DEVELOPMENT PLAN

15-29 Coomoora Road, Springvale South

Prepared for Development Victoria

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Prepared by:
Hollerich Town Planning Pty Ltd
Level 5, 111 Collins Street
Melbourne VIC 3000

Bent Architecture Pty Ltd
Level 1/14 Wilson Avenue
Brunswick VIC 3056

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1 Introduction

This Development Plan provides a framework for the redevelopment of approximately 2.4 hectares of land at 15-29 Coomoora Road, Springvale South (the subject site). This Development Plan has been prepared on behalf of Development Victoria.

This Development Plan provides a framework for the redevelopment of the subject site in accordance with the requirements of the Schedule 13 to the Development Plan Overlay (DPO13), as outlined by the Greater Dandenong Planning Scheme (the Scheme).

The subject site is former education land that was surplus to the needs of the Department of Education and Training. It was rezoned from Public Use Zone 2 – Education (PUZ2) to Neighbourhood Residential Zone, Schedule 1, and had the DPO13 applied as part of Amendment C190 to the Scheme.

The Development Plan consists of the following separate documents.

- This document prepared by Hollerich Town Planning Pty Ltd dated 20 March 2020, and including a series of plans prepared by Bent Architecture.
- Landscape Drawings prepared by MALA Studio.
- An ESD Statement prepared by Wood & Grieve Engineers.
- A Transport Impact Assessment and Integrated Traffic Management Plan prepared by OneMileGrid.
- A Stormwater Management Plan prepared by Wood & Grieve Engineers.
- An Infrastructure Servicing Report prepared by Wood & Grieve Engineers.
- An Arboricultural Assessment and Report prepared by Tree Logic.

2 Development Plan Objectives

The following objectives for the Development Plan are outlined in Part 1.0 of the DPO13.

- Achieve a high quality, integrated residential development that capitalises on the existing landscape features and adopts a form and density that is consistent with the identified future character, as described in Clause 22.09.
- Facilitate a high quality landscape outcome that integrates with the overall layout and design of the sites and recognises and protects existing identified vegetation.

3 Planning Policy

Various parts of the Scheme are relevant to the subject site and this Development Plan.

The following section outlines the relevant planning policy framework in response to which this Development Plan has been prepared and against which any future planning permit applications within the Development Plan area must be considered

3.1 State Planning Policy Framework

3.1.1 Clause 11 - Settlement

Clause 11 states that "*planning is to anticipate and respond to the needs of existing and future communities through provision of zoned and serviced land for housing, employment, recreation and open space, commercial and community facilities and infrastructure*".

The objective of Clause 11.02-1S (Supply of Urban Land) is "*to ensure a sufficient supply of land is available for residential, commercial, retail, industrial, recreational, institutional and other community uses*".

Strategies outlined by Clause 11.02-1S and that are relevant to the Development Plan are outlined below.

- Ensure the ongoing provision of land and supporting infrastructure to support sustainable urban development.
- Ensure that sufficient land is available to meet forecast demand.
- Plan to accommodate projected population growth over at least a 15 year period and provide clear direction on locations where growth should occur. Residential land supply will be considered on a municipal basis, rather than a town-by-town basis.
- Planning for urban growth should consider:
  - Opportunities for the consolidation, redevelopment and intensification of existing urban areas.
  - Neighbourhood character and landscape considerations.
  - The limits to land capability and natural hazards and environmental quality.
  - Service limitations and the costs of providing infrastructure.

The objective of Clause 11.02-2S (Structure Planning) is "*to facilitate the orderly development of urban areas*".

Strategies outlined by Clause 11.02-2S and that are relevant to the Development Plan are outlined below.

- Ensure effective planning and management of the land use and development of an area through the preparation of relevant plans.
- Undertake comprehensive planning for new areas as sustainable communities that offer high-quality, frequent and safe local and regional public transport and a range of local activities for living, working and recreation

3.1.2 Clause 15 – Built Environment and Heritage

Clause 15 is of particular relevance to this Development Plan. Clause 15 states the following.

- Planning is to recognise the role of urban design, building design, heritage and energy and resource efficiency in delivering liveable and sustainable cities, towns and neighbourhoods.
- Planning should ensure all land use and development appropriately responds to its surrounding landscape and character, valued built form and cultural context.
- Planning should protect places and sites with significant heritage, architectural, aesthetic, scientific and cultural value.
- Planning must support the establishment and maintenance of communities by delivering functional, accessible, safe and diverse physical and social environments, through the appropriate location of use and development and through high quality buildings and urban design.
- Planning should promote development that is environmentally sustainable and should minimise detrimental impacts on the built and natural environment.
- Planning should promote excellence in the built environment and create places that:
  - Are enjoyable, engaging and comfortable to be in.
  - Accommodate people of all abilities, ages and cultures.
  - Contribute positively to local character and sense of place.
  - Reflect the particular characteristics and cultural identity of the community.
  - Enhance the function, amenity and safety of the public realm.

The objective of Clause 15.01-2S (Building Design) is "*to achieve building design outcomes that contribute positively to the local context and enhance the public realm*".

Strategies outlined by Clause 15.01-2S and that are relevant to the Development Plan are outlined below.

- Ensure a comprehensive site analysis forms the starting point of the design process and provides the basis for the consideration of height, scale and massing of new development.
- Ensure development responds and contributes to the strategic and cultural context of its location.
- Minimise the detrimental impact of development on neighbouring properties, the public realm and the natural environment.
- Ensure the form, scale and appearance of development enhances the function and amenity of the public realm.
- Ensure buildings and their interface with the public realm support personal safety, perceptions of safety and property security.
- Ensure development provides safe access and egress for pedestrians, cyclists and vehicles.
- Ensure development provides landscaping that responds to its site context, enhances the built form and creates safe and attractive spaces.

The objective of Clause 15.01-3S (Subdivision Design) is "*to ensure the design of subdivisions achieves attractive, safe, accessible, diverse and sustainable neighbourhoods*".

The Strategy outlined by Clause 15.01-3S states that redevelopment of existing areas should be designed to create liveable and sustainable communities by achieving the following.

- Creating compact neighbourhoods that have walkable distances between activities.
- Creating urban places with a strong sense of place that are functional, safe and attractive.
- Provide a range of lot sizes to suit a variety of dwelling and household types to meet the needs and aspirations of different groups of people.
- Creating landscaped streets and a network of open spaces to meet a variety of needs with links to regional parks where possible.
- Reduce car dependency by allowing for:
  - convenient and safe public transport;
  - safe and attractive spaces and networks for walking and cycling;
  - subdivision layouts that allow easy movement within and between neighbourhoods;
  - a convenient and safe road network.
- Being accessible to people with disabilities.
- Creating an urban structure and providing utilities and services that enable energy efficiency, resource conservation, integrated water management and minimisation of waste and air pollution.

The objective of Clause 15.01-4S (Healthy Neighbourhoods) is "*to achieve neighbourhoods that foster healthy and active living and community wellbeing*".

The Strategy outlined by Clause 15.01-4S is to design neighbourhoods that foster community interaction and make it easy for people of all ages and abilities to live healthy lifestyles and engage in regular physical activity by providing:

- connected, safe, pleasant and attractive walking and cycling networks that enable and promote walking and cycling as part of daily life;
- streets with direct, safe and convenient access to destinations;
- conveniently located public spaces for active recreation and leisure;
- accessibly located public transport stops.;
- amenities and protection to support physical activity in all weather conditions.

The objective of Clause 15.01-1S (Urban Design) is "*to create urban environments that are safe, healthy, functional and enjoyable and that contribute to a sense of place and cultural identity*".

Strategies outlined by Clause 15.01-1S and that are relevant to the Development Plan are outlined below.

- Requirement development to respond to its context in terms of character, cultural identity, natural features, surrounding landscape and climate.
- Ensure development contributes to community and cultural life by improving the quality of living and working environments, facilitating accessibility and providing for inclusiveness.
- Ensure the interface between the private and public realm protects and enhances personal safety.
- Ensure development supports public realm amenity and safe access to walking and cycling environments and public transport.
- Ensure that the design and location of publicly accessible private spaces, including car parking areas, forecourts and walkways, is of a high standard, creates a safe environment for users and enables easy and efficient use.
- Ensure that development provides landscaping that supports the amenity, attractiveness and safety of the public realm.

- Ensure that development, including signs, minimises detrimental impacts on amenity, on the natural and built environment and on the safety and efficiency of roads.

The strategy outlined by Clause 15.01-4R (Healthy Neighbourhoods – Metropolitan Melbourne) is outlined below.

- Create a city of 20 minute neighbourhoods, that give people the ability to meet most of their everyday needs within a 20 minute walk, cycle or local public transport trip from their home.

The objective of Clause 15.01-5S (Neighbourhood Character) is "*to recognise, support and protect neighbourhood character, cultural identity, and sense of place*".

Strategies outlined by Clause 15.01-5S and that are relevant to the Development Plan are outlined below.

- Ensure development responds to cultural identity and contributes to existing or preferred neighbourhood character.
- Ensure development responds to its context and reinforces a sense of place and the valued features and characteristics of the local environment and place by emphasising the:
  - Pattern of local urban structure and subdivision.
  - Underlying natural landscape character and significant vegetation.
  - Heritage values and built form that reflect community identity.

The objective of Clause 15.01-1R (Urban Design – Metropolitan Melbourne) is "*to create a distinctive and liveable city with quality design and amenity*".

Strategies outlined by Clause 15.01-1R and that are relevant to the Development Plan are outlined below.

- Support the creation of well-designed places that are memorable, distinctive and liveable.
- Integrate place making practices into road space management.

The objective of Clause 15.02-1S (Energy and Resource Efficiency) is "to encourage land use and development that is energy and resource efficient, supports a cooler environment and minimises greenhouse gas emissions".

Strategies outlined by Clause 15.02-1S and that are relevant to the Development Plan are outlined below.

- Improve the energy, water and waste performance of buildings and subdivisions through environmentally sustainable development.
- Promote consolidation of urban development and integration of land use and transport.
- Improve efficiency in energy use through greater use of renewable energy technologies and other energy efficiency upgrades.
- Support low energy forms of transport such as walking and cycling.
- Reduce the urban heat island effect by greening urban areas, buildings, transport corridors and open spaces with vegetation.
- Encourage retention of existing vegetation and planting of new vegetation as part of development and subdivision proposals.

3.1.3 Clause 16 – Housing

Clause 16 is of particular relevance to this Development Plan. Clause 16 states the following.

- Planning should provide for housing diversity, and ensure the efficient provision of supporting infrastructure.
- Planning should ensure the long term sustainability of new housing, including access to services, walkability to activity centres, public transport, schools and open space.
- Planning for housing should include the provision of land for affordable housing.

The objective of Clause 16.01-4S (Housing Affordability) is "*to deliver more affordable housing closer to jobs, transport and service*s".

Strategies outlined by Clause 16.01-4S and that are relevant to the Development Plan are outlined below.

- Improve housing affordability by:
  - Ensuring land supply continues to be sufficient to meet demand.
  - Increasing choice in housing type, tenure and cost to meet the needs of households as they move through life cycle changes and to support diverse communities.
  - Promoting good housing and urban design to minimise negative environmental impacts and keep costs down for residents and the wider community.
  - Encouraging a significant proportion of new development to be affordable for households on very low to moderate incomes.

- Increase the supply of well-located affordable housing by:
  - Facilitating a mix of private, affordable and social housing in suburbs, activity centres and urban renewal precincts.
  - Ensuring the redevelopment and renewal of public housing stock better meets community needs.

The objective of Clause 16.01-3S (Housing Diversity) is "*to provide a range of housing types to meet diverse needs*".

Strategies outlined by Clause 16.01-3S and that are relevant to the Development Plan are outlined below.

- Ensure housing stock matches changing demand by widening housing choice.
- Facilitate diverse housing that offers choice and meets the changing household needs through:
  - A mix of housing types.
  - Adaptable internal dwelling design.
  - Universal design.
- Encourage the development of well-designed medium-density housing that:
  - Respects the neighbourhood character.
  - Improves housing choice.
  - Makes better use of existing infrastructure.
  - Improves energy efficiency of housing.
- Support opportunities for a range of income groups to choose housing in well-serviced locations.

The strategies outlined by Clause 16.01-1R (Integrated Housing – Metropolitan Melbourne) are outlined below.

- Provide certainty about the scale of growth by prescribing appropriate height and site coverage provisions for different areas.
- Allow for a range of minimal, incremental and high change residential areas that balance the need to protect valued areas with the need to ensure choice and growth in housing.

The objective of Clause 16.01-2S (Location of Residential Development) is "to locate new housing in designated locations that offer good access to jobs, services and transport.".

Strategies outlined by Clause 16.01-2S and that are relevant to the Development Plan are outlined below.

- Increase the proportion of new housing in designated locations within established urban areas and reduce the share of new dwellings in greenfield and dispersed development areas.
- Encourage higher density housing development on sites that are well located in relation to jobs, services and public transport.
- Ensure an adequate supply of redevelopment opportunities within established urban areas to reduce the pressure for fringe development.
- Facilitate residential development that is cost effective in infrastructure provision and use, energy efficient, water efficient and encourages public transport use.
- Identify opportunities for increased residential densities to help consolidate urban areas.

The objective of Clause 16.01-1S (Integrated Development) is "*to promote a housing market that meets community needs*".

Strategies outlined by Clause 16.01-1S and that are relevant to the Development Plan are outlined below.

- Increase the supply of housing in existing urban areas by facilitating increased housing yield in appropriate locations, including under-utilised urban land.
- Ensure that an appropriate quantity, quality and type of housing is provided, including aged care facilities and other housing suitable for older people, supported accommodation for people with disability, rooming houses, student accommodation and social housing.
- Ensure housing developments are integrated with infrastructure and services, whether they are located in existing suburbs, growth areas or regional towns.

3.1.4 Clause 18 – Transport

Clause 18 is of relevance to this Development Plan and states the following.

- Planning should ensure an integrated and sustainable transport system that provides access to social and economic opportunities, facilitates economic prosperity, contributes to environmental sustainability, coordinates reliable movements of people and goods, and is safe.

The objective of Clause 18.01-1S (Land Use and Transport Planning) is "to create a safe and sustainable transport system by integrating land use and transport".

Strategies outlined by Clause 18.01-1S and that are relevant to the Development Plan are outlined below.

- Develop integrated and accessible transport networks to connect people to jobs and services and goods to market.
- Plan urban development to be more accessible by:
  - Ensuring equitable access is provided to developments in accordance with forecast demand, taking advantage of all available modes of transport and to minimise adverse impacts on existing transport networks and the amenity of surrounding areas.
  - Coordinating improvements to public transport, walking and cycling networks with the ongoing development and redevelopment of urban areas.
  - Requiring integrated transport plans to be prepared for all new major residential, commercial and industrial developments.
  - Focussing major government and private sector investments in regional cities and centres on major transport corridors, particularly railway lines, in order to maximise the access and mobility of communities.
- Integrate public transport services and infrastructure into new development.

The objective of Clause 18.02-4S (Car Parking) is “to ensure an adequate supply of car parking that is appropriately designed and located”.

Strategies outlined by Clause 18.02-4S and that are relevant to the Development Plan are outlined below.

- Allocate or require land to be set aside for car parking subject to the existing and potential modes of access including public transport, the demand for off-street car parking, road capacity and the potential for demand management of car parking.
- Design and locate local car parking to:
  - Protect the role and function of nearby roads.
  - Enable easy and efficient use.
  - Enable the movement and delivery of goods.
  - Achieve a high standard of urban design and protect the amenity of the locality, including the amenity of pedestrians and other road uses.
  - Create a safe environment, particularly at night.
  - Facilitate the use of public transports.
  - Protect the amenity of residential precincts from the effects of road congestion created by on-street parking.

The strategies outlined by Clause 18.02-1R (Sustainable Personal Transport – Metropolitan Melbourne) are outlined below.

- Improve local travel options for walking and cycling to support 20 minute neighbourhoods.
- Development local cycling networks and new cycling facilities that support the development of 20-minute neighbourhoods and that link to complement the metropolitan-wide network of bicycle routes – the Principal Bicycle Network.

3.1.5 Clause 19 – Infrastructure

Clause 19 is of relevance to this Development Plan and states the following.

- Planning for development of social and physical infrastructure should enable it to be provided in a way that is efficient, equitable, accessible and timely.
- Planning is to recognise social needs by providing land for a range of accessible community resources, such as education, cultural, health and community support (mental health, aged care, disability, youth and family services) facilities.
- Planning should ensure that the growth and redevelopment of settlements is planned in a manner that allows for the logical and efficient provision and maintenance of infrastructure, including the setting aside of land for the construction of future transport routes.
- Planning should facilitate efficient use of existing infrastructure and human services. Providers of infrastructure, whether public or private bodies, are to be guided by planning policies and should assist strategic land use planning.
- Planning should minimise the impact the use and development on the operation of major infrastructure of national, state and regional significance, including communication networks and energy generation and distribution systems.
- Planning authorities should consider the use of development and infrastructure contributions in the funding of infrastructure.

The objective of Clause 19.03-2S (Infrastructure Design and Provision) is “to provide timely, efficient and cost-effective development infrastructure that meets the needs of the community”.

The strategy outlined by Clause 19.03-2S and that is relevant to the Development Plan is outlined below.

- Provide an integrated approach to the planning and engineering design of new subdivision and development.

The objective of Clause 19.03-3S (Integrated Water Management) is "*to sustainably manage water supply, water resources, wastewater, drainage and stormwater through an integrated water management approach*".

The strategies outlined by Clause 19.03-3S and that are relevant to the Development Plan are outlined below.

- Plan and coordinate integrated water management, bringing together stormwater, wastewater, drainage, water supply, waste treatment and re-use, to:
  - take into account the catchment context.
  - protect downstream, environments, waterways and bays;
  - manage and use potable water efficiently;
  - reduce pressure on Victoria's drinking water supplies;
  - minimise drainage, water or wastewater infrastructure and operational costs;
  - minimise flood risks;
  - provide urban environments that are more resilient to the effects of climate change.
- Integrate water into the landscape to facilitate cooling, local habitat improvements and provision of attractive and enjoyable spaces for community use.
- Facilitate use of alternative water sources such as rainwater, stormwater, recycled water and run-off from irrigated farmland.
- Ensure that development protects and improves the health of water bodies including creeks, rivers, wetlands, estuaries and bays by:
  - minimising stormwater quality and quantity related impacts;
  - filtering sediment and waste from stormwater prior to discharge from site;
  - managing industrial and commercial toxicants in an appropriate way;
  - requiring appropriate measures to mitigate litter, sediment and other discharges from construction sites.
- Manage stormwater quality and quantity through a mix of on-site measures and developer contributions at a scale that will provide the greatest net community benefit.
- Provide for sewerage at the time of subdivision or ensure lots created by the subdivision are capable of adequately treating and retaining all domestic wastewater within the boundaries of each lot.
- Ensure that land is set aside for water management infrastructure at the subdivision design stage.
- Minimise the potential impacts of water, sewerage and drainage assets on the environment.
- Protect significant water, sewerage and drainage assets from encroaching into sensitive and incompatible uses.

The objective of Clause 19.03-5S (Waste and Resource Recovery) is "*to reduce waste and maximise resource recovery so as to reduce reliance on landfills and minimise environmental, community amenity and public health impacts*".

The strategies outlined by Clause 19.03-5S and that are relevant to the Development Plan are outlined below.

- Ensure future waste and resource recovery infrastructure needs are identified and planned for to safely and sustainably manage all waste and maximise opportunities for resource recovery.
- Protect waste and resource recovery infrastructure against encroachment from incompatible land uses by ensuring buffer areas are defined, protected and maintained.
- Ensure waste and resource recovery facilities are sited, designed, built and operated so as to minimise impacts on surrounding communities and the environment.
- Encourage technologies that increase recovery and treatment of resources to produce energy and other marketable end products.
- Enable waste and resource recovery facilities to locate close together in order to share separation distances, reduce the impacts of waste transportation and improve economic viability of resource recovery.
- Site, design, manage and rehabilitate waste disposal facilities in accordance with the Waste Management Policy (*Siting, Design and Management of Landfills) (Environment Protection Authority, 2004*).
- Integrate waste and resource recovery infrastructure planning with land use and transport planning.
- Encourage development that facilitates sustainable waste and resource recovery.

Clause 19.03-4R (Telecommunications – Metropolitan Melbourne) outlines the following relevant strategy.

- Support the provision of high-quality telecommunications infrastructure in Melbourne's employment, urban renewal and growth areas through early planning for fibre-ready facilities and wireless infrastructure.

3.2 Local Planning Policy Framework

3.2.1 Municipal Strategic Statement (MSS)

Various parts of the MSS have relevance to the Development Plan and are summarised below.

Clause 21.04 (Land Use) is a detailed policy relating to all land in the Municipality. Clause 21.04 refers to the Greater Dandenong Housing Strategy 2014-2024, which outlines the expected population increase in the Municipality and the need to accommodate approximately 9,950 new households by 2024. Under the Strategic Residential Framework Plan at Clause 21.04, the subject site is located in a limited change area. It is noted that residential land to the north and west of the subject site is located in an area identified for incremental change.

Clause 21.04 includes a detailed set of objectives and strategies, a number of which are relevant to the subject site. Outlined below are the key objectives as they relate to this Development Plan.

- To encourage and facilitate a wide range of housing types and styles which increase diversity and cater for the changing needs of households.
- To respect and improve residential environments.
- To protect the amenity of residential areas adjacent to particular uses and protect sensitive particular uses from residential development.
- To improve access to affordable and appropriate housing.

Clause 21.05 (Built Form) applies to all land in the Municipality and includes numerous objectives and strategies. Outlined below are the key objectives as they relate to this Development Plan.

- To facilitate high quality building design and architecture.
- To facilitate high quality development, which has regard for the surrounding built environment and built form.
- To improve the quality, consistency and function of the city's environment.
- To provide for connected public open spaces and waterways systems.
- To ensure that design of the public and private environment supports accessibility and healthy living.
- To protect and improve streetscapes.
- To ensure landscaping that enhances the built environment.
- To encourage all development to achieve best practice environmentally sustainable outcomes.

Clause 21.07 (Infrastructure and Transportation) includes a detailed set of objectives and strategies, a number of which are relevant to the subject site. Outlined below are the key objectives as they relate to this Development Plan.

- To minimise the visual impact of physical infrastructure on the built and natural environment.
- To manage the impact of discharge of stormwater to minimise pollution and flooding.
- To minimise damage to physical infrastructure (including trees) from development.
- To ensure new developments meet the cost of infrastructure.
- To increase the use of public transport.
- To promote and facilitate walking and cycling.
- To promote significant modal shift away from the car.
- To protect residential and other sensitive uses from adverse impacts of vehicular traffic.

3.2.2 Local Planning Policies

There are various local planning policies relevant to this Development Plan, as summarised below.

The Environmentally Sustainable Development Policy is outlined at Clause 22.06 and is relevant to this Development Plan and any future planning permit on the subject site. The policy outlines a detailed series of objectives and application requirements. It also outlines the following policies.

- It is policy to ensure innovative technology, design and processes positively influence the sustainability of all development.
- It is policy that applications for the types of development listed in Table 1 of Clause 22.06 to be accompanied by information which demonstrates how relevant policy objectives will be achieved.

While it is noted that the detailed requirements of Clause 22.06 will be addressed and must be met at planning permit stage, the objectives and policies of Clause 22.06 should be considered by this Development Plan as they relate to the master planning of the subject site.

The Residential Development and Neighbourhood Policy at Clause 22.09 is particularly relevant to the Development Plan and applies to all residential development in the Municipality. The policy builds on the Greater Dandenong Neighbourhood Character Study (September 2007) and provides guidance to manage the evolution of neighbourhood character throughout the Municipality. It places an emphasis on development respecting the valued characteristics and identified future character of residential neighbourhoods.

Much of this policy has relevance to the proposal, with the following objectives and design principles considered of particular relevance to the Development Plan.

- Minimise the visual dominance of vehicle accessways and storage facilities, such as garages, carports and basement entrances.
- Incorporate active frontages including habitable room windows at each floor level that overlook the public realm, streets, laneways, internal access ways and car parking areas.
- Provide substantial, high quality landscaping (preferably indigenous), including along vehicular accessways and incorporate at least one substantial canopy tree to each front setback and ground level secluded private open space (SPOS) area.
- Avoid the removal of existing mature trees by incorporating their retention into the site design.
- Use landscaping to soften the appearance of built form.
- Where car parking is located in the front setback it should be fully located within the site boundary and capable of accommodating a vehicle between a garage or carport and site boundary.
- Development should provide appropriate side setbacks between buildings to enable screen planting where required, and at least one generous side setback to enable canopy vegetation.
- Ground level private open space should be able to accommodate boundary landscaping, domestic services and outdoor furniture.
- Private open space should be positioned to maximise solar access.
- Reduce the need for screening through the siting and design of dwellings.
- Use a consistent simple palette of materials, colours, finishes and architectural detailing.
- Domestic and building services should be visually integrated and appropriately screened so as not to be visible from the street or adjoining properties. They should not be located within secluded private open space areas, including balconies.

The subject site is located in a Limited Change Area as identified by Clause 22.09. These areas have been identified primarily as they lack the location and or access advantages compared to other areas close to activity centres and transport. The broad character is defined by detached dwellings and predominantly single storey scale on larger lots. Notwithstanding the location of the subject site in a Limited Change Area, it is noted that land to the north and west of the subject site is located in an Incremental Change Area.

Specific design principles for limited change areas are stated below.

- The preferred housing type for the Limited Change Area is low density.
- The maximum building height for land within the NRZ1 is up to 2 storeys, including ground level.
- Residential development should incorporate substantial landscaping to create a landscaped character, particularly canopy trees in the front and rear gardens; and to protect the outlook of adjoining properties.
- Garages and car parking areas should be located behind buildings, generally hidden from view or recessed so as not to dominate the streetscape.
- Car access, parking and paving within the front setback should be limited in order to maximise the opportunity for soft landscaping.
- Residential development should provide ground level secluded private open space at the side or rear of each dwelling to avoid the need for excessive screening or high front fencing.
- Residential development should:
  - Ensure that the built form respects the scale of existing prevailing built form character and responds to site circumstances and streetscape;
  - Provide separation between dwellings at the upper level;
  - Retain spines of open space at the rear of properties to maximise landscaping opportunities and protect private secluded open space;
  - Position more intense and higher elements of built form towards the front and centre of a site, transitioning to single storey elements to the rear of the lot.
- Residential developments should provide a level of visual interest through the use of contrast, texture and variation of materials.

3.3 Neighbourhood Residential Zone

The subject site is affected by the Neighbourhood Residential Zone (NRZ).

The purpose of the NRZ is outlined below.

- "*To implement the Municipal Planning Strategy and the Planning Policy Framework*".
- "*To recognise areas of predominantly single and double storey residential development*".
- "*To manage and ensure that development respects the identified neighbourhood character, heritage, environmental or landscape characteristics*".
- "*To allow educational, recreational, religious, community and a limited range of other non-residential uses to serve local community needs in appropriate locations*".

Under the NRZ, a permit is not required to use land for the purposes of a dwelling.

A planning permit is required under Clause 32.09-3 to subdivide land. An application to subdivide land, other than an application to subdivide land into lots each containing an existing dwelling or car parking space, must meet the requirements of Clause 56 and the objectives and standards as relevant.

A planning permit is required to construct or extend one dwelling on a lot less than 300 square metres in area. Any such application must meet the requirements of Clause 54.

A planning permit is required to construct two or more dwellings on a lot. Any such application must meet the requirements of Clause 55.

The subject site is affected by Schedule 1 to the NRZ (NRZ1).

The following neighbourhood character objectives are outlined by the NRZ1.

- To ensure the scale, built form and setbacks of residential development responds to the existing site circumstances by respecting the valued characteristics of the neighbourhood, including the predominant built form, façade street patterns and appropriate separation between dwellings.
- To provide appropriate front, side and rear setbacks, garden areas and private open space to allow for substantial high quality landscaping, including canopy trees to protect the amenity and outlook of adjoining properties and contribute to the landscape character.
- To maximise the opportunities to create high quality landscaping through minimal paving and the use of permeable ground surfaces.
- To ensure vehicle accessways and storage facilities do not visually dominate the streetscape.
- To ensure that residential development achieves high quality useable private open space outcomes for future residents, including the provision of ground level secluded private open space at the side or rear of each dwelling.

It is noted that the NRZ1 varies requirements of Clause 54 and 55 in terms of site coverage, permeability, landscaping, side and rear setbacks, private open space and front fence height.

A map of the zoning pattern in the local area is provided below at ***Figure 1***.

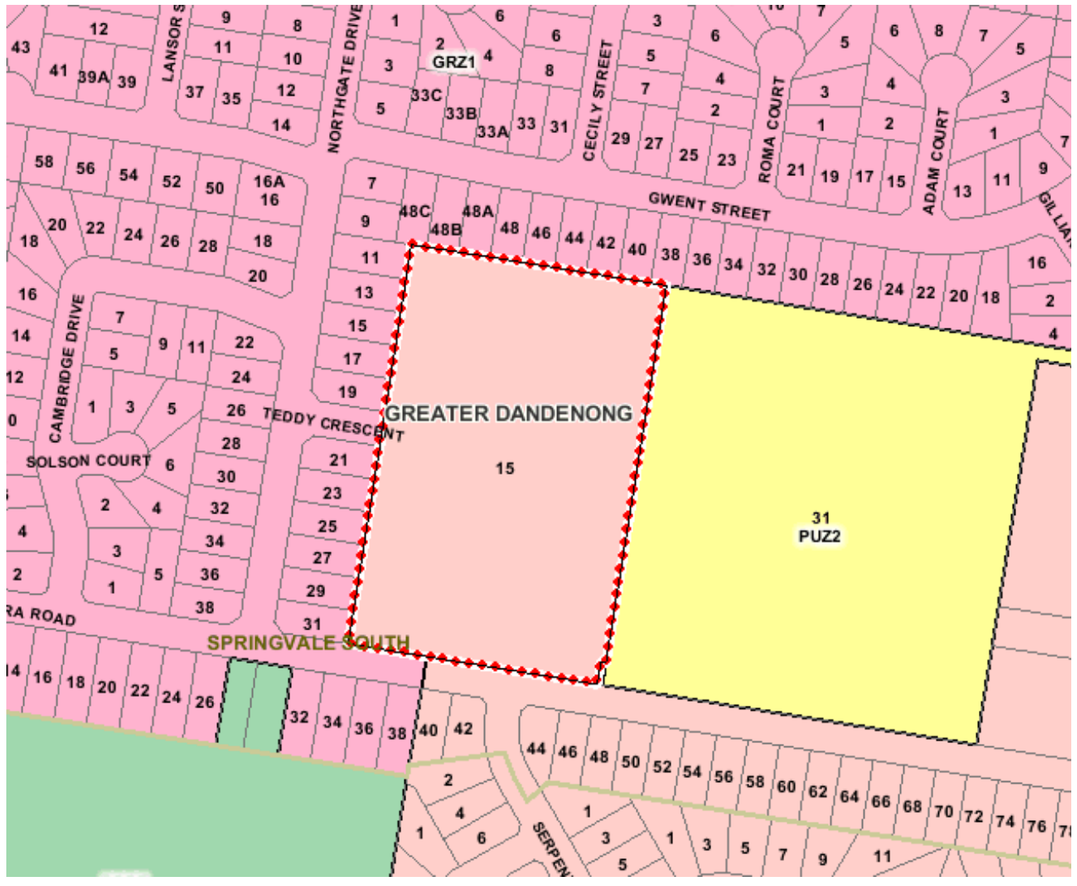


Figure 1: Zoning Map (source, Planning Maps Online)

3.4 Development Plan Overlay

The subject site is affected by a Development Plan Overlay (DPO). The purpose DPO is to:

- implement the State Planning Policy Framework and Local Planning Policy Framework, including the Municipal Strategic Statement and local planning policies;
- identify areas which require the form and conditions of future use and development to be shown on a development plan before a permit can be granted to use or develop the land;
- exempt an application from notice and review if a development plan has been prepared to the satisfaction of the responsible authority.

It is noted that under Clause 43.04-2 a planning permit must not be granted to use or subdivide, construct a building or construct of carry out works until a development plan has been prepared to the satisfaction of the responsible authority unless otherwise stated in the relevant schedule.

Furthermore, Clause 43.04-3 states that an application under any provision of the Scheme is exempt from notice and review requirements if a development plan has been approved.

Clause 43.04-4 states that a development plan:

- may consist of plans or other documents and may be prepared and implemented in stages;
- must meet the requirements of Clause 56;
- may be amended to the satisfaction of the responsible authority.

More specifically, Schedule 13 to the DPO (DPO13) applies to the subject site. This Development Plan is submitted for approval under the DPO13.

The DPO13 outlines a series of requirements that are responded to by this Development Plan.

3.5 Special Building Overlay

The subject site is partially affected by a Special Building Overlay (SBO). Those parts of the subject site affected by the SBO are indicated by ***Figure 2.***

The purpose of the SBO is outlined below.

- To implement the Municipal Planning Strategy and the Planning Policy Framework.
- To identify land in urban areas liable to inundation by overland flows from the urban drainage system as determined by, or in consultation with, the floodplain management authority.
- To ensure that development maintains the free passage and temporary storage of floodwaters, minimises flood damage, is compatible with the floor hazard and local drainage conditions and will not cause any significant rise in floor level or flow velocity.
- To protect water quality in accordance with the provisions of the relevant State Environment Protection Policies, particular in accordance with Clauses 33 and 35 of the State Environment Protection Policy (Waters of Victoria).

Under the SBO a planning permit is required for most buildings and works and is also required to subdivide land. An application must be referred to the relevant floodplain management authority.

Figure 2: Special Building Overlay Map (source, Planning Maps Online)

3.6 Particular Provisions

3.6.1 Clause 52.02 – Easements, Restrictions and Reserves

As the subject site is affected by a series of easements, Clause 52.02 is relevant to this Development Plan.

The purpose of Clause 52.02 is "*to enable the removal and variation of an easement or restrictions to enable a use or development that complies with the planning scheme after the interests of affected people are considered*".

Under Clause 52.02 a planning permit is required to remove easements from the Development Plan area.

3.6.2 Clause 52.06 – Car Parking

The purpose of Clause 52.06 is outlined below.

- To ensure that car parking is provided in accordance with the Municipal Planning Strategy and the Planning Policy Framework.
- To ensure the provision of an appropriate number of car parking spaces having regard to the demand likely to be generated, the activities on the land and the nature of the locality.
- To support sustainable transport alternatives to the motor car.
- To promote the efficient use of car parking spaces through the consolidation of car parking facilities.
- To ensure that car parking does not adversely affect the amenity of the locality.
- To ensure that the design and location of car parking is of a high standard, creates a safe environment for users and enables easy and efficient use.

Table 1 at Clause 52.06-5 outlines car parking rates for various uses. A planning permit is required under Clause 52.06-3 should the car parking rates outlined at Table 1 not be provided as part of a new or expanded development.

In relation to this Development Plan it is noted that the following car parking rates are outlined by Table 1 for dwellings.

- 1 car space to each one and two bedroom dwelling.
- 2 car spaces to each three or more bedroom dwelling.
- One visitor car space to every 5 dwellings for developments of 5 dwellings or more.

Clause 52.06 also outlines a detailed set of requirements for the design and layout of car parking areas.

3.6.3 Clause 53.01 – Public Open Space Contribution and Subdivision

This clause requires that a proponent seeking to subdivide land must make a contribution to the Council for public open space as required under Section 18 of the Subdivision Act 1988.

More specifically, Clause 53.01 requires that a person who proposes to subdivide land must make a contribution to the council for public open space in an amount specified in the schedule to this clause (being a percentage of the land intended to be used for residential, industrial or commercial purposes, or a percentage of the site value of such land, or a combination of both). If no amount is specified, a contribution open space may still be required under section 18 of the Subdivision Act 1988.

It is noted that the Schedule to Clause 53.01 outlines a 5% public open space contribution for the subject site.

3.6.5 Clause 54 – One Dwelling on a Lot

Clause 54 applies to applications to construct or carry out works associated with one dwelling on a lot under the provisions of the Neighbourhood Residential Zone.

The purpose of Clause 54 is as follows:

- To implement the Municipal Planning Strategy and Planning Policy Framework.
- To achieve residential development that respects the existing neighbourhood character or which contributes to a preferred neighbourhood character.
- To encourage residential development that provides reasonable standards of amenity for existing and new residents.
- To encourage residential development that is responsive to the site and the neighbourhood.

Clause 54 may therefore be applicable to future development on the subject site depending on the nature of future planning permit applications.

Clause 54 outlines a detailed list of objectives that must be met and standards that contain the requirements to meet the relevant objective. Standards should be met but may be

varied should the responsible authority be satisfied that an alternative design solution meets the relevant objective.

3.6.6 Clause 55 – Two or More Dwellings on a Lot

Clause 55 applies to applications in the NRZ for the following.

- Construct a dwelling if there is at least one dwelling existing on the lot
- Construct two or more dwellings on a lot.
- Extend a dwelling if there are two or more dwellings on the lot.
- Construct or extend a dwelling on common property.
- Construct or extend a residential building.

The purpose of Clause 55 is as follows.

- To implement the Municipal Planning Strategy and Planning Policy Framework.
- To achieve residential development that respects the existing neighbourhood character or which contributes to a preferred neighbourhood character.
- To encourage residential development that provides reasonable standards of amenity for existing and new residents.
- To encourage residential development that is responsive to the site and the neighbourhood.

Clause 55 may therefore be applicable to future development on the subject site depending on the nature of future planning permit applications.

Clause 55 outlines a detailed list of objectives that must be met and standards that contain the requirements to meet the relevant objective. Standards should be met but may be varied should the responsible authority be satisfied that an alternative design solution meets the relevant objective.

3.6.7 Clause 56 – Residential Subdivision

Clause 56 applies to applications to subdivide the subject site.

The purpose of Clause 56 is as follows.

- To implement the Municipal Planning Strategy and Planning Policy Framework.
- To create liveable and sustainable neighbourhoods and urban places with character and identity.
- To achieve residential subdivision outcomes that appropriately respond to the site and its context for:
  - Metropolitan Melbourne growth areas;
  - infill sites within established residential areas;
  - regional cities and towns.
- To ensure residential subdivision design appropriately provides for:
  - policy implementation;
  - liveable and sustainable communities;
  - residential lot design;
  - urban landscape;
  - access and mobility management;
  - integrated water management;
  - site management;
  - utilities.

Clause 56 outlines a detailed list of objectives that must be met and standards that contain the requirements to meet the relevant objective. Standards should be met but may be varied should the responsible authority be satisfied that an alternative design solution meets the relevant objective.

4 Site and Urban Context Analysis

4.1 Subject Site

The subject site is former education land located to the north of Coomoora Road in Springvale South. The subject site is formally known as Lot 1 on Plan of Subdivision 647548.

A detailed analysis of the subject site and surrounding urban context is provided by the ***Urban Context Analysis & Locality Plan*** and ***Site Analysis Plan*** on the following pages of this report.

A summary of the key features of the subject site is outlined below. The subject site:

- has an area of approximately 2.4 hectares;
- is rectangular in shape;
- has frontage to Coomoora Road (and general east-west dimension) of approximately 121.38 metres;
- has a north-south dimension of approximately 194.4 metres;
- is affected by a series of easements for the purposes of sewerage and drainage;
- abuts the Keysborough Primary School to the east;
- to the west abuts the rear of numerous residential properties that front Northgate Drive;
- To the north abuts the rear of a number of properties fronting Gwent Street;
- is accessed via a crossover from Coomoora Road towards the western end of the street frontage;
- has potential for vehicle and pedestrian access via Teddy Crescent to the west, which terminates at the western boundary of the subject site;
- is generally flat in topography although does have a series of mounds and other minor undulations;
- was previously occupied by education buildings, which have now been removed, however a series of bitumenised areas still exist;
- supports a series of canopy trees as described in further detail elsewhere in this Development Plan and in particular by the **Arboricultural Report and Assessment** prepared by Tree Logic that forms part of this Development Plan.

4.2 Urban Context

The subject site is located within the suburb of Springvale South in the local government area of the City of Greater Dandenong.

It is located in a predominantly residential area bound by Springvale Road to the west, the Dandenong Bypass and adjacent public open space areas to the south, Corrigan Road to the east and Heatherton Road to the North. Notwithstanding this, the Keysborough Primary School is located immediately to the east of the subject site and the Coomoora Reserve is a large area of public open space a short walk to the south west.

The Site is proximate to a number of public open spaces, education facilities, employment opportunities, transport facilities and retail centres, as generally outlined on the ***Urban Context Analysis & Locality Plan***.

The residential neighbourhood surrounding the subject site appears to have been largely developed in the 1970s and 1980s. Dwellings in these neighbourhoods:

- are predominantly single storey;
- are usually detached, with narrow setbacks to both side boundaries and often outbuildings / extension constructed to one or both side boundaries;
- are constructed of face brickwork;
- have hip roofs constructed of concrete tiles
- have consistent and large front setbacks;
- have large extensions, outbuildings, garages and pergolas built to the side and rear, with many properties having large, freestanding sheds to the rear constructed of iron.

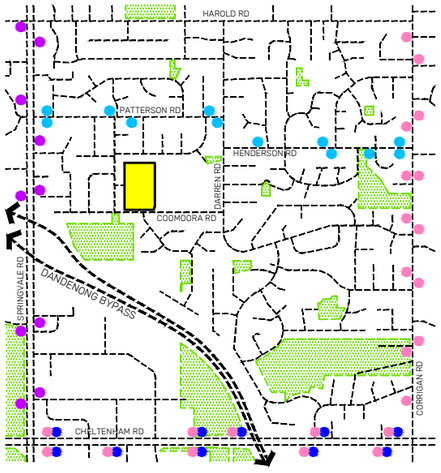
These residential neighbourhoods are based around an irregular street pattern of crescents and cul-de-sac popular to this period of development. While there are generally large front and rear gardens, there is minimal presence of canopy vegetation in the neighbourhood, with trees often limited to street tree planting.

It should be noted that the immediately abutting residential areas to the north and west are located in the General Residential Zone, Schedule 1 (GRZ1), while properties to the south of Coomoora Road are located in the same NRZ1 as the subject site.

DEVELOPMENT PLAN

15-29 Coomoora Road, Springvale South VIC 3172

DRAWING LIST - ARCHITECTURAL



LEGEND

- SUBJECT SITE (15-29 COOMOORA RD SPRINGVALE SOUTH)
- NEIGHBOURHOOD OPEN RECREATION SPACE
- 812 BUS ROUTE (DANDENONG-BRIGHTON VIA PARKMORE SHOPPING CENTRE) - 1.4km TO NEAREST STOP
- 824 BUS ROUTE (MOORABBIN-KEYSBOROUGH VIA CLAYTON & WESTALL) - 500m TO NEAREST STOP
- 828 BUS ROUTE (HAMPTON-BERWICK VIA SOUTHLAND SHOPPING CENTRE & DANENONG) - 1.5km TO NEAREST STOP
- 902 BUS ROUTE (CHELSEA-AIRPORT WEST) - 500m TO NEAREST STOP

LOCALITY PLAN

NOT TO SCALE

URBAN CONTEXT ANALYSIS PLAN

NOT TO SCALE

BENT ARCHITECTURE
Level 1 / 14 Wilson Ave Brunswick VIC 3056
T. (03) 9388 9033 E. info@bentarchitecture.com.au

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PROPRIETOR: DEVELOPMENT VICTORIA
Level 9, 8 Exhibition Street, Melbourne VIC 3000

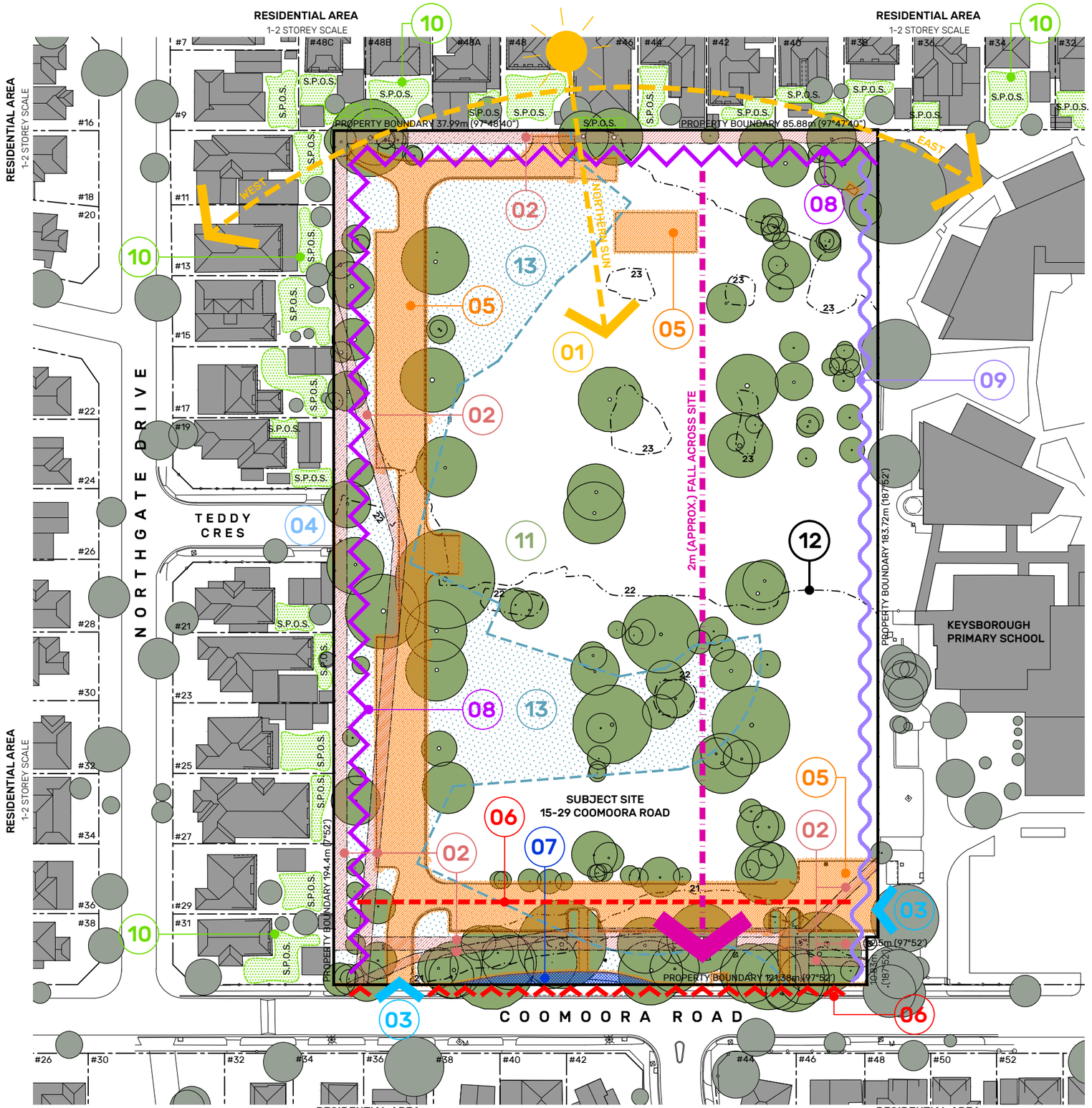
PROJECT TITLE: SPRINGVALE SOUTH
15-29 Coomoora Road, Springvale South VIC 3172

DRAWING TITLE: URBAN CONTEXT ANALYSIS & LOCALITY PLAN

REVISION REGISTER

No.	Date	Description
1	31.10.19	LAYOUT CHANGES & ASSOCIATED REVISIONS
2	19.03.20	REVISIONS AS PER COUNCIL RECOMMENDATIONS

SCALE	DRAWN BY	REVISION ISSUE	DRAWING NO.
NTS @ A3	PP RC TZ	2	DP01
PROJECT NO.	ISSUE DATE	DRAWING STATUS	
180102	19.03.20	DEVELOPMENT PLAN NOT FOR CONSTRUCTION PURPOSES	



LEGEND

- PROPERTY BOUNDARY
- NEIGHBOURING BUILDINGS
- EXISTING TREES ON SITE
- SURROUNDING NEIGHBOURHOOD TREES (SHOWN INDICATIVELY ONLY)
- EXISTING PRIMARY SITE CONTOURS

01 NORTHERN SUNLIGHT - LOT LAYOUT & HOUSING TYPES TO ALLOW FOR SOLAR PENETRATION INTO PUBLIC OPEN SPACE, COMMUNAL OPEN SPACE, PRIVATE OPEN SPACE & LIVING AREAS OF DWELLINGS (WHERE POSSIBLE)

02 INDICATIVE LOCATION OF EXISTING EASEMENTS ON SITE SHOWN SHADED - REFER DP19 - EASEMENT REMOVAL & RELOCATION PLAN

03 EXISTING VEHICULAR SITE ACCESS POINTS (FROM COOMOORA ROAD & VIA KEYSBOROUGH PRIMARY SCHOOL) - ACCESS POINT FROM KEYSBOROUGH PRIMARY SCHOOL TO BE TERMINATED. EXISTING CROSSOVER FROM COOMOORA ROAD TO BE REPLACED BY NEW CROSSOVER SLIGHTLY FURTHER TO THE EAST TO ALIGN WITH NEW ON-SITE ROAD NETWORK

04 TEDDY CRESCENT CURRENTLY TERMINATES AT PROPERTY BOUNDARY - POTENTIAL FOR NEW PEDESTRIAN SITE ACCESS POINT

05 EXISTING ROAD NETWORK, CONCRETE PADS, HARDSTANDS, SERVICES, PITS (AND THE LIKE) ON SITE TO BE DEMOLISHED TO FACILITATE THE PROPOSED DEVELOPMENT

06 PRIMARY STREET FRONTAGE TO SITE - POTENTIAL AMENITY IMPACTS (NOISE & LIGHT) FROM VEHICULAR TRAFFIC ALONG COOMOORA ROAD. A LANDSCAPED SETBACK / BUFFER ZONE (INCORPORATING BAND OF EXISTING TREES) TO BE ESTABLISHED ALONG COOMOORA ROAD FRONTAGE

07 EXISTING INDENTED PARKING ZONE ON COOMOORA ROAD (PARTIALLY WITHIN PROPERTY BOUNDARY)

08 SENSITIVE INTERFACE WITH NEIGHBOURING RESIDENTIAL PROPERTIES TO NORTH & WEST OF SITE - NEW BUILT FORM TO BE SETBACK TO MINIMISE POTENTIAL OVERSHADOWING & OVERLOOKING INTO NEIGHBOURING SECLUDED PRIVATE OPEN SPACE

09 SENSITIVE INTERFACE WITH NEIGHBOURING KEYSBOROUGH PRIMARY SCHOOL TO EAST OF SITE - NOISE EXPECTED DURING SCHOOL TIMES. SECLUDED PRIVATE OPEN SPACE OF DWELLINGS ALONG EAST BOUNDARY TO PROVIDE LANDSCAPED BUFFER ZONE

10 INDICATIVE LOCATION OF SECLUDED PRIVATE OPEN SPACE (S.P.O.S.) OF NEIGHBOURING RESIDENTIAL PROPERTIES

11 EXISTING TREES ON SITE (SHOWN SHADED GREEN) - REFER ARBORCULTURAL ASSESSMENT AND REPORT PREPARED BY TREE LOGIC (REF. 009059, DATED 13 APRIL 2018). CLUSTERS OF TREES OF 'HIGH' & 'MODERATE' RATING ARE TO BE GENERALLY RETAINED TO ADD VALUE TO PROPOSED DEVELOPMENT - REFER DP20 - EXISTING TREE PLAN, DP21 - TREE RETENTION PLAN & DP22 - TREE REMOVAL PLAN

12 EXISTING PRIMARY SITE CONTOURS (SHOWN AT 1m INTERVALS) - REFER FEATURE & LEVEL SURVEY. LEVELS ARE IN TERMS OF AHD BASED ON PM 1432 RL.24.205m. WHERE EXISTING TREES ARE REMOVED, ASSOCIATED MOUNDS ARE TO BE FLATTENED

13 EXTENT OF SPECIAL BUILDING OVERLAY (SBO) AFFECTING THE SITE - FLOODPLAIN MANAGEMENT AUTHORITY TO DETERMINE MINIMUM FLOOR LEVEL FOR DWELLINGS PROPOSED ON THE PORTION OF THE SITE SUBJECT TO THIS OVERLAY

APPROX. NORTH

0 10 20 30 40 50 60

BAR SCALE 1:1000 Metres

BENT ARCHITECTURE
Level 1 / 14 Wilson Ave Brunswick VIC 3056
T. (03) 9388 9033 E. info@bentarchitecture.com.au

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DEVELOPMENT VICTORIA
Level 9, 8 Exhibition Street, Melbourne VIC 3000

PROJECT TITLE
SPRINGVALE SOUTH
15-29 Coomoora Road, Springvale South VIC 3172

DRAWING TITLE
SITE ANALYSIS PLAN

REVISION REGISTER

No.	Date	Description
1	31.10.19	LAYOUT CHANGES & ASSOCIATED REVISIONS
2	19.03.20	REVISIONS AS PER COUNCIL RECOMMENDATIONS

SCALE	DRAWN BY	REVISION ISSUE	DRAWING NO.
1:1000@ A3	PP RC TZ	2	DP02
PROJECT NO.	ISSUE DATE	DRAWING STATUS	
180102	19.03.20	DEVELOPMENT PLAN NOT FOR CONSTRUCTION PURPOSES	

5 The Development Plan

The future development of the subject site is outlined by a series of drawings as follows on the following pages of this report. These drawings address the following themes.

