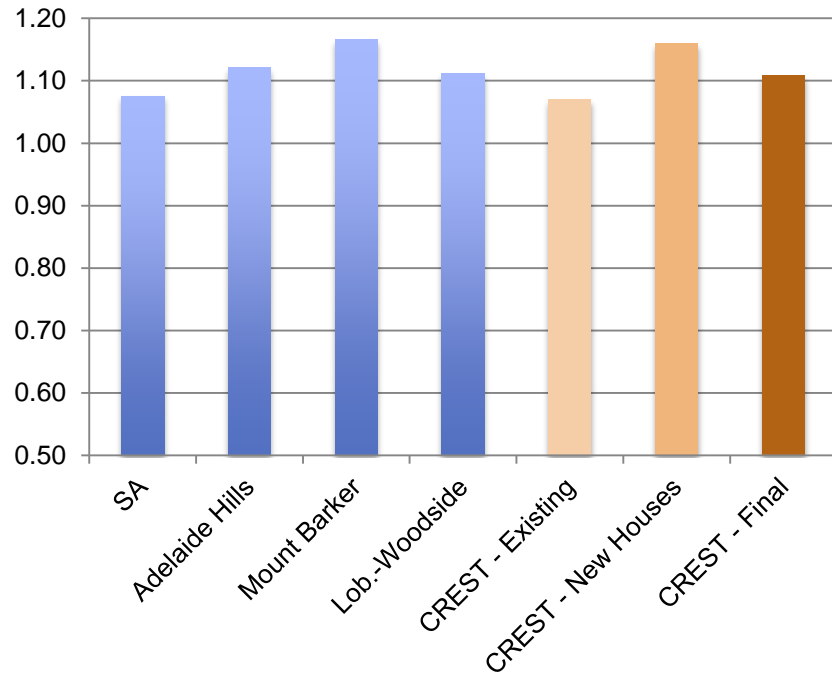
- ❑ CREST is expected to attract a relatively high proportion of Family Households, especially in the New Houses which are expected to be a premium product, larger and 4+ bedrooms. However, for the financial estimates we have assumed the Lobethal-Woodside average would persist post full development of the site.



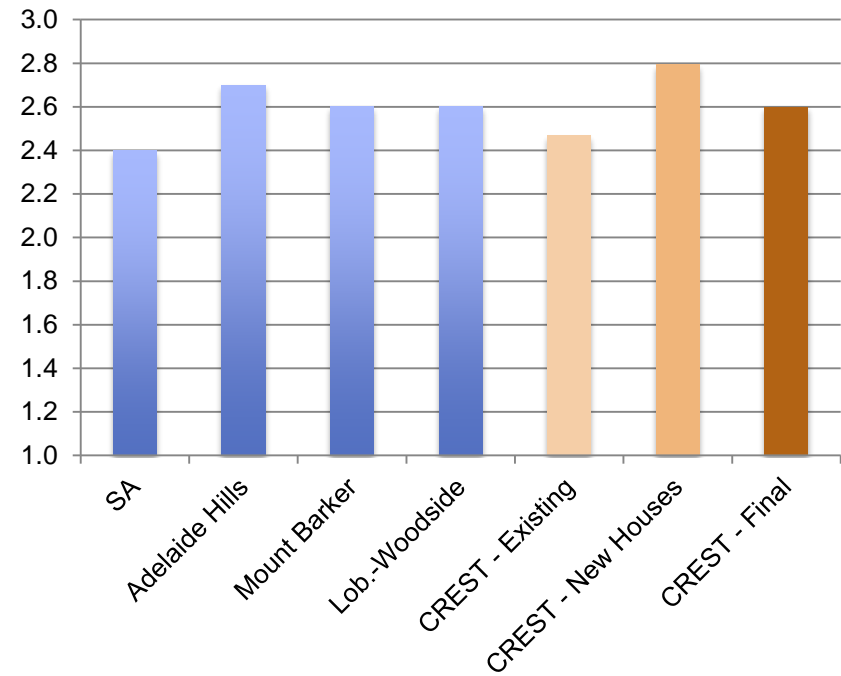
Comparison – Household Density

- While we expect to see a higher proportion of Families within CREST we have assumed the Lobethal-Woodside average