- General site layout.
- Built form, including setbacks, building height and other key principles.
- Easement removal and relocation.
- Tree retention and removal.
- Site access and movement.
- Open space.

It is proposed to develop the subject site with vacant land lots along the north and west boundaries that are ultimately to be each developed with two storey, detached dwellings, and a series of two storey dwellings throughout the central parts of the subject site. These dwellings will be located around a network of public and common open spaces and a communal road network.

The future development layout has been informed by the retention of clusters of canopy vegetation identified to have the highest retention value. As a result, three main clusters of trees are to be retained, resulting in a network of north-south and east-west open space linkages through the subject site from Teddy Crescent to Coomoora Road.

An area of public open space is proposed along the Coomoora Road frontage that comprises approximately 9.8% of the subject site. This area of public open space is to be complemented by a series of supplementary areas of communal open space extending east-west and north-south through the subject site that assist in retaining high quality canopy vegetation and also providing a clear and legible pedestrian network through the subject site from Coomoora Road to Teddy Crescent. The proposed public and communal open spaces represent a total of approximately 20% of the subject site as open space.

The street layout has been driven by tree retention and the location of public / communal open space, and a development typology that seeks to locate larger, detached dwellings along the residential interfaces of the site, with attached and semi-detached townhouses located internal to the site.

The street network has sought to be as regular as possible in layout and also seeks to ensure that a high level of passive surveillance is achieved over the proposed common and public open spaces. The street network also seeks to facilitate pedestrian and bicycle movements through the open space network within the site.

Vacant land lots are proposed along the north site boundary and much of the west site boundary where adjacent to existing dwellings on neighbouring properties. Each of these lots will be developed with a maximum of one dwelling, with larger dwellings expected on these lots than anticipated for the central parts of the subject site. These dwellings will be detached, will be a maximum of two storeys in height and will have a minimum 5 metres setback from neighbouring residential properties. At the northern interface, the side boundaries of future lots adjoining the rear of existing dwellings fronting Gwent Street have been aligned to match the side boundaries of the existing, neighbouring lots. These measures will ensure a landscaped interface along the site boundaries and an appropriate transition in built form intensity from the subject site to neighbouring properties.

Dwellings fronting Coomoora Road will be set back approximately 22 metres from the street, with a series of trees retained within public open space along this street setback. These dwellings will be separated at first floor to ensure that the retained vegetation remains the dominant feature of the Coomoora Road address. The land lot that sides onto Coomoora Road at the western edge of the subject site will be set back at least 13.7 metres from the street.

Two storey townhouses are proposed internal to the subject site, with a range of 2, 3 and 4 bedroom dwellings anticipated. These dwellings are to have a range of layouts and typologies, including a limited number of potential reverse-living dwellings that front on to an area of communal open space within the subject site.

Dwellings are expected to be set back 3 metres from internal streets, although there are some examples where smaller setbacks are acceptable, as indicated by the following plans. Any dwelling that is set back 3 metres from a street will also have a garage that is set back at least 5.4 metres from the street.

All proposed dwellings other than those in a reverse-living layout will meet the secluded private open space provisions of the NRZ1. All dwellings apart from those that have a reverse-living arrangement will provide at least 40 square metres of secluded private open space (SPOS) at ground floor level with a minimum dimension of at least 5 metres. Dwellings with a reverse-living arrangement will have smaller areas of SPOS at first floor level, with a minimum size of 10 square metres and minimum dimension of 2 metres. These areas of SPOS are to have a layout that ensures these spaces are highly functional for future residents. Areas of SPOS will be designed and sited to ensure they achieve reasonable solar access.

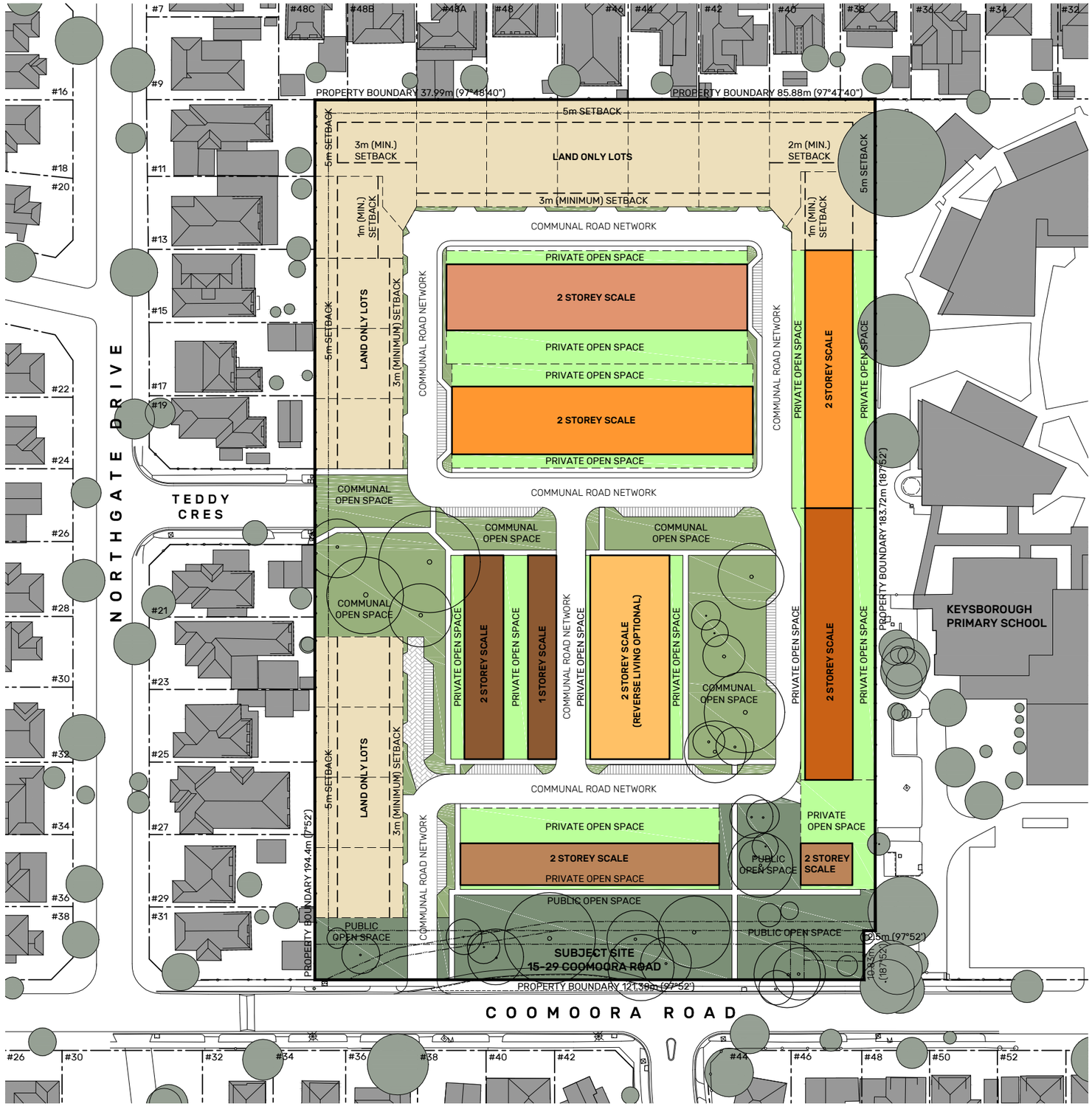
Vehicle access will be provided only from Coomoora Road to the south. Car parking will be provided in accordance with Clause 52.06 of the Scheme. Each two bedroom dwelling will be provided with at least one car parking space, and each dwelling with three or more bedrooms will be provided with at least two car parking spaces. Approximately 24 visitor spaces will be accommodated throughout the site through the provision of indented car

parking spaces within the internal street network, representing a provision of visitor car parking that is expected to be well in excess of the minimum requirements of Clause 52.06.

In addition, pedestrian / bicycle access is to be provided to the subject site from Teddy Crescent, as well as from Coomoora Road, with the path and open space network encouraging pedestrian and bicycle movements through the subject site.

The following drawings also indicate what easements require removal, and what easements require relocation to facilitate the future development of the subject site.

It is noted that while the following drawings contain a high level of detail as to how the subject site is to be developed, the detailed design of any future development will need to be determined at planning permit application stage and therefore the ultimate drawings may be subject to a level of change.



LEGEND

- PROPERTY BOUNDARY
- NEIGHBOURING BUILDINGS
- LOCATION OF EXISTING (REMAINING) & PROPOSED SEWER & DRAINAGE EASEMENTS ON SITE - REFER DP19 - EASEMENT REMOVAL & RELOCATION PLAN
- RETAINED TREES ON SITE
- SURROUNDING NEIGHBOURHOOD TREES (SHOWN INDICATIVELY ONLY)
- PROPOSED ON-SITE COMMUNAL ROAD NETWORK
- PROPOSED EXTENDED DRIVEWAYS FOR LOTS NOT DIRECTLY ACCESSIBLE FROM THE COMMUNAL ROAD NETWORK
- POTENTIAL VISITOR CAR PARKING AREAS - SPACES TO BE DISTRIBUTED THROUGHOUT THE DEVELOPMENT
- LAND ONLY LOTS TO HAVE DETACHED SINGLE OCCUPANCY DWELLINGS WITH 3 METRE (MINIMUM) FRONT SETBACK FROM THE COMMON ROADWAY, 5 METRE (MINIMUM) SETBACK TO GARAGE FROM THE COMMON ROADWAY & 5 METRE (MINIMUM) REAR SETBACK - SEPARATION TO BE PROVIDED BETWEEN DWELLINGS
- 2 STOREY SCALE BUILT FORM WITH 3 METRE (MINIMUM) FRONT SETBACK, 5.4 METRE (MINIMUM) SETBACK TO GARAGE & 5 METRE (MINIMUM) REAR SETBACK
- 2 STOREY SCALE BUILT FORM WITH 3 METRE (MINIMUM) FRONT SETBACK, 5.4 METRE (MINIMUM) SETBACK TO GARAGE & 7.4 METRE (MINIMUM) REAR SETBACK
- 2 STOREY SCALE BUILT FORM WITH 1 METRE (MINIMUM) FRONT SETBACK & 5 METRE (MINIMUM) REAR SETBACK
- 2 STOREY SCALE BUILT FORM (REVERSE LIVING OPTIONAL) WITH 3 METRE (MINIMUM) FRONT SETBACK & 1 METRE (MINIMUM) REAR SETBACK
- 2 STOREY SCALE BUILT FORM WITH 3 METRE (MINIMUM) FRONT SETBACK & 1 STOREY SCALE BUILT FORM WITH NO REAR SETBACK
- 2 STOREY SCALE BUILT FORM WITH 1 METRE (MINIMUM) FRONT SETBACK & 7.78 METRE (MINIMUM) REAR SETBACK - SEPARATION TO BE PROVIDED BETWEEN BUILT FORM AT FIRST FLOOR LEVEL ON ALL LOTS ALONG THE COOMOORA ROAD FRONTAGE
- PUBLIC OPEN SPACE AREAS ALONG COOMOORA ROAD STREET FRONTAGE - 5% (MINIMUM) OF THE SITE AREA
- COMMUNAL OPEN SPACE & LANDSCAPING AREAS THROUGHOUT THE DEVELOPMENT
- PRIVATE OPEN SPACE AREAS (AT GROUND FLOOR LEVEL) ASSOCIATED WITH BUILT FORM THROUGHOUT THE DEVELOPMENT

REFER TO INTERFACE DETAIL PLANS, STREETSCAPE SECTIONS & ROAD SECTIONS FOR FURTHER INFORMATION ON PROPOSED BUILT FORM, SETBACKS, ROADS, FOOTPATHS & LANDSCAPING THROUGHOUT THE DEVELOPMENT

APPROX. NORTH

0 10 20 30 40 50 60

BAR SCALE 1:1000 Metres

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DEVELOPMENT VICTORIA
Level 9, 8 Exhibition Street,
Melbourne VIC 3000

PROJECT TITLE
SPRINGVALE SOUTH
15-29 Coomoora Road,
Springvale South VIC 3172

DRAWING TITLE
MASTERPLAN - BUILT FORM, DISTRIBUTION & SCALE

REVISION REGISTER

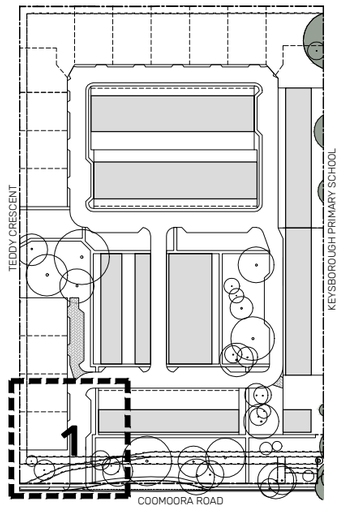
No.	Date	Description
1	30.04.20	REVISIONS AS PER COUNCIL RFI

SCALE	DRAWN BY
1:1000@ A3	PP RC TZ

PROJECT NO.	ISSUE DATE
180102	30.04.20

REVISION ISSUE	DRAWING NO.
1	**DP03-4**

DRAWING STATUS
DEVELOPMENT PLAN
NOT FOR CONSTRUCTION PURPOSES



KEY PLAN
SCALE 1:2500 @ A3

EXISTING SEWERAGE EASEMENT ALONG EAST SITE BOUNDARY TO REMAIN - REFER DP19 - EASEMENT REMOVAL & RELOCATION PLAN

1 METRE WIDE NATURE STRIP TO ACCOMMODATE LAWN / LOW PLANTING

FUTURE BUILT FORM ON LAND ONLY LOTS TO BE SETBACK 5 METRES (MINIMUM) FROM WEST SITE BOUNDARY TO PROVIDE A GREEN BUFFER TO ADJACENT PROPERTIES AND MINIMISE POTENTIAL OVERLOOKING & OVERSHADOWING OF ADJOINING SECLUDED PRIVATE OPEN SPACE (S.P.O.S.)

BLANK, WINDOWLESS WALLS ARE TO BE AVOIDED WHERE SIDE ELEVATIONS OF BUILT FORM ARE VISIBLE (TYPICAL THROUGHOUT THE DEVELOPMENT)

PUBLIC & COMMUNAL OPEN SPACE THROUGHOUT THE DEVELOPMENT IS TO BE GENERALLY CONCENTRATED AROUND CLUSTERS OF RETAINED 'HIGH' & 'MODERATE' RATED MATURE TREES

PRIMARY STREET FRONTAGE OF THE SITE - LANDSCAPED SETBACKS / BUFFER ZONES TO BE PROVIDED, INCORPORATING BAND OF EXISTING TREES TO BE RETAINED ALONG FULL EXTENT OF COOMOORA ROAD FRONTAGE

EXISTING SEWERAGE & DRAINAGE EASEMENTS ALONG COOMOORA ROAD SITE FRONTAGE TO REMAIN - REFER DP19 - EASEMENT REMOVAL & RELOCATION PLAN

EXISTING CROSSOVER ALONG COOMOORA ROAD REMOVED & REPLACED WITH NEW CROSSOVER TO SUIT NEW ROAD NETWORK WITHIN THE DEVELOPMENT. NATURE STRIP MADE GOOD TO MATCH EXISTING ADJACENT

5000 LOT SETBACK (REAR S.P.O.S.) | 5500 LOT SETBACK (DRIVEWAY) | 1000 NATURE STRIP | 6500 COMMUNAL ROADWAY | 2100 VISITOR CAR PARKING | 1860 NOM LAND. | 1200 PATH

SECLUDED PRIVATE OPEN SPACE (REAR YARDS) WITHIN EACH LOT TO ACCOMMODATE PLANTING & TWO NEW TREES - REFER LANDSCAPE PLAN

27 NORTHGATE DRIVE

29 NORTHGATE DRIVE

31 NORTHGATE DRIVE

S.P.O.S.

EASEMENT

LOT BOUNDARY

LAND ONLY LOTS

POTENTIAL DRIVEWAY CROSSOVER LOCATION

NATURE STRIP

3000 NOM EASEMENT

EXISTING SHED

EXISTING CARPORT

PROPERTY BOUNDARY 194.4m (7°52')

PROPERTY BOUNDARY 121.38m (97°52')

13710 SITE SETBACK (FRONT BOUNDARY)

TWO-WAY COMMUNAL ROADWAY

VISITOR CAR PARKING SPACES

LANDSCAPING

FOOTPATH

POTENTIAL DRIVEWAY CROSSOVER LOCATION

NATURE STRIP LOT BOUNDARY

1000 NATURE STRIP

7780 LOT SETBACK (DRIVEWAY)

7780 LOT SETBACK (REAR S.P.O.S.)

SECLUDED PRIVATE OPEN SPACE (S.P.O.S.)

2 STOREY SCALE

DWELLING DIRECTLY ABUTTING OPEN SPACE TO PROVIDE PASSIVE SURVEILLANCE AND ACTIVATION

PRIVATE OPEN SPACE

1200 PATH

1000 P.O.S.

PUBLIC OPEN SPACE

18705 (PUBLIC OPEN SPACE)

19905 SITE SETBACK (FRONT BOUNDARY)

2000 NOM EASEMENT

SUBJECT SITE

15-29 COOMOORA ROAD

EXISTING FOOTPATH

NATURE STRIP

NEW ROADWAY CROSSOVER

EXISTING INDENTED STREET PARKING

C O O M O O R A R O A D

3000 MIN. LOT SETBACK (FRONT YARD) | 1000 NATURE STRIP | 6500 COMMUNAL ROADWAY | 2685 LANDSCAPE | 1200 PATH

LANDSCAPE STRIPS TO ACCOMMODATE LOW PLANTING, STREET TREES, LIGHTING (AND THE LIKE) TO CREATE A VISUAL & PHYSICAL BARRIER BETWEEN ROADWAY & FOOTPATHS - REFER LANDSCAPE PLAN

BAND OF EXISTING 'MODERATE' RATED MATURE TREES TO BE RETAINED ALONG THE COOMOORA ROAD SITE FRONTAGE AND INTEGRATED INTO PUBLIC OPEN SPACE WITHIN THE DEVELOPMENT

NEW PEDESTRIAN SITE ACCESS POINT, CONNECTING FOOTPATH NETWORK WITHIN THE DEVELOPMENT TO EXISTING COUNCIL FOOTPATH ALONG COOMOORA ROAD. FOOTPATHS THROUGHOUT THE DEVELOPMENT TO BE 1.2 METRES WIDE AND BE ACCOMPANIED BY LANDSCAPING WHERE POSSIBLE

LEGEND

- PROPERTY BOUNDARY
- NEIGHBOURING BUILDINGS
- LOCATION OF EXISTING (REMAINING) & PROPOSED SEWER & DRAINAGE EASEMENTS ON SITE - REFER DP19 - EASEMENT REMOVAL & RELOCATION PLAN
- RETAINED TREES ON SITE - REFER DP21 - TREE RETENTION PLAN
- POTENTIAL LOCATION FOR NEW TREES/PLANTING IN PUBLIC/COMMUNAL OPEN SPACE (INDICATIVE ONLY) - REFER LANDSCAPE PLAN
- SURROUNDING NEIGHBOURHOOD TREES (SHOWN INDICATIVELY ONLY)
- PROPOSED ON-SITE COMMUNAL ROAD NETWORK
- PROPOSED EXTENDED DRIVEWAYS FOR LOTS NOT DIRECTLY ACCESSIBLE FROM THE COMMUNAL ROAD NETWORK
- POTENTIAL VISITOR CAR PARKING AREAS - SPACES TO BE DISTRIBUTED THROUGHOUT THE DEVELOPMENT
- LAND ONLY LOTS TO HAVE DETACHED SINGLE OCCUPANCY DWELLINGS WITH 3 METRE (MINIMUM) FRONT SETBACK FROM THE COMMON ROADWAY, 5 METRE (MINIMUM) SETBACK TO GARAGE FROM THE COMMON ROADWAY & 5 METRE (MINIMUM) REAR SETBACK - SEPARATION TO BE PROVIDED BETWEEN DWELLINGS
- 2 STOREY SCALE BUILT FORM WITH 3 METRE (MINIMUM) FRONT SETBACK, 5.4 METRE (MINIMUM) SETBACK TO GARAGE & 5 METRE (MINIMUM) REAR SETBACK
- 2 STOREY SCALE BUILT FORM WITH 3 METRE (MINIMUM) FRONT SETBACK, 5.4 METRE (MINIMUM) SETBACK TO GARAGE & 7.4 METRE (MINIMUM) REAR SETBACK
- 2 STOREY SCALE BUILT FORM WITH 1 METRE (MINIMUM) FRONT SETBACK & 5 METRE (MINIMUM) REAR SETBACK
- 2 STOREY SCALE BUILT FORM (REVERSE LIVING OPTIONAL) WITH 3 METRE (MINIMUM) FRONT SETBACK & 1 METRE (MINIMUM) REAR SETBACK
- 2 STOREY SCALE BUILT FORM WITH 3 METRE (MINIMUM) FRONT SETBACK & 1 STOREY SCALE BUILT FORM WITH NO REAR SETBACK
- 2 STOREY SCALE BUILT FORM WITH 1 METRE (MINIMUM) FRONT SETBACK & 7.78 METRE (MINIMUM) REAR SETBACK - SEPARATION TO BE PROVIDED BETWEEN BUILT FORM AT FIRST FLOOR LEVEL ON LOTS ALONG THE COOMOORA ROAD FRONTAGE
- PUBLIC OPEN SPACE AREAS ALONG COOMOORA ROAD STREET FRONTAGE - 5% (MINIMUM) OF THE SITE AREA
- COMMUNAL OPEN SPACE & LANDSCAPING AREAS THROUGHOUT THE DEVELOPMENT
- PRIVATE OPEN SPACE AREAS (AT GROUND FLOOR LEVEL) ASSOCIATED WITH BUILT FORM THROUGHOUT THE DEVELOPMENT - ALL LOTS WITH GROUND FLOOR LIVING ARRANGEMENTS TO INCLUDE 60 SQUARE METRES (MINIMUM) PRIVATE OPEN SPACE COMPRISING 40 SQUARE METRES (MINIMUM) SECLUDED PRIVATE OPEN SPACE WITH A MINIMUM DIMENSION OF 5 METRES AT THE REAR OF THE DWELLING

APPROX. NORTH

BAR SCALE 1:200 (0 2 4 6 8 10 12 Metres)

BENT ARCHITECTURE
Level 1 / 14 Wilson Ave Brunswick VIC 3056
T. (03) 9388 9033 E. info@bentarchitecture.com.au

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PROPRIETOR
DEVELOPMENT VICTORIA
Level 9, 8 Exhibition Street, Melbourne VIC 3000

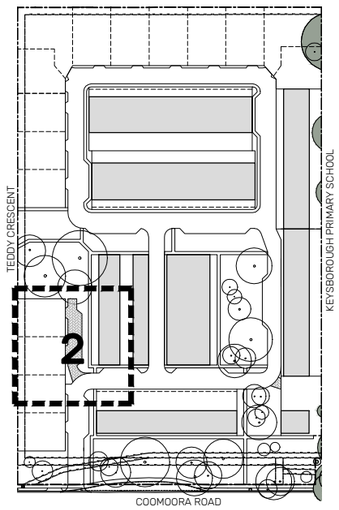
PROJECT TITLE
SPRINGVALE SOUTH
15-29 Coomoora Road, Springvale South VIC 3172

DRAWING TITLE
INTERFACE DETAIL PLAN 1 - COOMOORA ROAD

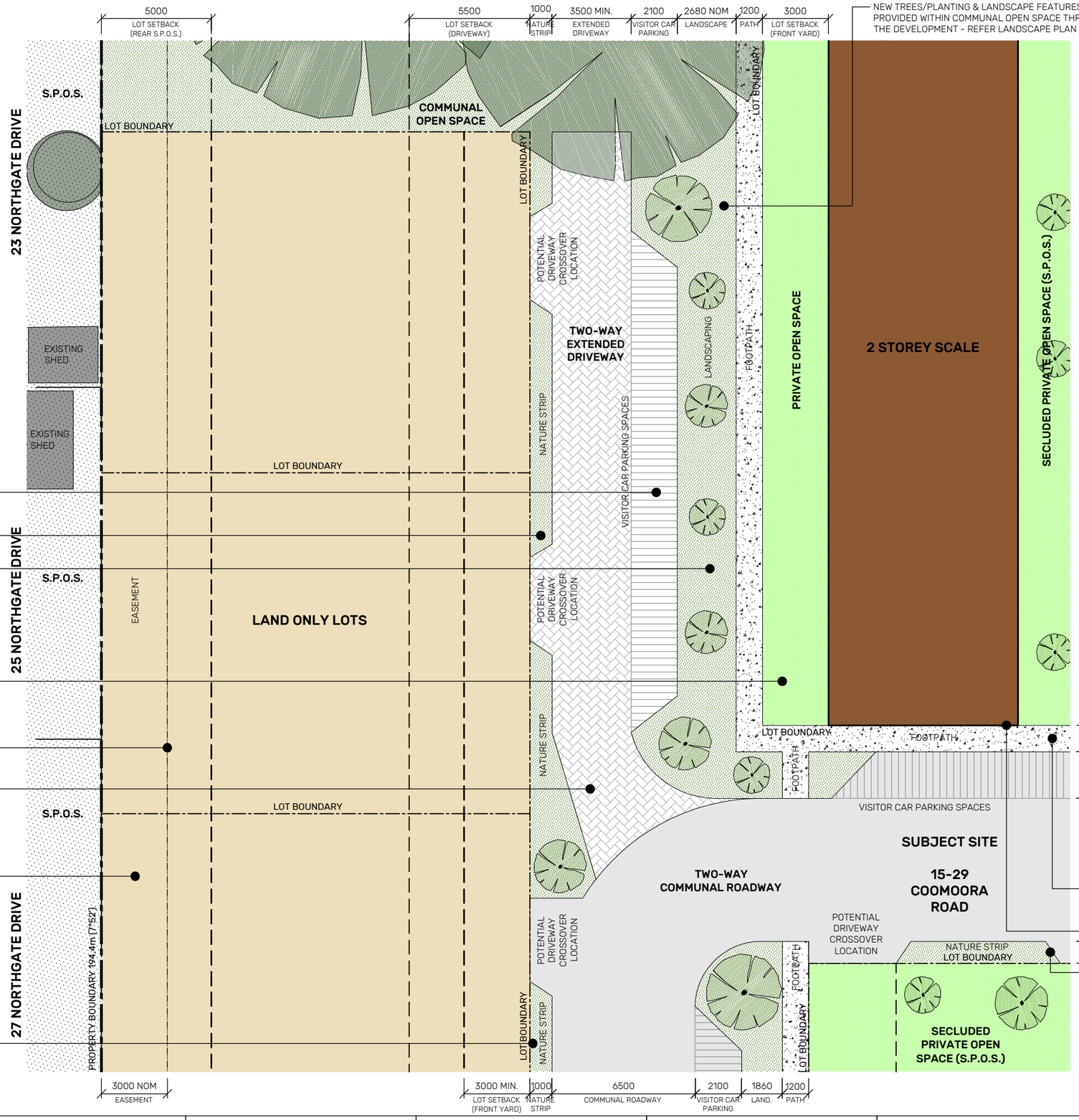
REVISION REGISTER

No.	Date	Description
1	31.10.19	LAYOUT CHANGES & ASSOCIATED REVISIONS
2	19.03.20	REVISIONS AS PER COUNCIL RECOMMENDATIONS
3	30.04.20	REVISIONS AS PER COUNCIL RFI

SCALE	DRAWN BY	REVISION ISSUE	DRAWING NO.
1:200@ A3	PP RC TZ	3	DP04
PROJECT NO.	ISSUE DATE	DRAWING STATUS	
180102	30.04.20	DEVELOPMENT PLAN NOT FOR CONSTRUCTION PURPOSES	



KEY PLAN
SCALE 1:2500 @ A3



LEGEND

- PROPERTY BOUNDARY
- NEIGHBOURING BUILDINGS
- LOCATION OF EXISTING (REMAINING) & PROPOSED SEWER & DRAINAGE EASEMENTS ON SITE - REFER DP19 - EASEMENT REMOVAL & RELOCATION PLAN
- RETAINED TREES ON SITE - REFER DP21 - TREE RETENTION PLAN
- POTENTIAL LOCATION FOR NEW TREES/PLANTING IN PUBLIC/COMMUNAL OPEN SPACE (INDICATIVE ONLY) - REFER LANDSCAPE PLAN
- SURROUNDING NEIGHBOURHOOD TREES (SHOWN INDICATIVELY ONLY)
- PROPOSED ON-SITE COMMUNAL ROAD NETWORK
- PROPOSED EXTENDED DRIVEWAYS FOR LOTS NOT DIRECTLY ACCESSIBLE FROM THE COMMUNAL ROAD NETWORK
- POTENTIAL VISITOR CAR PARKING AREAS - SPACES TO BE DISTRIBUTED THROUGHOUT THE DEVELOPMENT
- LAND ONLY LOTS TO HAVE DETACHED SINGLE OCCUPANCY DWELLINGS WITH 3 METRE (MINIMUM) FRONT SETBACK FROM THE COMMON ROADWAY, 5 METRE (MINIMUM) SETBACK TO GARAGE FROM THE COMMON ROADWAY & 5 METRE (MINIMUM) REAR SETBACK - SEPARATION TO BE PROVIDED BETWEEN DWELLINGS
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- 2 STOREY SCALE BUILT FORM WITH 1 METRE (MINIMUM) FRONT SETBACK & 7.78 METRE (MINIMUM) REAR SETBACK - SEPARATION TO BE PROVIDED BETWEEN BUILT FORM AT FIRST FLOOR LEVEL ON LOTS ALONG THE COOMOORA ROAD FRONTAGE
- PUBLIC OPEN SPACE AREAS ALONG COOMOORA ROAD STREET FRONTAGE - 5% (MINIMUM) OF THE SITE AREA
- COMMUNAL OPEN SPACE & LANDSCAPING AREAS THROUGHOUT THE DEVELOPMENT
- PRIVATE OPEN SPACE AREAS (AT GROUND FLOOR LEVEL) ASSOCIATED WITH BUILT FORM THROUGHOUT THE DEVELOPMENT - ALL LOTS WITH GROUND FLOOR LIVING ARRANGEMENTS TO INCLUDE 60 SQUARE METRES (MINIMUM) PRIVATE OPEN SPACE COMPRISING 40 SQUARE METRES (MINIMUM) SECLUDED PRIVATE OPEN SPACE WITH A MINIMUM DIMENSION OF 5 METRES AT THE REAR OF THE DWELLING

APPROX. NORTH

0 2 4 6 8 10 12

BAR SCALE 1:200 Metres

BENT ARCHITECTURE
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PROPRIETOR
DEVELOPMENT VICTORIA
Level 9, 8 Exhibition Street, Melbourne VIC 3000

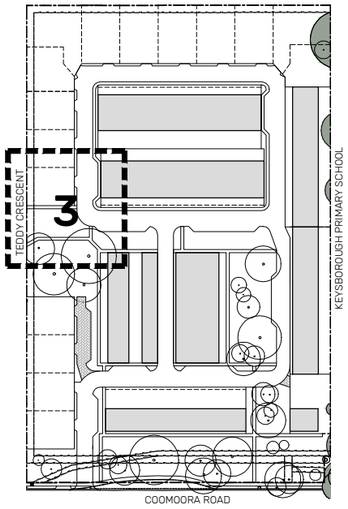
PROJECT TITLE
SPRINGVALE SOUTH
15-29 Coomoora Road, Springvale South VIC 3172

DRAWING TITLE
INTERFACE DETAIL PLAN 2 - EXTENDED DRIVEWAY

REVISION REGISTER

No.	Date	Description
1	31.10.19	LAYOUT CHANGES & ASSOCIATED REVISIONS
2	19.03.20	REVISIONS AS PER COUNCIL RECOMMENDATIONS
3	30.04.20	REVISIONS AS PER COUNCIL RFI

SCALE	DRAWN BY	REVISION ISSUE	DRAWING NO.
1:200@ A3	PP RC TZ	3	DP05
PROJECT NO.	ISSUE DATE	DRAWING STATUS	
180102	30.04.20	DEVELOPMENT PLAN NOT FOR CONSTRUCTION PURPOSES	



KEY PLAN
SCALE 1:2500 @ A3

VISITOR CAR PARKING SPACES ARE TO BE PROVIDED AND DISTRIBUTED THROUGHOUT THE DEVELOPMENT

1 METRE WIDE NATURE STRIP TO ACCOMMODATE LAWN / LOW PLANTING

EXISTING SEWERAGE EASEMENT ALONG EAST SITE BOUNDARY TO REMAIN - REFER DP19 - EASEMENT REMOVAL & RELOCATION PLAN

NEW TREES/PLANTING & LANDSCAPE FEATURES TO BE PROVIDED WITHIN COMMUNAL OPEN SPACE THROUGHOUT THE DEVELOPMENT - REFER LANDSCAPE PLAN

NO VEHICULAR ACCESS TO THE DEVELOPMENT FROM TEDDY CRESCENT - TEDDY CRESCENT TO REMAIN TERMINATED AT PROPERTY BOUNDARY

EXISTING COUNCIL FOOTPATHS ALONG TEDDY CRESCENT TO BE EXTENDED INTO THE DEVELOPMENT (BOTH SIDES OF TEDDY CRESCENT)

CLUSTER OF EXISTING 'HIGH' & 'MODERATE' RATED MATURE TREES TO BE RETAINED AND INTEGRATED INTO COMMUNAL OPEN SPACE ADJACENT TO THE TEDDY CRESCENT SITE ACCESS POINT

EXISTING SEWERAGE EASEMENT ALONG EAST SITE BOUNDARY TO REMAIN - REFER DP17 - EASEMENT REMOVAL & RELOCATION PLAN

SECLUDED PRIVATE OPEN SPACE (REAR YARDS) WITHIN EACH LOT TO ACCOMMODATE PLANTING & TWO NEW TREES - REFER LANDSCAPE PLAN

GREEN CORRIDOR THROUGH THE INTERIOR OF THE DEVELOPMENT TO PROVIDE PEDESTRIAN CONNECTIVITY THROUGHOUT THE SITE AND CONNECT OPEN SPACE

FOOTPATHS TO BE 1.2 METRES WIDE AND FACILITATE PEDESTRIAN MOVEMENT THROUGHOUT THE DEVELOPMENT. FOOTPATHS TO BE ACCOMPANIED BY LANDSCAPING WHERE POSSIBLE

BLANK, WINDOWLESS WALLS ARE TO BE AVOIDED WHERE SIDE ELEVATIONS OF BUILT FORM ARE VISIBLE (TYPICAL THROUGHOUT THE DEVELOPMENT)

17 NORTHGATE DRIVE
19 NORTHGATE DRIVE
21 NORTHGATE DRIVE
TEDDY CRESCENT
SUBJECT SITE
15-29 COOMOORA ROAD
S.P.O.S.
EXISTING SHED
LOT BOUNDARY
EASEMENT
3000 NOM EASEMENT
LAND ONLY LOTS
FUTURE BUILT FORM ON LAND ONLY LOTS TO BE SETBACK 5 METRES (MINIMUM) FROM WEST SITE BOUNDARY TO PROVIDE A GREEN BUFFER TO ADJACENT PROPERTIES AND MINIMISE POTENTIAL OVERLOOKING & OVERSHADOWING OF ADJOINING SECLUDED PRIVATE OPEN SPACE (S.P.O.S.)
NATURE STRIP
POTENTIAL DRIVEWAY CROSSOVER LOCATION
EXISTING FOOTPATH
FOOTPATH
EXISTING CROSSOVER
COMMUNAL OPEN SPACE
PROPERTY BOUNDARY 94.4m (7752)
5000 LOT SETBACK (REAR S.P.O.S.)
5500 LOT SETBACK (DRIVEWAY)
1000 NATURE STRIP
6500 COMMUNAL ROADWAY
1200 PATH
2100 LANDSCAPING
SECLUDED PRIVATE OPEN SPACE (S.P.O.S.)
2100 VISITOR CAR PARKING
VISITOR CAR PARKING SPACES
2 STOREY SCALE
3000 LOT SETBACK (FRONT YARD)
PRIVATE OPEN SPACE
TWO-WAY COMMUNAL ROADWAY
VISITOR CAR PARKING SPACES
7325 COMMUNAL OPEN SPACE (GREEN CORRIDOR)
COMMUNAL OPEN SPACE (GREEN CORRIDOR)
1315 NOM PATH
1420 NOM PATH
3000 LOT SETBACK (FRONT YARD)
1200 PATH

LEGEND

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- NEIGHBOURING BUILDINGS
- LOCATION OF EXISTING (REMAINING) & PROPOSED SEWER & DRAINAGE EASEMENTS ON SITE - REFER DP19 - EASEMENT REMOVAL & RELOCATION PLAN
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APPROX. NORTH

BAR SCALE 1:200 (0 2 4 6 8 10 12 Metres)

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PROPRIETOR
DEVELOPMENT VICTORIA
Level 9, 8 Exhibition Street, Melbourne VIC 3000

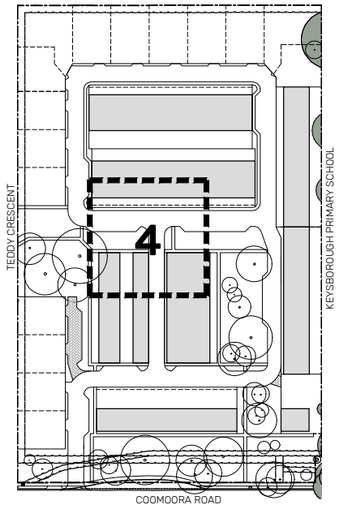
PROJECT TITLE
SPRINGVALE SOUTH
15-29 Coomoora Road, Springvale South VIC 3172

DRAWING TITLE
INTERFACE DETAIL PLAN 3 - TEDDY CRESCENT

REVISION REGISTER

No.	Date	Description
1	31.10.19	LAYOUT CHANGES & ASSOCIATED REVISIONS
2	19.03.20	REVISIONS AS PER COUNCIL RECOMMENDATIONS
3	30.04.20	REVISIONS AS PER COUNCIL RFI

SCALE	DRAWN BY	REVISION ISSUE	DRAWING NO.
1:200@ A3	PP RC TZ	3	DP06
PROJECT NO.	ISSUE DATE	DRAWING STATUS	
180102	30.04.20	DEVELOPMENT PLAN NOT FOR CONSTRUCTION PURPOSES	



KEY PLAN
SCALE 1:2500 @ A3

VISITOR CAR PARKING SPACES ARE TO BE PROVIDED AND DISTRIBUTED THROUGHOUT THE DEVELOPMENT

NEW TREES/PLANTING & LANDSCAPE FEATURES TO BE PROVIDED WITHIN COMMUNAL OPEN SPACE THROUGHOUT THE DEVELOPMENT - REFER LANDSCAPE PLAN

GREEN CORRIDOR THROUGH THE INTERIOR OF THE DEVELOPMENT TO PROVIDE PEDESTRIAN CONNECTIVITY THROUGHOUT THE SITE AND CONNECT OPEN SPACE

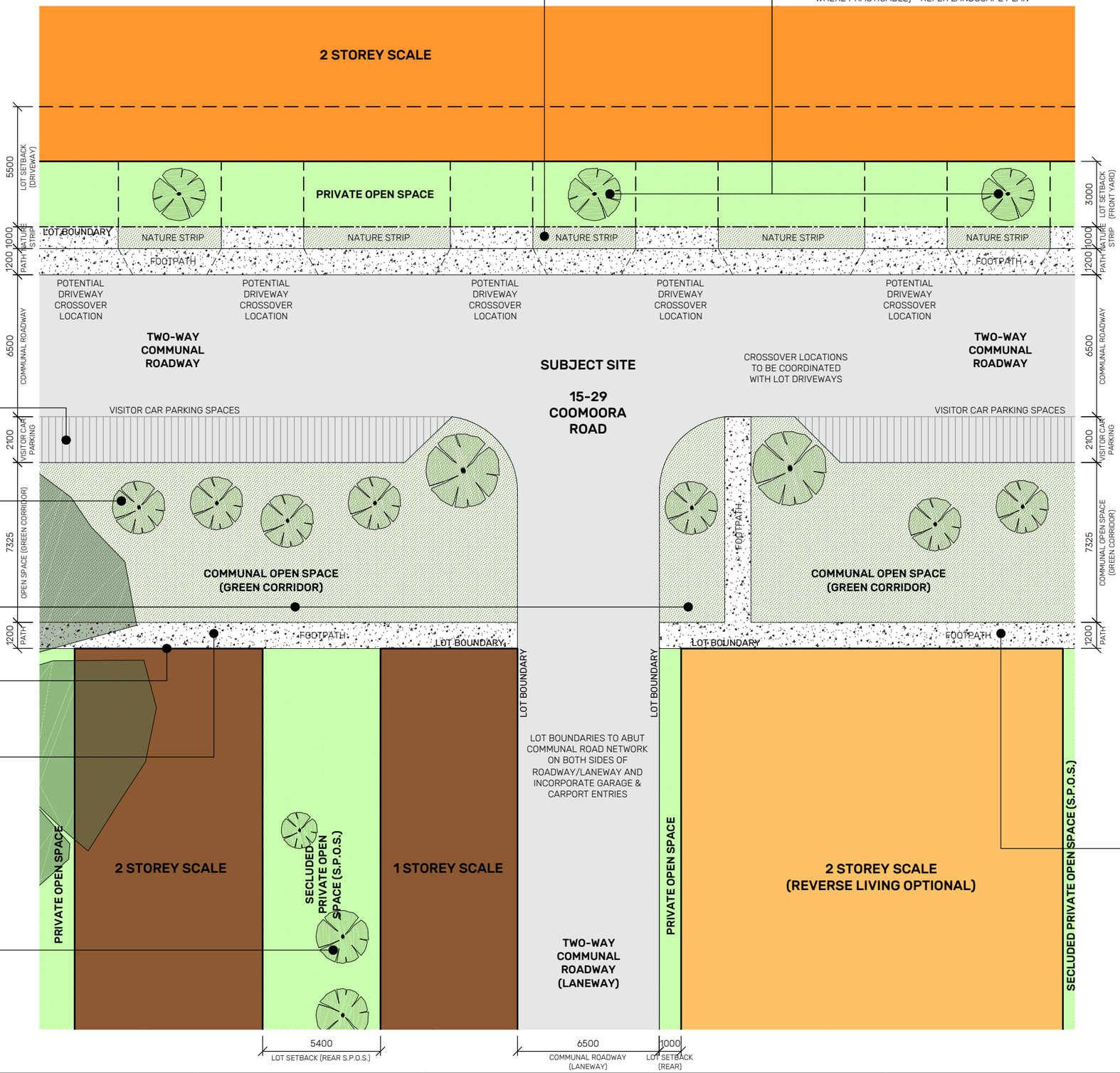
BLANK, WINDOWLESS WALLS ARE TO BE AVOIDED WHERE SIDE ELEVATIONS OF BUILT FORM ARE VISIBLE (TYPICAL THROUGHOUT THE DEVELOPMENT)

FOOTPATHS TO BE 1.2 METRES WIDE AND FACILITATE PEDESTRIAN MOVEMENT THROUGHOUT THE DEVELOPMENT. FOOTPATHS TO BE ACCOMPANIED BY LANDSCAPING WHERE POSSIBLE

SECLUDED PRIVATE OPEN SPACE (REAR YARDS) WITHIN EACH LOT TO ACCOMMODATE PLANTING & TWO NEW TREES - REFER LANDSCAPE PLAN

1 METRE WIDE NATURE STRIP TO ACCOMMODATE LAWN / LOW PLANTING BETWEEN LOT BOUNDARY & FOOTPATH/ COMMUNAL ROAD NETWORK - REFER LANDSCAPE PLAN