Number of Children per Family Household



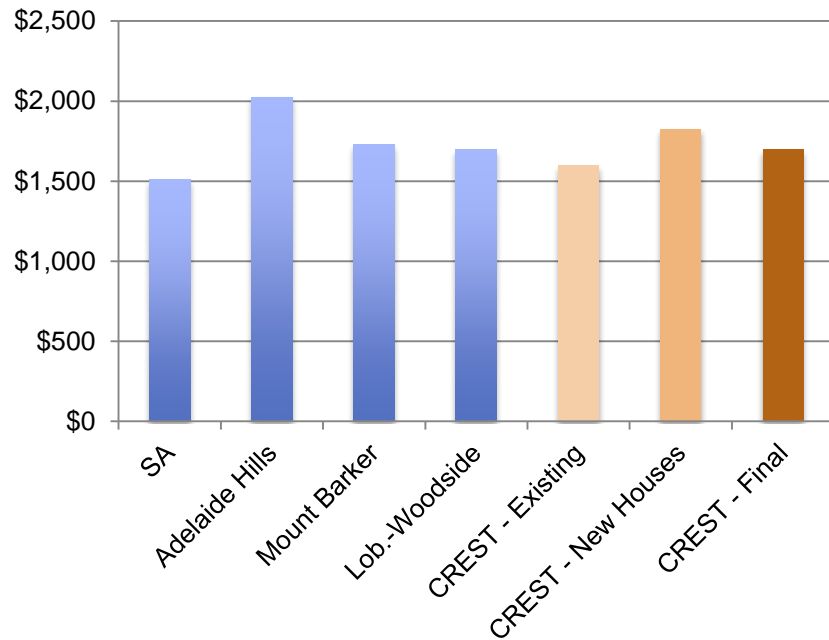
Number of People per Household



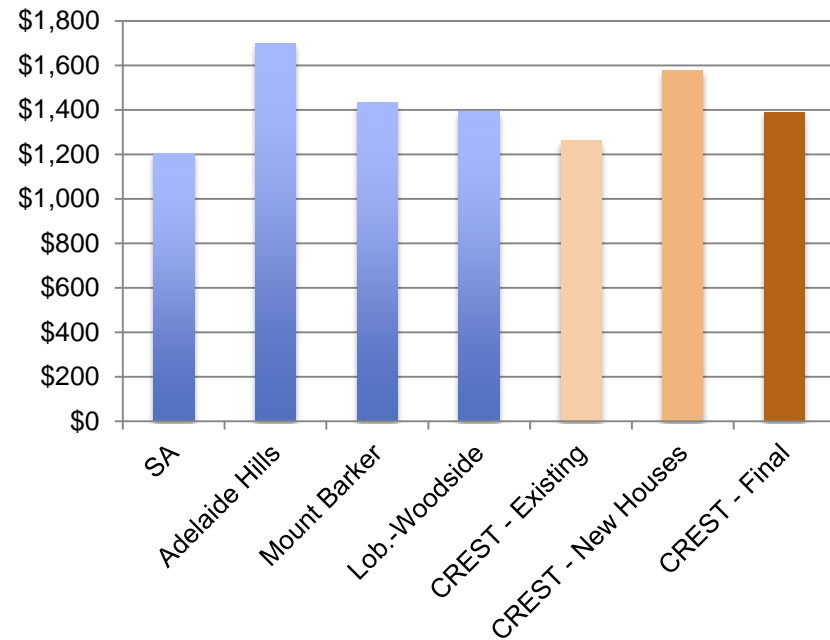
Comparison – Household Income

- ❑ MHC has assumed Median Household Income will equal that of Lobethal-Woodside across the CREST community. We expect that this will prove to be conservative and that income will be higher and more in line with Mount Barker-Adelaide Hills incomes