PRIVATE OPEN SPACE WITHIN LOTS ALONG ROADWAY TO ACCOMMODATE PLANTING & NEW TREE WHERE INDICATED ON THE LANDSCAPE PLAN (GENERALLY EVERY SECOND LOT WHERE PRACTICABLE) - REFER LANDSCAPE PLAN



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LEGEND

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APPROX. NORTH

BAR SCALE 1:200 (0, 2, 4, 6, 8, 10, 12 Metres)

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PROPRIETOR
DEVELOPMENT VICTORIA
Level 9, 8 Exhibition Street, Melbourne VIC 3000

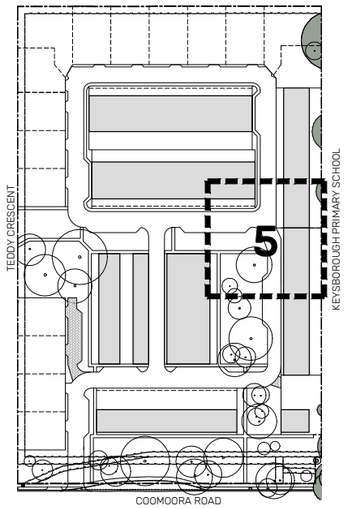
PROJECT TITLE
SPRINGVALE SOUTH
15-29 Coomoora Road, Springvale South VIC 3172

DRAWING TITLE
INTERFACE DETAIL PLAN 4 - GREEN CORRIDOR

REVISION REGISTER

No.	Date	Description
1	31.10.19	LAYOUT CHANGES & ASSOCIATED REVISIONS
2	19.03.20	REVISIONS AS PER COUNCIL RECOMMENDATIONS
3	30.04.20	REVISIONS AS PER COUNCIL RFI

SCALE	DRAWN BY	REVISION ISSUE	DRAWING NO.
1:200@ A3	PP RC TZ	3	DP07
PROJECT NO.	ISSUE DATE	DRAWING STATUS	
180102	30.04.20	DEVELOPMENT PLAN NOT FOR CONSTRUCTION PURPOSES	



KEY PLAN
SCALE 1:2500 @ A3

VISITOR CAR PARKING SPACES ARE TO BE PROVIDED AND DISTRIBUTED THROUGHOUT THE DEVELOPMENT

NEW TREES/PLANTING & LANDSCAPE FEATURES TO BE PROVIDED WITHIN COMMUNAL OPEN SPACE THROUGHOUT THE DEVELOPMENT - REFER LANDSCAPE PLAN

GREEN CORRIDOR THROUGH THE INTERIOR OF THE DEVELOPMENT TO PROVIDE PEDESTRIAN CONNECTIVITY THROUGHOUT THE SITE AND CONNECT OPEN SPACE

BLANK, WINDOWLESS WALLS ARE TO BE AVOIDED WHERE SIDE ELEVATIONS OF BUILT FORM ARE VISIBLE (TYPICAL THROUGHOUT THE DEVELOPMENT)

DWELLINGS ARE TO BE ORIENTED AND CONFIGURED TO COMMUNAL ROADWAYS AND FOOTPATHS AND PROVIDE PASSIVE SURVEILLANCE OVER COMMUNAL OPEN SPACE WHERE PRACTICABLE

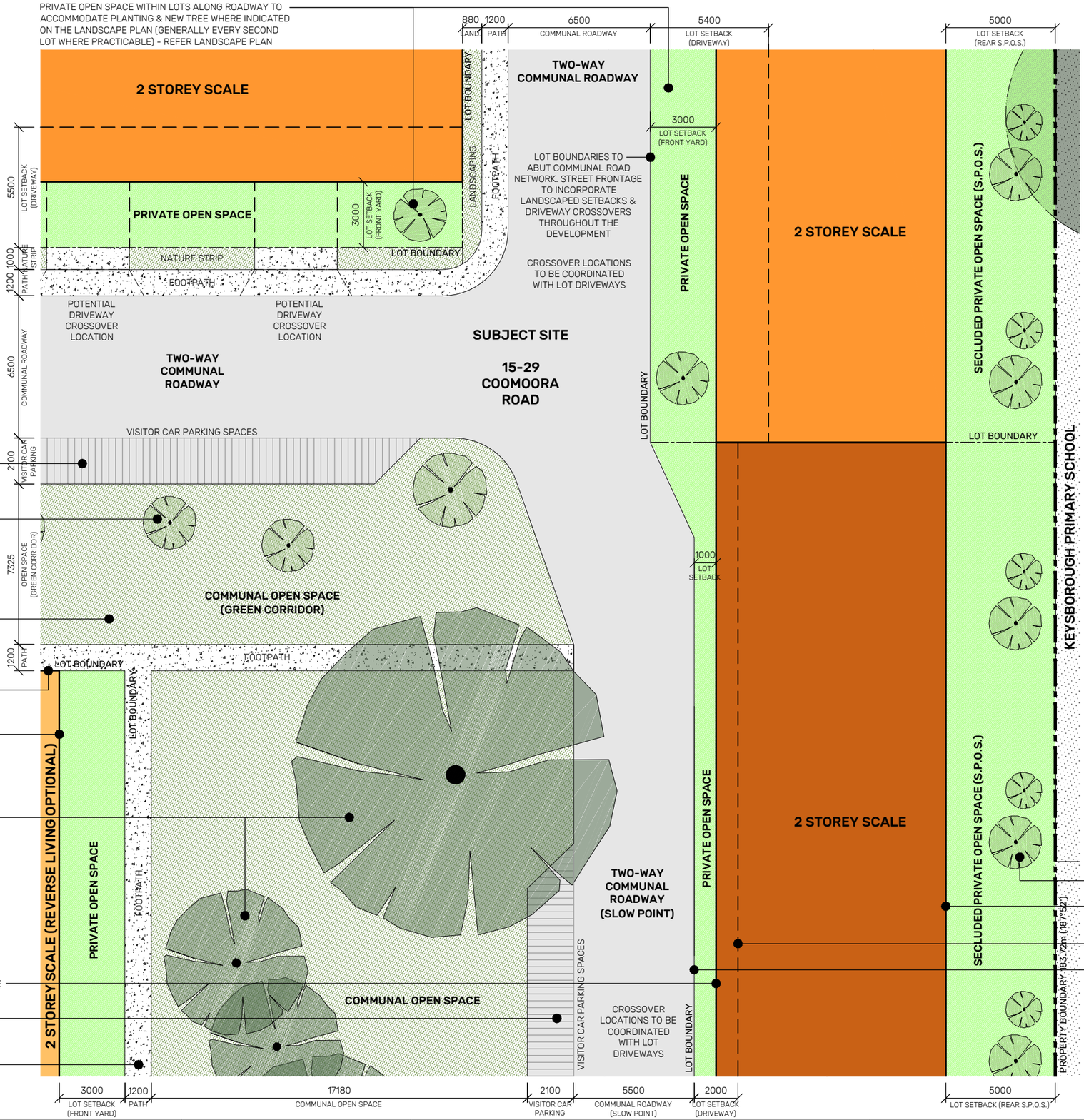
COMMUNAL OPEN SPACE IS TO BE GENERALLY CONCENTRATED AROUND CLUSTERS OF EXISTING 'MODERATE' RATED MATURE TREES TO BE RETAINED. NEW TREES/PLANTING & LANDSCAPE FEATURES TO BE PROVIDED WITHIN COMMUNAL OPEN SPACE THROUGHOUT THE DEVELOPMENT - REFER LANDSCAPE PLAN

DWELLINGS DIRECTLY ABUTTING OPEN SPACE TO PROVIDE PASSIVE SURVEILLANCE AND STREET ACTIVATION

VISITOR CAR PARKING SPACES ARE TO BE PROVIDED AND DISTRIBUTED THROUGHOUT THE DEVELOPMENT

FOOTPATHS TO BE 1.2 METRES WIDE AND FACILITATE PEDESTRIAN MOVEMENT THROUGHOUT THE DEVELOPMENT. FOOTPATHS TO BE ACCOMPANIED BY LANDSCAPING WHERE POSSIBLE

PRIVATE OPEN SPACE WITHIN LOTS ALONG ROADWAY TO ACCOMMODATE PLANTING & NEW TREE WHERE INDICATED ON THE LANDSCAPE PLAN (GENERALLY EVERY SECOND LOT WHERE PRACTICABLE) - REFER LANDSCAPE PLAN



SECLUDED PRIVATE OPEN SPACE (REAR YARDS) WITHIN EACH LOT TO ACCOMMODATE PLANTING & TWO NEW TREES - REFER LANDSCAPE PLAN

BUILT FORM TO BE SETBACK 5 METRES (MINIMUM) FROM EAST SITE BOUNDARY TO PROVIDE A GREEN BUFFER TO KEYSBOROUGH PRIMARY SCHOOL ADJACENT

GARAGES TO BE SETBACK 1m (MINIMUM) BEHIND FRONT FACADE OF DWELLINGS FOR THIS PORTION OF BUILT FORM

LOT BOUNDARY TO ABUT COMMUNAL ROAD NETWORK. STREET FRONTAGE TO INCORPORATE LANDSCAPED SETBACKS & DRIVEWAY CROSSOVERS THROUGHOUT THE DEVELOPMENT. DWELLINGS TO EAST OF 'SLOW POINT' TO HAVE A 1 METRE FRONT SETBACK

LEGEND

- PROPERTY BOUNDARY
- NEIGHBOURING BUILDINGS
- LOCATION OF EXISTING (REMAINING) & PROPOSED SEWER & DRAINAGE EASEMENTS ON SITE - REFER DP19 - EASEMENT REMOVAL & RELOCATION PLAN
- RETAINED TREES ON SITE - REFER DP21 - TREE RETENTION PLAN
- POTENTIAL LOCATION FOR NEW TREES/PLANTING IN PUBLIC/COMMUNAL OPEN SPACE (INDICATIVE ONLY) - REFER LANDSCAPE PLAN
- SURROUNDING NEIGHBOURHOOD TREES (SHOWN INDICATIVELY ONLY)
- PROPOSED ON-SITE COMMUNAL ROAD NETWORK
- PROPOSED EXTENDED DRIVEWAYS FOR LOTS NOT DIRECTLY ACCESSIBLE FROM THE COMMUNAL ROAD NETWORK
- POTENTIAL VISITOR CAR PARKING AREAS - SPACES TO BE DISTRIBUTED THROUGHOUT THE DEVELOPMENT
- LAND ONLY LOTS TO HAVE DETACHED SINGLE OCCUPANCY DWELLINGS WITH 3 METRE (MINIMUM) FRONT SETBACK FROM THE COMMON ROADWAY, 5 METRE (MINIMUM) SETBACK TO GARAGE FROM THE COMMON ROADWAY & 5 METRE (MINIMUM) REAR SETBACK - SEPARATION TO BE PROVIDED BETWEEN DWELLINGS
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- 2 STOREY SCALE BUILT FORM WITH 1 METRE (MINIMUM) FRONT SETBACK & 5 METRE (MINIMUM) REAR SETBACK
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- 2 STOREY SCALE BUILT FORM WITH 3 METRE (MINIMUM) FRONT SETBACK & 1 STOREY SCALE BUILT FORM WITH NO REAR SETBACK
- 2 STOREY SCALE BUILT FORM WITH 1 METRE (MINIMUM) FRONT SETBACK & 7.78 METRE (MINIMUM) REAR SETBACK - SEPARATION TO BE PROVIDED BETWEEN BUILT FORM AT FIRST FLOOR LEVEL ON LOTS ALONG THE COOMOORA ROAD FRONTAGE
- PUBLIC OPEN SPACE AREAS ALONG COOMOORA ROAD STREET FRONTAGE - 5% (MINIMUM) OF THE SITE AREA
- COMMUNAL OPEN SPACE & LANDSCAPING AREAS THROUGHOUT THE DEVELOPMENT
- PRIVATE OPEN SPACE AREAS (AT GROUND FLOOR LEVEL) ASSOCIATED WITH BUILT FORM THROUGHOUT THE DEVELOPMENT - ALL LOTS WITH GROUND FLOOR LIVING ARRANGEMENTS TO INCLUDE 60 SQUARE METRES (MINIMUM) PRIVATE OPEN SPACE COMPRISING 40 SQUARE METRES (MINIMUM) SECLUDED PRIVATE OPEN SPACE WITH A MINIMUM DIMENSION OF 5 METRES AT THE REAR OF THE DWELLING

APPROX. NORTH

0 2 4 6 8 10 12
BAR SCALE 1:200 Metres

BENT ARCHITECTURE
Level 1 / 14 Wilson Ave Brunswick VIC 3056
T. (03) 9388 9033 E. info@bentarchitecture.com.au

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PROPRIETOR
DEVELOPMENT VICTORIA
Level 9, 8 Exhibition Street, Melbourne VIC 3000

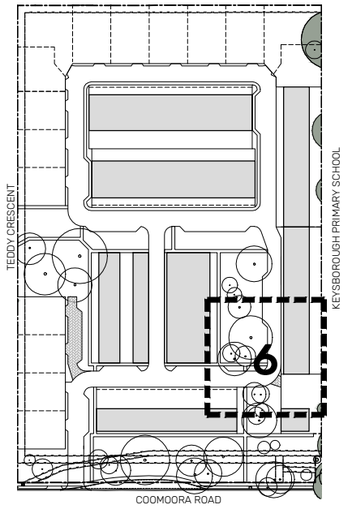
PROJECT TITLE
SPRINGVALE SOUTH
15-29 Coomoora Road, Springvale South VIC 3172

DRAWING TITLE
INTERFACE DETAIL PLAN 5 - OPEN SPACE

REVISION REGISTER

No.	Date	Description
1	31.10.19	LAYOUT CHANGES & ASSOCIATED REVISIONS
2	19.03.20	REVISIONS AS PER COUNCIL RECOMMENDATIONS
3	30.04.20	REVISIONS AS PER COUNCIL RFI

SCALE	DRAWN BY	REVISION ISSUE	DRAWING NO.
1:200@ A3	PP RC TZ	3	DP08
PROJECT NO.	ISSUE DATE	DRAWING STATUS	
180102	30.04.20	DEVELOPMENT PLAN NOT FOR CONSTRUCTION PURPOSES	



KEY PLAN

SCALE 1:2500 @ A3

LOT BOUNDARY TO ABUT COMMUNAL ROAD NETWORK. STREET FRONTAGE TO INCORPORATE LANDSCAPED SETBACKS & DRIVEWAY CROSSOVERS THROUGHOUT THE DEVELOPMENT

DWELLINGS ARE TO BE ORIENTED AND CONFIGURED TO COMMUNAL ROADWAYS AND FOOTPATHS AND PROVIDE PASSIVE SURVEILLANCE OVER COMMUNAL OPEN SPACE WHERE PRACTICABLE

COMMUNAL OPEN SPACE IS TO BE GENERALLY CONCENTRATED AROUND CLUSTERS OF EXISTING 'MODERATE' RATED MATURE TREES TO BE RETAINED.

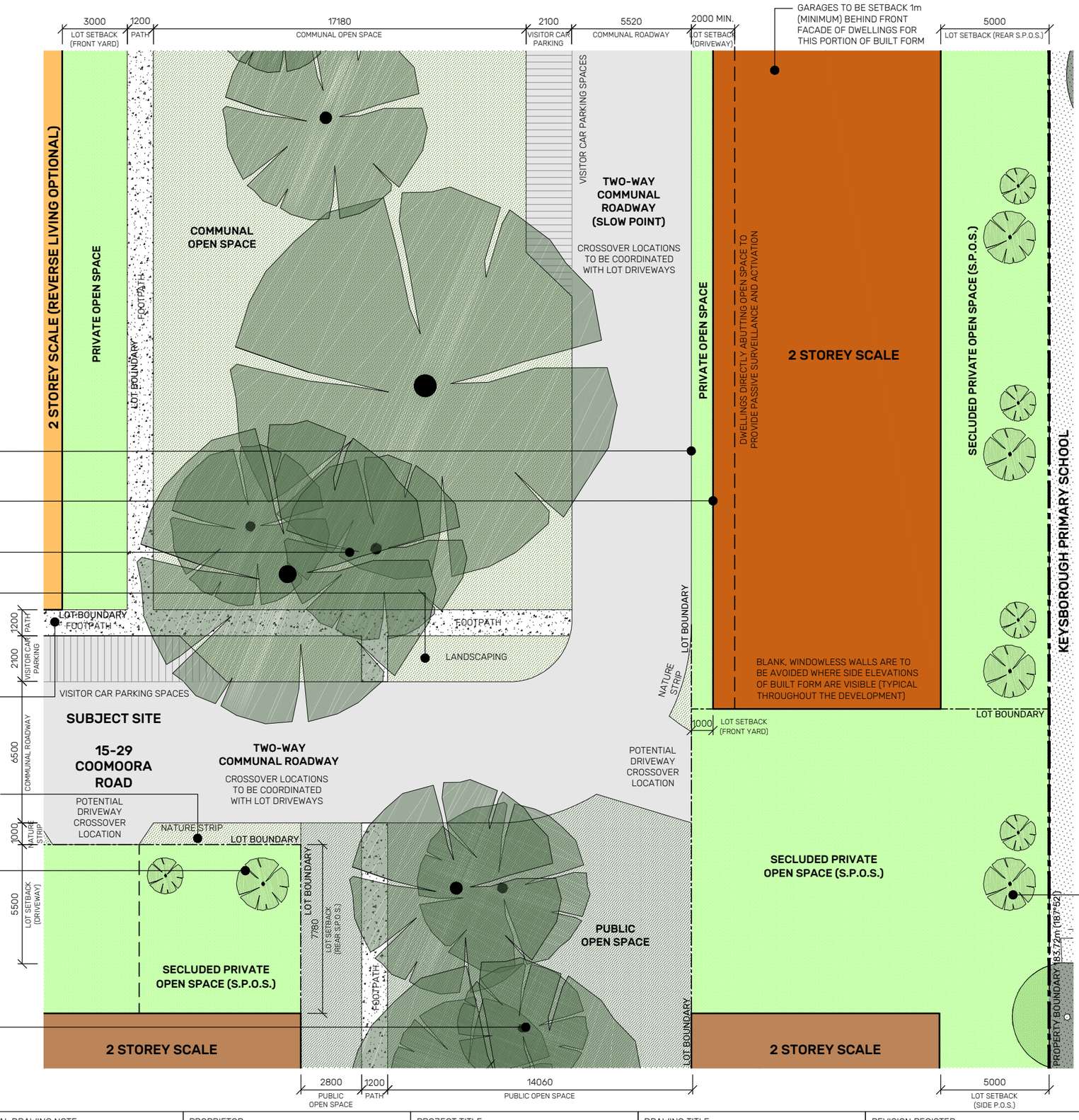
LANDSCAPE STRIPS TO ACCOMMODATE LOW PLANTING, STREET TREES, LIGHTING (AND THE LIKE) TO CREATE A VISUAL & PHYSICAL BARRIER BETWEEN ROADWAY & FOOTPATHS - REFER LANDSCAPE PLAN

FOOTPATHS TO BE 1.2 METRES WIDE AND FACILITATE PEDESTRIAN MOVEMENT THROUGHOUT THE DEVELOPMENT. FOOTPATHS TO BE ACCOMPANIED BY LANDSCAPING WHERE POSSIBLE

1 METRE WIDE NATURE STRIP TO ACCOMMODATE LAWN / LOW PLANTING BETWEEN LOT BOUNDARY & COMMUNAL ROAD NETWORK - REFER LANDSCAPE PLAN

SECLUDED PRIVATE OPEN SPACE (REAR YARDS) WITHIN EACH LOT TO ACCOMMODATE PLANTING & TWO NEW TREES - REFER LANDSCAPE PLAN

PUBLIC OPEN SPACE IS TO BE GENERALLY CONCENTRATED AROUND CLUSTERS OF EXISTING 'MODERATE' RATED MATURE TREES TO BE RETAINED



SECLUDED PRIVATE OPEN SPACE (REAR YARDS) WITHIN EACH LOT TO ACCOMMODATE PLANTING & TWO NEW TREES - REFER LANDSCAPE PLAN

LEGEND

- PROPERTY BOUNDARY
- NEIGHBOURING BUILDINGS
- LOCATION OF EXISTING (REMAINING) & PROPOSED SEWER & DRAINAGE EASEMENTS ON SITE - REFER DP19 - EASEMENT REMOVAL & RELOCATION PLAN
- RETAINED TREES ON SITE - REFER DP21 - TREE RETENTION PLAN
- POTENTIAL LOCATION FOR NEW TREES/PLANTING IN PUBLIC/COMMUNAL OPEN SPACE (INDICATIVE ONLY) - REFER LANDSCAPE PLAN
- SURROUNDING NEIGHBOURHOOD TREES (SHOWN INDICATIVELY ONLY)
- PROPOSED ON-SITE COMMUNAL ROAD NETWORK
- PROPOSED EXTENDED DRIVEWAYS FOR LOTS NOT DIRECTLY ACCESSIBLE FROM THE COMMUNAL ROAD NETWORK
- POTENTIAL VISITOR CAR PARKING AREAS - SPACES TO BE DISTRIBUTED THROUGHOUT THE DEVELOPMENT
- LAND ONLY LOTS TO HAVE DETACHED SINGLE OCCUPANCY DWELLINGS WITH 3 METRE (MINIMUM) FRONT SETBACK FROM THE COMMON ROADWAY, 5 METRE (MINIMUM) SETBACK TO GARAGE FROM THE COMMON ROADWAY & 5 METRE (MINIMUM) REAR SETBACK - SEPARATION TO BE PROVIDED BETWEEN DWELLINGS
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- PUBLIC OPEN SPACE AREAS ALONG COOMOORA ROAD STREET FRONTAGE - 5% (MINIMUM) OF THE SITE AREA
- COMMUNAL OPEN SPACE & LANDSCAPING AREAS THROUGHOUT THE DEVELOPMENT
- PRIVATE OPEN SPACE AREAS (AT GROUND FLOOR LEVEL) ASSOCIATED WITH BUILT FORM THROUGHOUT THE DEVELOPMENT - ALL LOTS WITH GROUND FLOOR LIVING ARRANGEMENTS TO INCLUDE 60 SQUARE METRES (MINIMUM) PRIVATE OPEN SPACE COMPRISING 40 SQUARE METRES (MINIMUM) SECLUDED PRIVATE OPEN SPACE WITH A MINIMUM DIMENSION OF 5 METRES AT THE REAR OF THE DWELLING

APPROX. NORTH

BAR SCALE 1:200 (0 2 4 6 8 10 12 Metres)

BENT ARCHITECTURE
Level 1 / 14 Wilson Ave Brunswick VIC 3056
T. (03) 9388 9033 E. info@bentarchitecture.com.au

GENERAL DRAWING NOTE

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PROPRIETOR
DEVELOPMENT VICTORIA
Level 9, 8 Exhibition Street, Melbourne VIC 3000

PROJECT TITLE
SPRINGVALE SOUTH
15-29 Coomoora Road, Springvale South VIC 3172

DRAWING TITLE
INTERFACE DETAIL PLAN 6 - OPEN SPACE

REVISION REGISTER

No.	Date	Description
1	31.10.19	LAYOUT CHANGES & ASSOCIATED REVISIONS
2	19.03.20	REVISIONS AS PER COUNCIL RECOMMENDATIONS
3	30.04.20	REVISIONS AS PER COUNCIL RFI

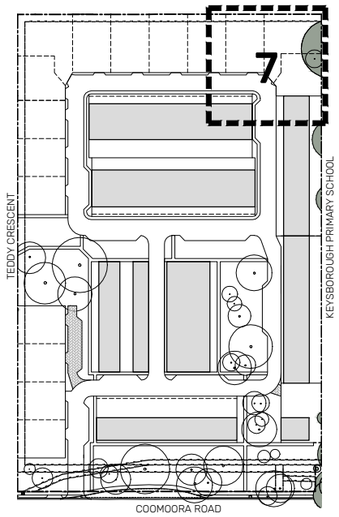
SCALE	DRAWN BY
1:200@ A3	PP RC TZ

PROJECT NO.	ISSUE DATE
180102	30.04.20

REVISION ISSUE **3**

DRAWING NO. **DP09**

DRAWING STATUS
DEVELOPMENT PLAN
NOT FOR CONSTRUCTION PURPOSES



KEY PLAN
SCALE 1:2500 @ A3

FUTURE BUILT FORM ON LAND ONLY LOTS TO BE SETBACK 5 METRES (MINIMUM) FROM NORTH SITE BOUNDARY TO PROVIDE A GREEN BUFFER TO ADJACENT PROPERTIES AND MINIMISE POTENTIAL OVERLOOKING INTO ADJOINING SECLUDED PRIVATE OPEN SPACE (S.P.O.S.)

1 METRE (NOM) WIDE NATURE STRIP TO ACCOMMODATE LAWN / LOW PLANTING BETWEEN LOT BOUNDARY & COMMUNAL ROAD NETWORK - REFER LANDSCAPE PLAN

LANDSCAPE STRIPS TO ACCOMMODATE LOW PLANTING, STREET TREES, LIGHTING (AND THE LIKE) TO CREATE A VISUAL & PHYSICAL BARRIER BETWEEN ROADWAY & LOT BOUNDARIES - REFER LANDSCAPE PLAN

FOOTPATHS TO BE 1.2 METRES WIDE AND FACILITATE PEDESTRIAN MOVEMENT THROUGHOUT THE DEVELOPMENT. FOOTPATHS TO BE ACCOMPANIED BY LANDSCAPING WHERE POSSIBLE

VISITOR CAR PARKING SPACES ARE TO BE PROVIDED AND DISTRIBUTED THROUGHOUT THE DEVELOPMENT

BLANK, WINDOWLESS WALLS ARE TO BE AVOIDED WHERE SIDE ELEVATIONS OF BUILT FORM ARE VISIBLE (TYPICAL THROUGHOUT THE DEVELOPMENT)

EXISTING SEWERAGE EASEMENT ALONG NORTH SITE BOUNDARY TO REMAIN - REFER DP19 - EASEMENT REMOVAL & RELOCATION PLAN

44 GWENT STREET
42 GWENT STREET
40 GWENT STREET
38 GWENT STREET
EXISTING PERGOLA
EXISTING SHED
S.P.O.S.
PROPERTY BOUNDARY 85.88m (97°47'40")
PROPERTY BOUNDARY 183.72m (187°52')
5000 LOT SETBACK (SIDE P.O.S.)
5000 LOT SETBACK (REAR S.P.O.S.)
3000 NOM EASEMENT
EASEMENT
LOT BOUNDARY
LAND ONLY LOTS
2000 MIN. LOT SETBACK (FRONT YARD)
5500 LOT SETBACK (DRIVEWAY)
3000 MIN. LOT SETBACK (FRONT YARD)
1000 NATURE STRIP
POTENTIAL DRIVEWAY CROSSOVER LOCATION
NATURE STRIP
6500 COMMUNAL ROADWAY
TWO-WAY COMMUNAL ROADWAY
SUBJECT SITE
15-29 COOMOORA ROAD
1200 PATH
FOOTPATH
LANDSCAPING
PRIVATE OPEN SPACE
2 STOREY SCALE
VISITOR CAR PARKING SPACES
1000 MIN. LOT SETBACK (FRONT YARD)
3000 LOT SETBACK (FRONT YARD)
LOT BOUNDARIES TO ABUT COMMUNAL ROAD NETWORK. STREET FRONTAGE TO INCORPORATE LANDSCAPED SETBACKS & DRIVEWAY CROSSOVERS THROUGHOUT THE DEVELOPMENT
CROSSOVER LOCATIONS TO BE COORDINATED WITH LOT DRIVEWAYS
PRIVATE OPEN SPACE
SECLUDED PRIVATE OPEN SPACE (S.P.O.S.)
KEYSBOROUGH PRIMARY SCHOOL
5000 LOT SETBACK (REAR S.P.O.S.)
2100 VISITOR CAR PARKING
6500 COMMUNAL ROADWAY
5400 LOT SETBACK (DRIVEWAY)

PRIVATE OPEN SPACE WITHIN LOTS ALONG ROADWAY TO ACCOMMODATE PLANTING & NEW TREE WHERE INDICATED ON THE LANDSCAPE PLAN (GENERALLY EVERY SECOND LOT WHERE PRACTICABLE) - REFER LANDSCAPE PLAN

SECLUDED PRIVATE OPEN SPACE (REAR YARDS) WITHIN EACH LOT TO ACCOMMODATE PLANTING & TWO NEW TREES - REFER LANDSCAPE PLAN

BUILT FORM TO BE SETBACK 5 METRES (MINIMUM) FROM EAST SITE BOUNDARY TO PROVIDE A GREEN BUFFER TO KEYSBOROUGH PRIMARY SCHOOL ADJACENT

LEGEND

- PROPERTY BOUNDARY
- NEIGHBOURING BUILDINGS
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APPROX. NORTH

BAR SCALE 1:200 (0 2 4 6 8 10 12 Metres)

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Level 1 / 14 Wilson Ave Brunswick VIC 3056
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PROPRIETOR
DEVELOPMENT VICTORIA
Level 9, 8 Exhibition Street, Melbourne VIC 3000

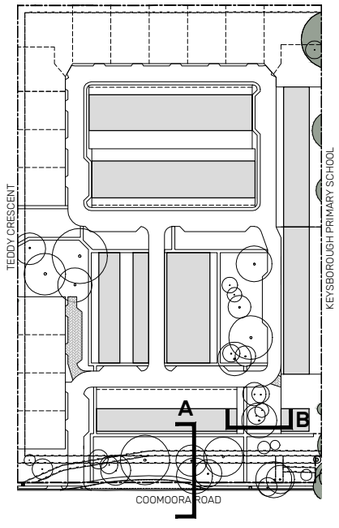
PROJECT TITLE
SPRINGVALE SOUTH
15-29 Coomoora Road, Springvale South VIC 3172

DRAWING TITLE
INTERFACE DETAIL PLAN 7 - TYPICAL ROADWAY

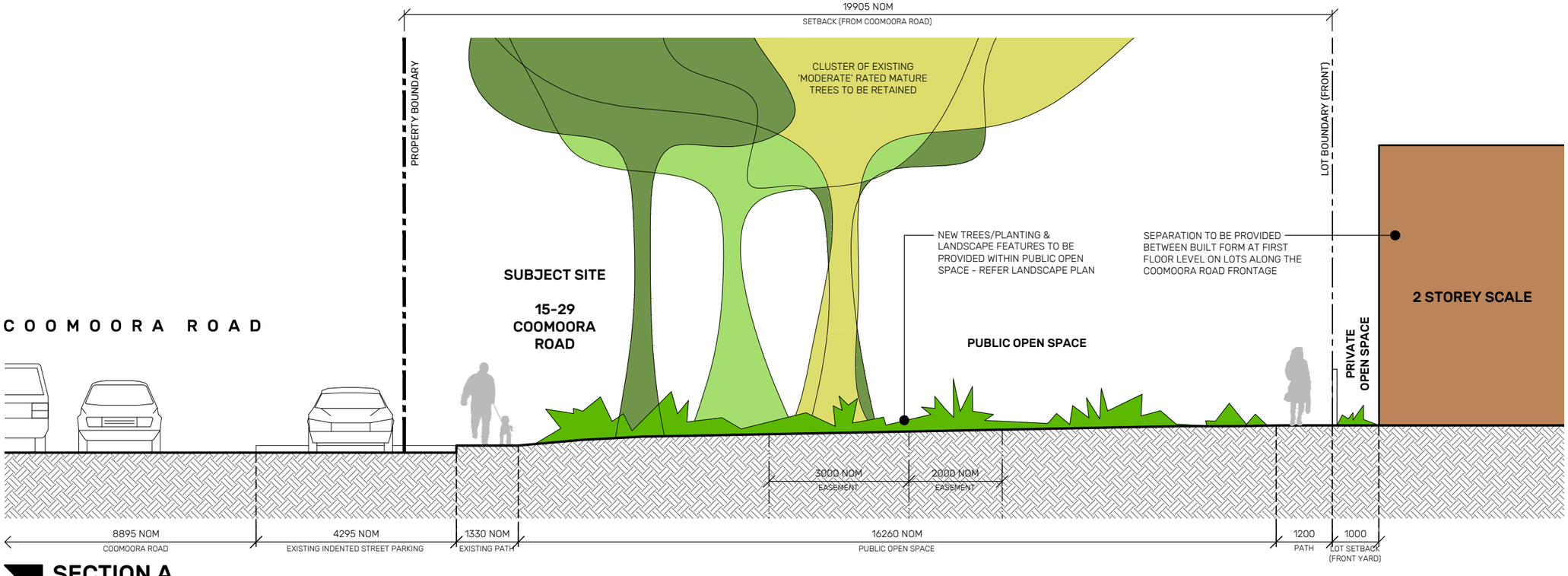
REVISION REGISTER

No.	Date	Description
1	31.10.19	LAYOUT CHANGES & ASSOCIATED REVISIONS
2	19.03.20	REVISIONS AS PER COUNCIL RECOMMENDATIONS
3	30.04.20	REVISIONS AS PER COUNCIL RFI

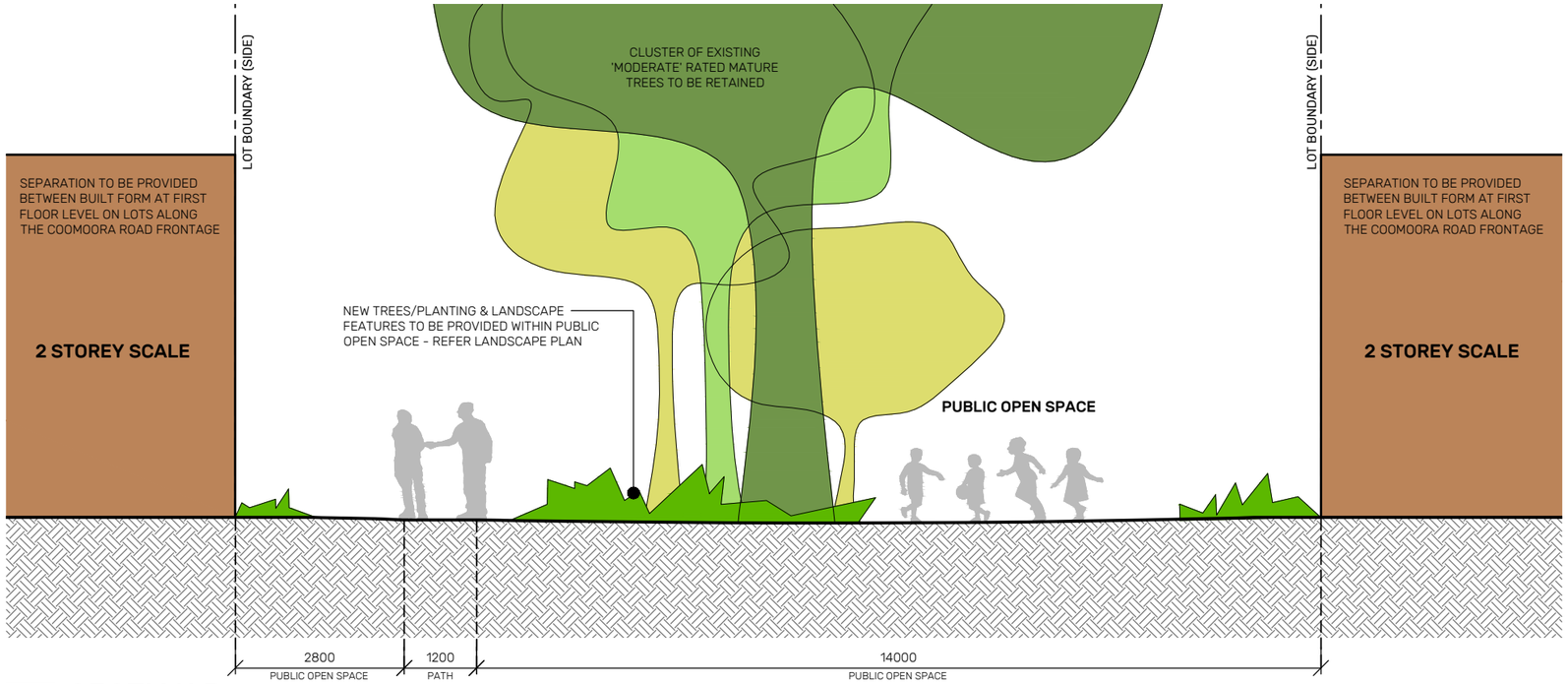
SCALE	DRAWN BY	REVISION ISSUE	DRAWING NO.
1:200@ A3	PP RC TZ	3	DP10
PROJECT NO.	ISSUE DATE	DRAWING STATUS	
180102	30.04.20	DEVELOPMENT PLAN NOT FOR CONSTRUCTION PURPOSES	



KEY PLAN
SCALE 1:2500 @ A3



SECTION A
SCALE 1:100 @ A3



SECTION B
SCALE 1:100 @ A3

REFER TO DP04-10 FOR LEGEND

0 1 2 3 4 5 6
BAR SCALE 1:100 *Metres*

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PROPRIETOR
DEVELOPMENT VICTORIA
Level 9, 8 Exhibition Street, Melbourne VIC 3000

PROJECT TITLE
SPRINGVALE SOUTH
15-29 Coomoora Road, Springvale South VIC 3172

DRAWING TITLE
STREETSCAPE SECTIONS 1 - COOMOORA ROAD & PUBLIC OPEN SPACE

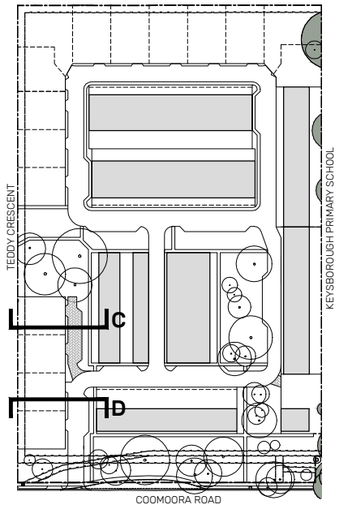
REVISION REGISTER

No.	Date	Description
1	31.10.19	LAYOUT CHANGES & ASSOCIATED REVISIONS
2	19.03.20	REVISIONS AS PER COUNCIL RECOMMENDATIONS

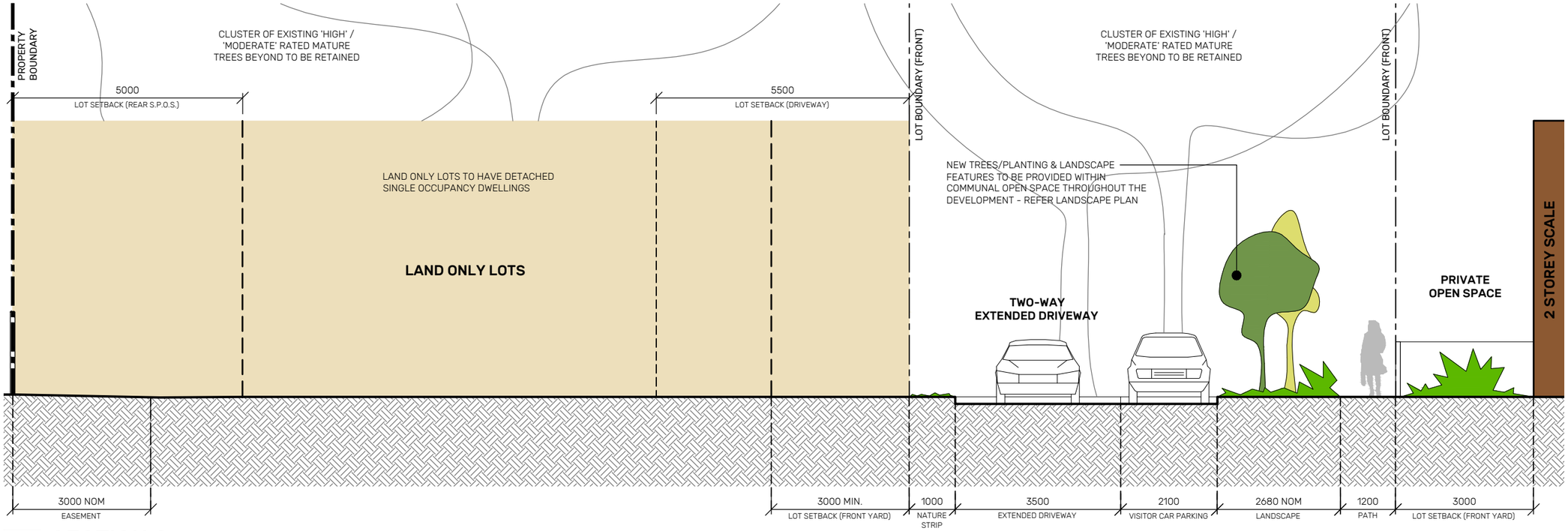
SCALE	DRAWN BY
1:100@ A3	PP RC TZ
PROJECT NO.	ISSUE DATE
180102	19.03.20

REVISION ISSUE	DRAWING NO.
2	**DP11**

DRAWING STATUS
DEVELOPMENT PLAN
NOT FOR CONSTRUCTION PURPOSES



KEY PLAN
SCALE 1:2500 @ A3



SECTION C
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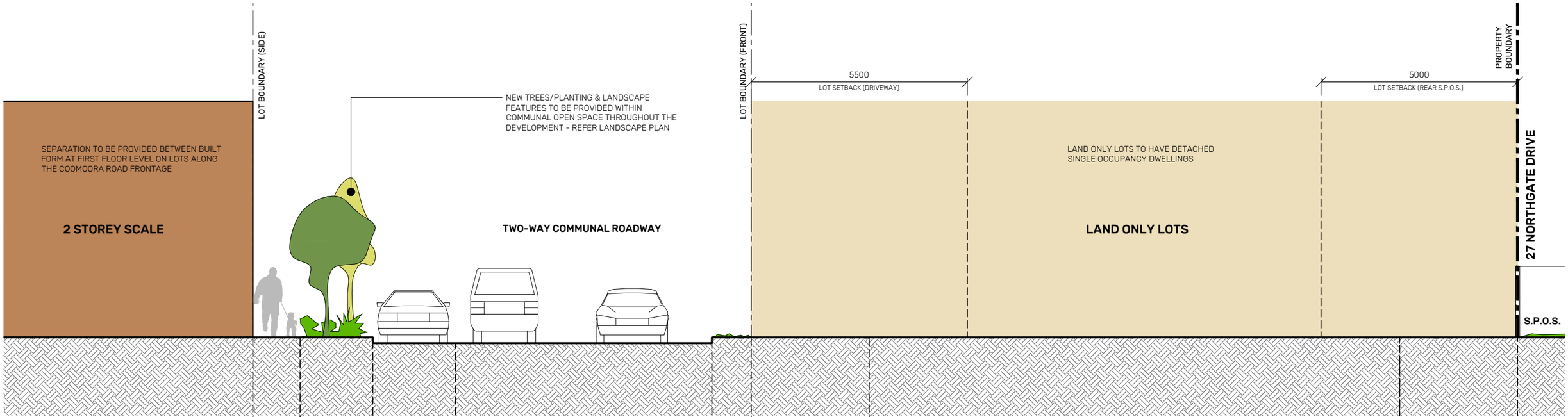

SECTION D
SCALE 1:100 @ A3

REFER TO DP04-10 FOR LEGEND

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PROPRIETOR
DEVELOPMENT VICTORIA
Level 9, 8 Exhibition Street, Melbourne VIC 3000

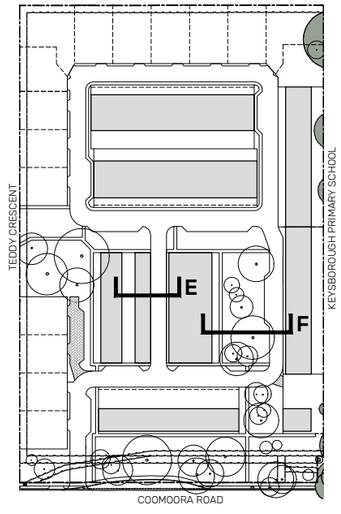
PROJECT TITLE
SPRINGVALE SOUTH
15-29 Coomoora Road, Springvale South VIC 3172

DRAWING TITLE
STREETSCAPE SECTIONS 2 - COOMOORA ROAD ENTRY & EXTENDED DRIVEWAY

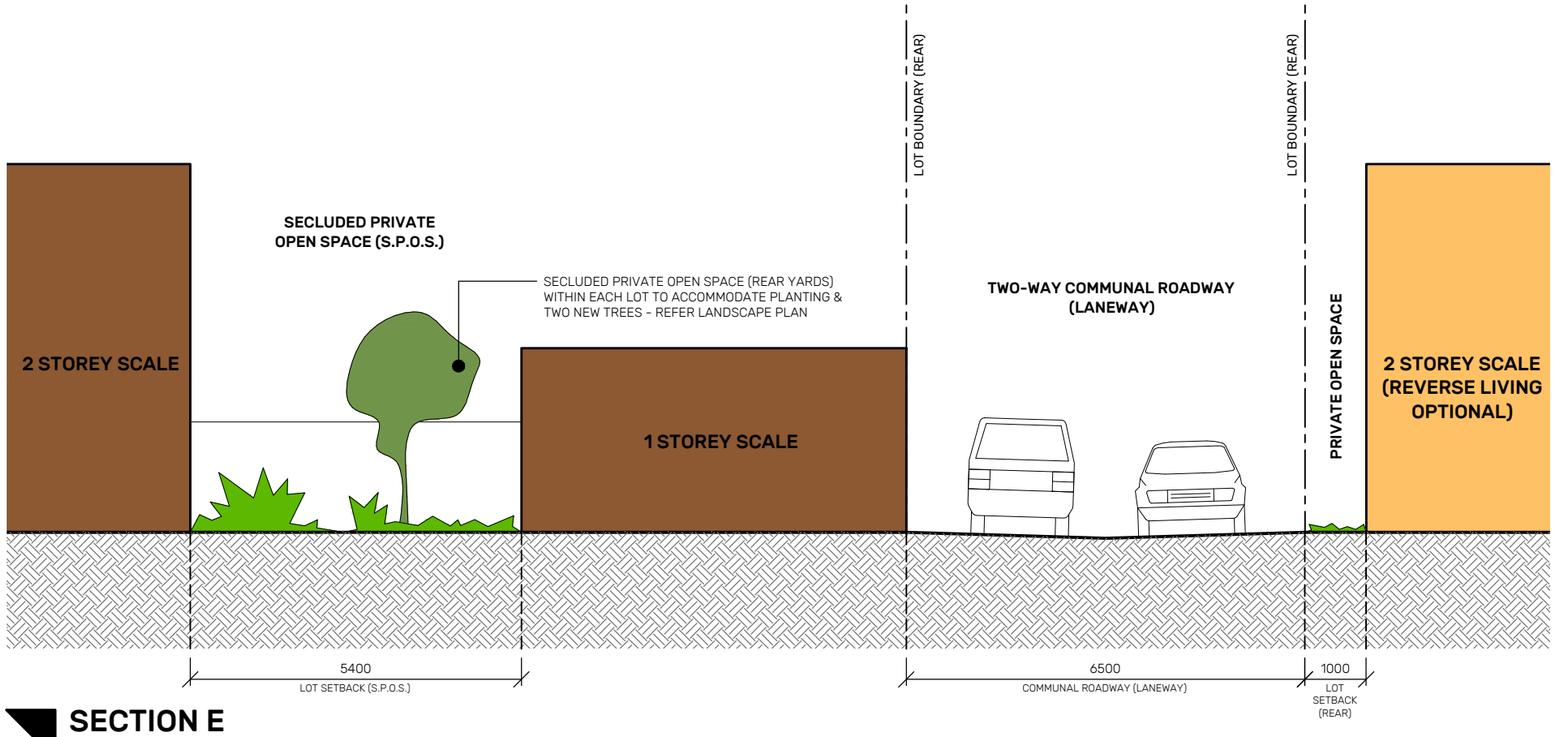
REVISION REGISTER

No.	Date	Description
1	31.10.19	LAYOUT CHANGES & ASSOCIATED REVISIONS
2	19.03.20	REVISIONS AS PER COUNCIL RECOMMENDATIONS

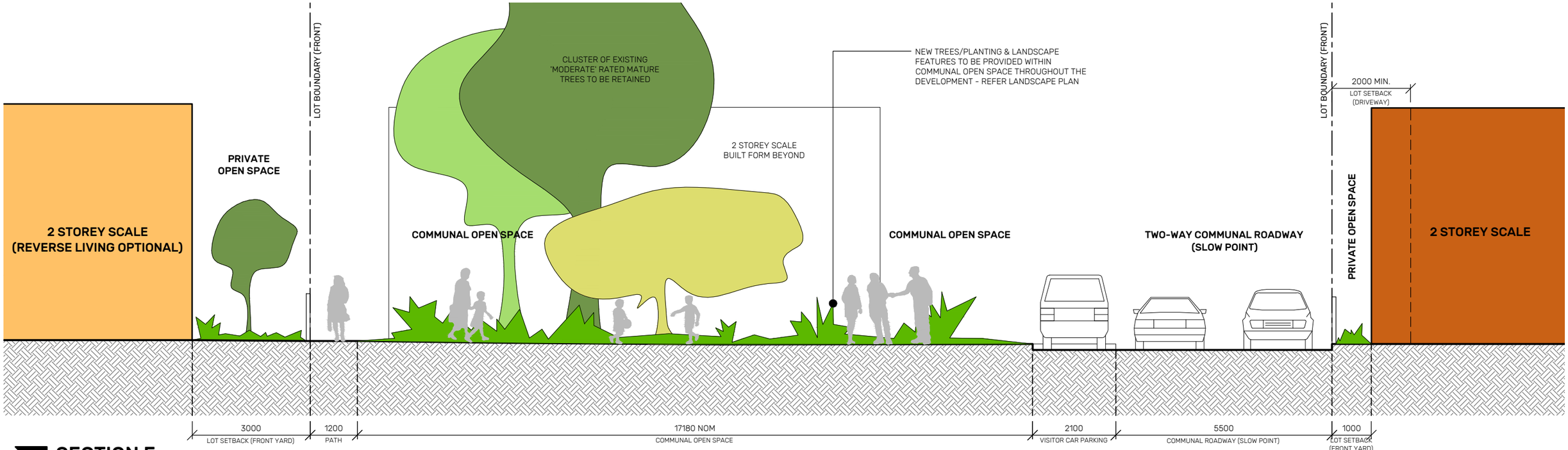
SCALE	DRAWN BY	REVISION ISSUE	DRAWING NO.
1:100@ A3	PP RC TZ	2	DP12
PROJECT NO.	ISSUE DATE	DRAWING STATUS	
180102	19.03.20	DEVELOPMENT PLAN NOT FOR CONSTRUCTION PURPOSES	



KEY PLAN
SCALE 1:2500 @ A3



SECTION E
SCALE 1:100 @ A3



SECTION F
SCALE 1:100 @ A3

REFER TO DP04-10 FOR LEGEND

0 1 2 3 4 5 6

BAR SCALE 1:100 *Metres*

BENT ARCHITECTURE
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T. (03) 9388 9033 E. info@bentarchitecture.com.au

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PROPRIETOR
DEVELOPMENT VICTORIA
Level 9, 8 Exhibition Street,
Melbourne VIC 3000

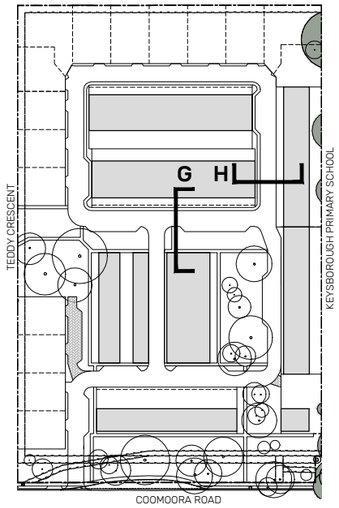
PROJECT TITLE
SPRINGVALE SOUTH
15-29 Coomoora Road,
Springvale South VIC 3172

DRAWING TITLE
STREETSCAPE SECTIONS 3 - LANEWAY & SLOW POINT

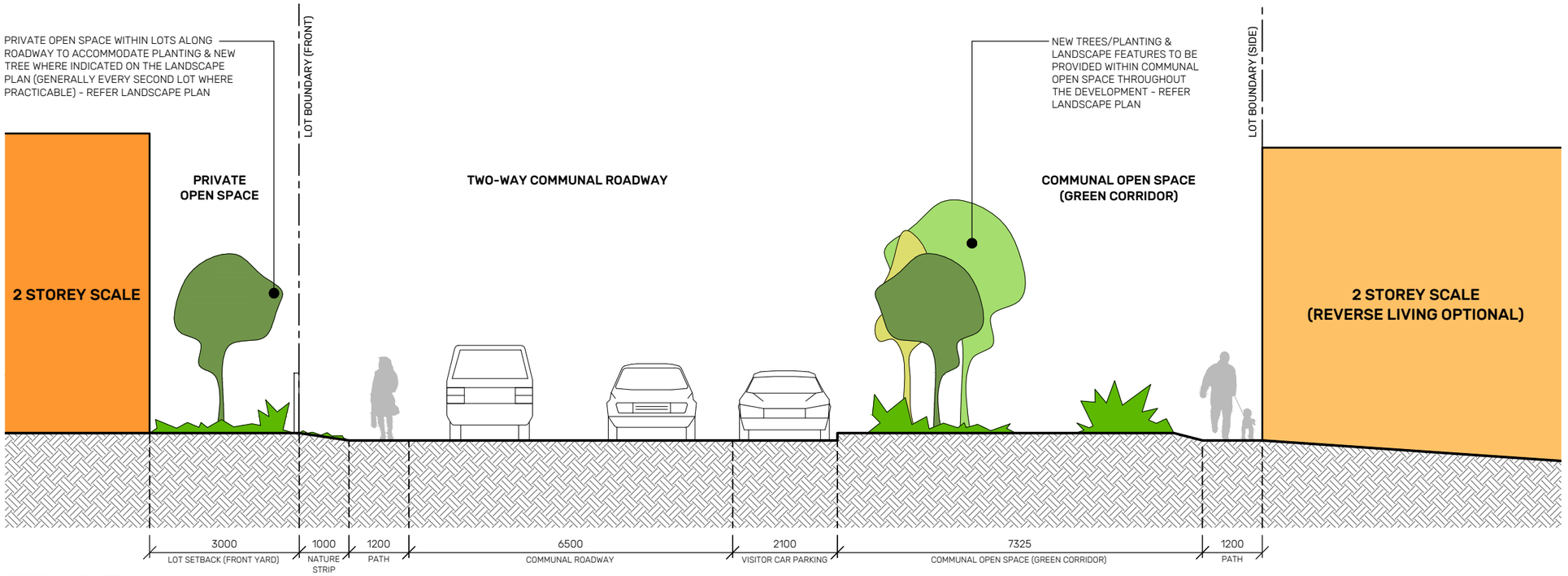
REVISION REGISTER

No.	Date	Description
1	31.10.19	LAYOUT CHANGES & ASSOCIATED REVISIONS
2	19.03.20	REVISIONS AS PER COUNCIL RECOMMENDATIONS

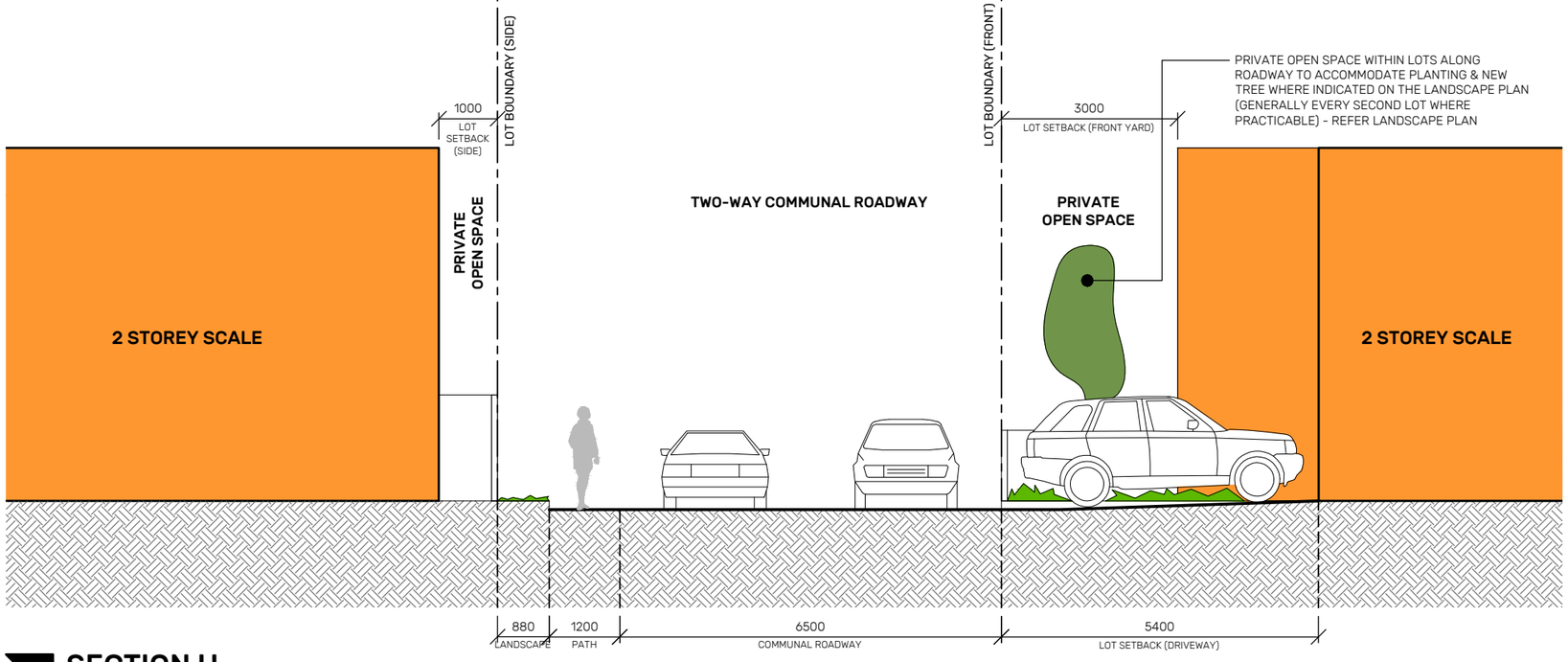
SCALE	DRAWN BY	REVISION ISSUE	DRAWING NO.
1:100@ A3	PP RC TZ	**2**	**DP13**
PROJECT NO.	ISSUE DATE	DRAWING STATUS	
180102	19.03.20	**DEVELOPMENT PLAN** NOT FOR CONSTRUCTION PURPOSES	



KEY PLAN
SCALE 1:2500 @ A3



SECTION G
SCALE 1:100 @ A3



SECTION H
SCALE 1:100 @ A3

REFER TO DP04-10 FOR LEGEND

0 1 2 3 4 5 6

BAR SCALE 1:100 *Metres*

BENTARCHITECTURE
Level 1 / 14 Wilson Ave Brunswick VIC 3056
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PROPRIETOR
DEVELOPMENT VICTORIA
Level 9, 8 Exhibition Street,
Melbourne VIC 3000

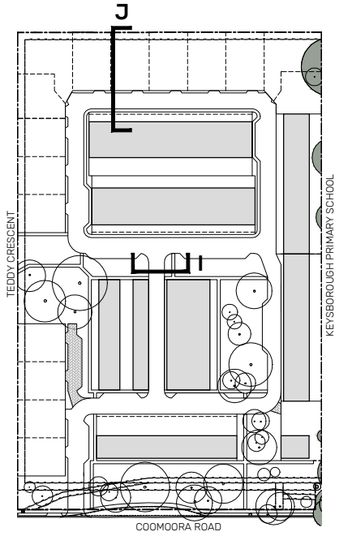
PROJECT TITLE
SPRINGVALE SOUTH
15-29 Coomoora Road,
Springvale South VIC 3172

DRAWING TITLE
STREETSCAPE SECTIONS 4 - GREEN CORRIDOR & TYPICAL ROADWAY

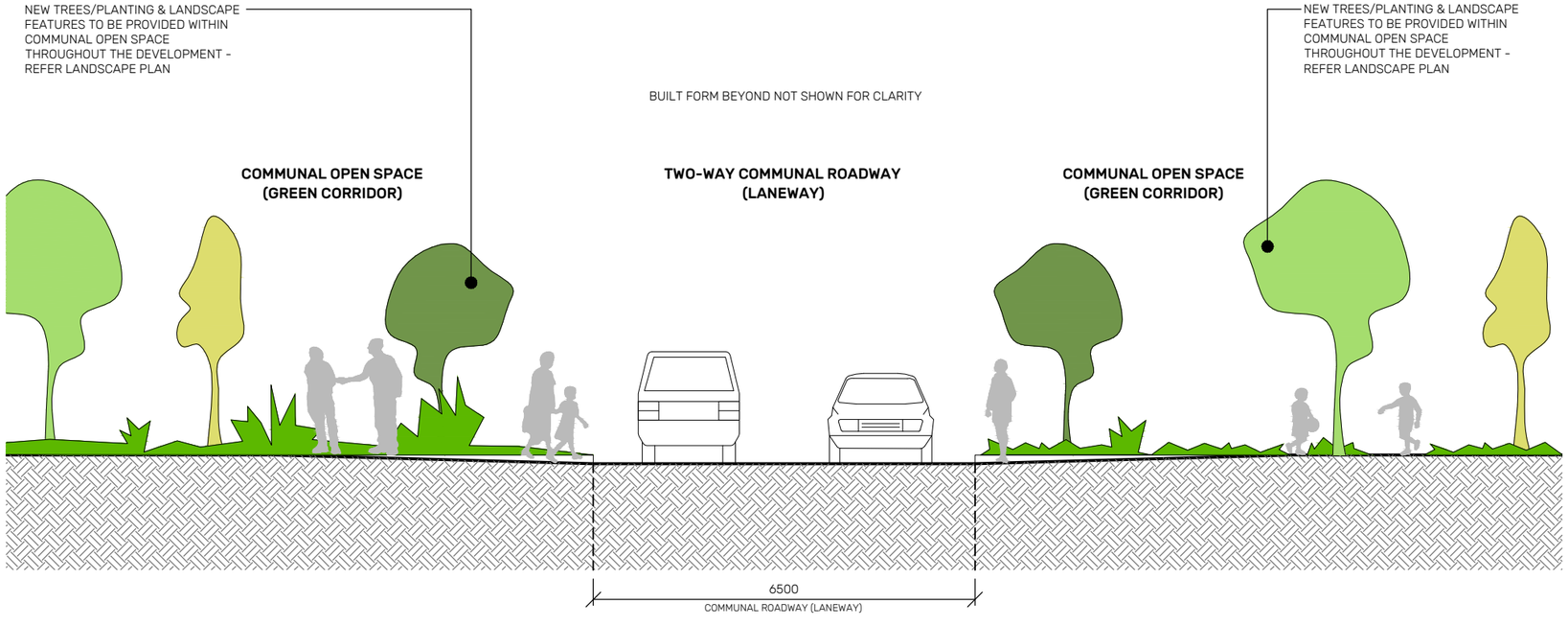
REVISION REGISTER

No.	Date	Description
1	31.10.19	LAYOUT CHANGES & ASSOCIATED REVISIONS
2	19.03.20	REVISIONS AS PER COUNCIL RECOMMENDATIONS

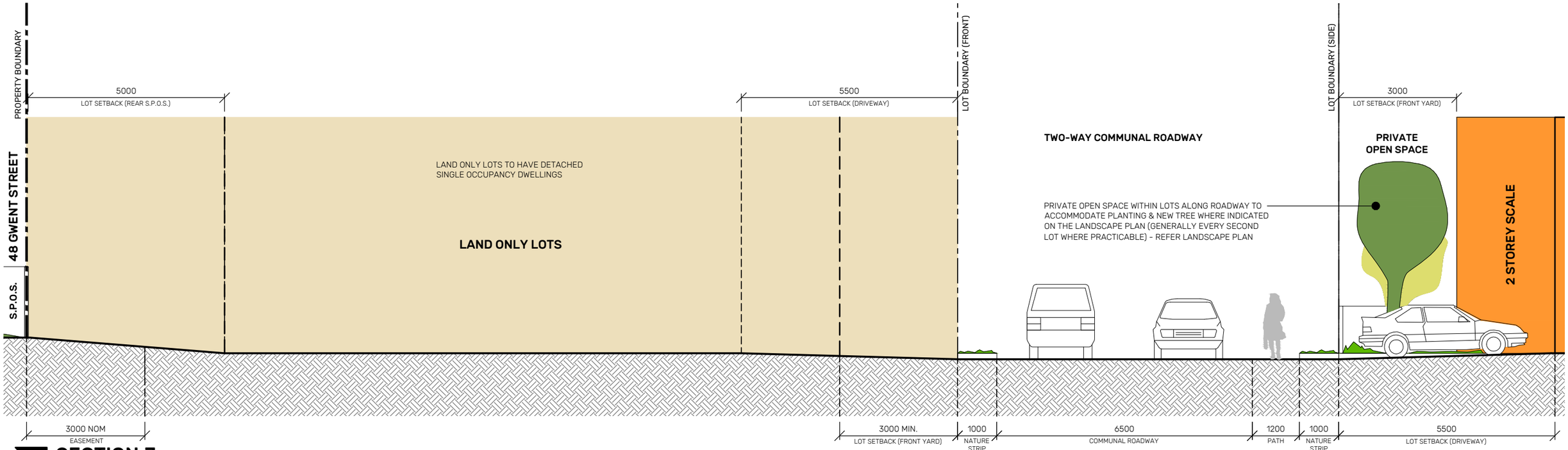
SCALE	DRAWN BY	REVISION ISSUE	DRAWING NO.
1:100@ A3	PP RC TZ	**2**	**DP14**
PROJECT NO.	ISSUE DATE	DRAWING STATUS	
180102	19.03.20	**DEVELOPMENT PLAN** NOT FOR CONSTRUCTION PURPOSES	



KEY PLAN
SCALE 1:2500 @ A3



SECTION I
SCALE 1:100 @ A3



SECTION J
SCALE 1:100 @ A3

REFER TO DP04-10 FOR LEGEND

0 1 2 3 4 5 6

BAR SCALE 1:100 *Metres*

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PROPRIETOR
DEVELOPMENT VICTORIA
Level 9, 8 Exhibition Street, Melbourne VIC 3000

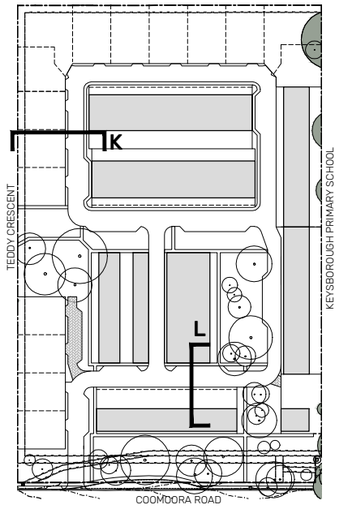
PROJECT TITLE
SPRINGVALE SOUTH
15-29 Coomoora Road, Springvale South VIC 3172

DRAWING TITLE
STREETSCAPE SECTIONS 5 - GREEN CORRIDOR & TYPICAL ROADWAYS

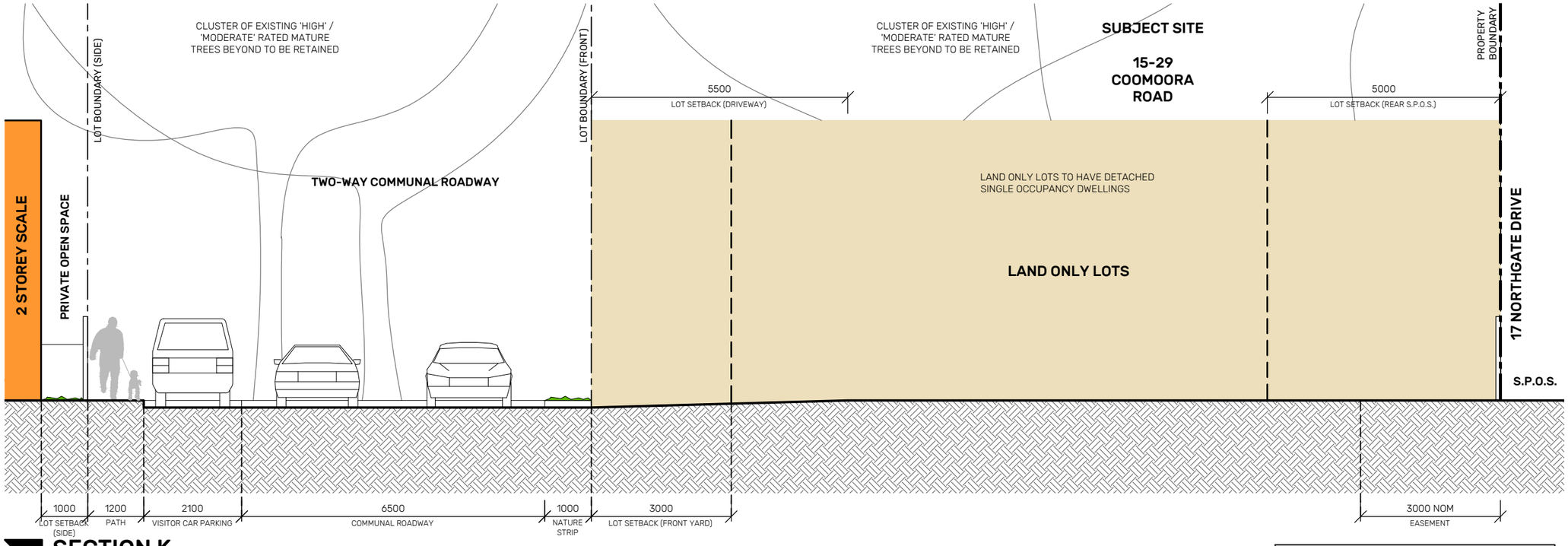
REVISION REGISTER

No.	Date	Description
1	31.10.19	LAYOUT CHANGES & ASSOCIATED REVISIONS
2	19.03.20	REVISIONS AS PER COUNCIL RECOMMENDATIONS

SCALE	DRAWN BY	REVISION ISSUE	DRAWING NO.
1:100@ A3	PP RC TZ	**2**	**DP15**
PROJECT NO.	ISSUE DATE	DRAWING STATUS	
180102	19.03.20	**DEVELOPMENT PLAN** NOT FOR CONSTRUCTION PURPOSES	

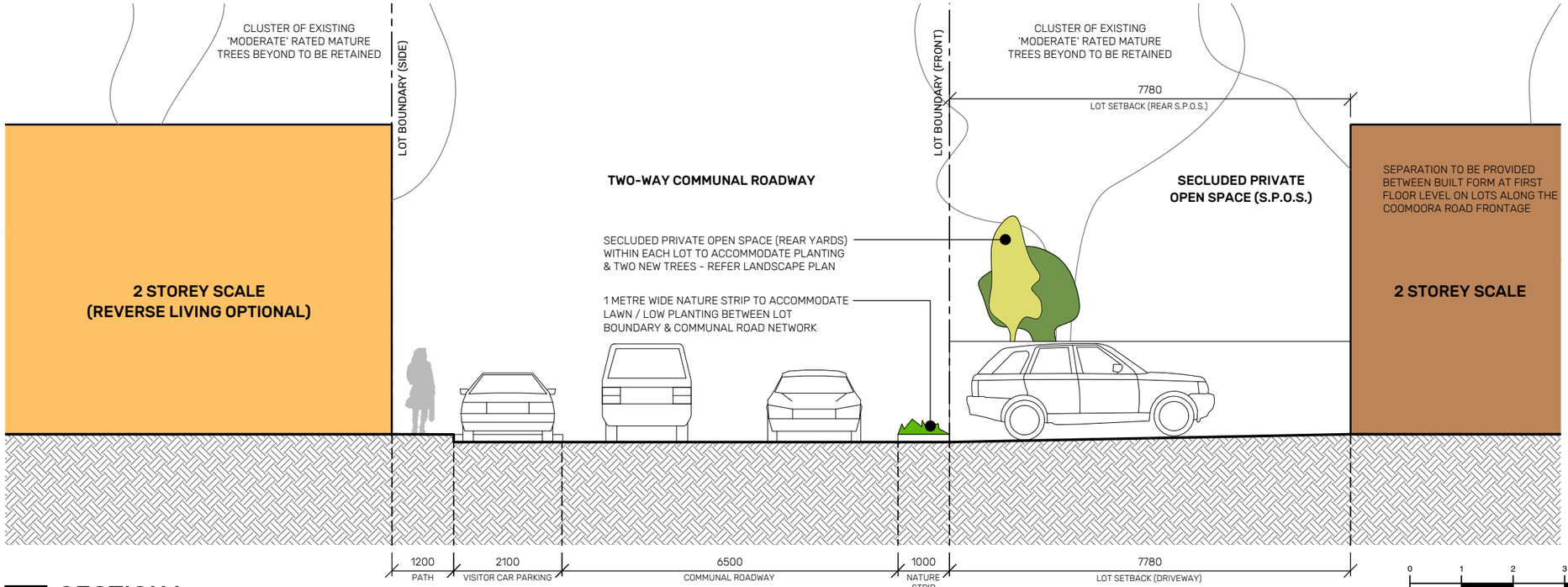


KEY PLAN
SCALE 1:2500 @ A3



SECTION K
SCALE 1:100 @ A3

REFER TO DP04-10 FOR LEGEND



SECTION L
SCALE 1:100 @ A3

BAR SCALE 1:100 (0 1 2 3 4 5 6 Metres)

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Level 1 / 14 Wilson Ave Brunswick VIC 3056
T. (03) 9388 9033 E. info@bentarchitecture.com.au

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PROPRIETOR
DEVELOPMENT VICTORIA
Level 9, 8 Exhibition Street, Melbourne VIC 3000

PROJECT TITLE
SPRINGVALE SOUTH
15-29 Coomoora Road, Springvale South VIC 3172

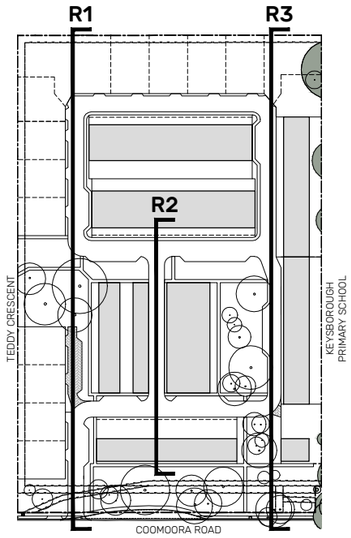
DRAWING TITLE
STREETSCAPE SECTIONS 6 - TYPICAL ROADWAYS

REVISION REGISTER

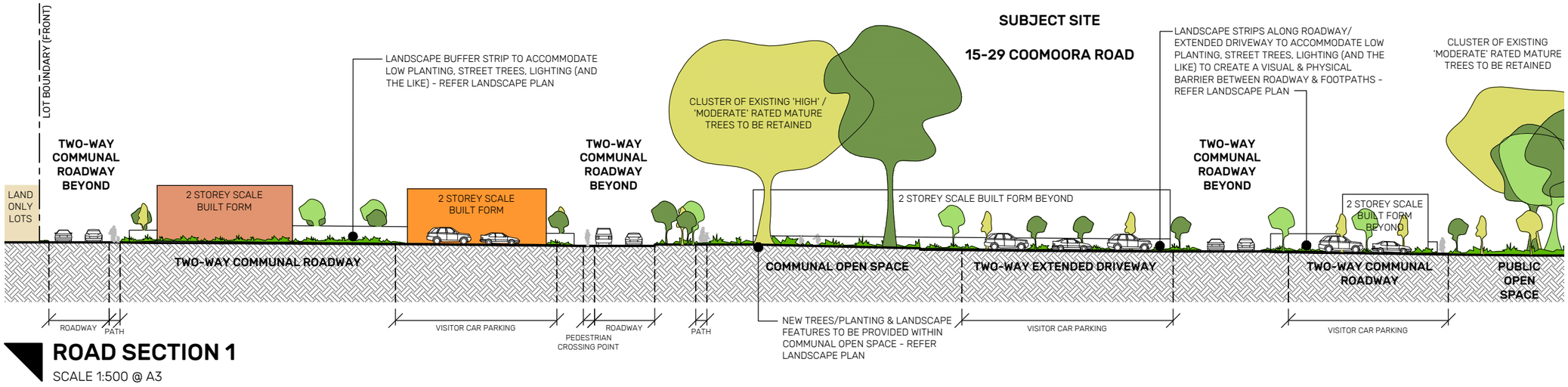
No.	Date	Description
1	31.10.19	LAYOUT CHANGES & ASSOCIATED REVISIONS
2	19.03.20	REVISIONS AS PER COUNCIL RECOMMENDATIONS

SCALE	DRAWN BY
1:100@ A3	PP RC TZ
PROJECT NO.	ISSUE DATE
180102	19.03.20

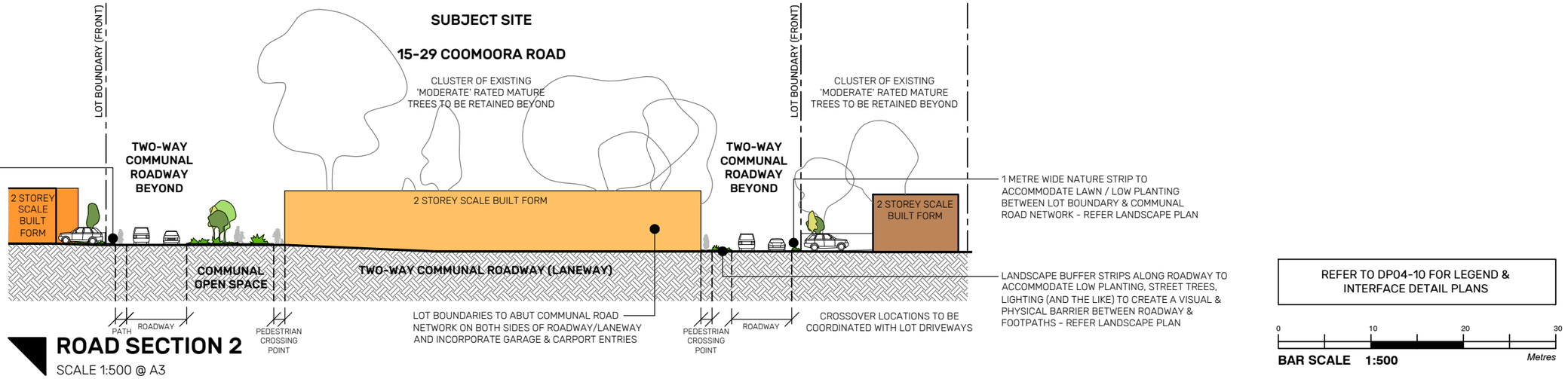
REVISION ISSUE	DRAWING NO.
2	**DP16**
DRAWING STATUS	
DEVELOPMENT PLAN NOT FOR CONSTRUCTION PURPOSES	



KEY PLAN
SCALE 1:2500 @ A3



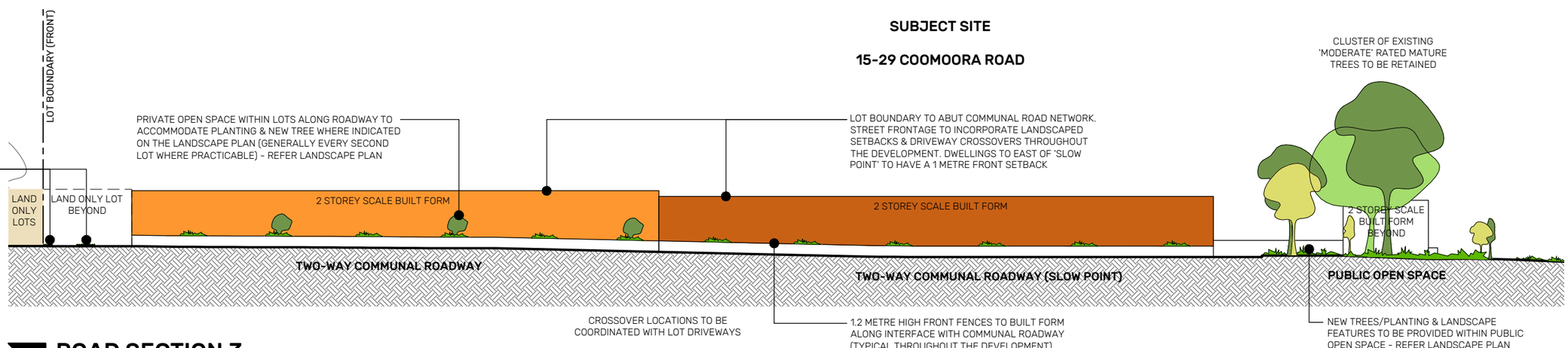
ROAD SECTION 1
SCALE 1:500 @ A3



ROAD SECTION 2
SCALE 1:500 @ A3

REFER TO DP04-10 FOR LEGEND & INTERFACE DETAIL PLANS

BAR SCALE 1:500 — 0, 10, 20, 30 Metres



ROAD SECTION 3
SCALE 1:500 @ A3

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PROPRIETOR
DEVELOPMENT VICTORIA
Level 9, 8 Exhibition Street, Melbourne VIC 3000

PROJECT TITLE
SPRINGVALE SOUTH
15-29 Coomoora Road, Springvale South VIC 3172

DRAWING TITLE
ROAD SECTIONS 1 - NORTH-SOUTH ROADWAYS

REVISION REGISTER

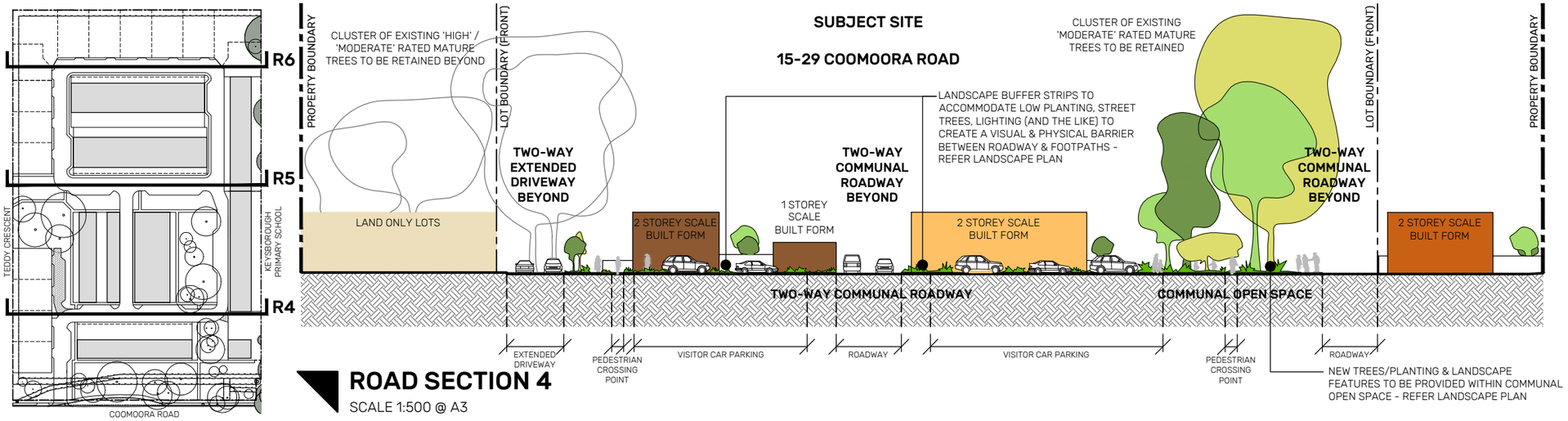
No.	Date	Description
-	-	-

SCALE	DRAWN BY
1:500@ A3	PP RC TZ

PROJECT NO.	ISSUE DATE
180102	19.03.20

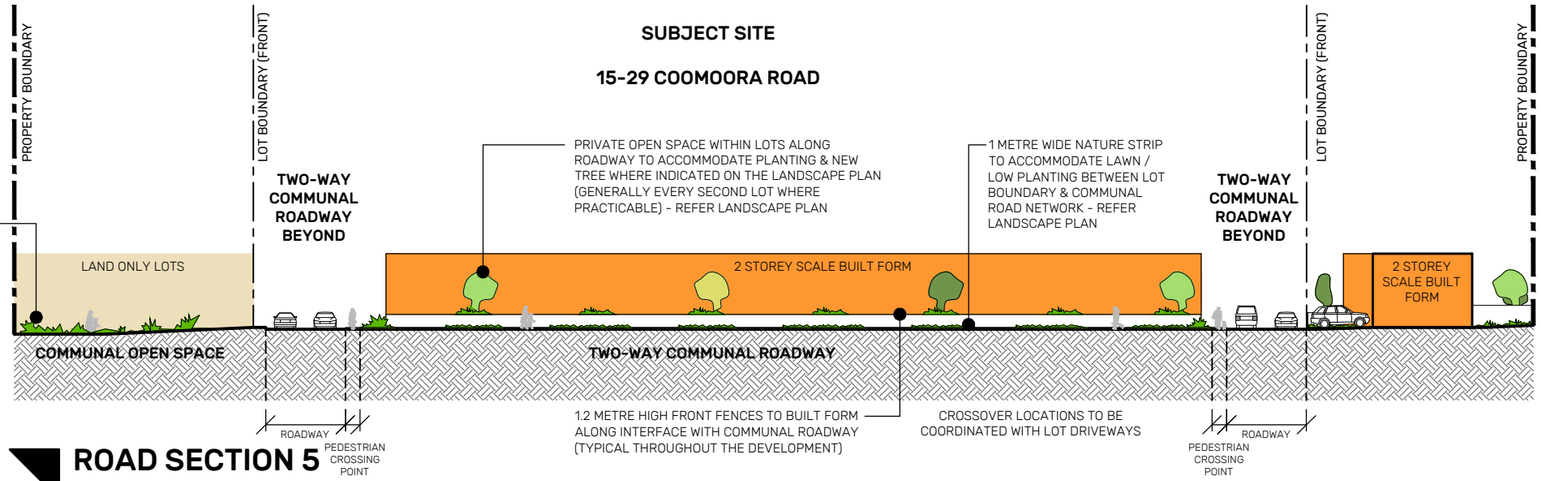
REVISION ISSUE: -
DRAWING NO.: DP17

DRAWING STATUS
DEVELOPMENT PLAN
NOT FOR CONSTRUCTION PURPOSES

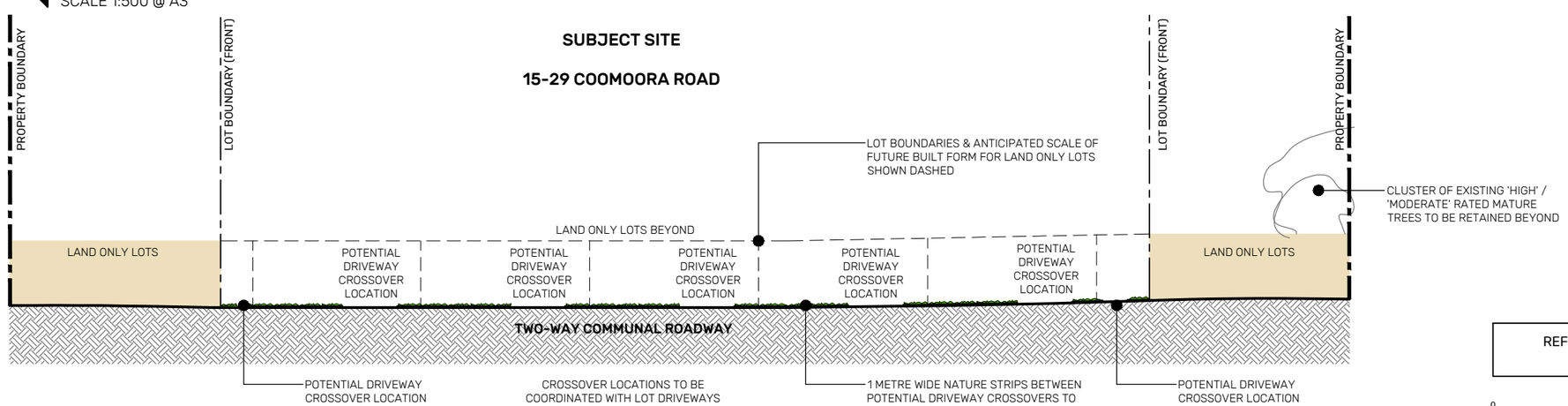


ROAD SECTION 4
SCALE 1:500 @ A3

KEY PLAN
SCALE 1:2500 @ A3



ROAD SECTION 5
SCALE 1:500 @ A3



ROAD SECTION 6
SCALE 1:500 @ A3

REFER TO DP04-10 FOR LEGEND & INTERFACE DETAIL PLANS

BAR SCALE 1:500 — 0, 10, 20, 30 Metres

BENT ARCHITECTURE
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PROPRIETOR
DEVELOPMENT VICTORIA
Level 9, 8 Exhibition Street, Melbourne VIC 3000

PROJECT TITLE
SPRINGVALE SOUTH
15-29 Coomoora Road, Springvale South VIC 3172

DRAWING TITLE
ROAD SECTIONS 2 - EAST-WEST ROADWAYS

REVISION REGISTER

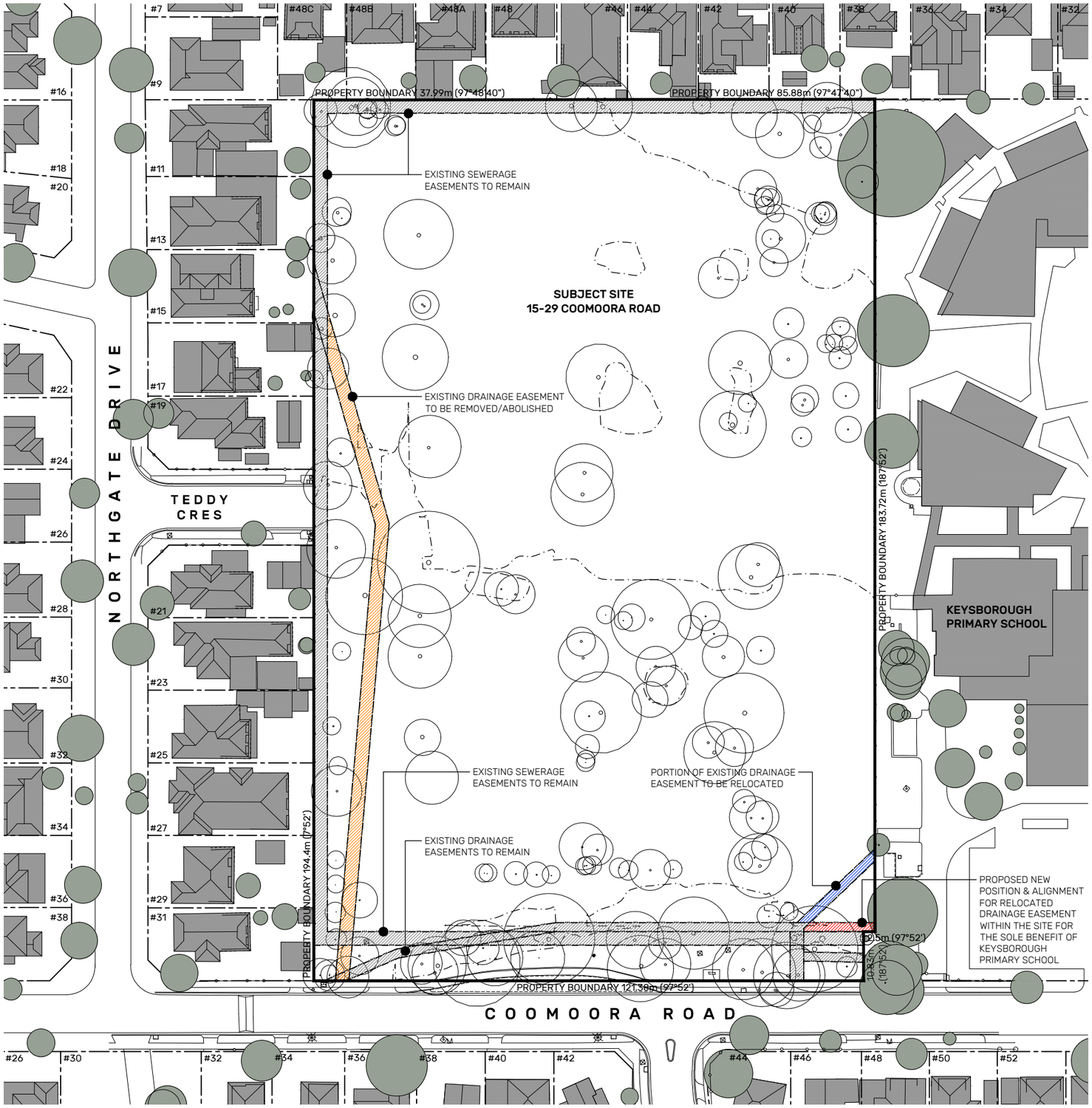
No.	Date	Description
-	-	-

SCALE	DRAWN BY
1:500@ A3	PP RC TZ

PROJECT NO.	ISSUE DATE
180102	19.03.20

REVISION ISSUE	DRAWING NO.
-	DP18

DRAWING STATUS
DEVELOPMENT PLAN
NOT FOR CONSTRUCTION PURPOSES



LEGEND

- PROPERTY BOUNDARY
- NEIGHBOURING BUILDINGS
- EXISTING TREES ON SITE
- SURROUNDING NEIGHBOURHOOD TREES (SHOWN INDICATIVELY ONLY)
- EXISTING PRIMARY SITE CONTOURS (SHOWN AT 1m INTERVALS) - REFER FEATURE & LEVEL SURVEY. LEVELS ARE IN TERMS OF AHD BASED ON PM 1432 RL.24.205m.
- EXTENT OF EXISTING SEWER & DRAINAGE EASEMENTS ON SITE TO REMAIN
- EXTENT OF EXISTING DRAINAGE EASEMENTS ON SITE TO BE REMOVED/ABOLISHED
- PORTION OF EXISTING DRAINAGE EASEMENT ON SITE (FOR THE SOLE BENEFIT OF KEYSBOROUGH PRIMARY SCHOOL) TO BE RELOCATED
- PROPOSED NEW POSITION AND ALIGNMENT FOR DRAINAGE EASEMENT ON SITE (FOR THE SOLE BENEFIT OF KEYSBOROUGH PRIMARY SCHOOL) - RECONNECT TO THE EXISTING EASEMENT ON KEYSBOROUGH PRIMARY SCHOOL SIDE OF THE PROPERTY BOUNDARY

REFER TO PLAN OF SUBDIVISION (PS 647548Q) FOR MORE DETAILED INFORMATION REGARDING THE PRECISE LOCATION, EXTENT AND PURPOSE OF EASEMENTS ON SITE

APPROX. NORTH

0 10 20 30 40 50 60

BAR SCALE 1:1000 Metres

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Melbourne VIC 3000

PROJECT TITLE
SPRINGVALE SOUTH
15-29 Coomoora Road,
Springvale South VIC 3172

DRAWING TITLE
EASEMENT REMOVAL & RELOCATION PLAN

REVISION REGISTER

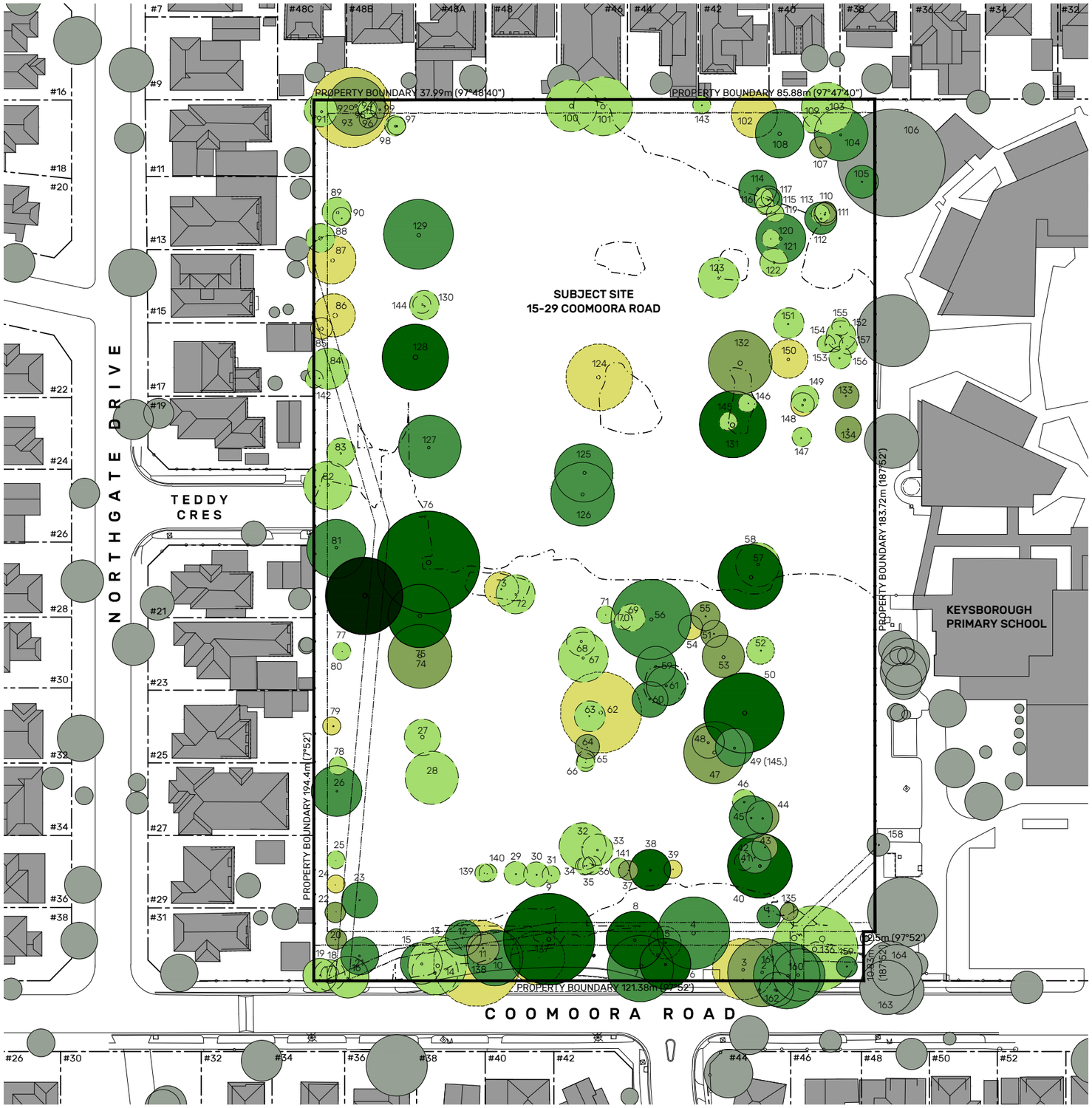
No.	Date	Description
1	31.10.19	LAYOUT CHANGES & ASSOCIATED REVISIONS
2	19.03.20	REVISIONS AS PER COUNCIL RECOMMENDATIONS