**Median Income of Family Households
(\$ per week)**



**Median Income of All Households
(\$ per week)**



Appendices

Appendix A - Adelaide Hills LGA Socio-Demographics

- ❑ Adelaide Hills has 38,863 people:
 - High proportion of Professionals and Managers at 44% v. 32% in SA
 - Low unemployment rate of 4.4% v. 7.5% in SA

- ❑ With Relatively High Personal Incomes and Families with Dual-Incomes:
 - High proportion of Family Households (ie. not Group or Single Person Households) at 79% v. 68% in SA
 - Low proportion of Single Parent Families at 11% v. 17% in SA
 - Low proportion of Family Households with Both Couples Not Working at 17% v 23% in SA
 - Low proportion of 20-34 year olds at 12.8% v. 19.4% in SA (moving closer to tertiary education and workplaces)

- ❑ Which together materially lifts Median Household Incomes:
 - High Median Family Household Income of \$2,026 per week which is 34% higher than SA
 - High Median Household Income of \$1,701 per week which is 41% higher than SA

- ❑ Within 15,454 Private Dwellings:
 - High proportion are free standing houses at 97% v. 78% in SA
 - High proportion are Owner-Occupied at 86% (40% owned outright and 46% with a mortgage) v. 68% in SA
 - Median Mortgage Repayments of \$1,733 per month is 16% higher than SA
 - Low proportion are Rented at 11% (median rent of \$302 per week) v. 29% in SA (\$260 per week)

Appendix B – Potential Socio-Demographics

- ❑ MHC has used Lobethal-Woodside as a benchmark demographically

- ❑ MHC has assumed:
 - the current refurbished housing will have a slightly lower than median demographic profile
 - the Newer Housing stock (with larger, brand new houses) will have slightly higher than median demographic profile.

- ❑ Post the full development of the site we have assumed CREST will have a profile similar to that of Lobethal-Woodside, however, we note that these are conservative assumptions and would not be surprised if overall demographics are more favourable than the median Lobethal-Woodside

- ❑ CREST will have the following characteristics:
 - Proportion of 3+ bedroom houses of 100% (v. 81% in Lobethal-Woodside) and average number of bedrooms per house of 3.4 (v. 3.2 in Lobethal-Woodside)
 - 76% Family Households (v. 76% in Lobethal-Woodside) – 12.7% of which are Single-Parent (v 12.7% in Lobethal-Woodside)
 - Average number of Children per Family Household of 1.11 (v. 1.11 in Lobethal-Woodside)
 - Average number of People per Household 2.6 (v. 2.6 in Lobethal-Woodside)
 - Median and Average Income of Family Households of \$1,698 (v. median of \$1,698 in Lobethal-Woodside)
 - Median and Average Income of All Households of \$1,393 (v. median of \$1,393 in Lobethal-Woodside)

Appendix B – Potential Socio-Demographics...cont'd

- ❑ Compared to the Existing Houses, the New Houses are expected to attract:
 - A higher proportion of Dual-Income Couple Families (less Single-Parent Families and less Single-Person Households)
 - A larger number of Children per Family / Household (likely to build 4+ bedroom houses on the generous block sizes)
 - Higher median Household Incomes
 - ...Providing a positive feedback loop to the Existing Houses over time

- ❑ The aggregate result with the described assumptions would be:
 - A vibrant, diversified community of about 360 people split approximately 70% / 30% adults and children
 - Represents approximately 3.9% increase for Lobethal-Woodside population and 0.9% increase in Adelaide Hills population
 - Total Household Income of \$9.6m annually

- ❑ **It should be noted that our total household income forecast assumes AVERAGE income equals MEDIAN income – this is very conservative because average household income is typically at least 20% higher than the median (in Australia)**

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