SCALE	DRAWN BY
1:1000@ A3	PP RC TZ

PROJECT NO.	ISSUE DATE
180102	19.03.20

REVISION ISSUE	DRAWING NO.
2	**DP19**

DRAWING STATUS
DEVELOPMENT PLAN
NOT FOR CONSTRUCTION PURPOSES



LEGEND

- PROPERTY BOUNDARY
- NEIGHBOURING BUILDINGS
- EXISTING PRIMARY SITE CONTOURS (SHOWN AT 1m INTERVALS) - REFER FEATURE & LEVEL SURVEY
- LOCATION OF EXISTING (REMAINING) & PROPOSED SEWER & DRAINAGE EASEMENTS ON SITE - REFER DP19 - EASEMENT REMOVAL & RELOCATION PLAN
- SURROUNDING NEIGHBOURHOOD TREES (SHOWN INDICATIVELY ONLY)

LEGEND - EXISTING TREES

THE EXISTING TREES ON THE SITE HAVE BEEN ASSESSED BY TREE LOGIC, NUMBERED AND ATTRIBUTED AN ARBORICULTURAL RATING WHICH REFLECTS THE RETENTION VALUE OF EACH TREE - REFER ARBORICULTURAL ASSESSMENT AND REPORT HAS BEEN PREPARED BY TREE LOGIC (REF. 009059, DATED 13 APRIL 2018)

1x	HIGH	77
11x	MODERATE A	6, 8, 9, 38, 40, 50, 58, 75, 76, 128, 131
32x	MODERATE B	1, 4, 7, 10, 12, 15, 21, 23, 26, 41, 45, 49 (145,), 56, 59, 60, 61, 81, 104, 105, 108, 112, 114, 115, 121, 125, 126, 127, 129, 159, 160, 161, 162
22x	MODERATE C	2, 11, 20, 22, 37, 43, 44, 47, 48, 51, 53, 55, 64, 74, 93, 107, 110, 111, 132, 133, 134, 135
70x	LOW	13, 14, 16, 17, 18, 19, 25, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 42, 46, 52, 57, 63, 65, 66, 67, 68, 69, 70, 71, 72, 78, 80, 82, 83, 84, 88, 89, 91, 94, 98, 100, 101, 103, 109, 113, 116, 118, 119, 120, 122, 123, 130, 136, 139, 140, 141, 142, 143, 144, 145, 146, 147, 149, 151, 152, 153, 154, 155, 156, 157
24x	NONE	3, 5, 24, 39, 54, 62, 73, 79, 85, 86, 87, 90, 92, 95, 96, 97, 99, 102, 117, 124, 137, 138, 148, 150

TOTAL: **160 EXISTING TREES ON SITE**

THERE ARE ALSO 4 TREES THAT HAVE BEEN ASSESSED AND RATED IN THE TREE LOGIC ARBORICULTURAL ASSESSMENT AND REPORT THAT ARE NOT LOCATED ON THE SITE. THESE ARE AS FOLLOWS:

- 106 (MODERATE A)
- 158 (LOW)
- 163 (MODERATE B)
- 164 (MODERATE B)

THESE 4 TREES ARE SHOWN AS SURROUNDING NEIGHBOURHOOD TREES AND ARE NUMBERED ON THE EXISTING TREE PLAN FOR REFERENCE

REFER DP21 - TREE RETENTION PLAN & DP22 - TREE REMOVAL PLAN

APPROX. NORTH

0 10 20 30 40 50 60

BAR SCALE 1:1000 *Metres*

BENT ARCHITECTURE
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PROPRIETOR
DEVELOPMENT VICTORIA
Level 9, 8 Exhibition Street,
Melbourne VIC 3000

PROJECT TITLE
SPRINGVALE SOUTH
15-29 Coomoora Road,
Springvale South VIC 3172

DRAWING TITLE
EXISTING TREE PLAN

REVISION REGISTER

No.	Date	Description
1	31.10.19	LAYOUT CHANGES & ASSOCIATED REVISIONS
2	19.03.20	REVISIONS AS PER COUNCIL RECOMMENDATIONS

SCALE	DRAWN BY	REVISION ISSUE	DRAWING NO.
1:1000@ A3	PP RC TZ	**2**	**DP20**
PROJECT NO.	ISSUE DATE	DRAWING STATUS	
180102	19.03.20	**DEVELOPMENT PLAN** NOT FOR CONSTRUCTION PURPOSES	

LEGEND

- PROPERTY BOUNDARY
- NEIGHBOURING BUILDINGS
- EXISTING PRIMARY SITE CONTOURS (SHOWN AT 1m INTERVALS) - REFER FEATURE & LEVEL SURVEY
- LOCATION OF EXISTING (REMAINING) & PROPOSED SEWER & DRAINAGE EASEMENTS ON SITE - REFER DP19 - EASEMENT REMOVAL & RELOCATION PLAN
- SURROUNDING NEIGHBOURHOOD TREES (SHOWN INDICATIVELY ONLY)

LEGEND - TREE RETENTION

THE FOLLOWING EXISTING TREES ON SITE ARE TO BE RETAINED:

1x	HIGH	77
8x	MODERATE A	6, 8, 9, 40, 50, 58, 75, 76
15x	MODERATE B	1, 4, 7, 10, 12, 21, 41, 45, 49 (145,), 81, 105, 159, 160, 161, 162
10x	MODERATE C	11, 20, 43, 44, 47, 48, 51, 53, 55, 135
0x	LOW (NIL)	
0x	NONE (NIL)	

TOTAL: 34 EXISTING TREES ON SITE TO BE RETAINED

TREE NUMBERS SHOWN ARE TAKEN FROM THE ARBORICULTURAL ASSESSMENT AND REPORT PREPARED BY TREE LOGIC (REF. 009059, DATED 13 APRIL 2018)

APPROX. NORTH

0 10 20 30 40 50 60

BAR SCALE 1:1000 *Metres*

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DEVELOPMENT VICTORIA
Level 9, 8 Exhibition Street,
Melbourne VIC 3000

PROJECT TITLE
SPRINGVALE SOUTH
15-29 Coomoora Road,
Springvale South VIC 3172

DRAWING TITLE
TREE RETENTION PLAN

REVISION REGISTER

No.	Date	Description
1	31.10.19	LAYOUT CHANGES & ASSOCIATED REVISIONS
2	19.03.20	REVISIONS AS PER COUNCIL RECOMMENDATIONS

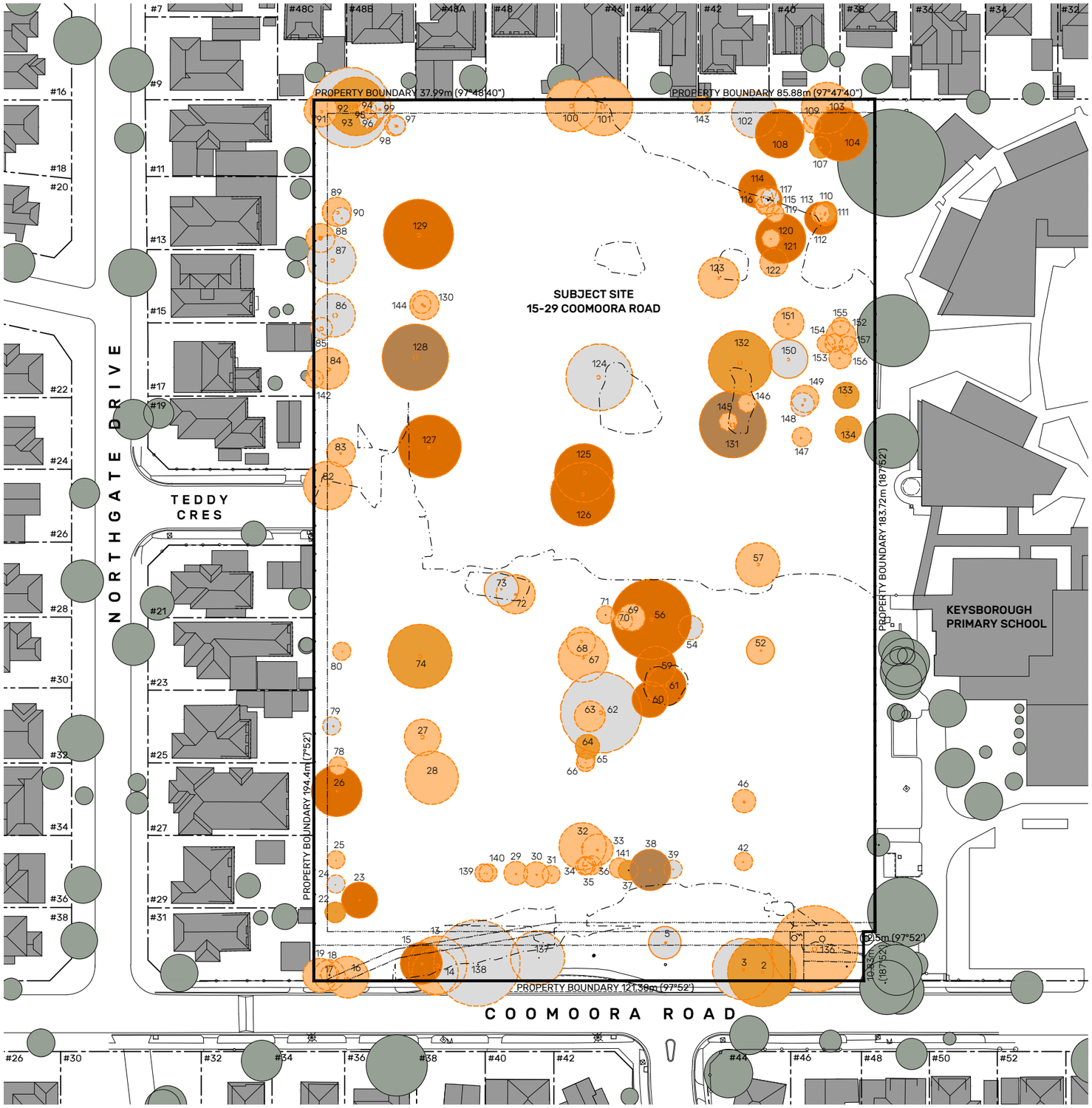
SCALE	DRAWN BY
1:1000@ A3	PP RC TZ

PROJECT NO.	ISSUE DATE
180102	19.03.20

REVISION ISSUE **2**

DRAWING NO. **DP21**

DRAWING STATUS
DEVELOPMENT PLAN
NOT FOR CONSTRUCTION PURPOSES



LEGEND

- PROPERTY BOUNDARY
- NEIGHBOURING BUILDINGS
- EXISTING PRIMARY SITE CONTOURS (SHOWN AT 1m INTERVALS) - REFER FEATURE & LEVEL SURVEY
- LOCATION OF EXISTING (REMAINING) & PROPOSED SEWER & DRAINAGE EASEMENTS ON SITE - REFER DP19 - EASEMENT REMOVAL & RELOCATION PLAN
- SURROUNDING NEIGHBOURHOOD TREES (SHOWN INDICATIVELY ONLY)

LEGEND - TREE REMOVAL

THE FOLLOWING EXISTING TREES ON SITE ARE TO BE REMOVED:

0x	HIGH	
3x	MODERATE A	38, 128, 131
17x	MODERATE B	15, 23, 26, 56, 59, 60, 61, 104, 108, 112, 114, 115, 121, 125, 126, 127, 129
12x	MODERATE C	2, 22, 37, 64, 74, 93, 107, 110, 111, 132, 133, 134
70x	LOW (ALL)	
24x	NONE (ALL)	

TOTAL: **126 EXISTING TREES ON SITE TO BE REMOVED**

TREE NUMBERS SHOWN ARE TAKEN FROM THE ARBORICULTURAL ASSESSMENT AND REPORT PREPARED BY TREE LOGIC (REF. 009059, DATED 13 APRIL 2018)

APPROX. NORTH

0 10 20 30 40 50 60

BAR SCALE 1:1000 *Metres*

BENTARCHITECTURE
Level 1 / 14 Wilson Ave Brunswick VIC 3056
T. (03) 9388 9033 E. info@bentarchitecture.com.au

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PROPRIETOR
DEVELOPMENT VICTORIA
Level 9, 8 Exhibition Street,
Melbourne VIC 3000

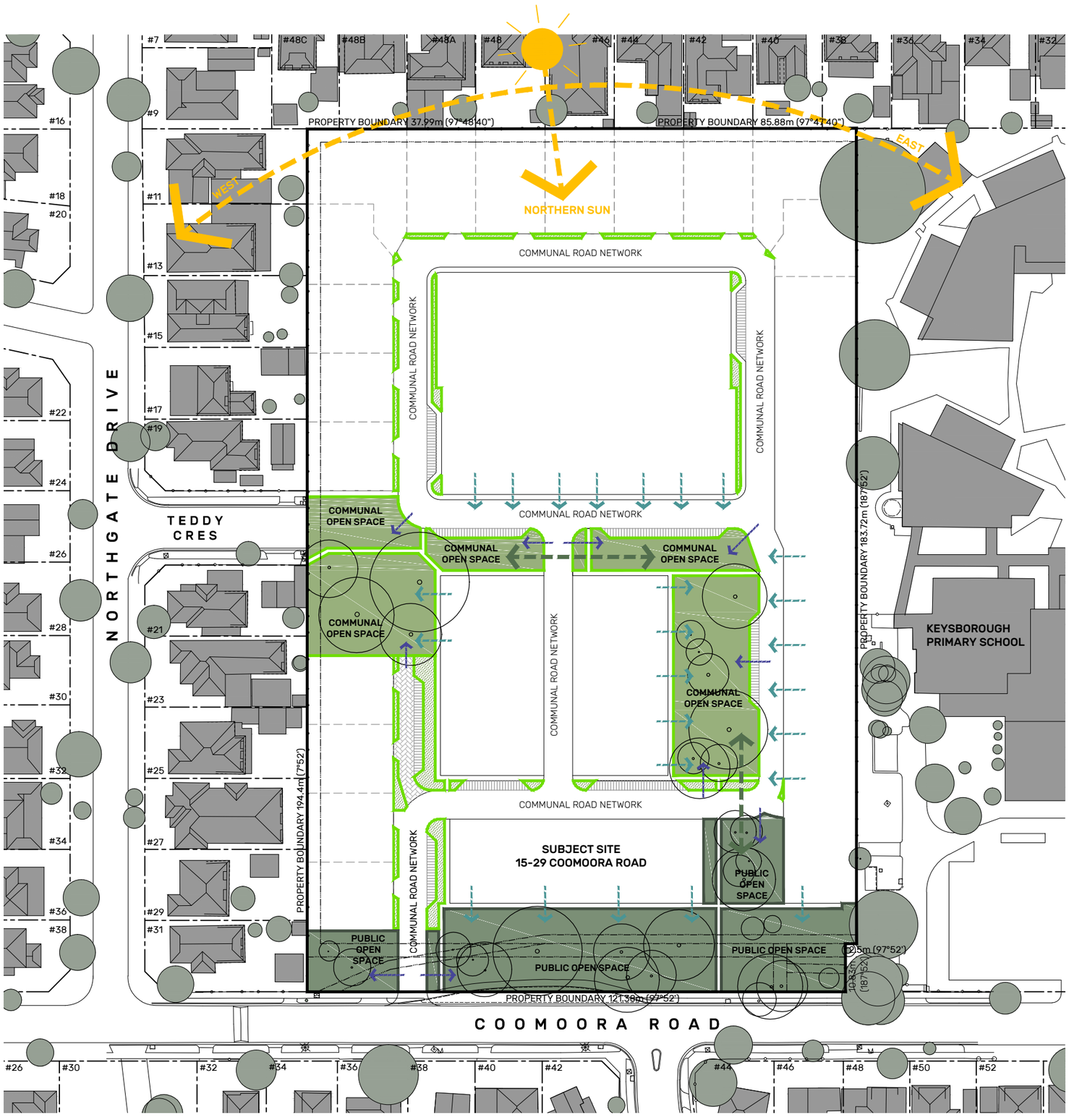
PROJECT TITLE
SPRINGVALE SOUTH
15-29 Coomoora Road,
Springvale South VIC 3172

DRAWING TITLE
TREE REMOVAL PLAN

REVISION REGISTER

No.	Date	Description
1	31.10.19	LAYOUT CHANGES & ASSOCIATED REVISIONS
2	19.03.20	REVISIONS AS PER COUNCIL RECOMMENDATIONS

SCALE	DRAWN BY	REVISION ISSUE	DRAWING NO.
1:1000@ A3	PP RC TZ	**2**	**DP22**
PROJECT NO.	ISSUE DATE	DRAWING STATUS	
180102	19.03.20	**DEVELOPMENT PLAN** NOT FOR CONSTRUCTION PURPOSES	



LEGEND

- PROPERTY BOUNDARY
- NEIGHBOURING BUILDINGS
- LOCATION OF EXISTING (REMAINING) & PROPOSED SEWER & DRAINAGE EASEMENTS ON SITE - REFER DP19 - EASEMENT REMOVAL & RELOCATION PLAN
- RETAINED TREES ON SITE
- SURROUNDING NEIGHBOURHOOD TREES (SHOWN INDICATIVELY ONLY)
- PROPOSED ON-SITE COMMUNAL ROAD NETWORK
- PROPOSED EXTENDED DRIVEWAYS FOR LOTS NOT DIRECTLY ACCESSIBLE FROM THE COMMUNAL ROAD NETWORK
- POTENTIAL VISITOR CAR PARKING AREAS - SPACES TO BE DISTRIBUTED THROUGHOUT THE DEVELOPMENT
- PUBLIC OPEN SPACE AREAS ALONG COOMOORA ROAD STREET FRONTAGE - 5% (MINIMUM) OF THE SITE AREA
- COMMUNAL OPEN SPACE AREAS THROUGHOUT THE DEVELOPMENT
- LANDSCAPING/STREET PLANTING AREAS THROUGHOUT THE DEVELOPMENT
- PEDESTRIAN CONNECTIVITY BETWEEN OPEN SPACE AREAS WITHIN THE DEVELOPMENT
- PASSIVE SURVEILLANCE OPPORTUNITIES OVER PUBLIC/COMMUNAL OPEN SPACE FROM DWELLINGS
- PASSIVE SURVEILLANCE OPPORTUNITIES OVER PUBLIC/COMMUNAL OPEN SPACE FROM ROAD NETWORK

PUBLIC OPEN SPACE & COMMUNAL OPEN SPACE AREAS TO BE GENERALLY CONCENTRATED AROUND CLUSTERS OF RETAINED TREES

PUBLIC OPEN SPACE

APPROXIMATELY 2,346 SQUARE METRES OF PUBLIC OPEN SPACE IS PROPOSED FOR THE DEVELOPMENT (IN EXCESS OF THE 5% PUBLIC OPEN SPACE CONTRIBUTION REQUIRED BY THE PLANNING SCHEME FOR A DEVELOPMENT OF THIS SCALE) ALONG THE COOMOORA ROAD FRONTAGE AS INDICATED

COMMUNAL OPEN SPACE

APPROXIMATELY 2,259 SQUARE METRES OF COMMUNAL OPEN SPACE IS PROPOSED FOR THE DEVELOPMENT

APPROX. NORTH

0 10 20 30 40 50 60

BAR SCALE 1:1000 Metres

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PROPRIETOR
DEVELOPMENT VICTORIA
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Melbourne VIC 3000

PROJECT TITLE
SPRINGVALE SOUTH
15-29 Coomoora Road,
Springvale South VIC 3172

DRAWING TITLE
OPEN SPACE &
SOLAR ACCESS PLAN

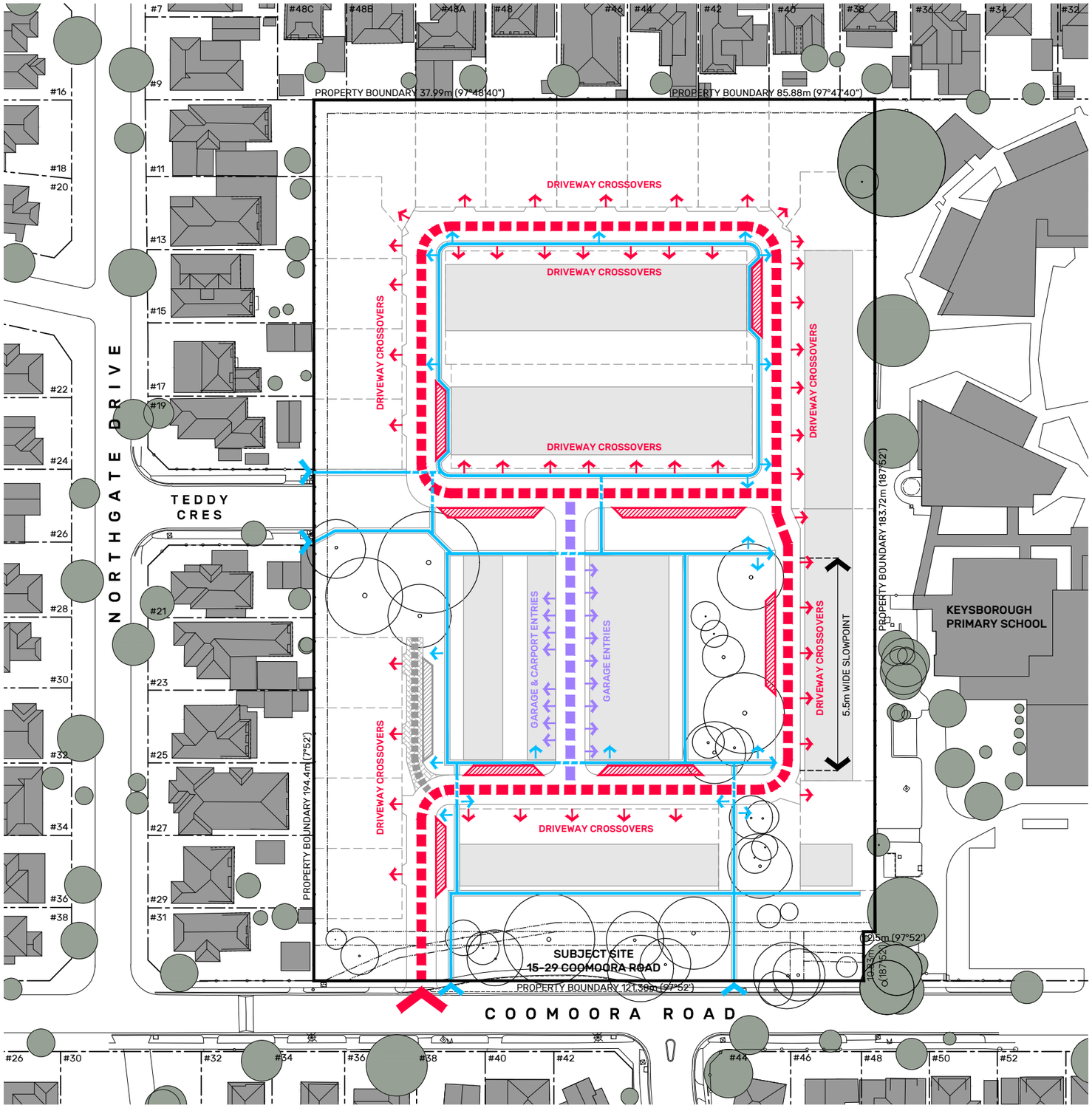
REVISION REGISTER

No.	Date	Description
1	31.10.19	LAYOUT CHANGES & ASSOCIATED REVISIONS
2	19.03.20	REVISIONS AS PER COUNCIL RECOMMENDATIONS

SCALE	DRAWN BY	REVISION ISSUE	DRAWING NO.
1:1000@ A3	PP RC TZ	2	DP23
PROJECT NO.	ISSUE DATE	DRAWING STATUS	
180102	19.03.20	DEVELOPMENT PLAN NOT FOR CONSTRUCTION PURPOSES	

VISITOR CAR PARKING SPACES

IT IS ESTIMATED THAT THIS DEVELOPMENT WILL INCLUDE A TOTAL OF 24 VISITOR CAR PARKING SPACES DISTRIBUTED THROUGHOUT THE DEVELOPMENT IN THE LOCATIONS INDICATED



LEGEND

- PROPERTY BOUNDARY
- NEIGHBOURING BUILDINGS
- LOCATION OF EXISTING (REMAINING) & PROPOSED SEWER & DRAINAGE EASEMENTS ON SITE - REFER DP19 - EASEMENT REMOVAL & RELOCATION PLAN
- RETAINED TREES ON SITE
- SURROUNDING NEIGHBOURHOOD TREES (SHOWN INDICATIVELY ONLY)
- BUILT FORM - REFER DP03-4 - MASTERPLAN - BUILT FORM, DISTRIBUTION & SCALE
- NEW VEHICULAR CROSSOVER (SITE ACCESS POINT) TO/FROM COOMOORA ROAD, PROVIDING ACCESS TO PRIMARY ON-SITE COMMUNAL ROAD NETWORK THROUGHOUT THE DEVELOPMENT. CROSSOVERS ALONG COOMOORA ROAD TO BE MINIMISED TO REDUCE IMPACT ON EXISTING INDENTED & KERBSIDE PARKING WHICH IS HEAVILY USED DURING SCHOOL TIMES. EXISTING CROSSOVER ON COOMOORA ROAD TO BE REMOVED AND REPLACED WITH NEW CROSSOVER ON COOMOORA ROAD TO SUIT PROPOSED ON-SITE ROAD ALIGNMENT AND PROVIDE LEFT & RIGHT TURN TRAFFIC MOVEMENTS FOR BOTH IN & OUT MOVEMENTS
- PRIMARY ON-SITE COMMUNAL ROAD THROUGHOUT THE DEVELOPMENT PROVIDING ACCESS TO THE MAJORITY OF LOTS - WIDTHS OF ROADS TO BE GENERALLY 6.5m (MINIMUM) WIDE, EXCEPT FOR SLOW POINT ALONG EDGE OF OPEN SPACE WHERE ROAD TO BE 5.5m (MINIMUM) WIDE FOR THIS SECTION
- SECONDARY ON-SITE COMMUNAL ROAD/LANEWAY BETWEEN PRIMARY ROADS - WIDTH OF SECONDARY ROAD/LANEWAY TO BE 6.5m (MINIMUM) WIDE TO FACILITATE ACCESS INTO DRIVEWAYS, GARAGES & CARPORTS OF LOTS LOCATED ALONG THE LANEWAY
- EXTENDED DRIVEWAYS TO SERVICE LOTS LOCATED OFF THE COMMUNAL ROAD NETWORK - WIDTH OF EXTENDED DRIVEWAYS TO BE 3.5m (MINIMUM) WIDE TO FACILITATE ACCESS INTO DRIVEWAYS OF LOTS LOCATED ALONG EXTENDED DRIVEWAYS
- POTENTIAL LOCATIONS FOR DRIVEWAY CROSSOVERS INTO DEVELOPMENT LOTS FROM PRIMARY ON-SITE COMMUNAL ROADS
- POTENTIAL LOCATIONS FOR DRIVEWAY CROSSOVERS, GARAGE & CARPORT ENTRIES INTO DEVELOPMENT LOTS FROM SECONDARY ON-SITE COMMUNAL ROAD/LANEWAY
- PROPOSED LOCATIONS FOR INDENTED VISITOR PARKING SPACES ALONG PRIMARY ACCESS ROAD
- PROPOSED LOCATIONS FOR INDENTED VISITOR PARKING SPACES ALONG EXTENDED DRIVEWAYS
- NEW PEDESTRIAN SITE ACCESS POINTS TO/FROM COOMOORA ROAD & TEDDY CRESCENT, CONNECTING EXISTING COUNCIL FOOTPATHS TO NEW FOOTPATHS WITHIN THE DEVELOPMENT
- PRIMARY FOOTPATH NETWORK PROVIDING NORTH-SOUTH & EAST-WEST PEDESTRIAN CIRCULATION THROUGHOUT THE DEVELOPMENT - WIDTHS OF FOOTPATHS TO BE 1.2m (MINIMUM) WIDE GENERALLY. FOOTPATH NETWORK TO CONNECT SITE ACCESS POINTS (COOMOORA ROAD & TEDDY CRESCENT) WITH PUBLIC/COMMUNAL OPEN SPACE WITHIN THE DEVELOPMENT AND DISTRIBUTE PEDESTRIAN TRAFFIC WITHIN CLOSE PROXIMITY OF ALL LOTS. DETACHED ARROWS INDICATE LOCATIONS WHERE PEDESTRIANS WILL NEED TO USE THE COMMUNAL ROAD NETWORK TO REACH NEARBY LOTS

APPROX. NORTH

0 10 20 30 40 50 60

BAR SCALE 1:1000 *Metres*

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Level 1 / 14 Wilson Ave Brunswick VIC 3056
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PROPRIETOR
DEVELOPMENT VICTORIA
Level 9, 8 Exhibition Street,
Melbourne VIC 3000

PROJECT TITLE
SPRINGVALE SOUTH
15-29 Coomoora Road,
Springvale South VIC 3172

DRAWING TITLE
SITE ACCESS POINTS & CIRCULATION PLAN

REVISION REGISTER

No.	Date	Description
1	31.10.19	LAYOUT CHANGES & ASSOCIATED REVISIONS
2	19.03.20	REVISIONS AS PER COUNCIL RECOMMENDATIONS

SCALE	DRAWN BY
1:1000@ A3	PP RC TZ

PROJECT NO.	ISSUE DATE
180102	19.03.20

REVISION ISSUE	DRAWING NO.
2	**DP24**

DRAWING STATUS
DEVELOPMENT PLAN
NOT FOR CONSTRUCTION PURPOSES

6 Design Principles

The following design principles are intended to guide the future development of the subject site and should be considered when assessing any planning permit application for development of the subject site.

DESIGN PRINCIPLES

SITE DESIGN & LAYOUT

Typology, Density and Housing Diversity

> Dwelling typology is to be single-occupancy dwellings (attached or semi-detached townhouses).
> Land Only Lots to have detached single occupancy housing.
> Separation to be provided at the upper level for at least every second dwelling, with the exception of the dwellings fronting Coomoora Road and the reverse living dwellings.
> Separation to be provided at the upper level for every dwelling fronting Coomoora Road.
> The development is to incorporate a mix of lot sizes, housing sizes and housing types comprising 2-bedroom, 3-bedroom and 4-bedroom dwellings that are designed to respond to the unique conditions of the site and orientation within the masterplan.
> Maximum of sixteen (16) Land Only Lots to be located along northern and western site boundaries where the site directly abuts the existing residential neighbourhood. Lot boundaries along the north site boundary are to align with the adjacent lot boundaries of the existing residential lots on Gwent Street.
> Land Only Lots proposed within the development are not to be further subdivided.
> Reverse Living housing is to be limited to the envelopes identified on the masterplan, being located directly opposite communal open space to provide passive surveillance and activation.

Building Height

> Building height is to be limited to 2 storeys (maximum) throughout the site.
> Where affected by the Special Building Overlay (SBO), minimum floor levels for built form to be set to the satisfaction of the Responsible Authority.

Site Setbacks/Green Buffers

> A setback of 13.7-22 metres is proposed for the lots along the Coomoora Road frontage to enable a substantial number of existing trees to be retained between the lots and Coomoora Road. This setback is to be handed over as public open space.
> A 5 metre (minimum) setback is to be provided along the north, east and west site boundaries to provide a green buffer to adjacent properties.

Lot Layout/Orientation

> Lot size and layout to facilitate a range of housing types, house sizes and living arrangements.
> Lot layout to minimise removal of existing high-grade trees on the site, promote passive surveillance over public and communal open space, and activate edges of open space with pedestrian traffic.
> Lot layout and housing types should enable secluded private open space to receive direct sunlight during the course of the day.
> Lot layout to minimise secluded private open space on the south side of dwellings.

Site Coverage

> All lots comprising dwellings with a traditional ground floor living arrangement are to have a maximum site coverage of 50% of the lot and all lots comprising reverse living optional dwellings are to have a maximum site coverage of 75% of the lot.

Site Permeability

> All lots comprising dwellings with a traditional ground floor living arrangement are to have a minimum site permeability of 40% of the lot and all lots comprising reverse living optional dwellings are to have a minimum site permeability of 20% of the lot.

Tree Retention/Communal Open Space

> Trees are to be retained in accordance with the approved Arborist Report and Tree Retention Plan.
> Public Open Space and Communal Open Space must be provided in accordance with the masterplan.
> Two trees to be provided within the rear yards of each dwelling.
> A maximum of 50% of the dwellings boundary fencing abutting public or communal open space areas may be solid fencing with the remainder to be visually permeable. Fencing required to provide private open space is excluded from this calculation.
> Dwelling boundary fences abutting public or communal open space areas are to be set at least three (3) metres behind the principle building line.

Road Network/Car Parking/Footpaths/Landscaping

> New communal road network to connect with existing road network at Coomoora Road.
> The new communal road network is to be a private accessway.
> Dwellings are to be oriented and configured to internal roadways and/or footpaths.
> Internal roads are to be generally 6.5 metres wide throughout the development with slow point along eastern edge of central open space to be 5.5 metres wide.
> Internal roads are to incorporate a kerb and channel generally to discourage parking on the nature strips and to provide a level of protection to the landscaping.
> Extended driveways servicing dwellings that are not located directly on the communal road network are to be generally 3.5 metres (minimum) wide, with a different surface treatment to the internal road network.
> Off-street car parking is to be provided to all lots at a rate of 1 space per 2-bedroom dwelling & 2 spaces per 3-bedroom/4-bedroom dwelling.
> Visitor car parking is to be provided on the internal road network of the development in accordance with the masterplan. A combination of indented visitor car parking bays and perpendicular visitor car parking bays are to be provided, which do not encroach into the 5.5 metre or 6.5 metre wide carriageways.
> Footpaths throughout the development are to be 1.2 metres wide generally.
> Landscaping and public lighting to be incorporated with all roadways and footpaths to the satisfaction of the Responsible Authority. Lighting is to be positioned and baffled as required to avoid creating nuisance to on-site dwellings and neighbouring properties.
> Canopy tree planting to be included in secluded private open space of dwellings to the satisfaction of the Responsible Authority.

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PROPRIETOR
DEVELOPMENT VICTORIA
Level 9, 8 Exhibition Street,
Melbourne VIC 3000

PROJECT TITLE
SPRINGVALE SOUTH
15-29 Coomoora Road,
Springvale South VIC 3172

DRAWING TITLE
DESIGN PRINCIPLES -
SITE DESIGN & LAYOUT

REVISION REGISTER

No.	Date	Description
1	31.10.19	LAYOUT CHANGES & ASSOCIATED REVISIONS
2	19.03.20	REVISIONS AS PER COUNCIL RECOMMENDATIONS

SCALE	DRAWN BY	REVISION ISSUE	DRAWING NO.
NTS @ A3	PP RC TZ	**2**	**DP25**
PROJECT NO.	ISSUE DATE	DRAWING STATUS	
180102	19.03.20	**DEVELOPMENT PLAN** NOT FOR CONSTRUCTION PURPOSES	

DESIGN PRINCIPLES

EXTERIOR BUILDING DESIGN

Building Forms

> Building forms should incorporate ground floor and first floor setbacks to foster amenity and functionality for dwellings within the development.
> Front setbacks should be at least three (3) metres, with lots facing the proposed public open space along Coomoora Road and approximately half of the lots along the east site boundary opposite the central communal open space to have a front setback of 1 metre.
> Front setbacks to garages of 3-bedroom & 4-bedroom dwellings should be 5.4 metres (minimum) to accommodate a second off-street car parking space, unless side-by-side car parking arrangements are provided.
> Separation to be provided at the upper level for at least every second dwelling, with the exception of the dwellings fronting Coomoora Road and the reverse living dwellings.
> Dwellings on all Land Only Lots to be detached at ground floor and first floor.
> Separation to be provided at the upper level for every dwelling fronting Coomoora Road.
> Roof forms should be orientated towards the north generally with roof heights considered to accommodate solar panels (and the like).

Streetscapes

> Street frontages are to incorporate landscaped setbacks with built form directly on front boundary to be avoided.
> Laneway streetscapes comprising continuous and unbroken runs of rear garage doors should be minimised.
> Front fences to be 1.2 metres (maximum) high throughout the development.

Building Materiality / Façade Design

> Building materials should use quality, durable building materials and finishes that are designed for residential purposes.
> The use of commercial or industrial style building materials and finishes should be avoided.
> Using materials such as rendered cement sheeting, unarticulated surfaces and excessive repetitive use of materials should be avoided.
> Use a consistent simple palette of materials, colours, finishes and architectural detailing.
> Maximise the ongoing affordability and sustainability of residential developments through the selection of low maintenance, resource and energy efficient materials and finished that can be reasonably expected to endure for the life of the building.
> At least one (1) habitable room window to be provided on the ground floor front facade to all dwellings.

Orientation

> Living areas of all dwellings should be located with direct connection to secluded private open space.
> For North-South lots, living areas and secluded private open space should be north facing to take advantage of direct solar access.
> North facing windows should be provided to all dwellings where possible and beneficial.

Private Open Space

> Secluded private open space throughout the site to be well proportioned, well connected to dwelling living areas and have access to direct sunlight during the course of the day.
> All lots comprising dwellings with a traditional ground floor living arrangement should include 60 square metres of private open space with one part provided as secluded private open space comprising 40 square metres (minimum) with a minimum dimension of 5 metres at the rear of the dwellings.
> All lots comprising reverse living dwellings to include 10 square metre (minimum) secluded private open space with a minimum dimension of 2 metres in the form of a balcony/terrace that faces communal open space within the development.
> External folding clotheslines to be provided to all dwellings within the private open space, located so that they are not visible from the public realm.

Services

> Services installations should be located and/or screened to avoid visibility from the public realm.

Storage

> All dwellings are to have 6 cubic metres (minimum) external secure storage.

Waste

> Bins storage areas/enclosures are to be located and configured to minmise visibility from the public realm and should not be located within dwelling front setbacks, where practicable.

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PROJECT TITLE
SPRINGVALE SOUTH
15-29 Coomoora Road,
Springvale South VIC 3172

DRAWING TITLE
DESIGN PRINCIPLES - EXTERIOR BUILDING DESIGN

REVISION REGISTER

No.	Date	Description
1	31.10.19	LAYOUT CHANGES & ASSOCIATED REVISIONS
2	19.03.20	REVISIONS AS PER COUNCIL RECOMMENDATIONS
3	30.04.20	REVISIONS AS PER COUNCIL RFI

SCALE	DRAWN BY	REVISION ISSUE	DRAWING NO.
NTS @ A3	PP RC TZ	3	DP26
PROJECT NO.	ISSUE DATE	DRAWING STATUS	
180102	30.04.20	DEVELOPMENT PLAN NOT FOR CONSTRUCTION PURPOSES	

7 Response to Neighbourhood Character

There are various relevant considerations relative to neighbourhood character, including the Neighbourhood Character Study September 2007 (revised), the Greater Dandenong Housing Strategy 2014-2024 and the relevant sections of the planning policy framework as summarised previously in this Development Plan but in particular the Residential Development & Neighbourhood Character Policy at Clause 22.09 of the Scheme.

The Neighbourhood Character Study September 2007 (revised) provides guidance to manage the projected growth of dwellings within the Municipality and the impact on established and evolving neighbourhood character areas. In the Neighbourhood Character Study, the subject site is situated between two existing character areas under the 'Existing Character Areas' map. Neighbourhood Character Area 12 is located to the north and west of the subject site, while Area 11 is located to the south and east.

The Strategic Residential Framework Plan at Clause 21.04 however, identifies the subject site as being in a limited change area, with Clause 22.09 therefore needing to be responded to in this regard.

The neighbourhood character response must have consideration for the objectives of the Greater Dandenong Housing Strategy 2014-2024, which sets out a policy framework and plan for the provision of housing that meets the needs of the growing Municipality. Key objectives of the Housing Strategy include to provide an increased diversity of housing type and increase the affordability of housing within the Municipality.

In relation to housing affordability, the large, undeveloped and reasonably well-serviced nature of the subject site presents an opportunity to increase housing diversity in an area where there are almost exclusively large dwellings on large lots. Providing a diversity of housing, and in particular smaller housing on smaller lots, is important to increase housing choice in the area and to also provide housing at a lower price point for entry level for purchasers in the area. This is a clear vision for Development Victoria in relation to the subject site.

As a result, opportunities for smaller housing types are a strong preference for the subject site, as long as the smaller housing products are appropriately located and designed to respond in a manner that respects the neighbourhood character objectives outlined by the Scheme.

The intended future development of the subject site has given due consideration to the valued character elements as identified by the abovementioned documents, as demonstrated through the various responses outlined below.

- The internal road pattern generally exhibits a north-south and east-west alignment, consistent with the surrounding area.
- A generous offering of public and communal open space (approximately 20% of the subject site) will ensure retention of canopy vegetation and the planting of new vegetation (including canopy vegetation) throughout the subject site, responding to a key neighbourhood character objective. This landscape character will be further complemented by landscaping within private lots.
- Larger lots have been specifically located along the north and east interfaces, where immediately adjacent to the established neighbourhood. Smaller lots, to add to housing diversity and affordability, have been provided internal to the subject site.
- New lots adjoining existing residential properties are larger and will provide for single dwellings on larger lots that will be well set back (at least 5 metres) from the site boundary to reflect the conventional suburban character of the surrounding area.
- Separation in built form will be provided between dwellings adjacent to the north and west site boundaries and between the first floor of dwellings that address Coomoora Road – all lots that have a direct relationship with existing residential neighbourhoods. The separation of dwellings where adjacent to existing residential neighbourhoods will reinforce the pattern of spacing between dwellings at the sensitive interfaces of the subject site and will ensure that dwellings appear to sit within landscaped surrounds.
- Dwellings will be no more than two-storey in height, consistent with the maximum building height in the locality.
- Dwellings will be set back at least 22 metres from Coomoora Road, apart from a single land lot at the western end of the frontage that will be set back at least 13.7 metres from the street. All dwellings fronting Coomoora Road will be separated at first floor.
- The large setbacks, retained vegetation and proposed built form with first floor separation, will ensure that the built form address to Coomoora Road is responsive and sensitive in its relationship to this street address.
- Smaller, townhouse style dwellings are located within the central parts of the subject site where they do not have a direct relationship with the existing residential neighbourhoods.
- This development plan does not facilitate apartment style housing.
- The anticipated lot sizes enable the provision of large areas of ground level secluded private open space on the majority of lots, and additional garden area in which to establish landscaping. All dwellings, apart from the limited number of reverse living dwellings, will be provided with at least 40 square metres of SPOS that has a minimum dimension of at least 5 metres, and a minimum 60 square metres of total private open space. Coupled with the approximately 20% of the site proposed as either public or communal open space, the Development Plan provides adequate and substantial opportunity for the planting of new canopy vegetation to complement the vegetation retained throughout the subject site.

- Site coverage and permeability will comfortably exceed the minimum recommendations of the NRZ1 when considered on a whole-of-site basis, with individual dwellings also generally expected to meet or exceed the NRZ1 in this regard apart from some of the smaller, and in particular reverse living, allotments.
- Rear setbacks of 5 metes for the land lots adjacent to the north and west boundaries, and for a large proportion of internal lots, will reflect and enhance the backyard character of the neighbourhood.
- Front fences, where proposed, are to be no more than 1.2 metres in height, reflecting the preferred front boundary treatment for incremental and limited change areas.
- This Development Plan is supported by an Environmentally Sustainable Design (ESD) Strategy that identifies opportunities to reduce the environmental impact of the development and use.
- The design principles outlined in this Development Plan will ensure a high standard of housing that respects the established neighbourhood character of the surrounding area.

8 Landscape Concept Plan

Landscape drawings have been prepared by MALA Studio and form part of this Development Plan.

A key component of the development is the retention of clusters of existing canopy vegetation within areas of open space throughout the site. The existing vegetation will be supported by substantial new planting as outlined in the landscape drawings. The plant palette comprises predominantly native species with some exotic species.

Landscaping will be provided around the perimeter of the site to provide a soft transition from the subject site to neighbouring properties.

Areas of public and communal open space will feature a variety of soft and hard landscaping treatments, including canopy vegetation, garden beds, areas of lawn, and paths and seating.

9 Environmentally Sustainable Design

An Environmentally Sustainable Design (ESD) statement has been prepared by Wood & Grieve Engineers and forms part of this Development Plan.

This Statement outlines, from a general perspective, how the proposed development of the subject site will respond to Clause 22.06 (Environmentally Sustainable Development) of the Scheme.

Some of the key ESD initiatives identified for this project are summarised below.

- All dwellings are to be designed to exceed the minimum 6 star NatHERS energy rating.
- All dwellings to achieve the energy efficiency requirements of the Building Code of Australia.
- Rainwater collection tanks with a minimum capacity of 2.5 kilolitres per dwelling.
- Thermally robust facades to enhance thermal comfort and reduce the reliance on artificial heating and cooling.
- Cross ventilation to all dwellings with openings on at least two aspects of each dwelling.
- Use of low PVC content or PVC free materials where possible.
- Minimisation of indoor air pollutants by selecting Low Volatile Organic Compounds (VOC's) materials.

It is noted that further detail as to how Clause 22.06 is to be met, will be provided as part of any future planning permit applications for the subject site. Nevertheless, the ESD statement confirms that the proposed development layout does not include features that would prevent future development from achieving positive ESD outcome for the subject site.

10 Traffic, Transport and Car Parking

A Transport Impact Assessment and Integrated Traffic Management Plan has been prepared by OneMileGrid in accordance with the requirements of the DPO13. This report forms part of this Development Plan.

As outlined in the Transport Impact Assessment and Integrated Traffic Management Plan, vehicle access will be obtained via a new internal private road network that will connect to Teddy Crescent to the west and via a new crossover to Coomoora Road to the south. The internal road network comprises predominantly 6.5 metres and 5.5 metres wide roads that are capable of facilitating two-way traffic. The proposed road network is sufficient to accommodate the predicted traffic volumes. Standard kerb and channel will be incorporated throughout the road network and will assist in discouraging car parking on the landscaped verges. In addition, landscaping treatment in the form of low shrub-type planting will be used to further discourage/prevent cars from parking on landscaped verges.

Private car parking and visitor car parking will be adequately accommodated with car parking spaces to each dwelling provided in accordance with Clause 52.06 of the Scheme. Visitor car parking will comfortably exceed the statutory requirements in relation to provision of car parking spaces and therefore no overflow of visitor car parking is expected. Visitor parking will be provided through indented car parking bays.

The development is predicted to have a minimal effect on the operation of nearby intersections, including the signalised intersection of Springvale Road and Patterson Road, and intersection of Henderson Road and Corrigan Road.

11 Stormwater Management Plan and Infrastructure Servicing Report

A Stormwater Management Plan (SWMP) and Infrastructure Servicing Report has been prepared by Wood & Grieve Engineers and forms part of this Development Plan.

The SWMP demonstrates that the development will meet best practice water quality performance objectives and complies with Clause 53.18 of the Scheme and also how the provisions of the SBO will be met in relation to the development. This includes a detailed summary of preliminary discussions and advice received from Melbourne Water in terms of the SWMP approach.

Through the use of stormwater attenuation devices, the proposed development will have no external adverse effect and the proposed lots will be able to withstand a 1.5yr ARI storm event.

Each lot will be constructed with on-site storage for re-use and the balance for detention prior to discharge off the site. Table 6 in the SWMP outlines the storage proposed for each lot type.

The Infrastructure Servicing Report outlines the design approach to the engineering aspects of the development, including earthworks, stormwater and servicing requirements. The report identifies the existing infrastructure services available to the subject site and the method in which new infrastructure is to be provided to the future development.

A brief summary of how the future development will be serviced is provided below.

Sewer

South East Water has confirmed that there is sufficient capacity for the proposed sewerage network to connect to the existing manhole in the southeast corner of the site.

Water

Advice from South East Water has confirmed that there is ability to connect to the 150 millimetres diameter spur on Teddy Crescent. A secondary point of connection on Coomoora Road will also be considered in order to provide greater security of supply. The design of the internal water network is described in detail in the Infrastructure Servicing Report.

A combined fire and drinking water service is preferred and results in a need for only one service to reticulate to the site. Hydrants will be required throughout the site.

Power

As the road network is being designed and managed by an owners corporation, the electrical network will be an AS3000 network as detailed in the Infrastructure Servicing Report.

Communications

As the subject site is within proximity to existing NBN infrastructure, it is likely that the NBN will take on the development. The developer will need to install and fund the pit and pipe systems to meet NBN requirements.

Gas

Gas supply is expected to be connected to the existing reticulation in either Coomoora Road or Teddy Crescent.

12 Arboricultural Assessment and Tree Retention / Removal

The DPO13 references the '*Ecology and Arboricultural Assessment and Tree Retention Plan*' prepared by Jacobs and dated 2015.

A key part of preparing this Development Plan was having an updated arboricultural assessment completed of all existing trees on and near the subject site. This assessment has been completed by Tree Logic and forms part of this Development Plan.

The Tree Logic assessment has provided up-to-date analysis of the existing trees on the subject site and provided guidance as to the preferred strategy of tree retention and removal. The assessment provides detailed information as to the species, size, health, tree protection zone and an overall rating of each tree on the subject site.

The report identifies that there are specific patches of highly valued vegetation on parts of the subject site. This has in turn guided the general approach of the Development Plan in retaining patches of highly rated vegetation, with removal of vegetation focussed on the lower rated trees or those higher rated trees that are isolated from other highly rated trees.

For further detail refer to the Arboricultural Assessment and Report prepared by Tree Logic and the relevant 'Existing Trees Plan', 'Tree Retention Plan' and 'Tree Removal Plan' that form part of this Development Plan.

13 Urban Design Guidelines for Victoria

The Urban Design Guidelines for Victoria provide advice on:

- the design of public spaces;
- building design in relation to a building's interface with public spaces; and
- the layout of cities, towns and neighbourhoods.

The guidelines have been categorised into 6 urban elements.

Relevant principles from each element of the Urban Design Guidelines for Victoria have been incorporated into this Development Plan as summarised below.

ELEMENT 1 – URBAN STRUCTURE

- The new residential community will be physically connected and integrated with the existing adjacent neighbourhood.
- The Development Plan incorporates a legible network of streets that provides convenient access both internally and externally and a high level of amenity and functionality for future residents.
- The public realm structure has been designed to enable convenient and safe access to public and communal spaces.
- The amenity of the adjoining established lots will be maintained with larger lots provided adjacent to existing dwellings.

ELEMENT 2 – MOVEMENT NETWORK

- Footpaths for pedestrian travel are provided throughout the development and will generally be 1.2 metres in width, allowing pedestrians to walk two abreast.
- The movement networks has been designed to safely accommodate a range of transport modes, including walking and cycling.
- Dwellings have a frontage to the communal road network or an area of public open space in order to facilitate passive surveillance of streets public spaces.
- Opportunities for on-street parking have been optimised. Indented bays have been provided throughout the internal street network to minimise conflict between other road users.
- The street network has been designed to limit the ability for vehicles to speed with straight stretches of road not exceeding 130 metres (refer to Transport Impact Assessment and Integrated Traffic Management Plan).

ELEMENT 3 – PUBLIC SPACES

- Pedestrian paths connect to and extend through the communal and public open spaces provided.
- All communal and public open spaces will be visible from neighbouring streets and dwellings.
- All future residents will convenient and safe access to functional open spaces.
- Where dwellings front open space, surveillance opportunities at first floor level will be encouraged.
- Front fence heights will generally be limited to 1.2 metres throughout the development, ensuring a high degree of visibility between the public and private realms.

ELEMENT 4 – PUBLIC TRANSPORT ENVIRONS

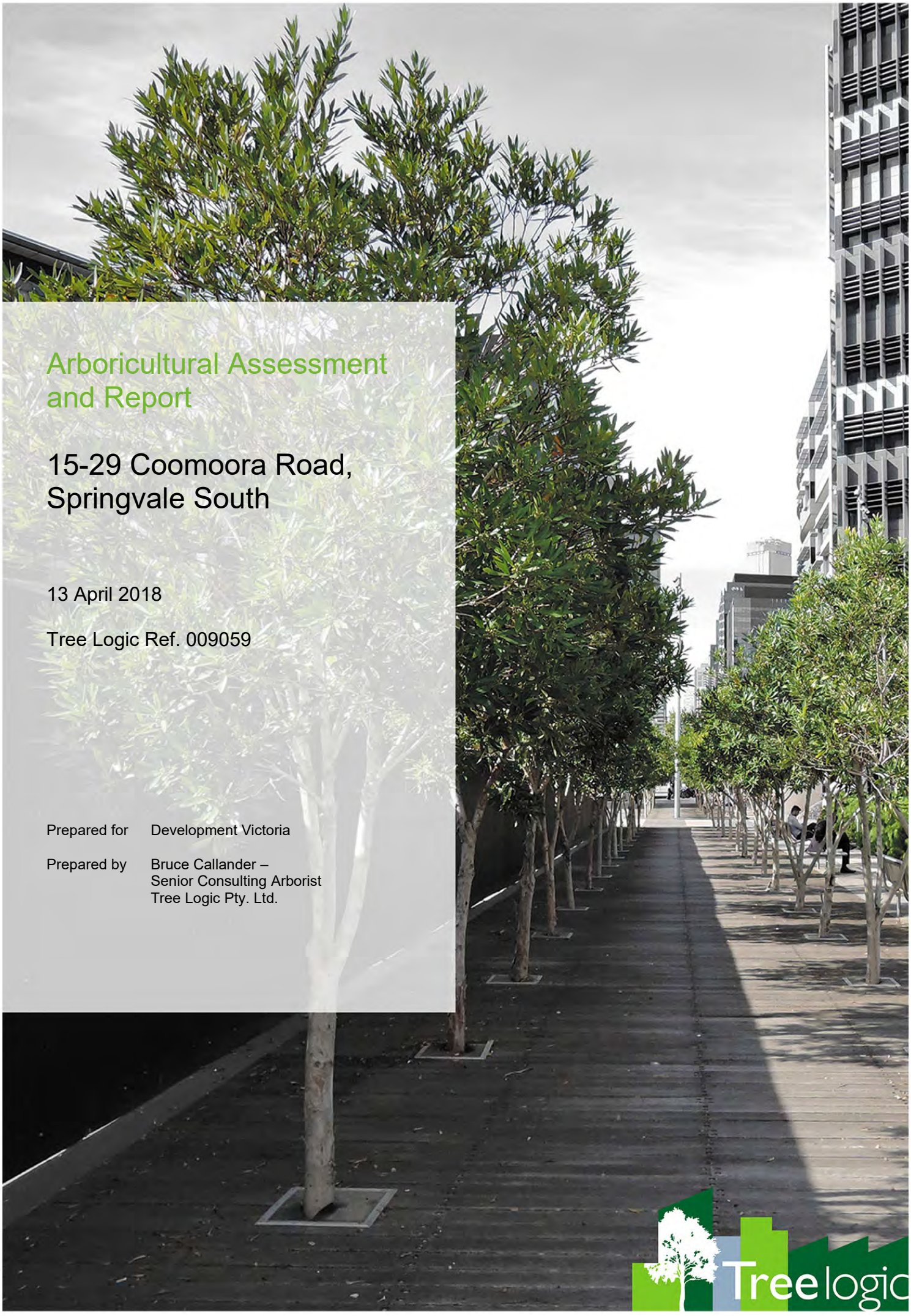
- The street and pedestrian path network connects to the existing broader movement network that connects to public transport services.

ELEMENT 5 – BUILDINGS

This element is not considered relevant to this Development Plan.

ELEMENT 6 – OBJECTS IN THE PUBLIC REALM

- Trees and other vegetation to be planted within the public realm will be determined in consultation with Council to ensure that species are fit for purpose and contribute to the local context and identity.
- Lighting within public and communal areas will be provided to support night-time social and recreational activity, amenity and safety within public and communal areas.



Arboricultural Assessment and Report

15-29 Coomoora Road, Springvale South

13 April 2018

Tree Logic Ref. 009059

Prepared for Development Victoria

Prepared by Bruce Callander –
Senior Consulting Arborist
Tree Logic Pty. Ltd.

Contents

Tree report_009059 - 15-29 Coomoora road, Springvale South

File No.	Version	Author	Issue date	Edits	Issued by.
009059	Tree report_ 009059_15-29 Coomoora road, Springvale South	Bruce Callander	22/12/2017	Preliminary report	BC

1 Executive Summary

1.1 Tree Logic was engaged by Development Victoria to undertake an arboricultural assessment and prepare a report for site trees at 15 to 29 Coomoora Road (Greater Dandenong Council Property Number: 471315) to inform proposed site redevelopment. The primary objectives of the arboricultural report include;

- Provide information on the species, origin, dimensions, health and structure of the trees associated with the site including trees in adjacent properties within 5 metres of the boundary including street trees.
- Determine appropriate tree protection zone dimensions compliant with Australian Standard AS4970 'Protection of trees on development sites'

1.2 One hundred and sixty-four (164) trees were inspected in total comprising a mixture of Australian native and exotic specimens planted for amenity purposes.

1.3 The trees were growing in turfed areas around car parks and other infrastructure associated with the former Keysborough Primary School that has since been removed.

1.4 All trees were attributed an arboricultural rating which reflects the retention value of the trees.

- One (1) tree listed as a High arboricultural rating due to its good health structure and symmetry.
- Sixty eight (68) trees were attributed a Moderate arboricultural rating including,
  - 12 trees were rated Moderate A (high end of range as better than typical for species)
  - 34 tree that was rated Moderate B (middle of the range and typical of the species)
  - 22 trees that were rated Moderate C (being of either small size (30 trees) or tending towards Low arboricultural value (19 trees).
- Seventy one (71) trees were rated 'Low'
  - Thirty-nine (39) trees due to having health and / or structural deficiencies,
  - Thirteen (13) trees due to them being small specimens
  - Nineteen (19) trees due to their status as pest plants
- Twenty-four (24) trees were attributed an arboricultural rating of 'None' as they were either dead (9), dying or their health and / or structure made them not worthy of retention.

1.5 Nineteen (19) trees were of a species considered to be indigenous to the local region. All other trees were introduced specimens planted for garden, screening and amenity purposes or were self-sown weed species growing relatively unchecked.

1.6 At the time of preparing the tree assessment report there was no design required to be reviewed.

1.7 Retention suitability will be dependent on the proposed landscape setting in which trees are intended to be retained. The following recommendations are provided for consideration in the design process.

1.8 The decision on which trees are to be removed should be based on sound arboricultural advice and be guided by the arboricultural rating attributed to each tree which relates to the combined tree condition factors, including age, health, structure, useful life expectancy and retention value.

1.9 On the basis of future site safety and potential amenity, preference should be given to retaining trees primarily of High and Moderate arboricultural value in built areas, or areas of increased target potential.

2 Objectives

2.1 Tree Logic was engaged by Development Victoria to undertake an arboricultural assessment and prepare a report to ascertain the current status, condition and arboricultural value of the trees associated with 15-29 Coomoora Road, Springvale South. The requirements of the arboricultural report include;

- To assess trees within the defined tree study area and provide information on the species, origin, dimensions including trunk diameter (DBH) tree height & canopy width, health and structure of the trees, Useful Life Expectancy (ULE) and Arboricultural rating which indicates their appropriateness for retention
- Determine the Tree Protection Zones (TPZ) for trees compliant with AS4970 'Protection of trees on development sites'
- Provide a Tree Location Plan showing the Tree Number, Retention value and Tree Protection Zone (TPZ) requirements.

3 Method

3.1 A site inspection was carried out on Wednesday, 4th April, 2018 during mild conditions. The trees were inspected from the ground and observations were made of the growing environment and surrounding area.

3.2 Tree locations were recorded on ruggedized field computers running GIS software with GPS, high resolution aerial imagery and measuring tools facilities.
The level and feature survey plan prepared by Think Spatial (2017) was used as a GIS layer to accurately Geo-locate the subject trees during the tree assessment.

3.3 Observations were made of the assessed trees to determine the species, age category, and condition with measurements taken to establish tree crown height (measured with a height meter) and crown width (paced) and trunk dimensions (measured 1.4 metres above ground level with a diameter tape unless otherwise stated).
Where trees were on neighbouring properties, estimations were made on some measurements.

3.4 Assessment details of individual trees are listed in Appendix 1 and a copy of the tree location plan can be seen in Appendix 2. Descriptors used in the assessment can be seen in Appendix 3.

3.5 Photographs of the trees and the environs were taken for further reference when preparing the report.

3.6 Each of the assessed trees was attributed an 'Arboricultural Rating'. The arboricultural rating correlates the combination of tree condition factors (health and structure) with tree amenity value. Definitions of arboricultural ratings can be seen in Appendix 3.

3.7 The assessed trees have been allocated tree protection zones (TPZ). The Australian Standard, AS 4970-2009, has been used as a guide in the allocation of TPZs for the assessed trees. This method provides a TPZ that addresses both the stability and growing requirements of a tree. TPZ distances are measured as a radius, from the centre of the trunk at (or near) ground level. All TPZ measurements for are provided in Appendix 1.

Documents reviewed;

Planning Property report for 15 - 29 Coomoora Road. *Department of Planning & Community Development, cited 12/04/2018*.
The site falls within the City of Greater Dandenong Council Planning Scheme and is zoned Neighbourhood Residential Zone – Schedule 1 (NRZ1)

Development Plan Overlay – Schedule 13 (DPO13)

Springvale South – Feature and Contour Survey – Prepared by Think Spatial, Proj. No: 170503 - Coomoora Road West Reserve. Date: Nov 2017.

NBD - Coomoora Road, Springvale South - ~C190 Ecology and Arboriculture Assessment and Tree Retention Plan November 2015. Prepared by Jacobs.

Nearmaps high resolution aerial imagery of the defined tree study area.

4 Tree Permit Requirements

4.1 The site falls within the City of Greater Dandenong Council Planning Scheme.

4.2 Street trees and neighbour's trees, being under third party ownership, will require basic protection measures to be considered throughout the design and construction phase to sustain current condition and typical expected growth.

4.3 Tree controls will apply to the site under Development Plan Overlay - Schedule 13 (DPO13) with reference to an *Ecology and Arboriculture Assessment and Tree Retention Plan* prepared by Jacobs in 2015.

- Based on a review of the *Ecology and Arboriculture Assessment and Tree Retention Plan* (Jacobs 2015) it was felt that the mapping detail was insufficient to be able to use for the current update and that the tree locations and numbering was not an accurate representation of the trees identified in the most recent site survey plan that has been used for the purpose of this report.
  On this basis a new tree numbering system has been applied and full tree condition inventory has been prepared to better reflect the arboricultural and retention values of the trees on site as well as fully mapping the tree protection zone requirements for all trees and especially those trees most suitable to retain.

4.4 Clause 52.17 of the state planning scheme pertaining to the Guidelines for the Removal, Destruction or Lopping of Native Vegetation (Department of Environment, Land, Water and Planning [DWELP], 2017) applies vegetation native to Victoria.

- Naturally occurring indigenous vegetation proposed to be removed will trigger a permit and offset requirements, the value of which an accredited native vegetation assessor must determine the ecological value of the scattered trees or vegetation patches and the surrounding areas.

Exemptions apply under clause 52.17-7 to the following;

- Native vegetation that is dead with a standing dead trunk diameter of less than 40 centimetres at a height of 1.3 metres above ground level.
- Planted vegetation to be removed, destroyed or lopped that was either planted or grown as a result of direct seeding (for garden, screening and amenity purposes).
    - *This exemption does not apply to native vegetation planted or managed with public funding for the purpose of land protection or enhancing biodiversity unless the removal, destruction or lopping of the native vegetation is in accordance with written permission of the agency (or its successor) that provided the funding.*

  Though the trees were most likely planted for garden, amenity and screening purposes, being the site of a former government funded primary school, the removal of Victorian native vegetation may trigger permit and offset requirements.
- Nineteen (19) trees were identified as species that would be considered indigenous to the local region including Mealy Stringybark (*Eucalyptus cephalocarpa*), River Red Gum (*Eucalyptus camaldulensis*) and Blackwood (*Acacia melanoxylon*).
- All other specimens were introduced species planted for garden, screening and amenity purposes or were self-sown weeds that were spreading relatively unchecked on site.
- The assessment pathway for an application to remove native vegetation reflects its potential impact on biodiversity and is determined from the location and extent of the native vegetation to be removed. The three assessment pathways are:
    - Basic – limited impacts on biodiversity.
    - Intermediate – could impact on large trees, endangered EVCs, and sensitive wetlands and coastal areas.
    - Detailed – could impact on large trees, endangered EVCs, sensitive wetlands and coastal areas, and could significantly impact on habitat for rare or threatened species.

  The pathway for this site is likely to be classed as Detailed on the basis that the area of the site exceeds 0.5 hectares. A habitat hectare assessment by an accredited native vegetation assessor will be required to fulfil the requirements of permit and offset.

5 Observations

5.1 The tree study area comprised trees planted within turfed area around car parks and other infrastructure associated with the former Keysborough Primary School that was demolished in mid 2014 and has sat idle since.

5.2 The site is to the north of Coomoora Road bordered by predominantly established residential allotments. Refer to below for view of existing site conditions.

***Plate 1**- Aerial view of subject site, 15-29 Coomoora Road, Springvale South study area.*

(*Image from Nearmaps*)

5.3 The site is ostensibly flat with no more than 3 meter level difference across the entire site. There are no creeks or naturally occurring drainage lines within the vicinity of the tree study area.

5.4 **Tree population**

One hundred and sixty four (164) individual trees were assessed in total.

All trees were introduced Victorian or Australian native specimens or exotic specimens planted for amenity purposes. Refer to Table 1 for list of the main species and origins.

Table1: Tree species list

Botanic name	Common Name	Origin	No of trees
Melaleuca armillaris	Bracelet Honey-myrtle	Victorian native	17
Eucalyptus botryoides	Southern Mahogany	Victorian native	14
Eucalyptus camaldulensis	River Red Gum	Indigenous	12
Callistemon viminalis	Weeping Bottlebrush	Australian native	11
Eucalyptus leucoxylon	Yellow Gum	Victorian native	13
Corymbia maculata	Spotted Gum	Victorian native	10
Fraxinus angustifolia	Narrow-leaved Ash	Exotic deciduous	9
Coprosma repens	Mirror Bush	Exotic evergreen	9
Melaleuca styphelioides	Prickly-leaved Paperbark	Australian native	5
Casuarina cunninghamiana	River She-oak	Australian native	4
Eucalyptus sp. (Dead)	Gum Tree	Australian native	4
Melaleuca linariifolia	Snow in Summer	Australian native	4
Callistemon 'Kings Park Special'	King's Park Special Bottlebrush	Australian native	3
Corymbia citriodora	Lemon-scented Gum	Australian native	3
Eucalyptus cephalocarpa	Mealy Stringybark	Indigenous	3
Agonis flexuosa	Willow Myrtle	Australian native	2
Angophora costata	Smooth-barked Apple	Australian native	2
Brachychiton acerifolius	Illawarra Flame Tree	Australian native	2

5.5 Nineteen (19) trees were of a species considered to be indigenous to the local region. All other trees were introduced specimens planted for garden, screening and amenity purposes or were self-sown weed species growing relatively unchecked.

5.6 Refer to Table 2 for breakdown of Species by Origin

Table 2: Species Origin	Total
Indigenous	19
Victorian native	70
Australian native	53
Exotic deciduous	12
Exotic evergreen	9
Palm	1
Total	164

5.7 **Tree health** was assessed based on foliage colour, size and density as well as shoot initiation and elongation where possible.

- One hundred and three (103) trees, displayed Health indicators that are considered to be Fair and typical or better for the species growing in this location.
- Twenty-two (22) trees displayed better than typical and healthy growth for their species and displayed Good health.
- Twenty-six (26) trees displayed Fair to poor health with evidence of reduced foliage density, size or colour or minor dieback.

- Three (3) trees displayed Poor and declining health with little evidence of shoot initiation or wound response.
- One (1) tree was in very poor health and close to death
- Nine (9) trees were dead.

5.8 **Tree structure** was assessed for structural defects and deficiencies, likelihood of failures and risk to potential targets.

- One (1) tree displayed Good structure in terms of primary branching arrangement and architecture, weight distribution and sound wood.
- Sixty-nine (69) trees displayed Fair and acceptable structure in regard to primary branching arrangement and architecture, weight distribution and sound wood.
- Fifty-five (55) trees were assessed as having Fair to poor structure with structural deficiencies such as deadwood, co-dominant stems with included bark forks, asymmetric form, heavy past power line pruning or evidence of previous failures.
- Twenty-six (26) trees displayed Poor structure with evidence of potential defects such as included bark forks, incipient decay, fungal brackets or vandalism.
- Two (2) trees displayed Very Poor structure being either dead or a stump re-sprout, 2 were dead stumps, 3 had collapsed and 6 were collapsing.

5.9 **Age Class and Useful Life Expectancy**

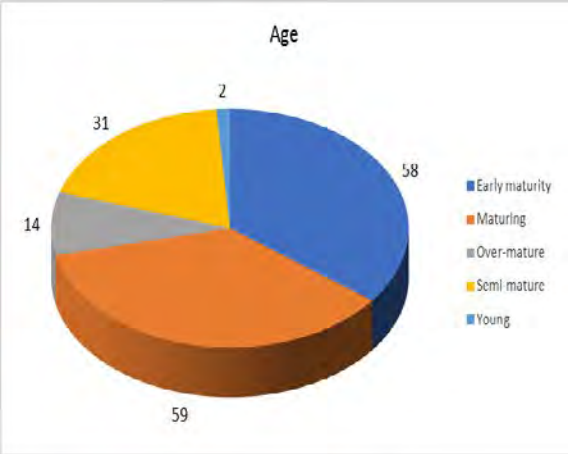
The age class of the assessed trees is dependent on known species characteristics and longevity in the urban setting and partially informs the assessment of the useful life expectancy.

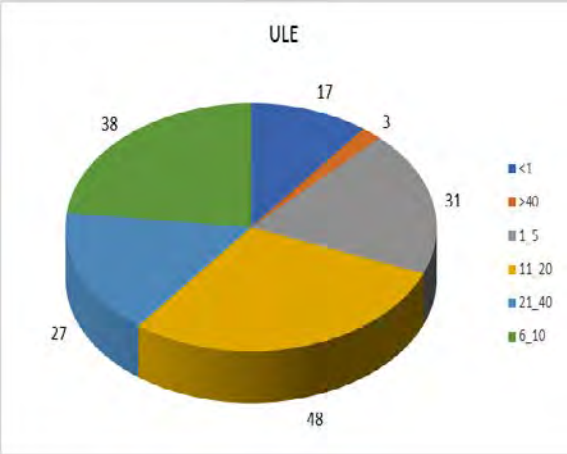
Assessment of useful life expectancy (ULE) provides an indication of health and appropriateness of trees in the urban landscape context. It offers an estimate of how long a tree is likely to remain viable in the landscape based on species, stage of life (cycle), health, contribution to environmental and amenity values, conflicts with adjacent infrastructure and risk to the community.

ULE is not a measure of the biological life of the tree within the natural range of the species. It is more a measure of the health status and the trees' positive contribution to the urban landscape and suggests a point at which the costs to maintain the asset (tree) outweigh the benefits the tree might be returning.

It may assist tree managers to develop long-term plans for the eventual removal and replacement of existing trees in the public realm.

The assessment of ULE is based on the site conditions not being significantly altered and that any prescribed maintenance works are carried out.





5.10 Arboricultural Rating

The assessed trees were attributed an arboricultural rating. This rating relates to the combination of tree condition factors, including health and structure (arboricultural merit), and also conveys an amenity value.

It should be noted that the arboricultural rating is different to the conservation/ecological values placed on trees by other professions.

Refer to Table 3 : Trees by Arboricultural rating

Table 3: Arboricultural rating	No. of Trees	Tree numbers
High	1	77
Moderate A	12	6, 8, 9, 38, 40, 50, 58, 75, 76, 106, 128,131
Moderate B	34	1, 4, 7, 10, 12, 15, 21, 23, 26, 41, 45, 49, 56, 59, 60, 61, 81, 104, 105, 108, 112, 114, 115, 121, 125, 126, 127, 129, 159, 160, 161, 162, 163,164
Moderate C	22	2, 11, 20, 22, 37, 43, 44, 47, 48, 51, 53, 55, 64, 74, 93, 107, 110, 111, 132, 133, 134, 135
Low	39	13, 14, 16, 17, 19, 27, 28, 32, 33, 35, 46, 57, 63, 67, 68, 69, 72, 80, 82, 84, 88, 89, 91, 94, 98, 100, 101, 103, 109, 118, 119, 120, 122, 123, 130, 136, 149, 156, 158
Low - size	13	25, 42, 71, 83, 113, 116, 140, 142, 145, 146, 151, 155, 157.
Low- Weed	19	18, 29, 30, 31, 34, 36, 52, 65, 66, 70, 78, 139, 141, 143, 144, 147, 152, 153, 154.
None	24	3, 5, 24, 39, 54, 62, 73, 79, 85, 86, 87, 90, 92, 95, 96, 97, 99, 102, 117, 124, 137, 138, 148, 150.

- High rated trees represent trees that are a prominent arboricultural and or landscape feature and a particularly good example of the species, that should be considered for retention and appropriate protection during the proposed redevelopment of the site. Retention of such trees is highly desirable.
- Moderate A rated trees represent the best opportunity to retain established trees of better quality and should be considered for retention and appropriate protection during the proposed redevelopment of the site

- Moderate B rated trees represent an opportunity to retain established trees of Fair and typical quality for the species and should be considered for retention and appropriate protection during the proposed redevelopment of the site.
- Trees attributed an arboricultural rating of Moderate C were either established trees of comparatively small size not yet being or without the potential to become a landscape feature or were maturing trees that were accumulating defects and trending towards becoming of Low arboricultural value.
- Trees attributed an arboricultural rating of Low are generally not considered worthy of being a constraint on reasonable design intent and outcome delivery due to either health and / or structural deficiencies.
  Small sized trees have been given a Low-size rating and pest plants a Low-weed rating. Small trees of Low arboricultural value that are otherwise in reasonable condition (Fair-poor or better Health and /or Structure) may offer a potential established tree resource, even if only as an interim measure.
- Trees attributed an arboricultural rating of None are unsuitable to retain and should generally be removed.

Refer to Appendix 1 for individual tree data, Appendix 2 for Tree location plan and Appendix 3 for definitions of arboricultural ratings.

6 Tree Protection Zones

The Tree Protection Zones (TPZs) provided for each tree in the Tree Assessment Table in Appendix 1 are calculated using the formula provided in the Australian Standard AS4970 where the Radial TPZ = Trunk diameter (DBH) measured at 1.4m above grade and multiplied by 12. TPZ distances are measured as a radius from the centre of the trunk at (or near) ground level. The method for calculating, applying and managing the tree protection zone is described in Appendix 4.

The TPZ forms an area around a tree or group of trees that addresses both the stability and growing requirements of a tree. Construction and worksite activities within the TPZ need to be determined to assess their impacts in order to preserve tree condition.

Minor encroachment, up to 10% of the TPZ area, is generally permissible provided encroachment is compensated for by recruitment of an equal area contiguous with the TPZ. Encroachment greater than 10% is considered major encroachment under AS4970 and is only permissible if it can be demonstrated that after such encroachment the tree would remain viable. Refer to Figure 2A and 2B.

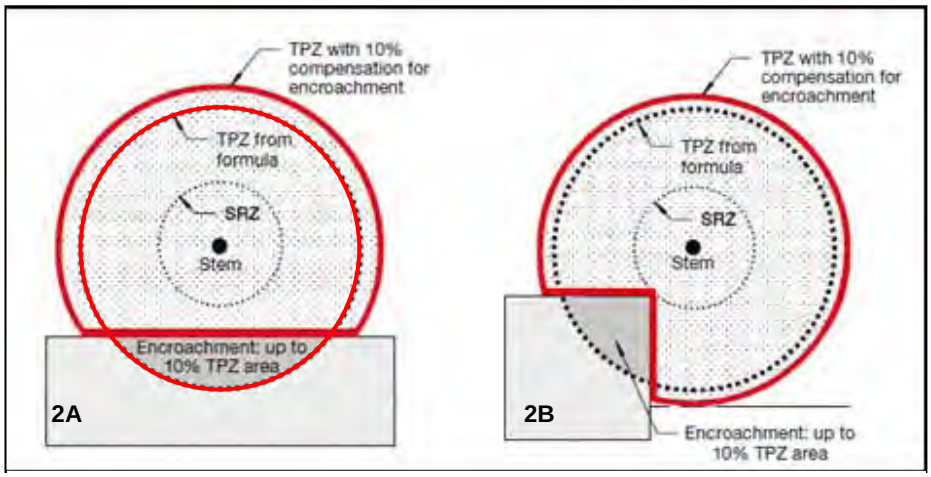


Figure 2: 2A & 2B - Examples of minor encroachment into a TPZ.

Extract from: AS4970-2009, Appendix D, pg. 30 of 32

The Structural Root Zone (SRZ) provided for each tree has been calculated using the method provided in AS4970. The SRZ is the area in which the larger woody roots required for tree stability are found close to the trunk and which then generally taper rapidly. This is the minimum area recommended to maintain tree stability but does not reflect the area required to sustain tree health. No works should occur within the SRZ radius as tree stability could be compromised.

See Appendix 4 for TPZ establishment and types of encroachment.

It is recommended that TPZs for all trees to be retained should be transferred and overlaid on any design plans.

All TPZ measurements are provided in the tree assessment data in Appendix 1.

7 Tree impact considerations.

7.1 The pre – development arboricultural inspection report provides planners and designers with information on whether trees are worthy or not of being a constraint on the site.

7.2 It also provides a basis on which to identify when and where potential impacts to trees will occur from various design elements and evaluates the possible severity of the impact during the design phase of any site redevelopment.

7.3 Trees are an integral component of the urban landscape and they can be threatened by activities associated with development, and improving or maintaining infrastructure. This is recognised by the City of Greater Dandenong Council where specific tree controls apply to the site under Development Plan Overlay - Schedule 13 (DPO13) which refers to the Ecology and Arboriculture Assessment and Tree Retention Plan prepared by Jacobs in 2015).

7.4 Trees grow in a delicate balance with their environment and any changes to that balance must be minimised if the tree is to remain in a healthy state and fulfil its potential.
It is rarely possible to repair stressed and injured trees, so damage needs to be avoided during all stages of development and construction.
Tree protection cannot be achieved without a proactive approach. The planning and design stages of any construction project can be instrumental and determine the success of tree preservation.

7.5 The hierarchy of principles for tree protection are:

- Avoid damage to the subject trees
- Minimize damage to the subject trees
- Replace the subject trees and improve the landscape (as a last resort).

7.6 At the time of preparing the report no development plans were available to be reviewed.
In the absence of specific site design plans, it is not appropriate to speculate on which trees are most appropriate for retention, beyond the general guide provided by the arboricultural ratings attributed to each tree feature. Retention suitability will be dependent on the proposed landscape setting in which trees are intended to be retained. The following recommendations are provided for consideration in the design process.

7.7 On the basis of future site safety and potential amenity, preference should be given to retaining trees of High and Moderate arboricultural value in built areas, or areas of increased target potential.
Furthermore, trees attributed an arboricultural rating of Moderate A and B would be more appropriate to retain than Trees attributed a rating of Moderate C.

7.8 Trees of Low arboricultural value should not compromise reasonable design intent.

7.9 Small trees of Low arboricultural value that are otherwise in reasonable condition (Fair-poor or better Health and /or Structure) may offer a potential established tree resource, even if only as an interim measure.

7.10 Low rated trees with health or structural deficiencies (Poor or worse Health and/or Structure) or trees recognized as environmental weed species should generally be considered for removal based on sound arboricultural opinion.

7.11 Trees attributed and arboricultural rating of None are not suitable to retain and should be removed.

7.12 The majority of trees assessed were planted specimens planted for garden, screening and amenity purposes interspersed with approximately 19 trees that are considered indigenous to the local area.
Indigenous and Victorian native trees may trigger permit and offset requirement. The assessment pathway for this site is classed as Detailed on the basis that the area of the site exceeds 0.5 hectares. A habitat hectare assessment by an accredited native vegetation assessor will be required to fulfil the requirements of permit and offset.

7.13 Trees under third party ownership must be duly protected unless the council, tree owner or manager of the tree authorises works to occur to the tree or within the TPZ.

7.14 All trees that are to be retained in the vicinity of any proposed works will require Tree Protection Zones to be established prior to commencing any works onsite including demolition, bulk earthworks, trenching, construction, landscaping activity, delivery and storage of materials or placement of site sheds.

Appropriate tree protection fencing must be established and maintained around all trees to be retained.

Where the trees exist in adjacent properties the boundary fence would suffice but the need for ground protection within the subject site may still be required to avoid adversely affecting or compacting the soil within the root zone.

Appropriate ground buffering materials should be installed on the TPZ area that extends into the subject site to prevent soil compaction.

7.15 No form of excavation for trenching for installation of underground services is permitted within the nominated TPZ areas for any retained trees without prior consultation with the council and / or site arborist, to avoid severing roots that could be vital to the stability and continued sustainability of the retained trees.

- Trenching for the installation of any and all underground services must be designed to avoid encroaching the TPZ of any retained trees including all neighbors and street trees.

- If it is unavoidable that an underground service must pass through a defined TPZ, the service must be installed via directional boring at a minimum depth of 750mm to the top of the bore head.
  All entry and exit points for the boring must be located beyond the TPZ radius.
- Lubricants or waste water from the boring process must not be permitted to enter or contaminate the soils within the TPZ.

7.16 Temporary facilities and site sheds may be established on existing hard stand where it is already present within a TPZ providing there are no physical impacts to the trees and no requirement to penetrate the surface within the TPZ for installation of footings or underground services.
Access / egress to these facilities must not encroach or compact the native soil within the TPZ of any retained trees.

7.17 Design should ensure appropriate growing space is allocated for all trees that are to be retained. Approximately 55% of the subject trees comprised young early-mature specimens which will increase in size over the coming years.
If infrastructure is constructed too close to any of the retained trees, there will be potential for damage to occur from root activity.
Damage to paving from root activity is most likely to occur within 2 m of the trunk base of a tree where the large woody structural root zone may contributes to upheaval.
It is recommended that a minimum 2 metre clearance is provided from any tree to any hard paved surface.

7.18 TPZs for council street trees should be fenced to the back of kerb, edge of the foot path and the radial distance of the TPZ within the nature strip to prevent storage of materials or spoil or vehicular access damaging the trees or compacting soil within the TPZ.
The TPZ fencing should not hinder pedestrian access unless an alternative arrangement has been approved by the relevant authorities.

7.19 All TPZ and reduced TPZ radius distances are provided in Appendix 1.

8 Photographic examples


Spotted Gum, Tree 77 rated High


Tree 6, Forest Red Gum, rated Moderate A


Tree 8, Lemon-scented Gum, rated Moderate A


Tree 9, Red Ironbark, rated Moderate A


Tree 76, Spotted Gum, rated Moderate A


Tree 131, Manna Gum, rated Moderate A


Tree 106, Yellow Gum, rated Moderate A growing beyond the site boundary


Tree 7, indigenous Mealy Stringybark, rated Moderate B requires pruning


Tree 10, indigenous Mealy Stringybark, rated Moderate B


Tree 15, indigenous Mealy Stringybark, rated Moderate B


Tree 114, indigenous River Red Gum, rated Moderate B


Tree 121, indigenous River Red Gum, rated Moderate B


Tree 104, Yellow Gum, rated Moderate B


Tree 125 & 126, Smooth-barked Apple, rated Moderate B. Both require aerial inspection of trunk wounds in main fork


Tree 127, Southern Mahogany, rated Moderate B


Tree 123, Yellow Gum, rated Low due to dieback and poor structure


Tree 101, Bracelet Honey-myrtle, rated Low due to subsiding form


Tree 136, Sydney Blue Gum, rated Low due to dieback and decline symptoms

9 Conclusion

9.1 The tree study area comprised trees within a former school site at 15 to 29 Coomoora Road and north of Coomoora Road, bordered by predominantly established residential allotments..

9.2 One hundred and sixty-four (164) trees were inspected in total and comprised of forty-nine (49) different species.

9.3 Nineteen (19) specimens were classed as being of an indigenous species, 70 specimens were Victorian native origin, 53 were Australian native, 12 were exotic deciduous, 9 were exotic evergreens and 1 was an exotic palm specimens. Refer to Section 5.4

9.4 It is most likely that all were specimens planted for garden, screening and amenity purposes. Refer to Section 5.6.

9.5 Each tree was attributed an arboricultural rating that summarised the tree species, size and condition and suitability to retain. Refer to Section 5.10 for tree numbers sorted by arboricultural ratings.

9.6 In the absence of specific site design plans, it is not appropriate to speculate on which trees are most appropriate for retention, beyond the general guide provided by the arboricultural ratings attributed to each tree feature. Retention suitability will be dependent on the proposed landscape setting in which trees are intended to be retained. The following recommendations are provided for consideration in the design process.

- Preference should be given to retaining trees primarily of High and Moderate arboricultural value in built areas, or areas of increased target potential.
- Trees of Low arboricultural value should not compromise reasonable design intent.
- Small trees of Low arboricultural value that are otherwise in reasonable condition (Fair-poor or better Health and /or Structure) may offer a potential established tree resource, even if only as an interim measure.
- Low rated trees with health or structural deficiencies (Poor or worse Health and/or Structure) or trees recognized as environmental weed species should generally be considered for removal based on sound arboricultural opinion.
- Trees attributed an arboricultural rating of None are unsuitable to retain and are recommended for removal based on sound arboricultural opinion.

9.7 To successfully retain those trees deemed to be most suitable for retention in conjunction with any redevelopment, tree protection zones must be incorporated into the design and appropriate construction controls, fencing and management practices must be implemented prior to commencing any construction related activity, including demolition and bulk earthworks.

9.8 Where TPZ fencing is impractical, ground protection measures will be required.
All TPZ measurements are provided in the tree assessment data in Appendix 1.

9.9 Temporary facilities and site sheds may be established on existing hard stand is already present within a TPZ providing there is no physical impacts to the trees and no requirement to penetrate the surface within the TPZ for installation of footings or underground services. Access / egress to these facilities must not encroach or compact the native soil within the TPZ.

9.10 Trenching for the installation of any and all underground services must be designed to avoid encroaching the reduced TPZ of any retained trees including all neighbour's and street trees.

- If it is unavoidable that an underground service must pass through a defined TPZ the service must be installed via directional boring at a minimum depth of 750mm to the top of the bore head with all entry and exit points for the boring to be located beyond the TPZ radius.

9.11 To successfully retain those trees deemed to be most suitable for retention in conjunction with any redevelopment, tree protection zones must be incorporated into the design and appropriate construction controls, fencing and management practices must be implemented prior to commencing any construction related activity, including demolition and bulk earthworks. Where TPZ fencing is impractical, ground protection measures will be required.
All TPZ measurements are provided in the tree assessment data in Appendix 1.

Refer to Appendix 3 for Tree Descriptors and Appendix 4 for TPZ establishment and management guidelines.

9.12 Tree condition can change quickly in response to environmental conditions or altered landscape conditions. Retained trees should be re-inspected on a 3-5 year basis or following any locally damaging weather events and appropriate remedial works undertaken as required.

I am available to answer any questions arising from this report.

Signed 

Bruce Callander Senior Consultant Arborist Treelogic P/L

E: bruce.callander@treelogic.com.au

T: 03 9870 7700 Mob: 0425 872 007

References and bibliography:

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Clark, J.R. & Matheny, N.P (1998), Trees and Development: A technical guide to preservation of trees during land development. ISA, Champaign, Illinois.

Standards Australia (2007), Australian Standard (4373-2007) - Pruning of Amenity trees, Standards Australia, Homebush, NSW

10 Appendix 1: Tree Assessment Data: 15-29 Coomoora road, Springvale South

Refer to following 7 pages

Key: DBH = Diameter at breast height (1.4m up trunk) unless otherwise indicated. Basal dimensions is trunk diameter at base immediately above root buttress.
Arb. Rating = arboricultural rating. TPZ = Tree protection zone in radial metres. SRZ = Structural root zone in radial metres.
Definition of the descriptor categories used in the assessment can be seen in Appendix 3.

Tree No	*Botanic name*	Common Name	Origin	Age	DBH	DBH at	Basal	Height	Width	Health	Structure	Symmetry	Arb rating	Comment	Works Req	Priority	ULE	TPZ	SRZ
1	*Brachychiton acerifolius*	Illawarra Flame Tree	Australian native	Early maturity	22	1.4m	28	6	4	Good	Fair	Symmetric	Moderate B				21_40	2.6	1.9
2	*Eucalyptus botryoides*	Southern Mahogany	Victorian native	Maturing	63	1.4m	68	17	15	Fair	Fair to poor	Minor asymmetry	Moderate C	Incipient decay; Trunk wounds, Borer exit holes			11_20	7.6	2.8
3	*Melaleuca armillaris*	Bracelet Honey-myrtle	Victorian native	Over-mature	40,40	1.4m	80	5	16	Fair to poor	Collapsed	Collapsed	None				<1	6.8	3
4	*Eucalyptus botryoides*	Southern Mahogany	Victorian native	Maturing	67	1.4m	68	18	18	Good	Fair	Symmetric	Moderate B	Deadwood >50mm; Incipient decay; Trunk wounds, occluding at 4-5m			11_20	8	2.8
5	*Eucalyptus botryoides*	Southern Mahogany	Victorian native	Early maturity	30	1.4m	36	14	5	Dead	Poor	Symmetric	None				<1	3.6	2.2
6	*Eucalyptus tereticornis*	Forest Red Gum	Victorian native	Early maturity	47	1.4m	55	16	13	Good	Fair	Symmetric	Moderate A	Low limb pruning wound occluding well			>40	5.6	2.6
7	*Eucalyptus cephalocarpa*	Mealy Stringybark	Indigenous	Early maturity	49,36	1.4m	73	14	12	Good	Fair to poor	Asymmetric crown	Moderate B	Basal wounds; Congested primary union; Included bark forks; Past branch failure; Partly suppressed_crown bias, to West	Reduce Lesser co-dominant stem	Low	11_20	7.3	2.9
8	*Corymbia citriodora*	Lemon-scented Gum	Australian native	Maturing	53	1.4m	66	18	17	Fair	Fair	Symmetric	Moderate A	Over-extended limbs; Past limb failure, kerb 2m Nth	Crown Maintenance	Moderate	21_40	6.4	2.8
9	*Eucalyptus sideroxylon*	Red Ironbark	Victorian native	Maturing	84	1.4m	94	18	19	Good	Fair	Symmetric	Moderate A	Crossing branches; Over-extended limbs, w excessive endweight	Crown Maintenance; Weight reduction	Moderate	11_20	10.1	3.2
10	*Eucalyptus cephalocarpa*	Mealy Stringybark	Indigenous	Maturing	52	1.4m	59	16	11	Good	Fair	Minor asymmetry	Moderate B	Past branch failure; Partly suppressed_ crown bias, to East			21_40	6.2	2.7
11	*Corymbia maculata*	Spotted Gum	Victorian native	Semi-mature	30	1.4m	36	13	7	Fair	Fair	Minor asymmetry	Moderate C	Past branch failure; Trunk wounds; Partly suppressed_ crown bias, to Nth			11_20	3.6	2.2
12	*Casuarina cunninghamiana*	River She-oak	Australian native	Early maturity	33	1.4m	45	14	7	Fair	Fair	Minor asymmetry	Moderate B	Partly suppressed_ crown bias, to Nth. Kerb 2m Nth.			11_20	4	2.4
13	*Melaleuca armillaris*	Bracelet Honey-myrtle	Victorian native	Over-mature	27,28,23,24,14	1.4m	100	8	12	Fair	Fair to poor	Leaning stem	Low	Fungal brackets; Over-extended limbs; Subsiding limbs			6_10	6.4	3.3
14	*Melaleuca armillaris*	Bracelet Honey-myrtle	Victorian native	Over-mature	30,26,15	1.4m	74	9	9	Fair	Poor	Minor asymmetry	Low	Past stem failure; Subsiding limbs			6_10	5.1	2.9
15	*Eucalyptus cephalocarpa*	Mealy Stringybark	Indigenous	Early maturity	39	1.4m	47	8	12	Good	Fair	Minor asymmetry	Moderate B	Partly suppressed_crown bias, to West			21_40	4.7	2.4
16	*Callistemon 'Kings Park Special'*	King's Park Special Bottlebrush	Australian native	Maturing	28,27	1.4m	37	7	8	Good	Poor	Minor asymmetry	Low	Active split; Codominant stems; Over-extended limbs	Crown reduction;	Moderate	6_10	4.7	2.2
17	*Callistemon 'Kings Park Special'*	King's Park Special Bottlebrush	Australian native	Maturing	29	1.4m	34	7	8	Fair to poor	Poor	Minor asymmetry	Low	Active split; Over-extended limbs; Past limb failure, to excessive endweight	Crown reduction;	Moderate	1_5	3.5	2.1
18	*Acacia longifolia var. sophorae*	Coast Wattle	Victorian native	Early maturity	10	1.4m	12	2	9	Fair	Poor	Leaning stem	Low weed	Sprawling Coast Wattle			1_5	2	1.5
19	*Callistemon 'Kings Park Special'*	King's Park Special Bottlebrush	Australian native	Early maturity	23,22	1.4m	33	6	6	Fair	Fair to poor	Symmetric	Low	Remove rubbish & beer bottles at base	Multiple tasks - see comments	Low	11_20	3.8	2.1
20	*Eucalyptus leucoxylon*	Yellow Gum	Australian native	Semi-mature	19	1.4m	22	7	7	Fair	Fair	Symmetric	Moderate C				21_40	2.3	1.8

Tree No	*Botanic name*	Common Name	Origin	Age	DBH	DBH at	Basal	Height	Width	Health	Structure	Symmetry	Arb rating	Comment	Works Req	Priority	ULE	TPZ	SRZ
21	*Eucalyptus leucoxylon*	Yellow Gum	Australian native	Maturing	35	1.4m	42	10	10	Good	Fair	Symmetric	Moderate B	Acute forks	Weight reduction; Reduce Lesser co-dominant stem	Low	11_20	4.2	2.3
22	*Eucalyptus polyanthemos*	Red Box	Victorian native	Semi-mature	19	1.4m	19	5	6	Fair	Fair to poor	Leaning stem	Moderate C		Weight reduction; Reduce Lesser co-dominant stem; Formative pruning	Low	11_20	2.3	1.6
23	*Eucalyptus polyanthemos*	Red Box	Victorian native	Early maturity	33	1.4m	37	11	9	Good	Fair	Symmetric	Moderate B	Past limb failure; Trunk wounds			11_20	4	2.2
24	*Eucalyptus sp.*	Gum Tree	Australian native	Semi-mature	13	1.4m	16	4	3	Dead	Poor	Asymmetric crown	None				<1	2	1.5
25	*Eucalyptus leucoxylon*	Yellow Gum	Victorian native	Young	10	1.4m	12	3	4	Fair	Fair	Minor asymmetry	Low size				21_40	2	1.5
26	*Eucalyptus botryoides*	Southern Mahogany	Victorian native	Early maturity	46	1.0m	43	8	11	Fair	Fair	Minor asymmetry	Moderate B	Deadwood >50mm; Over-extended limbs, Low spreading habit			11_20	5.5	2.3
27	*Callistemon viminalis*	Weeping Bottlebrush	Australian native	Maturing	16,16,15,15,12	est.	70	4	11	Good	Fair to poor	Symmetric	Low	Multi-stemmed, Remove Coprosma repens growing throughout	Multiple tasks - see comments	Moderate	11_20	4	2.8
28	*Leptospermum laevigatum*	Coast Tea-tree	Victorian native	Maturing	36,25,22	1.4m	55	5	10	Fair	Poor	Symmetric	Low	Basal wounds; Incipient decay; Past branch failure; Subsiding limbs, . Split at base			6_10	5.9	2.6
29	*Fraxinus angustifolia*	Narrow-leaved Ash	Exotic deciduous	Semi-mature	22	1.4m	28	8	9	Fair	Fair	Minor asymmetry	Low weed				11_20	2.6	1.9
30	*Pittosporum undulatum*	Sweet Pittosporum	Victorian native	Semi-mature	18,15	1.4m	24	5	5	Fair to poor	Fair to poor	Symmetric	Low weed				6_10	2.8	1.8
31	*Pittosporum undulatum*	Sweet Pittosporum	Victorian native	Semi-mature	12,12	1.4m	25	4	5	Fair	Fair to poor	Symmetric	Low weed				6_10	2	1.8
32	*Callistemon viminalis*	Weeping Bottlebrush	Australian native	Maturing	30,26,20	1.4m	47	9	8	Fair	Fair to poor	Minor asymmetry	Low	Acute forks; Dieback; Past branch failure			6_10	5.3	2.4
33	*Eucalyptus botryoides*	Southern Mahogany	Victorian native	Early maturity	18,17,16	1.4m	33	8	6	Poor	Poor	Minor asymmetry	Low	Basal decay; Deadwood >50mm			1_5	3.5	2.1
34	*Prunus cerasifera 'Nigra'*	Purple Leaf Cherry Plum	Exotic deciduous	Early maturity	16	1.4m	19	6	5	Fair	Fair to poor	Minor asymmetry	Low weed				6_10	2	1.6
35	*Callistemon salignus*	Willow Bottlebrush	Australian native	Semi-mature	14	1.4m	19	6	4	Fair to poor	Fair to poor	Symmetric	Low				6_10	2	1.6
36	*Coprosma repens*	Mirror Bush	Exotic evergreen	Maturing	10,10,10	1.4m	30	4	6	Fair	Poor	Symmetric	Low weed				1_5	2.1	2
37	*Allocasuarina verticillata*	Drooping She-oak	Victorian native	Early maturity	18	1.4m	23	8	5	Fair	Fair to poor	Minor asymmetry	Moderate C	Congested primary union; Trunk wounds; Partly suppressed_crown bias, to Nth			11_20	2.2	1.8
38	*Corymbia citriodora*	Lemon-scented Gum	Australian native	Early maturity	38	1.4m	45	15	16	Fair	Fair	Symmetric	Moderate A	Trunk wounds			21_40	4.6	2.4
39	*Acacia dealbata*	Silver Wattle	Victorian native	Maturing	15	1.4m	30	6	6	Poor	Poor	Asymmetric crown	None	In irreversible decline			1_5	2	2
40	*Casuarina cunninghamiana*	River She-oak	Australian native	Maturing	60	1.4m	64	19	13	Good	Fair	Symmetric	Moderate A	1.5m away from kerb			21_40	7.2	2.7
41	*Eucalyptus scoparia*	Wallangarra White Gum	Australian native	Early maturity	29	1.4m	40	14	10	Fair	Fair	Symmetric	Moderate B	Minor dieback; Partly suppressed_crown bias, NTH			21_40	3.5	2.3

Tree No	*Botanic name*	Common Name	Origin	Age	DBH	DBH at	Basal	Height	Width	Health	Structure	Symmetry	Arb rating	Comment	Works Req	Priority	ULE	TPZ	SRZ
42	*Syagrus romanzoffiana*	Queen Palm	Palm	Early maturity	17	1.4m	19	6	3	Fair to poor	Fair	Symmetric	Low size				6_10	2	1.6
43	*Melaleuca styphelioides*	Prickly-leaved Paperbark	Australian native	Early maturity	20,13	1.4m	29	5	6	Fair	Fair	Symmetric	Moderate C				11_20	2.9	2
44	*Melaleuca styphelioides*	Prickly-leaved Paperbark	Australian native	Early maturity	31	1.4m	38	7	7	Fair	Fair to poor	Symmetric	Moderate C	Lopped			6_10	3.7	2.2
45	*Melaleuca styphelioides*	Prickly-leaved Paperbark	Australian native	Early maturity	40	1.4m	48	10	7	Fair	Fair	Symmetric	Moderate B	Acute forks			11_20	4.8	2.4
46	*Eucalyptus botryoides*	Southern Mahogany	Victorian native	Early maturity	16,14	1.4m	40	12	6	Fair	Poor	Symmetric	Low	Multi-stemmed; Stump resprout			6_10	2.6	2.3
47	*Melaleuca styphelioides*	Prickly-leaved Paperbark	Australian native	Maturing	39,24,22,21,17	1.4m	70	12	11	Fair to poor	Fair to poor	Symmetric	Moderate C	Acute forks; Deadwood >50mm; Dieback	Dead wooding	Low	6_10	6.9	2.8
48	*Melaleuca styphelioides*	Prickly-leaved Paperbark	Australian native	Early maturity	20,16,16	1.4m	40	11	9	Fair	Fair to poor	Symmetric	Moderate C				11_20	3.6	2.3
145,	*Corymbia maculata*	Spotted Gum	Victorian native	Early maturity	35	1.4m	44	17	10	Fair	Fair	Symmetric	Moderate B	Trunk wounds			21_40	4.2	2.3
50	*Corymbia maculata*	Spotted Gum	Victorian native	Maturing	74	1.4m	89	19	15	Good	Fair	Symmetric	Moderate A	Past limb failure; Trunk wounds			21_40	8.9	3.2
51	*Corymbia maculata*	Spotted Gum	Victorian native	Semi-mature	25	1.4m	31	16	6	Fair	Fair to poor	Symmetric	Moderate C	Acute forks; Codominant stems; Included bark fork above 10m. Reduced taper	Reduce Lesser co-dominant stem	Moderate	11_20	3	2
52	*Fraxinus angustifolia*	Narrow-leaved Ash	Exotic deciduous	Early maturity	22,14	1.0m	31	5	6	Fair	Fair to poor	Symmetric	Low weed				6_10	3.1	2
53	*Agonis flexuosa*	Willow Myrtle	Australian native	Early maturity	23,20,20,15	1.4m	57	4	7	Fair	Fair	Symmetric	Moderate C				11_20	4.7	2.6
54	*Eucalyptus botryoides*	Southern Mahogany	Victorian native	Early maturity	18,13	1.4m	45	9	5	Fair	Poor	Symmetric	None	Stump resprout			1_5	2.7	2.4
55	*Eucalyptus botryoides*	Southern Mahogany	Victorian native	Semi-mature	27	1.4m	34	8	6	Fair to poor	Fair to poor	Symmetric	Moderate C	Acute forks; Minor dieback			11_20	3.2	2.1
56	*Eucalyptus botryoides*	Southern Mahogany	Victorian native	Maturing	74	1.4m	70	16	16	Fair	Fair	Symmetric	Moderate B				11_20	8.9	2.8
57	*Melaleuca armillaris*	Bracelet Honey-myrtle	Victorian native	Maturing	28,25,15	1.4m	53	7	10	Fair	Fair to poor	Symmetric	Low	Lopped			6_10	4.9	2.5
58	*Corymbia maculata*	Spotted Gum	Victorian native	Maturing	61	1.4m	78	26	15	Fair	Fair	Symmetric	Moderate A	Acute forks; Codominant stems, Occluded pruning wound			21_40	7.3	3
59	*Eucalyptus scoparia*	Wallangarra White Gum	Australian native	Maturing	37	1.4m	42	15	14	Fair	Fair	Symmetric	Moderate B				21_40	4.4	2.3
60	*Eucalyptus leucoxylon*	Yellow Gum	Victorian native	Early maturity	33	1.4m	38	13	12	Fair	Fair	Symmetric	Moderate B	Minor dieback			11_20	4	2.2
61	*Eucalyptus leucoxylon*	Yellow Gum	Victorian native	Early maturity	28,24	1.4m	44	12	13	Fair	Fair	Symmetric	Moderate B	Deadwood >50mm; Minor dieback			11_20	4.4	2.3
62	*Eucalyptus botryoides*	Southern Mahogany	Victorian native	Over-mature	75	1.4m	80	17	15	Dead	Poor	Symmetric	None				<1	9	3
63	*Callistemon viminalis*	Weeping Bottlebrush	Australian native	Early maturity	18,13,13,12	1.4m	38	6	7	Fair	Fair	Symmetric	Low	Multi-stemmed			11_20	3.4	2.2
64	*Agonis flexuosa*	Willow Myrtle	Australian native	Early maturity	18,13	1.4m	26	5	6	Fair to poor	Fair	Minor asymmetry	Moderate C				11_20	2.7	1.9
65	*Fraxinus angustifolia*	Narrow-leaved Ash	Exotic deciduous	Semi-mature	14	1.4m	18	5	5	Fair	Fair to poor	Symmetric	Low weed				6_10	2	1.6
66	*Fraxinus angustifolia*	Narrow-leaved Ash	Exotic deciduous	Semi-mature	11	1.4m	13	5	4	Fair	Fair to poor	Minor asymmetry	Low weed				6_10	2	1.5
67	*Melaleuca armillaris*	Bracelet Honey-myrtle	Victorian native	Maturing	33,22,23	1.4m	60	6	7	Fair	Fair to poor	Asymmetric crown	Low	Subsiding limbs			6_10	5.5	2.7
68	*Melaleuca armillaris*	Bracelet Honey-myrtle	Victorian native	Maturing	27	1.4m	46	6	5	Fair	Fair to poor	Asymmetric crown	Low	Lopped; Subsiding limbs			6_10	3.2	2.4
69	*Melaleuca armillaris*	Bracelet Honey-myrtle	Victorian native	Maturing	25	1.4m	34	8	7	Fair	Fair to poor	Asymmetric crown	Low	Included bark forks; Subsiding limbs			6_10	3	2.1

Tree No	Botanic name	Common Name	Origin	Age	DBH	DBH at	Basal	Height	Width	Health	Structure	Symmetry	Arb rating	Comment	Works Req	Priority	ULE	TPZ	SRZ
70	*Acacia longifolia var. sophorae*	Coast Wattle	Victorian native	Early maturity	11,8	1.4m	18	4	7	Fair	Fair to poor	Symmetric	Low weed				6_10	2	1.6
71	*Callistemon viminalis*	Weeping Bottlebrush	Australian native	Semi-mature	8,7	1.4m	17	4	3	Fair	Fair	Symmetric	Low size				11_20	2	1.6
72	*Melaleuca linariifolia*	Snow in Summer	Australian native	Early maturity	36	1.4m	45	8	8	Fair to poor	Fair	Symmetric	Low	Dieback; Partly suppressed_crown bias, to East			6_10	4.3	2.4
73	*Banksia integrifolia*	Coast Banksia	Victorian native	Early maturity	27,16	1.4m	43	6	9	Dead	Poor	Symmetric	None				<1	3.8	2.3
74	*Casuarina cunninghamiana*	River She-oak	Australian native	Maturing	59	1.4m	70	17	13	Fair to poor	Fair	Symmetric	Moderate C	Minor dieback			11_20	7.1	2.8
75	*Corymbia citriodora*	Lemon-scented Gum	Australian native	Maturing	58	1.4m	76	24	18	Good	Fair	Symmetric	Moderate A	Over-extended limbs; Partly suppressed_crown bias, restricted to Nth			21_40	7	2.9
76	*Corymbia maculata*	Spotted Gum	Victorian native	Maturing	94	1.4m	101	22	17	Good	Fair	Symmetric	Moderate A	Kerb<1m Nth, dead stub	Crown Maintenance	Low	21_40	11.3	3.3
77	*Corymbia maculata*	Spotted Gum	Victorian native	Maturing	71	1.4m	85	18	17	Good	Good	Symmetric	High				21_40	8.5	3.1
78	*Coprosma repens*	Mirror Bush	Exotic evergreen	Early maturity	9	1.4m	11	3	4	Fair	Fair to poor	Symmetric	Low weed	Growing over stump resprout			1_5	2	1.5
79	*Eucalyptus sp.*	Gum Tree	Australian native	Semi-mature	2,2,1	1.4m	1	2	4	Fair	Very Poor	Stump re-sprout	None	Stump resprout			<1	2	1.5
80	*Casuarina cunninghamiana*	River She-oak	Australian native	Semi-mature	11	1.4m	17	4	4	Fair to poor	Fair to poor	Stump re-sprout	Low	Dieback; Main leader dead			6_10	2	1.6
81	*Eucalyptus botryoides*	Southern Mahogany	Victorian native	Maturing	54	1.4m	62	15	15	Fair	Fair	Symmetric	Moderate B	Deadwood >50mm; Past branch failure, Hanger	Crown Maintenance	Moderate	11_20	6.5	2.7
82	*Melaleuca armillaris*	Bracelet Honey-myrtle	Victorian native	Over-mature	44	1.4m	60	5	9	Fair	Fair to poor	Asymmetric crown	Low	Leaning trunk; Lopped; Past stem failure; Subsiding limbs			1_5	5.3	2.7
83	*Callistemon sieberi*	River Bottlebrush	Victorian native	Maturing	21,17	1.4m	35	4	5	Fair	Fair to poor	Minor asymmetry	Low size				6_10	3.2	2.1
84	*Melaleuca armillaris*	Bracelet Honey-myrtle	Victorian native	Over-mature	38	1.4m	50	5	7	Fair	Poor	Asymmetric crown	Low	Leaning trunk; Lopped; Subsiding limbs			1_5	4.6	2.5
85	*Melaleuca armillaris*	Bracelet Honey-myrtle	Victorian native	Maturing	~20	1.4m	30	3	5	Fair to poor	Fair to poor	Asymmetric crown	None	Vine infested			1_5	2.4	2
86	*Melaleuca armillaris*	Bracelet Honey-myrtle	Victorian native	Over-mature	~40	est.	50	4	10	Fair	Collapsing	Asymmetric crown	None	Subsiding limbs; Vine infested			1_5	4.8	2.5
87	*Melaleuca armillaris*	Bracelet Honey-myrtle	Victorian native	Over-mature	45	1.0m	90	4	10	Fair to poor	Collapsed	Collapsed	None				<1	5.4	3.2
88	*Callistemon viminalis*	Weeping Bottlebrush	Australian native	Early maturity	16,15,15	1.0m	32	6	6	Fair	Fair to poor	Symmetric	Low	Weed infested, Remove Coprosma	Multiple tasks - see comments	Moderate	11_20	3.2	2.1
89	*Callistemon viminalis*	Weeping Bottlebrush	Australian native	Early maturity	18,14,15	1.4m	33	5	10	Fair	Fair to poor	Minor asymmetry	Low	Weed infested, Remove Coprosma	Multiple tasks - see comments	Moderate	11_20	3.3	2.1
90	*Coprosma repens*	Mirror Bush	Exotic evergreen	Early maturity	<10	1.4m	12	4	4	Fair	Poor	Minor asymmetry	None	Woody weed sp.			1_5	2	1.5
91	*Callistemon viminalis*	Weeping Bottlebrush	Australian native	Maturing	19,18,16	1.4m	46	4	7	Fair to poor	Fair to poor	Minor asymmetry	Low	Dieback; Suppressed; Vine infested, Remove collapsed tree from crown	Crown Maintenance; Remove Vines; Multiple tasks - see comments	High	6_10	3.7	2.4
92	*Melaleuca armillaris*	Bracelet Honey-myrtle	Australian native	Over-mature	55,38,33	1.4m	75	7	12	Fair	Collapsing	Collapsing	None	Subsiding limbs; Vine infested			1_5	8.9	2.9

Tree No	*Botanic name*	Common Name	Origin	Age	DBH	DBH at	Basal	Height	Width	Health	Structure	Symmetry	Arb rating	Comment	Works Req	Priority	ULE	TPZ	SRZ
93	*Eucalyptus botryoides*	Southern Mahogany	Victorian native	Maturing	54	1.4m	62	14	15	Fair	Fair to poor	Symmetric	Moderate C	Over-extended limbs; Vine infested, Reinspect after vines gone	Remove Vines; Multiple tasks - see comments	Moderate	6_10	6.5	2.7
94	*Callistemon viminalis*	Weeping Bottlebrush	Australian native	Early maturity	15,10	1.4m	20	3	5	Poor	Poor	Asymmetric crown	Low	Suppressed; Vine infested			1_5	2.2	1.7
95	*Coprosma repens*	Mirror Bush	Exotic evergreen	Maturing	12	1.4m	16	4	5	Fair	Poor	Asymmetric crown	None	Vine infested; Woody weed sp.			1_5	2	1.5
96	*Coprosma repens*	Mirror Bush	Exotic evergreen	Early maturity	10	1.4m	12	4	7	Fair	Fair to poor	Symmetric	None	Vine infested; Woody weed sp.			<1	2	1.5
97	*Coprosma repens*	Mirror Bush	Exotic evergreen	Early maturity	9	1.4m	10	3	5	Fair	Poor	Symmetric	None	Vine infested; Woody weed sp.			<1	2	1.5
98	*Callistemon viminalis*	Weeping Bottlebrush	Australian native	Early maturity	15,12	1.4m	20	3	5	Fair to poor	Fair to poor	Symmetric	Low	Vine infested, Remove Coprosma	Remove vines and Coprosma	Moderate	6_10	2.3	1.7
99	*Coprosma repens*	Mirror Bush	Exotic evergreen	Maturing	14	1.4m	16	3	6	Fair	Poor	Asymmetric crown	None	Vine infested; Woody weed sp.			1_5	2	1.5
100	*Melaleuca armillaris*	Bracelet Honey-myrtle	Victorian native	Over-mature	48	1.4m	80	6	6	Fair	Fair to poor	Asymmetric crown	Low	Past stem failure; Subsiding limbs			1_5	5.8	3
101	*Melaleuca armillaris*	Bracelet Honey-myrtle	Victorian native	Over-mature	46,30	1.4m	80	6	9	Fair	Poor	Collapsing	Low	Past stem failure; Subsiding limbs			1_5	6.6	3
102	*Melaleuca armillaris*	Bracelet Honey-myrtle	Victorian native	Over-mature	30,22,20	1.4m	70	4	14	Fair to poor	Collapsed	Collapsed	None	Past stem failure; Subsiding limbs			1_5	5.1	2.8
103	*Melaleuca armillaris*	Bracelet Honey-myrtle	Victorian native	Over-mature	30,27,26	1.4m	68	6	12	Fair	Collapsing	Collapsing	Low	Past stem failure; Subsiding limbs			1_5	5.8	2.8
104	*Eucalyptus leucoxylon*	Yellow Gum	Victorian native	Maturing	37,34	1.4m	51	9	15	Fair	Fair	Symmetric	Moderate B	Past branch failure			11_20	6	2.5
105	*Eucalyptus leucoxylon*	Yellow Gum	Victorian native	Early maturity	31	1.4m	36	12	11	Fair	Fair	Minor asymmetry	Moderate B	Over-extended limbs; Partly suppressed_crown bias, West			11_20	3.7	2.2
106	*Eucalyptus leucoxylon*	Yellow Gum	Victorian native	Maturing	~100	est.	110	15	20	Good	Fair	Symmetric	Moderate A	Basal wounds; Neighbour's tree; Over-extended limbs			11_20	12	3.4
107	*Eucalyptus leucoxylon*	Yellow Gum	Victorian native	Early maturity	20	1.4m	27	7	8	Fair	Fair	Minor asymmetry	Moderate C	Partly suppressed_crown bias, to South			11_20	2.4	1.9
108	*Eucalyptus leucoxylon*	Yellow Gum	Victorian native	Maturing	45	1.4m	50	10	12	Good	Fair	Symmetric	Moderate B	Past limb failure	Crown Maintenance	Low	11_20	5.4	2.5
109	*Eucalyptus leucoxylon*	Yellow Gum	Victorian native	Semi-mature	15	1.4m	17	6	4	Fair to poor	Fair to poor	Minor asymmetry	Low	Suppressed			6_10	2	1.6
110	*Eucalyptus camaldulensis*	River Red Gum	Indigenous	Semi-mature	20	1.4m	22	6	4	Fair	Fair	Minor asymmetry	Moderate C	Partly suppressed_crown bias, to North			21_40	2.4	1.8
111	*Eucalyptus camaldulensis*	River Red Gum	Indigenous	Semi-mature	21	1.4m	24	7	5	Fair	Fair	Symmetric	Moderate C				21_40	2.5	1.8
112	*Eucalyptus camaldulensis*	River Red Gum	Indigenous	Semi-mature	30	1.4m	38	9	5	Fair	Fair	Minor asymmetry	Moderate B	Partly suppressed_crown bias, to South			21_40	3.6	2.2
113	*Eucalyptus camaldulensis*	River Red Gum	Indigenous	Semi-mature	11	0.75m	15	3	3	Fair	Fair	Minor asymmetry	Low size				21_40	2	1.5
114	*Eucalyptus camaldulensis*	River Red Gum	Indigenous	Semi-mature	35	1.4m	49	10	7	Fair	Fair	Symmetric	Moderate B				21_40	4.2	2.5
115	*Eucalyptus camaldulensis*	River Red Gum	Indigenous	Semi-mature	26	1.4m	35	11	8	Fair	Fair	Symmetric	Moderate B				21_40	3.1	2.1
116	*Eucalyptus camaldulensis*	River Red Gum	Indigenous	Semi-mature	9	1.4m	13	4	2	Fair to poor	Fair	Symmetric	Low size				11_20	2	1.5
117	*Eucalyptus camaldulensis*	River Red Gum	Indigenous	Semi-mature	10	1.4m	16	5	4	Dead	Poor	Symmetric	None				<1	2	1.5

Tree No	*Botanic name*	Common Name	Origin	Age	DBH	DBH at	Basal	Height	Width	Health	Structure	Symmetry	Arb rating	Comment	Works Req	Priority	ULE	TPZ	SRZ
118	*Eucalyptus camaldulensis*	River Red Gum	Indigenous	Semi-mature	11	1.4m	16	6	4	Very Poor	Poor	Minor asymmetry	Low	Main leader dead, Few epicormic shoots, nearly dead			1_5	2	1.5
119	*Eucalyptus camaldulensis*	River Red Gum	Indigenous	Semi-mature	12,8	1.4m	16	4	3	Fair to poor	Fair to poor	Symmetric	Low	Dieback; Lost main leader			6_10	2	1.5
120	*Eucalyptus camaldulensis*	River Red Gum	Indigenous	Semi-mature	12	1.4m	17	5	4	Fair to poor	Fair to poor	Minor asymmetry	Low	Lost main leader; Reduced foliage density			11_20	2	1.6
121	*Eucalyptus camaldulensis*	River Red Gum	Indigenous	Early maturity	46	1.4m	60	14	10	Fair	Fair	Minor asymmetry	Moderate B	Mower damage to surface roots, Pushing through weed mat			21_40	5.5	2.7
122	*Eucalyptus ovata*	Swamp Gum	Indigenous	Early maturity	18,17,8	1.4m	40	8	8	Fair	Poor	Stump re-sprout	Low	Stump resprout			6_10	3.1	2.3
123	*Eucalyptus leucoxylon*	Yellow Gum	Victorian native	Maturing	28,26	1.4m	52	6	12	Fair to poor	Fair to poor	Symmetric	Low	Incipient decay; Included bark forks; Past stem failure; Reduced foliage density, Lost holding wood			6_10	4.6	2.5
124	*Eucalyptus ovata*	Swamp Gum	Indigenous	Over-mature	45,42	1.4m	60	10	9	Dead	Very Poor	Symmetric	None				<1	7.4	2.7
125	*Angophora costata*	Smooth-barked Apple	Australian native	Maturing	54	1.4m	68	15	15	Fair	Fair	Symmetric	Moderate B	Canker wounds; Trunk wounds, in main fork	Aerial inspection	Moderate	11_20	6.5	2.8
126	*Angophora costata*	Smooth-barked Apple	Australian native	Maturing	58	1.4m	66	17	14	Fair	Fair to poor	Symmetric	Moderate B	Canker wounds; Incipient decay; Trunk wounds, Cavity in main fork	Crown Maintenance; Aerial inspection	Moderate	11_20	7	2.8
127	*Eucalyptus botryoides*	Southern Mahogany	Victorian native	Maturing	58	1.4m	59	13	14	Fair	Fair	Symmetric	Moderate B	Basal wounds			11_20	7	2.7
128	*Corymbia maculata*	Spotted Gum	Victorian native	Maturing	51,33	1.4m	83	16	16	Fair	Fair	Symmetric	Moderate A		Reduce Lesser co-dominant stem	Low	21_40	7.3	3.1
129	*Eucalyptus botryoides*	Southern Mahogany	Victorian native	Maturing	65	1.4m	69	15	15	Fair	Fair	Symmetric	Moderate B	Minor dieback			11_20	7.8	2.8
130	*Callistemon viminalis*	Weeping Bottlebrush	Australian native	Early maturity	17,16,14	est.	34	4	5	Fair to poor	Fair to poor	Symmetric	Low	Vine infested			6_10	3.3	2.1
131	*Eucalyptus viminalis*	Manna Gum	Victorian native	Maturing	62	1.4m	81	17	17	Fair	Fair	Symmetric	Moderate A	Small deadwood, surface oriented roots on raised mound			21_40	7.4	3
132	*Eucalyptus leucoxylon*	Yellow Gum	Victorian native	Maturing	36,34,32	1.4m	73	9	13	Fair	Fair to poor	Symmetric	Moderate C	Incipient decay; Included bark forks; Past limb failure; Trunk wounds			6_10	7.1	2.9
133	*Corymbia maculata*	Spotted Gum	Victorian native	Semi-mature	24	1.4m	30	12	6	Good	Fair	Symmetric	Moderate C				21_40	2.9	2
134	*Corymbia maculata*	Spotted Gum	Victorian native	Semi-mature	24	1.4m	31	12	6	Good	Fair	Symmetric	Moderate C	M nesophylla & A floribunda around bases			21_40	2.9	2
135	*Brachychiton acerifolius*	Illawarra Flame Tree	Australian native	Semi-mature	12	1.4m	19	4	2	Fair	Fair	Symmetric	Moderate C				>40	2	1.6
136	*Eucalyptus saligna*	Sydney Blue Gum	Australian native	Maturing	80	1.4m	90	22	17	Fair to poor	Fair to poor	Symmetric	Low	Canker wounds; Deadwood >50mm; Declining, large dead spar			1_5	9.6	3.2
137	*Eucalyptus sp.*	Gum Tree	Australian native	Maturing	50		56	1	1	Dead	Dead stump		None	Dead stump			<1	6	2.6
138	*Eucalyptus sp.*	Gum Tree	Australian native	Maturing	80		90	0	1	Dead	Dead stump		None	Dead stump			<1	9.6	3.2
139	*Fraxinus angustifolia*	Narrow-leaved Ash	Exotic deciduous	Semi-mature	8		9	4	2	Fair	Fair		Low weed				1_5	2	1.5

Tree No	*Botanic name*	Common Name	Origin	Age	DBH	DBH at	Basal	Height	Width	Health	Structure	Symmetry	Arb rating	Comment	Works Req	Priority	ULE	TPZ	SRZ
140	*Agonis flexuosa 'Nana'*	Willow Myrtle	Australian native	Early maturity	7		8	1	2	Fair	Fair to poor		Low size	A. flexuosa 'Nana'			6_10	2	1.5
141	*Prunus cerasifera 'Nigra'*	Purple Leaf Cherry Plum	Exotic deciduous	Early maturity	13,13		21	6	6	Fair to poor	Fair to poor		Low weed				1_5	2.2	1.7
142	*Prunus persica ssp.*	Nectarine	Exotic deciduous	Early maturity	<10		11	4	4	Good	Fair		Low size	Neighbour's nectarine			6_10	2	1.5
143	*Coprosma repens*	Mirror Bush	Exotic evergreen	Maturing	<10		11	3	5	Fair	Poor		Low weed				<1	2	1.5
144	*Coprosma repens*	Mirror Bush	Exotic evergreen	Maturing	<10		11	3	4	Fair	Poor		Low weed				<1	2	1.5
145	*Acacia fimbriata*	Fringed Wattle	Victorian native	Early maturity	<6		7	3	5	Fair	Fair to poor		Low size	A fimbriata			1_5	2	1.5
146	*Callistemon sp.*	Bottlebrush	Australian native	Early maturity	<10		11	2	4	Fair	Collapsing		Low size				1_5	2	1.5
147	*Fraxinus angustifolia*	Narrow-leaved Ash	Exotic deciduous	Maturing	13,10,9		21	4	6	Fair	Fair to poor		Low weed				1_5	2.2	1.7
148	*Acacia sp.*	Wattle Tree	Australian native	Maturing	16,14		24	6	6	Dead	Collapsing		None				<1	2.6	1.8
149	*Acacia melanoxylon*	Blackwood	Indigenous	Maturing	18,17		39	6	6	Fair	Fair to poor		Low	Included bark fork	Reduce lesser co-dominant stem	Moderate	6_10	3	2.2
150	*Melaleuca nesophila*	Showy Honey-myrtle	Australian native	Maturing	28,22		40	4	10	Fair to poor	Collapsing		None	M nesophylla			<1	4.3	2.3
151	*Melaleuca linariifolia*	Snow in Summer	Australian native	Early maturity	24,15		32	5	5	Fair	Fair		Low size				11_20	3.4	2.1
152	*Fraxinus angustifolia*	Narrow-leaved Ash	Exotic deciduous	Early maturity	16,16,15		35	6	6	Fair	Fair to poor		Low weed				1_5	3.3	2.1
153	*Fraxinus angustifolia*	Narrow-leaved Ash	Exotic deciduous	Early maturity	17		25	6	4	Fair	Fair		Low weed				1_5	2	1.8
154	*Fraxinus angustifolia*	Narrow-leaved Ash	Exotic deciduous	Early maturity	10,13		15	5	3	Fair	Fair		Low weed				1_5	2	1.5
155	*Acacia paradoxa*	Hedge Wattle	Victorian native	Young	5		6	2	4	Fair	Fair to poor		Low size	A paradoxa			1_5	2	1.5
156	*Acacia melanoxylon*	Blackwood	Indigenous	Early maturity	17,12		28	6	5	Fair	Fair to poor		Low	Dieback, Included bark fork.			6_10	2.5	1.9
157	*Kunzea ericoides*	Burgan	Victorian native	Early maturity	5,3,2		11	3	3	Fair	Fair to poor		Low size				6_10	2	1.5
158	*Callistemon viminalis*	Weeping Bottlebrush	Australian native	Maturing	15,15		30	4	4	Fair to poor	Fair to poor		Low	Past stem failure			11_20	2.5	2

11 Appendix 2: Tree Location Plan: 15-29 Coomoora road, Springvale South

Refer to following 7 pages.

Appendix 2 - Tree Locations, Numbers and TPZs
15-29 Coomoora Road, Springvale South

Map 1

Legend

Trees by Arb rating

- High
- Low
- Low size
- Low weed
- Moderate A
- Moderate B
- Moderate C
- None

Buffers

TPZ

SRZ

Property cadastre

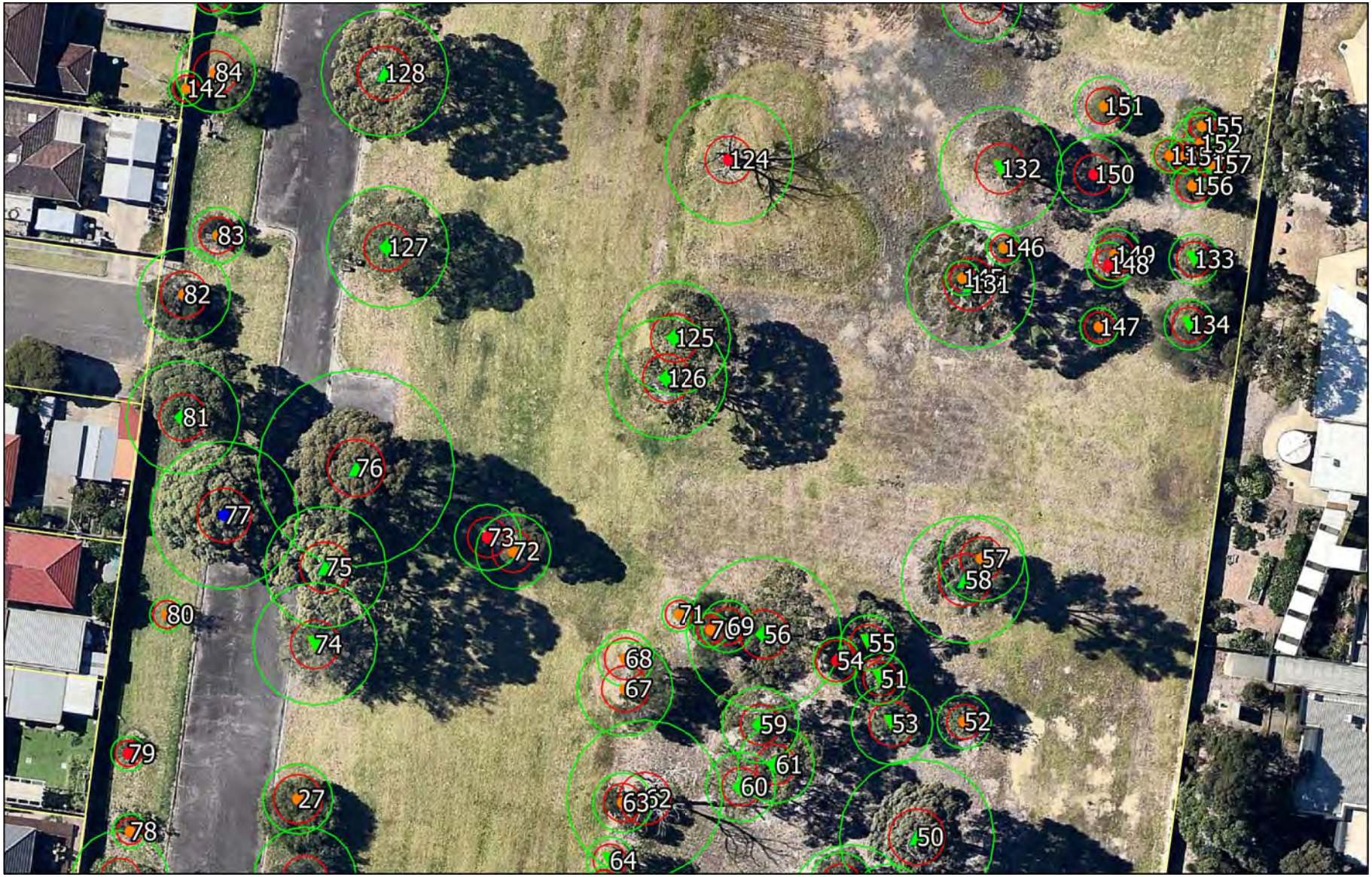
Client: Development Victoria
Map Source: Near Maps
Author: Tree Logic
Date: 12/04/2018

Co-ordinate System: GDA 1994
MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

0 10 20 30 m

N

Appendix 2 - Tree Locations, Numbers and TPZs
15-29 Coomoora Road, Springvale South



Map 2

Legend

Trees by Arb rating

- High
- Low
- Low size
- Low weed
- Moderate A
- Moderate B
- Moderate C
- None

Buffers

TPZ

SRZ

Property cadastre

Client: Development Victoria
Map Source: Near Maps
Author: Tree Logic
Date: 12/04/2018

Co-ordinate System: GDA 1994
MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

0 10 20 30 m

N

Appendix 2 - Tree Locations, Numbers and TPZs
15-29 Coomoora Road, Springvale South

Map 3

Legend

Trees by Arb rating

- High
- Low
- Low size
- Low weed
- Moderate A
- Moderate B
- Moderate C
- None

Buffers

TPZ

SRZ

Property cadastre

Client: Development Victoria
Map Source: Near Maps
Author: Tree Logic
Date: 12/04/2018

Co-ordinate System: GDA 1994
MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

0 10 20 30 m

N

Appendix 2A - High & Moderate A rated trees only
15-29 Coomoora Road, Springvale South

N

0 10 20 30 m

Legend

Trees by Arb rating
- High
- Moderate A
- Moderate B
- Moderate C

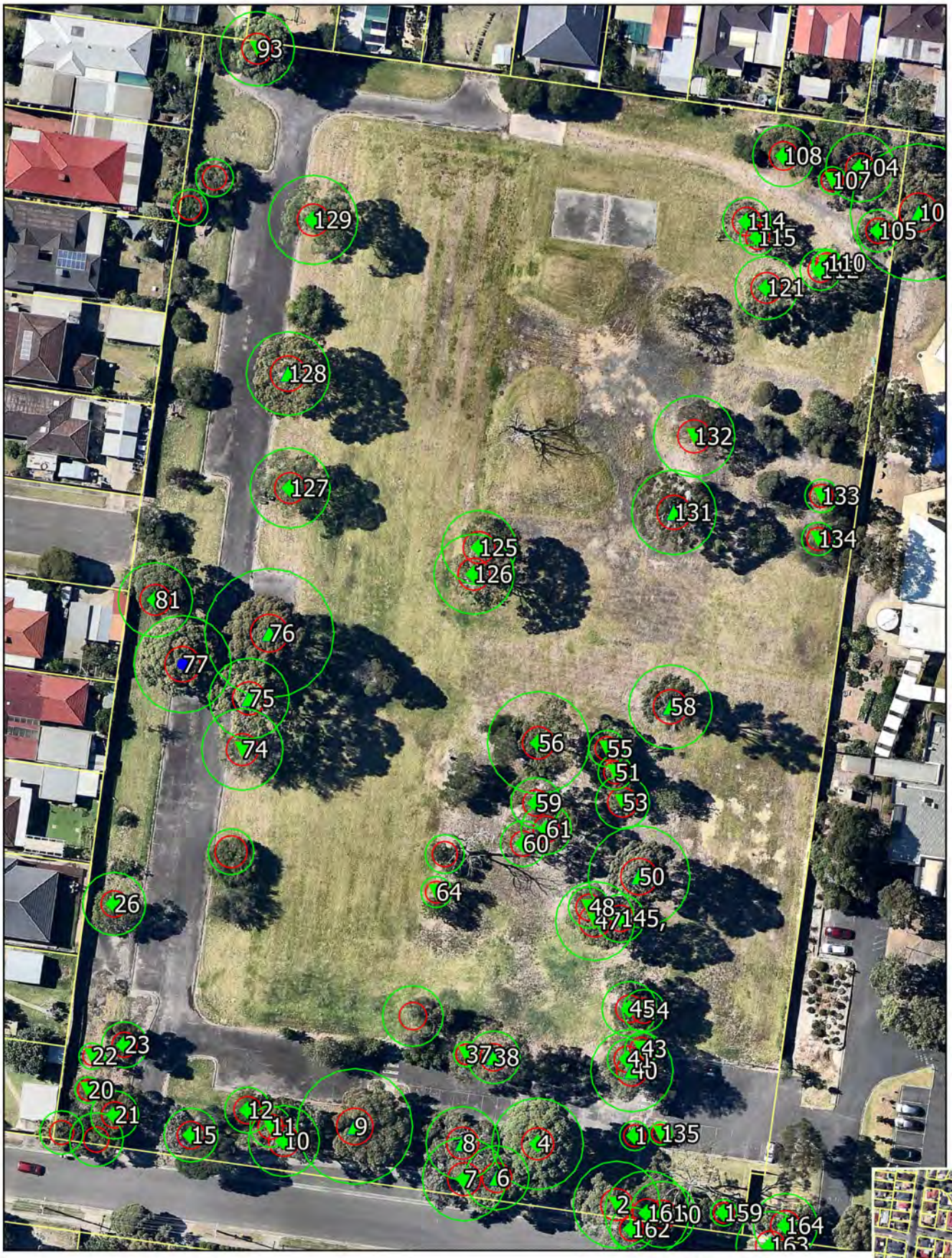
- Low
- Low size
- Low weed
- None

TPZ
SRZ
Property Cadastre

Client: GHD for Melbourne Water
Map Source: Near Maps
Author: Tree Logic
Date: 7/2/2017

Co-ordinate System: GDA 1994
MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

Appendix 2A - High & all Moderate rated trees
15-29 Coomoora Road, Springvale South



N

0 10 20 30 m

Legend

Trees by Arb rating
- High
- Moderate A
- Moderate B
- Moderate C

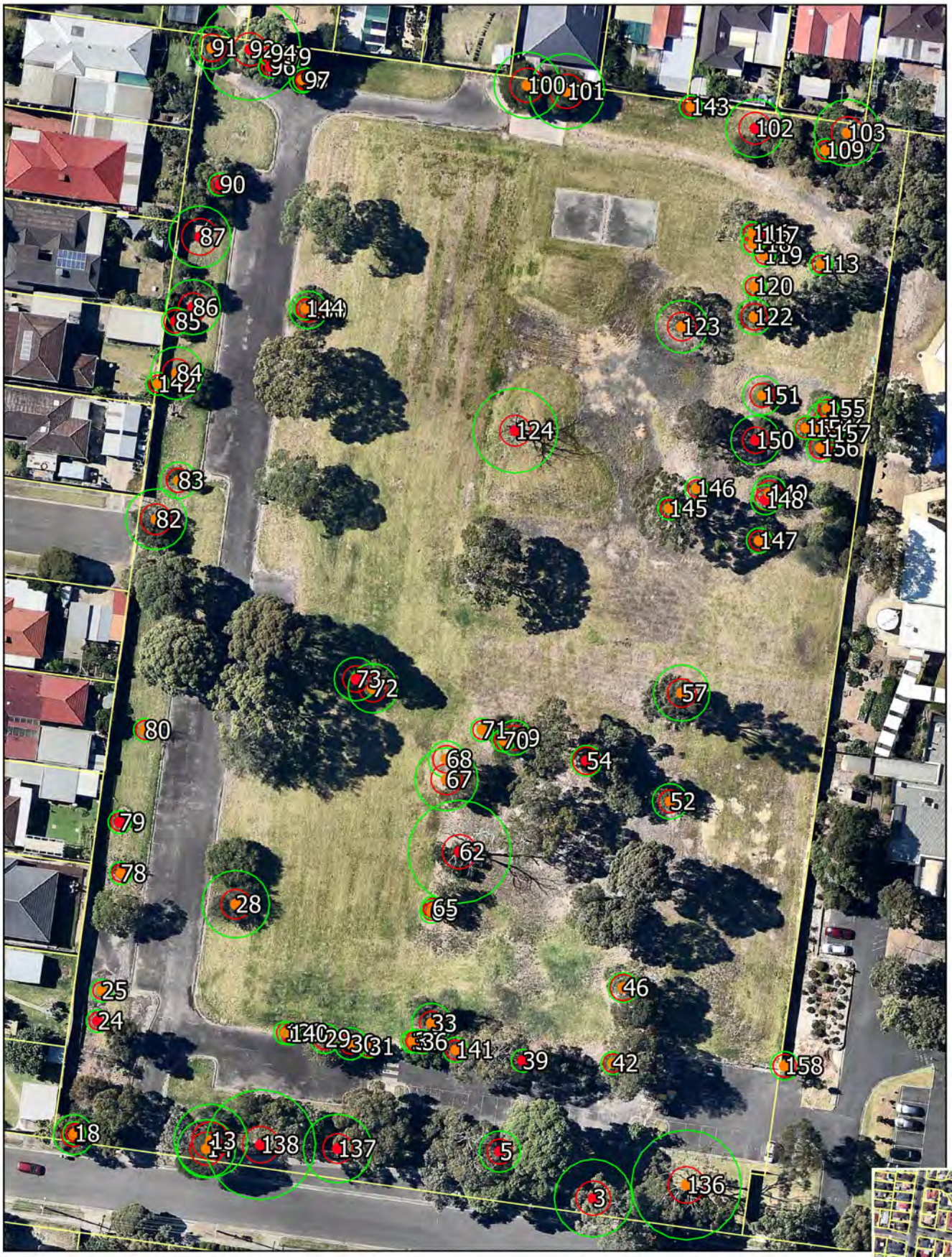
- Low
- Low size
- Low weed
- None

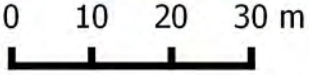
TPZ
SRZ
Property Cadastre

Client: GHD for Melbourne Water
Map Source: Near Maps
Author: Tree Logic
Date: 7/2/2017

Co-ordinate System: GDA 1994
MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

Appendix 2A - Low and None rated trees only
15-29 Coomoora Road, Springvale South





Legend

Trees by Arb rating		TPZ
High	Low size	
Moderate A	Low weed	SRZ
Moderate B	None	
Moderate C		Property Cadastre

Client: GHD for Melbourne Water
Map Source: Near Maps
Author: Tree Logic
Date: 7/2/2017

Co-ordinate System: GDA 1994
MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994

Appendix 2: Tree locations and numbers

PROJECT
15-29 Coomoora Rd, Springvale South

CLIENT
Development Victoria

PROJECT NO.
009059

DRAWING TITLE
Existing conditions

DATE
12/04/2018

REV NO.
01

PAGE NO.
01

NOTES
- Tree Protection Zone
- Structural Root Zone
Surveyed Tree feature

Dwg adapted from Survey Plan prepared by Think Spatial (Dwg name: COOMOORA ROAD WEST RESERVE FEATURE AND CONTOUR SURVEY

TREELOGIC PTY LTD
Unit 4, 21 Eugene Terrace
Ringwood Victoria
Australia 3134
ABN: 95 080 021 610
TEL: 1300 656 926

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Plan, manage, protect

12 Appendix 3: Arboricultural Descriptors (June 2017)

Note that not all of the described tree descriptors may be used in a tree assessment and report. The assessment is undertaken with regard to contemporary arboricultural practices and consists of a visual inspection of external and above-ground tree parts.

1. Tree Condition

The assessment of tree condition evaluates factors of health and structure. The descriptors of health and structure attributed to a tree evaluate the individual specimen to what could be considered typical for that species growing in its location under current climatic conditions. For example, some species can display inherently poor branching architecture, such as multiple acute branch attachments with included bark. Whilst these structural defects may technically be considered arboriculturally poor, they are typical for the species and may not constitute an increased risk of failure. These trees may be assigned a structural rating of fair-poor (rather than poor) at the discretion of the assessor.

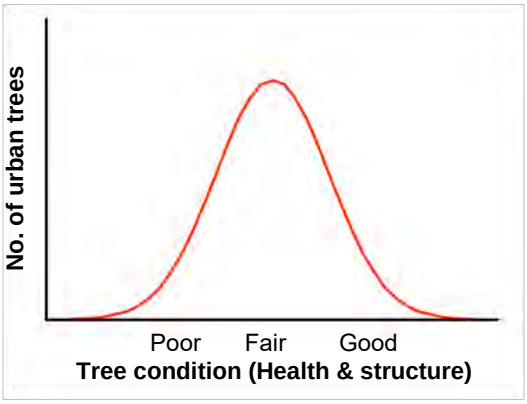


Diagram 1: Indicative normal distribution curve for tree condition

Diagram 1, provides an indicative distribution curve for tree condition to illustrate that within a normal tree population the majority of specimens are centrally located within the condition range (normal distribution curve). Furthermore, that those individual trees with an assessed condition approaching the outer ends of the spectrum occur less often.

2. Tree Name

Provides botanical name, (genus, species, variety and cultivar) according to accepted international code of taxonomic classification, and common name.

3. Tree Type

Describes the general geographic origin of the species and its type e.g. deciduous or evergreen.

Category	Description
Indigenous	Occurs naturally in the area or region of the subject site. Remnant.
Victorian native	Occurs naturally within some part of the State of Victoria (not exclusively) but is not indigenous (component of EVC benchmark). Could be planted indigenous trees.
Australian native	Occurs naturally within Australia but is not a Victorian native or indigenous
Exotic deciduous	Occurs outside of Australia and typically sheds its leaves during winter
Exotic evergreen	Occurs outside of Australia and typically holds its leaves all year round
Exotic conifer	Occurs outside of Australia and is classified as a gymnosperm
Native conifer	Occurs naturally within Australia and is classified as a gymnosperm
Native Palm	Occurs naturally within Australia. Woody monocotyledon
Exotic Palm	Occurs outside of Australia. Woody monocotyledon

4. Height and Width

Indicates height and width of the individual tree; dimensions are expressed in metres. Crown heights are measured with a height meter where possible. Due to the topography of some sites and/or the density of vegetation it may not be possible to do this for every tree. Tree heights may be estimated in line with previous height meter readings in conjunction with assessor's experience. Crown widths are generally paced (estimated) at the widest axis or can be measured on two axes and averaged. In some instances the crown width can be measured on the four cardinal direction points (North, South, East and West).

Crown height, crown spread are generally recorded to the nearest half metre (crown spread would be rounded up) for dimensions up to 10 m and the nearest whole metre for dimensions over 10 m. Estimated dimensions (e.g. for off-site or otherwise inaccessible trees where accurate data cannot be recovered) shall be clearly identified in the assessment data.

5. Trunk diameters

The position where trunk diameters are captured may vary dependent on the requirements of the specific assessment and an individual trees specific characteristics. DBH is the typical trunk diameter captured as it relates to the allocation of tree protection distances. The basal trunk diameter assists in the allocation of a structural root zone. Some municipalities require trunk diameters be captured at different heights, with 1.0 m above grade being a common requirement. The specific planning schemes will be checked to ascertain requirements.

Stem diameters shall be recorded in centimetres, rounded to the nearest 1 cm (0.01 m).

Diameter at Breast Height (DBH)

Indicates the trunk diameter (expressed in centimetres) of an individual tree measured at 1.4m above the existing ground level or where otherwise indicated, multiple leaders are measured individually. Plants with multiple leader habit may be measured at the base. The range of methods to suit particular trunk shapes, configurations and site conditions can be seen in Appendix A of Australian Standard *AS 4970-2009 Protection of trees on development site*s. Measurements undertaken using foresters tape or builders tape.

Basal trunk diameter

The basal dimension is the trunk diameter measured at the base of the trunk or main stem(s) immediately above the root buttress. Used to ascertain the Structural Root Zone (SRZ) as outlined in AS4970.

6. Age class

Relates to the physiological stage of the tree's life cycle.

Category	Description
Young	Sapling tree and/or recently planted. Approximately 5 or less years in location.
Semi-mature	Tree increasing in size and yet to achieve expected size in situation. Primary developmental stage.
Early-mature	Tree established, generally growing vigorously. > 50% of attainable age/size.
Mature	Specimen approaching expected size in situation, with reduced incremental growth.
Over-mature	Mature full-size with a retrenching crown. Tree is senescent and in decline. Significant decay generally present.

7. Health

Assesses various attributes to describe the overall health and vigour of the tree.

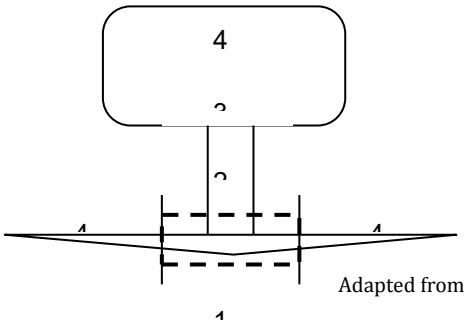
Health Category	Vigour, Extension growth	Decline symptoms, Deadwood, Dieback	Foliage density, colour, size, intactness	Pests and or disease
Good	Above typical. Excellent. Full canopy density	Negligible	Better than typical	Negligible
Fair	Typical vigour. >80% canopy density	Minor or expected. Little or no dead wood	Typical. Minor deficiencies or defects could be present.	Minor, within damage thresholds
Fair to Poor	Below typical - low vigour	More than typical. Small sub-branch dieback	Exhibiting deficiencies. Could be thinning, or smaller	Exceeds damage thresholds
Poor	Minimal - declining	Excessive, large and/or prominent amount & size of dead wood	Exhibiting severe deficiencies. Thinning foliage, generally smaller or deformed	Extreme and contributing to decline
Dead	N/A	N/A	N/A	N/A

8. Structure

Assesses principal components of tree structure (Diagram 2).
Structure ratings will also take into account general branching architecture, stem taper, live crown ratio, crown symmetry (bias or lean) and crown position such as tree being suppressed amongst more dominant trees.

Diagram 2: Tree structure zones

1. Root plate & lower stem
2. Trunk
3. Primary branch support
4. Outer crown & roots



Adapted from Coder (1996)

The lowest or worst descriptor assigned to the tree in any column could generally be the overall rating assigned to the tree. The assessment for structure is limited to observations of external and above ground tree parts. It does not include any exploratory assessment of underground or internal tree parts unless this is requested as part of the investigation. Trees are assessed and then given a rating for a point in time. Generally, trees with a poor or very poor structure are beyond the benefit of practical arboricultural treatments.

The management of trees in the urban environment requires appropriate arboricultural input and consideration of risk. Risk potential will take into account the combination of likelihood of failure and impact, including the perceived importance of the target(s). See table over page.

Structure Category	Zone 1 - Root plate & lower stem	Zone 2 - Trunk	Zone 3 - Primary branch support	Zone 4 - Outer crown and roots
Good	No obvious damage, disease or decay; obvious basal flare / stable in ground	No obvious damage, disease or decay; well tapered	Well formed, attached, spaced and tapered. No history of failure.	No obvious damage, disease, decay or structural defect. No history of failure.
Fair	Minor damage or decay. Basal flare present.	Minor damage or decay	Generally well attached, spaced and tapered branches. Minor structural deficiencies may be present or developing. No history of branch failure.	Minor damage, disease or decay; minor branch end-weight or over-extension. No history of branch failure.
Fair to Poor	Moderate damage or decay; minimal basal flare.	Moderate damage or decay; approaching recognised thresholds	Weak, decayed or with acute branch attachments; previous branch failure evidence.	Moderate damage, disease or decay; moderate branch end-weight or over-extension. Minor branch failure evident.
Poor	Major damage, disease or decay; fungal fruiting bodies present. Excessive lean placing pressure on root plate	Major damage, disease or decay; exceeds recognised thresholds; fungal fruiting bodies present. Acute lean. Stump re-sprout	Decayed, cavities or has acute branch attachments with included bark; excessive compression flaring; failure likely. Evidence of major branch failure.	Major damage, disease or decay; fungal fruiting bodies present; major branch end-weight or over-extension. Branch failure evident.
Very Poor	Excessive damage, disease or decay; unstable / loose in ground; altered exposure; failure probable	Excessive damage, disease or decay; cavities. Excessive lean. Stump re-sprout	Decayed, cavities or branch attachments with active split; failure imminent. History of major branch failure.	Excessive damage, disease or decay; excessive branch end-weight or over-extension. History of branch failure.

Useful life expectancy

Assessment of useful life expectancy provides an indication of health and tree appropriateness and involves an estimate of how long a tree is likely to remain in the landscape based on species, stage of life (cycle), health, amenity, environmental services contribution, conflicts with adjacent infrastructure and risk to the community. It would enable tree managers to develop long-term plans for the eventual removal and replacement of existing trees in the public realm. It is not a measure of the biological life of the tree within the natural range of the species. It is more a measure of the health status and the trees positive contribution to the urban landscape.

Within an urban landscape context, particularly in relation to street trees, it could be considered a point where the costs to maintain the asset (tree) outweigh the benefits the tree is returning.

The assessment is based on the site conditions not being significantly altered and that any prescribed maintenance works are carried out (site conditions are presumed to remain relatively constant and the tree would be maintained under scheduled maintenance programs). See table over page.

Useful Life Expectancy category	Typical characteristics
<1 year (No remaining ULE)	Tree may be dead or mostly dead. Tree may exhibit major structural faults. Tree may be an imminent failure hazard. Excessive infrastructure damage with high risk potential that cannot be remedied.
1-5 years (Transitory, Brief)	Tree is exhibiting severe chronic decline. Crown is likely to be less than 50% typical density. Crown may be mostly epicormic growth. Dieback of large limbs is common (large deadwood may have been pruned out). Tree may be over-mature and senescing. Infrastructure conflicts with heightened risk potential. Tree has outgrown site constraints.
6-10 years (Short)	Tree is exhibiting chronic decline. Crown density will be less than typical and epicormic growth is likely to present. The crown may still be mostly entire, but some dieback is likely to be evident. Dieback may include large limbs. Over-mature and senescing or early decline symptoms in short-lived species. Early infrastructure conflicts with potential to increase regardless of management inputs.
11-20 years (Moderate)	Tree not showing symptoms of chronic decline, but growth characteristics are likely to be reduced (bud development, extension growth etc.). Tree may be over-mature and beginning to senesce. Potential for infrastructure conflicts regardless of management inputs.
21-40 years (Moderately long)	Trees displaying normal growth characteristics but vigour is likely to be reduced (bud development, extension growth etc.). Tree may be growing in restricted environment (e.g. streetscapes) or may be in late maturity. Semi-mature and mature trees exhibiting normal growth characteristics. Juvenile trees in streetscapes.
>40 years (Long)	Generally juvenile and semi-mature trees exhibiting normal growth characteristics within adequate spaces to sustain growth, such as in parks or open space. Could also pertain to maturing, long-lived trees. Tree well suited to the site with negligible potential for infrastructure conflicts.

Note that ULE may change for a tree dependent on the prevailing climatic conditions, which can either increase or decrease, or sudden changes to a tree's growing environment creating an acute stress.

The ULE may not be applicable for trees that are manipulated, such as topiary, or grown for specific horticultural purposes, such as fruit trees.

There may be instances where remedial tree maintenance could be extend a tree's ULE.

9. Arboricultural Rating

Relates to the combination of tree condition factors, including health and structure (arboricultural merit), and also conveys an amenity value. Amenity relates to the trees biological, functional and aesthetic characteristics (Hitchmough 1994) within an urban landscape context. The presence of any serious disease or tree-related hazards that would impact risk potential are taken into account. See table over page.

Arboricultural rating Category	Description
High	Tree of high quality in good to fair condition; good vigour. Generally a prominent arboricultural/landscape feature. Particularly good example of the species; rare or uncommon. Tree may have significant conservation or other cultural value. These trees have the potential to be a medium- to long-term components of the landscape (moderately long to long ULE) if managed appropriately. Retention of these trees is highly desirable.
Moderate	*General* - Tree of moderate quality, in fair or better condition. Tree may have a condition, and or structural problem that will respond to arboricultural treatment. These trees have the potential to be a moderate- to long-term component of the landscape (moderate to long ULE) if managed appropriately. Retention of these trees is generally desirable. The following sub-categories relate predominately to age and size and amenity.
	A. Moderate to large, maturing tree. Contributes to the landscape character. Tree may have conservation or other cultural value.
	B. Moderate sized, established tree, > 50% of attainable age/size. Contributes to the landscape character.
	C. Small and/or semi-mature tree, established, >5 years in the location. May not be a dominant canopy. No special qualities.
Low	Unremarkable tree of low quality or little amenity value. Tree in either poor health or with poor structure or a combination. Short to transitory useful life expectancy. Tree is not significant because of either its size or age, such as young trees with a stem diameter below 15 cm. Trees regularly pruned to restrict size. These trees are easily replaceable. Tree (species) is functionally inappropriate to specific location and would be expected to be problematic if retained. Retention of such trees may be considered if not requiring a disproportionate expenditure of resources for a tree in its condition and location.
None	Trees of low quality with an estimated remaining life expectancy of less than 5 years. Tree has either a severe structural defect or health problem or combination that cannot be sustained with practical arboricultural techniques and the loss of the tree would be expected in the short term. Trees that are dead or are showing signs of significant, immediate, and irreversible overall decline. Tree infected with pathogens of significance to either the health or safety of the tree or other adjacent trees. Tree whose retention would not be viable after the removal of adjacent trees (includes trees that have developed in close spaced groups and would not be expected to acclimatise to severe alterations to surrounding environment – removal of adjacent shelter trees). Tree has a detrimental effect on the environment, for example, the tree is a recognised environmental woody weed with potential to spread into waterways or natural areas. Unremarkable tree of no material landscape, conservation or other cultural value.

Trees have many values, not all of which are considered when an arboricultural assessment is undertaken. However, individual trees or tree group features may be considered important community resources because of unique or noteworthy characteristics or values other than their age, dimensions, health or structural condition. Recognition of one or more of the following criterion is designed to highlight other considerations that may influence the future management of such trees.

Significance	Description
Horticultural Value/ Rarity	Outstanding horticultural or genetic value; could be an important source of propagating stock, including specimens that are particularly resistant to disease or exposure. Any tree of a species or variety that is rare.
Historic, Aboriginal Cultural or Heritage Value	Tree could have value as a remnant of a particular important historical period or a remnant of a site or activity no longer in action. Tree has a recognised association with historic aboriginal activities, including scar trees. Tree commemorates a particular occasion, including plantings by notable people, or having associations with an important event in local history.
Ecological Value	Tree could have value as habitat for indigenous wildlife, including providing breeding, foraging or roosting habitat, or is a component of a wildlife reserve. Remnant Indigenous vegetation that contribute to biological diversity

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13 Appendix 4: Tree protection zones.

Introduction

In order to sustain trees on a development site consideration must be given to the establishment of tree protection zones.

The physical dimensions of tree protection zones can sometimes be difficult to define. The projection of a tree's crown can provide a guide but is by no means the definitive measure. The unpredictable nature of roots and their growth, differences between species and their tolerances, and observable and hidden changes to the trees growing environment, as a result of development, are variables that must be considered.

Most vigorous, broad canopied trees survive well if the area within the drip-line of the canopy is protected. Fine root density is usually greater beneath the canopy than beyond (Gilman, 1997). If few to no roots over 3cm in diameter are encountered and severed during excavation the tree will probably tolerate the impact and root loss. A healthy tree can sustain a loss of between 30% and 50% of absorbing roots (Harris, Clark, Matheny, 1999), however encroachment into the structural root system of a tree may be problematic.

The structural root system of a tree is responsible for ensuring the stability of the entire tree structure in the ground. A tree could not sustain loss of structural root system and be expected to survive let alone stand up to average annual wind loads upon the crown.

Allocation of tree protection zone (TPZ)

The method of allocating a TPZ to a particular tree will be influenced by site factors, the tree species, its age and developed form.

Once it has been established, through an arboricultural assessment, which trees and tree groups are to be retained, the next step will require careful management through the development process to minimise any impacts on the designated trees. The successful retention of trees on any particular site will require the commitment and understanding of all parties involved in the development process. The most important activity, after determining the trees that will be retained is the implementation of a TPZ.

The intention of tree protection zones is to:

- mitigate tree hazards;
- provide adequate root space to sustain the health and aesthetics of the tree into the future;
- minimise changes to the trees growing environment, which is particularly important for mature specimens;
- minimise physical damage to the root system, canopy and trunk; and
- define the physical alignment of the tree protection fencing

Tree protection

The most important consideration for the successful retention of trees is to allow appropriate above and below ground space for the trees to continue to grow. This requires the allocation of tree protection zones for retained trees.

The Australian Standard AS 4970-2009 Protection of trees on development sites has been used as a guide in the allocation of TPZs for the assessed trees.

The TPZ for individual trees is calculated based on trunk (stem) diameter (DBH), measured at 1.4 metres up from ground level. The radius of the TPZ is calculated by multiplying the trees DBH by 12. The method provides a TPZ that addresses both the stability and growing requirements of a tree. TPZ distances are measured as a radius from the centre of the trunk at (or near) ground level. The minimum TPZ should be no less than 2m and the maximum no more than 15m radius. The TPZ of palms should be not less than 1.0m outside the crown projection.

Encroachment into the TPZ is permissible under certain circumstances though is dependent on both site conditions and tree characteristics. Minor encroachment, up to 10% of the TPZ, is generally permissible provided encroachment is compensated for by recruitment of an equal area contiguous with the TPZ. Examples are provided in Diagram 1. Encroachment greater than 10% is considered major encroachment under AS4970-2009 and is only permissible if it can be demonstrated that after such encroachment the tree would remain viable.

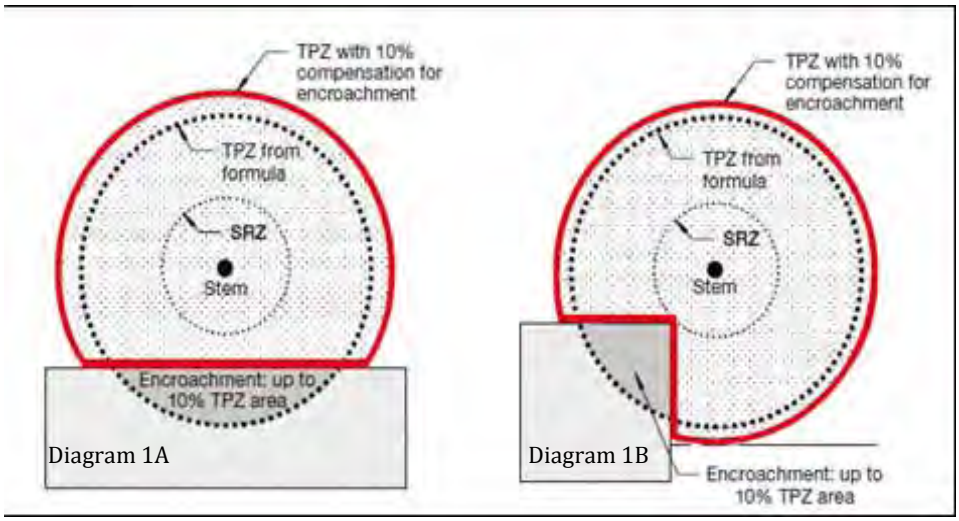


Diagram 1: Examples of minor encroachment into a TPZ.

(Extract from: AS4970-2009, Appendix D, p30 of 32)

The 10% encroachment on one side equates to approximately ⅓ radial distance. Tree root growth is opportunistic and occurs where the essentials to life (primarily air and water) are present. Heterogeneous soil conditions, existing barriers, hard surfaces and buildings may have inhibited the development of a symmetrically radiating root system.

Existing infrastructure around some trees may be within the TPZ or root plate radius. The roots of some trees may have grown in response to the site conditions and therefore if existing hard surfaces and building alignments are utilised in new designs the impacts on the trees should be minimal. The most reliable way to estimate root disturbance is to find out where the roots are in relation to the demolition, excavation or construction works that will take place (Matheny & Clark, 1998). Exploratory excavation prior to commencement of construction can help establish the extent of the root system and where it may be appropriate to excavate or build.

The TPZ should also give consideration to the canopy and overall form of the tree. If the canopy requires severe pruning in order to accommodate a building and in the process the form of the tree is diminished it may be worthwhile considering altering the design or removing the tree.

General tree protection guidelines

The most important factors are:

- Prior to construction works the trees nominated for tree works should be pruned to remove larger dead wood. Pruning works may also identify other tree hazards that require remedial works.
- Installation of tree protection fencing. Once the tree protection zones have been determined the next step is to mulch the zone with woodchip and erect tree protection fencing. This must be completed prior to any materials being brought on-site, erection of temporary site facilities or demolition/earth works. The protection fencing must be sturdy and withstand winds and construction impacts. The protection fence should only be moved with approval of the site supervisor. Other root zone protection methods can be incorporated if the TPZ area needs to be traversed.
- Appropriate signage is to be fixed to the fencing to alert people as to importance of the tree protection zone.
- The importance of tree preservation must be communicated to all relevant parties involved with the site.
- Inspection of trees during excavation works.

Exploratory excavation

The most reliable way to estimate root disturbance is to find out where the roots are in relation to the demolition, excavation or construction works that will take place (Matheny & Clark, 1998).

Exploratory excavation prior to commencement of construction can help establish the extent of the root system and where it may be appropriate to excavate or build. This also allows management decisions to be made and allows time for redesign works if required.

Any exploratory excavation within the allocated TPZ is to be undertaken with due care of the roots. Minor exploration is possible with hand tools. More extensive exploration may require the use of high pressure water or air excavation techniques. Either hydraulic or pneumatic excavation techniques will safely expose tree roots; both have specific benefits dependent on the situation and soil type. An arborist is to be consulted on which system is best suited for the site conditions.

Substantial roots are to be exposed and left intact.

Once roots are exposed decisions can be made regarding the management of the tree. Decisions will be dependent on the tree species, its condition, its age, its relative tolerance to root loss, and the amount of root system exposed and requiring pruning.

Other alternative measures to encroaching the TPZ may include boring or tunnelling.

How to determine the diameter of a substantial root

The size of a substantial root will vary according to the distance of the exposed root to the trunk of the tree. The further away from the trunk of a tree that a root is, the less significant the root is likely to be to the tree's health and stability.

The determination of what is a substantial root is often difficult because the form, depth and spread of roots will vary between species and sites. However, because smaller roots are connected to larger roots in a framework, there can be no doubt that if larger roots are severed, the smaller roots attached to them will die. Therefore, the larger the root, the more significant it may be.

Gilman (1997) suggests that trees may contain 4-11 major lateral roots and that the five largest lateral roots account (act as a conduit) for 75% of the total root system.

These large lateral roots quickly taper within a distance to the tree, this distance is identified as the Structural Root Zone (SRZ). Within the SRZ distance, all roots and the soil surrounding the roots are deemed significant.

No root or soil disturbance is permitted within the SRZ.
In the area outside the SRZ the tree may tolerate the loss of one or a number of roots. The table below indicates the size of tree roots, outside the SRZ that would be deemed substantial for various tree heights. The assessment of combined root loss within the TPZ would need to be undertaken by an arborist on an individual basis because the location of the tree, its condition and environment would need to be assessed.

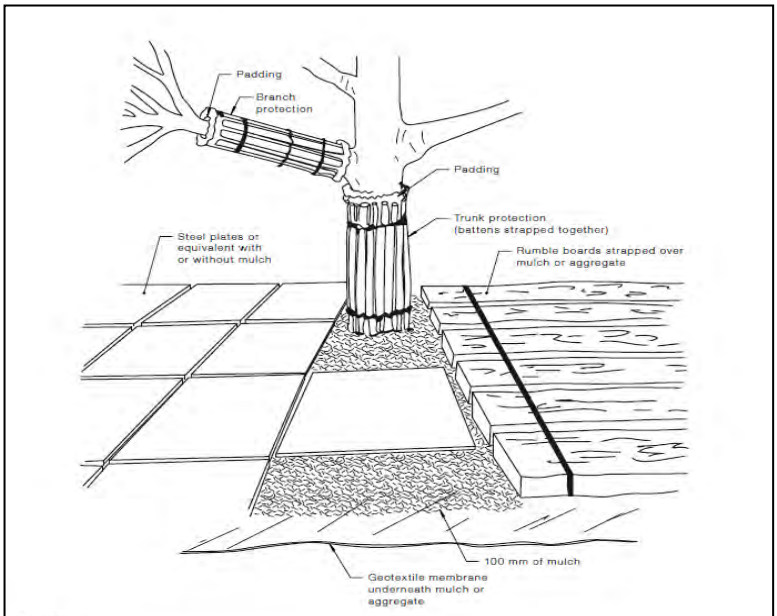
Table 1: Estimated significant root sizes outside SRZ

Height of tree	Diameter of root
Less than 5m	≥ 30mm
Between 5m - 15m	≥ 50mm
More than 15m	≥ 70mm

Ground buffering

Where works are required to be undertaken within the Tree root zone without penetration of the surface, ground buffering and trunk and limb protection must be provided to minimise the potential for soil to become compacted and avoid potential for impact wounds to occur to surface roots, trunk or limbs. Refer below.

Diagram 2: Examples of ground buffering and trunk and limb protection.



NOTES:
1 For trunk and branch protection use boards and padding that will prevent damage to bark. Boards are to be strapped to trees, not nailed or screwed.
2 Rumble boards should be of a suitable thickness to prevent soil compaction and root damage.

FIGURE 4 EXAMPLES OF TRUNK, BRANCH AND GROUND PROTECTION

(Extract from: AS4970-2009, Appendix D, pg17)

14 Construction Guidelines

The following are guidelines that must be implemented to minimise the impact of the proposed construction works on the retained trees.

- The Tree Protection Zone (TPZ) is fenced and clearly marked at all times. The actual fence specifications should be a minimum of 1.2 - 1.5 metres of chain mesh or like fence with 1.8 meter posts (e.g. treated pine or star pickets) or like support every 3-4 metres and a top line of high visibility plastic hazard tape. The posts should be strong enough to sustain knocks from on site excavation equipment. This fence will deter the placement of building materials, entry of heavy equipment and vehicles and also the entry of workers and/or the public into the TPZ. Note: There are many different variations on the construction type and material used for TPZ fences, suffice to say that the fence should satisfy the responsible authority.
- Contractors and site workers should receive written and verbal instruction as to the importance of tree protection and preservation within the site. Successful tree preservation occurs when there is a commitment from all relevant parties involved in designing, constructing and managing a development project. Members of the project team need to interact with each other to minimise the impacts to the trees, either through design decisions or construction practices. The importance of tree preservation must be communicated to all relevant parties involved with the site.
- The consultant arborist is on-site to supervise excavation works around the existing trees where the TPZ will be encroached.
- A layer of organic mulch (woodchips) to a depth of no more than 100mm should be placed over the root systems within the TPZ of trees, which are to be retained so as to assist with moisture retention and to reduce the impact of compaction.
- No persons, vehicles or machinery to enter the TPZ without the consent of the consulting arborist or site manager.
- Where machinery is required to operate inside the TPZ it must be a small skid drive machine (i.e Dingo or similar) operating only forwards and backwards in a radial direction facing the tree trunk and not altering direction whilst inside the TPZ to avoid damaging, compacting or scuffing the roots.
- Any underground service installations within the allocated TPZ should be bored and utility authorities should common trench where possible.
- No fuel, oil dumps or chemicals shall be allowed in or stored on the TPZ and the servicing and re-fuelling of equipment and vehicles should be carried out away from the root zones.
- No storage of material, equipment or temporary building should take place over the root zone of any tree.
- Nothing whatsoever should be attached to any tree including temporary services wires, nails, screws or any other fixing device.
- Supplementary watering should be provided to all trees through any dry periods during and after the construction process. Proper watering is the most important maintenance task in terms of successfully retaining the designated trees. The areas under the canopy drip lines should be mulched with woodchip to a depth of no more than 100mm. The mulch will help maintain soil moisture levels. Testing with a soil probe in a number of locations around the tree will help ascertain soil moisture levels and requirements to irrigate. Water needs to be applied slowly to avoid runoff. A daily watering with 5 litres of water for every 30 mm of trunk calliper may provide the most even soil moisture level for roots (Watson & Himelick, 1997), however light frequent irrigations should be avoided. Irrigation

should wet the entire root zone and be allowed to dry out prior to another application. Watering should continue from October until April.

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15 Disclaimer

Tree Logic Pty. Ltd.
Unit 4, 21 Eugene Terrace
Ringwood Vic 3134

RE: Arboricultural Consultancy

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- Tree Logic assumes that any property or project is not in violation of any applicable codes, ordinances, statutes or other local, state or federal government regulations.
- Tree Logic shall take care to obtain all information from reliable sources. All data shall be verified insofar as possible; however Tree Logic can neither guarantee nor be responsible for the accuracy of the information provided by others not directly under Tree Logic's control.
- No Tree Logic employee or contractor shall be required to give testimony or to attend court by reason of the Report unless subpoenaed or subsequent contractual arrangements are made, including payment of an additional fee for such services.
- Loss of the report or alteration of any part of the report not undertaken by Tree Logic invalidates the entire Report and shall not be relied upon by any party.
- The Report and any values expressed therein represent the opinion of Tree Logic's consultant and Tree Logic's fee is in no way conditional upon the reporting of a specified value, a stipulated result, the occurrence of a subsequent event, nor upon any finding to be reported.
- Sketches, diagrams, graphs and photographs used in the Report, being intended as visual aids, are not necessarily to scale and should not be construed as engineering or architectural drawings, reports or surveys.
- Unless expressed otherwise: i) Information contained in the Report will cover those items that were outlined in the project brief or that were examined during the assessment and reflect the condition of those items at the time of inspection; and ii) The inspection is limited to visual examination of accessible components without dissection, excavation or probing unless otherwise stipulated.
- There is no warranty or guarantee, expressed or implied by Tree Logic, that the problems or deficiencies of the plants or site in question may not arise in the future.
- All instructions (verbal or written) that define the scope of the Report have been included in the Report and all documents and other materials that the Tree Logic consultant has been instructed to consider or to take into account in preparing the Report have been included or listed within the Report.
- The Report is strictly limited to the matters stated in it and does not apply by implication to any other matters.
- To the writer's knowledge all facts, matter and all assumptions upon which the Report proceeds have been stated within the body of the report and all opinion contained within the report will be fully researched and referenced and any such opinion not duly researched is based upon the writer's experience and observations.

WOOD & GRIEVE ENGINEERS
NOW PART OF
Stantec

ENQUIRIES: CORMAC KELLY
PROJECT NO: 38195

11 March 2020

Development Victoria
Level 9, 8 Exhibition Street,
Melbourne VIC 3000

Attention: Tim Miller

RE: DEVELOPMENT PLAN ESD STRATEGY:- 15-29 COOMOORA ROAD, SPRINGVALE SOUTH

Tim,

This document has been prepared at the request of Development Victoria to identify the Environmentally Sustainable Design (ESD) elements that are to be considered for inclusion with the proposed development at 15-29 Coomoora Road, Springvale South.

As per DPO13, the proposed development will incorporate environmentally sustainable practices and best practice water sensitive design principles such as energy and water conservation, passive solar design, waste minimisation, vegetation retention, the promotion of alternative transport options and other innovative practices.

As design progresses, the project will ensure that requirements outlined in Clause 22.06 (Environmentally Sustainable Development) of the Greater Dandenong Planning Scheme are adhered to.

Discussion points obtained within this report have been based on our review of the design documentation to date and subsequent discussions with relevant design team members.

To us, it's more than just work

Level 22, 570 Bourke Street, Melbourne VIC 3000
Phone +61 3 8554 7000 Fax +61 3 8554 7100 Email melbourne@wge.com.au **www.wge.com.au**
Wood & Grieve Engineers Limited ACN 137 999 609 trading as Wood & Grieve Engineers ABN 97 137 999 609
Albany • Brisbane • Busselton • Melbourne • Perth • Sydney

ESD STRATEGIES

Greenhouse Gas Reduction

- The dwellings will all be designed in accordance with the energy efficiency requirements of the BCA.
- In this case, all dwellings will be designed to exceed the minimum 6 star NatHERS performance target.
- Energy efficient lighting selections shall be made incorporating LED installations within all internal areas.
- **Private external spaces** have been allocated to each dwelling allowing the opportunity for natural clothes drying, rather than a reliance on electricity intensive clothes dryers.
- Energy efficient mechanical and air conditioning systems throughout.

Internal Environmental Quality

- The dwellings will have thermally robust facades that improve internal comfort conditions by reducing heat-losses, down-draughts and infiltration associated with this exposed location.
- Significant reduction in noise penetration from external will be delivered to the dwelling occupants through facade design.
- High levels of natural daylight will be prioritised, improving the indoor environmental quality and well-being of the occupants, whilst reducing the consumption demand on artificial lighting.
- Dwelling ventilation is provided to each dwelling via a dedicated and separated kitchen extract fan. This ensures that the dedicated kitchen exhaust is ducted directly to the external façade improving indoor environmental quality.

Potable Water Reduction

- Low flow fixtures and fittings which reduce potable mains water demand for the development includes flow restricting devices on all fixtures:
  - 3 Star WELS rated showerheads (9L/min maximum)
  - 4 Star WELS rated cisterns (6/3L dual-flush)
  - 5 Star WELS rated tap-ware (4.5L minute)
- The use of localised rainwater collection tanks for irrigation; and toilet flushing within each dwelling.
- The project will develop a Water Sensitive Urban Design (WSUD) strategy, inclusive of MUSIC modelling to ensure a Best Practice stormwater management outcome for the site.

WSUD is a framework for managing urban stormwater both as a resource, and in a way that protects receiving aquatic ecosystem (CSIRO, 2005). The main objectives of WSUD include; protecting existing natural features and ecological processes; maintaining the natural hydrologic behaviour of catchments; protecting water quality of surface and ground waters; minimising demand on the natural environment; and integrating water into the landscape to enhance visual, social, cultural and ecological values (eWater, 2010).

Waste

- A site specific waste management plan will be prepared for the incorporation of waste management and recycling facilities into the design of the development.
- The head contractor shall prepare a site specific construction waste management plan (WMP), retain waste records and provide quarterly reports to the building owner.

Material Selection

- Low PVC content or PVC free material will be selected, where possible. Where PVC content is present in materials, the proposed construction has sought materials from suppliers who manufacture products in accordance with Best Practice Guidelines for PVC in the built environment.
- Minimisation of Indoor Air Pollutants through the selection of Low Volatile Organic Compounds (VOC's) materials selections. Paints, adhesives, sealants, carpets and wall coverings have been considered to reduce VOC off-gassing in order to improve the indoor environmental quality of the dwelling.
- Low Formaldehyde composite wood products have been selected to improve the indoor environment quality through reduced off-gassing concentrations emitted at room temperature.
- Uniform Design minimising the waste generated during construction, construction duration and disruption to the road/area. The dwellings have seven main designs. As the elements of the dwellings are constructed in a uniform manner this allows for repeatability, ease of construction on-site and a reduced waste due to the mass production of certain key elements.
- Emissions from the production of insulation materials have the potential to be detrimental to the ozone layer and as a result the impact of these emissions have be reduced through the selection of pipework insulation products with zero ODP ratings.

Ecology

- The site is a brownfield site development (repurposing an existing site), thus minimising the environmental impact of a greenfield development.
- Hazardous materials – During construction stage works, should it be determined the land is contaminated, appropriate procedures will be taken to safely treat the land.
- A large number of existing significant native trees are to be retained on site, maintaining natural habitat.
- Diverse planting of endemic and native species within public open space and streetscapes will increase biodiversity, attracting birds and supporting pollinators.

We trust the above information suitably identifies the key sustainability outcomes associated with the proposed development.

Yours faithfully

Cormac Kelly
for **Wood & Grieve Engineers now part of Stantec**

WOOD & GRIEVE ENGINEERS

Springvale South

Infrastructure Servicing Report

Prepared for:

Tim Miller
Development Victoria

Prepared by:

Justin Zelones
Project No. 38195
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Level 22, 570 Bourke Street, Melbourne VIC 3000
T: (03) 8554 7000 **E:** melbourne@wge.com.au **W:** www.wge.com.au

Date:
07 November 2019

Revision

REVISION	DATE	COMMENT	APPROVED BY
A	20 July 2018	Draft	Justin Zelones
B	23 May 2019	Draft	Justin Zelones
C	29 May 2019	Draft	Justin Zelones
D	30 May 2019	Draft	Justin Zelones
E	31 May 2019	Draft	Justin Zelones
F	**07 November 2019**	**Draft**	**Justin Zelones**

Contents

1. Introduction

Wood & Grieve Engineers (WGE) have been commissioned by Development Victoria (DV) to provide an Infrastructure Servicing Report to support the Development Plan for 15-29 Coomoora Road Springvale South being submitted to the City of Greater Dandenong. The proposed works entail the development of 56 townhouses and 11 land only lots. The delivery of the project will be over four phases consisting of:

- Phase 1 – Master Planning and Development Plan
- Phase 2 – Schematic Design
- Phase 3 – Detailed Design and Documentation
- Phase 4 – Construction Phase

The objective of this report is to support the proposed Development Plan related to the future residential use and development of the above-mentioned land. This report examines the opportunities and constraints of the project to support the Development Plan submission to council.

To identify opportunities and constraints WGE's investigation has involved the following tasks:

- Review of City of Greater Dandenong requirements including Schedule 13 to the Development Plan Overlay of the Greater Dandenong Planning Scheme (included in Appendix A)
- Review of existing services and liaison with service authorities
- Review site survey and existing conditions
- Review previously completed technical documents provided in the RFP.

In addition to the opportunities and constraints our Master Planning and Development Plan Report includes the following deliverables:

- Summary of main development characteristics
- Base design approach
- Concept servicing strategy
- Summary of statutory requirements and civil engineering approvals
- Summary of consultation with authorities
- Civil concept drawings based on the Masterplan Layout dated October 2019
- Stormwater Management Plan
- Preliminary Risk Management Report

2. Site Characteristics

2.1 Location

The site is located within the City of Greater Dandenong (CGD) in the suburb of Springvale South on Coomoora Road. The site is bound to the north and west by existing housing, to the east by Keysborough Primary School and to the south by Coomoora Road. A summary of the site location details is provided in Table 1 below.

Site Address	15-29 Coomoora Road, Springvale South
Latitude & Longitude	-37.982417, 145.151120
Lot & Plan Number	Lot 1 PS647548
Local Authority	City of Greater Dandenong
Directory Ref	88 K6

Table 1 – Site Location Details

2.2 Topography

The site has been surveyed and gently grades from the north east corner to the south west. The high point is at 23.75 and the low point is at 20.55. There are several earth mounds within the site. The topography of the site is shown in the Existing Conditions Plan included in Appendix B.

2.3 Key Characteristics

The site is currently mostly vegetated with grass and a large number of mature trees. The trees have been inspected by an Arborist and a report on the type and condition of the tree has been completed. The Arborist report is included in Appendix C. An aspiration of the project is to maintain all trees classed as High or Moderate A value.

A geotechnical investigation has been performed (refer Appendix D). The geotechnical report has identified the soil strata as a silty sand fill overlying naturally occurring silty sand clay.

There is a small road that runs through the site connecting to Coomoora Road at the south east corner of the site. The road will be removed as part of the development works.

Both sewer and stormwater drainage easements exist on the site and will need to be addressed as part of the development layout and/or by engineering design.

2.4 Existing Conditions

2.4.1 Sewer

An assessment of the existing sewer assets was undertaken using DBYD information and Preliminary Servicing Advice provided by South East Water (SEW) which is provided in Appendix E. There are existing sewer assets along the northern, western and southern boundaries of the site.

2.4.2 Water

An assessment of the existing water services was undertaken using DBYD information and Preliminary Servicing Advice from SEW (refer Appendix E). There are existing 150mm diameter reticulation mains in Coomoora Road, Northgate Drive and Gwent Street with a 150mm diameter spur along Teddy Crescent.

2.4.3 Power

An overall investigation around this site was carried out and shows an existing overhead high voltage (HV) and low voltage (LV) network along Coomoora Rd and an existing overhead LV network along Northgate Drive. There are no electrical services within or provided to this site.

2.4.4 Communications

An analysis of NBN's roll out map, Telstra and NBN DBYD plans have been conducted in order to determine the location of the existing NBN network to service the development. The nearest existing NBN network is located on the southern side of Coomoora Rd and the western side of Northgate. It was also noted that there is existing Telstra infrastructure which traverses the southern section of the development along Coomoora Rd which may need to be relocated back into the communications corridor. In addition, there also appears to be a small section of Telstra infrastructure within the site along the eastern lot boundary that will require removal to facilitate development.

2.4.5 Gas

The existing gas network at the site runs along Coomoora Road and along Teddy Crescent. There is an existing valve and gas connectors off Coomoora Road. The existing pipe work on site would need to be diverted as it would interfere with the current concept master plan.

2.4.6 Stormwater

There are a number of CGD assets located within and in close proximity to the site. The assets that are currently within the site connect to the CGD drainage network on Coomoora Road. These drainage assets also provide drainage to the existing school site upstream of the site. The drainage assets will need to be relocated based on the current concept masterplan or the masterplan adjusted to maintain the drainage assets in their current location.

A Melbourne Water (MW) culvert falls from north to south underneath Northgate Drive to the west of the site. The culvert then crosses under Coomoora Road and heads south west under the properties on the south side of Coomoora Road. To get more information on this culvert a separate application will need to be made to MW.

3. Development Strategy

The following describes the base engineering design approach to the Concept Masterplan. The base design approach addresses various engineering elements including earthworks, stormwater, roadworks, footpaths and servicing in the context of the site, planning requirements and the Detailed Project Design Brief.

The Concept Masterplan presents delivery of the project via a body corporate arrangement. Our base design strategy has been documented on this delivery model. Where applicable we have noted the impacts of a change in delivery strategy to a strata title outcome.

3.1 Earthworks

The earthworks strategy for the site will be dictated by tree retention, flood levels, maintaining overland stormwater flow paths and tie-in to existing site boundaries.

The Detailed Project Design Brief has indicated that an aspirational goal for the project is to retain all High and Moderate A retention value trees. To achieve this, earthworks levels near the trees should be varied no more than +/- 200mm to give the tree the best chance of survival. The root zones of the trees will also need to be considered with disturbance to these areas minimised.

MW has advised that the south west portion of the site is subject to flood events which have a probability of a 1% occurrence in any one year. Lots near the identified flood area are required to have a minimum pad level of 300mm above the flood level. To meet this requirement lots in the south west corner of the site will need to be raised a minimum of 450mm above the existing surface level.

Lots adjacent existing property boundaries to the north, east and west will need to match levels at these locations. Some flexibility is available to the south given the proposed landscape area adjacent Coomoora Road.

The above strategy identifies design constraints which will need to be addressed during the detailed design process. The flood overlay, stormwater flow path and boundary levels will ultimately dictate site levels. Flexibility will be required regarding tree retention given the non-negotiable nature of the aforementioned earthworks design constraints.

3.2 Stormwater

Melbourne Water provided the following conditions and advice on 4 May 2018:

1. *A stormwater management and drainage strategy must be submitted and approved by Melbourne Water. This strategy must provide details of the outfall/s for the development and calculate the appropriate flow volumes and flood levels for the 100-year ARI storm event and demonstrates how stormwater runoff from the subdivision will achieve State Environment Protection Policy (Waters of Victoria) objectives for environmental management of stormwater.*
2. *Stormwater runoff from the subdivision must achieve State Environment Protection Policy (Waters of Victoria) objectives for environmental management of stormwater as set out in the 'Urban Stormwater Best Practice Environmental Management Guidelines (CSIRO) 1999'.*
3. *Unless otherwise agreed in writing by the relevant drainage authority, the development must retard stormwater back to pre-development levels before entering the downstream drainage system and/or retard stormwater back to the sufficient capacity of the downstream drainage system, whichever is appropriate.*
4. *The development is to make provision for overland flows from the upstream catchment utilising roads and/or reserves.*
5. *Any road or access way intended to act as a stormwater overland flow path must be designed and constructed to comply with the floodway safety criteria as specified by Melbourne Water.*
6. *All new lots are to be filled to a minimum of 300mm above the 1 in 100 year flood levels associated with any existing or proposed Melbourne Water pipeline or to a minimum of 600mm above the 1 in 100 year flood level associated with any existing or proposed Melbourne Water wetland, retarding basin or waterway.*

7. *A separate application direct to Melbourne Water must be made for any new, temporary or modified storm water connection to Melbourne Water's drains or watercourses.*

This site is located within the Edithvale Road Drainage Scheme. No further payment of contributions is required as part of this scheme. Melbourne Water assesses development applications in accordance with our Guidelines for Development in Flood-prone Areas. Under these guidelines, development in or adjacent to a floodplain may only be acceptable where the new development is protected from flooding, has safe access to and around the development and does not interfere with the passage and storage of floodwaters.

Further to this information Melbourne Water also provided the 1% AEP flood levels for the site. The flood levels vary from 0.15m deep at the junction with Teddy Crescent and 0.05m at the current entrance to the site on Coomoora Road.

CGD has designated a single Legal Point of Discharge (LPD) in the south west corner of the site (refer to Appendix E) with a maximum allowable discharge rate for the site to be 189l/s and a minimum storage prior to discharge off-site of 191m^3. To achieve connection to this, point the existing Council drainage assets along the southern side of the site will need to be diverted.

The CGD also have water quality standards that must be met. A Music model assessment was undertaken to ascertain the methods that would be most suited to treating the water. Please see the Storm Water Management Strategy in Appendix F for further detail on the requirements and the results of this assessment.

There is a run of CGD drainage existing in the southern section of the site. This will be diverted as part of the works to ensure that the drainage line is maintained.

The main outcome of this assessment was that rainwater tanks of varying sizes would be required on all lots to achieve the on-site storage requirements. All stormwater treatment will occur at the end of the line, this will be done with a Gross Pollutant Trap (GPT) and a secondary water treatment device.

Figure 1 below shows the potential stormwater designs based upon the concept layout plan received.

As the road network is going to be designed around it being a body corporate development the drainage for this site will be designed to AS3500 Part 3: Stormwater drainage.

As the site is subject to a special building overlay the road network will need to be designed to become the flow path for the flood. The flood path currently enters the site at Teddy Crescent. In the current site plan there is no direct road link between Teddy Crescent and the point the flood waters will discharge from site as there is an area of public open space. This area will require minor earthworks to form a channel to ensure that the flood water will get to the road to the south.

Flood Modelling will be required as part of the design works to ensure that the major flows can be contained within the road system and minor events can be contained in the pit and pipe network. This will be used in the approval process with Melbourne Water.

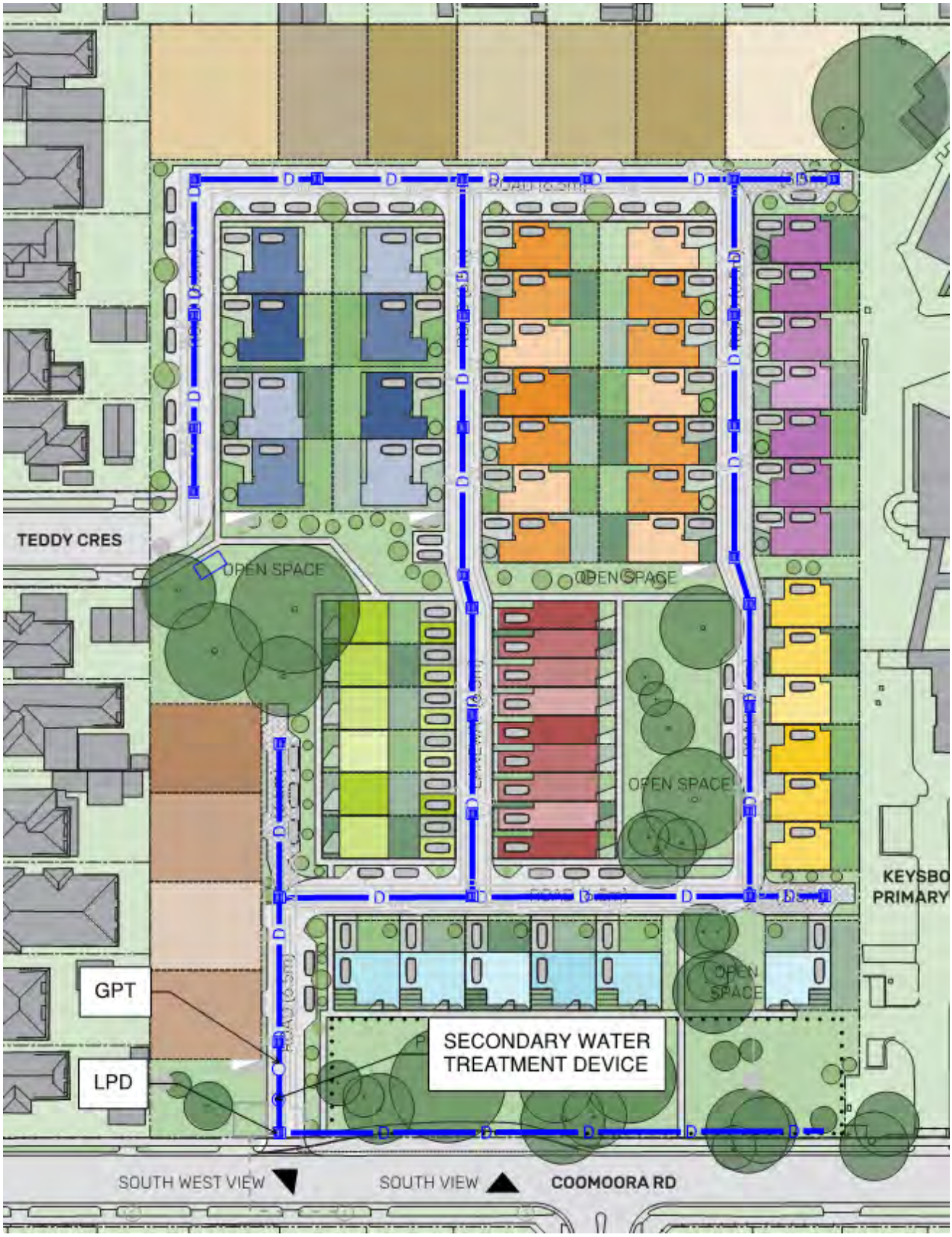


Figure 1: Proposed Drainage Strategy

The design has assumed that the road will be designed with an inverted crown, this will allow for drainage to run down the centre. By doing this it will reduce the service congestion under the footpaths and vegetation strip areas.

Summary

With the current layout plan only, a body corporate set out can be achieved therefore the drainage system will have to comply with AS3500.

Furthermore, a Humeceptor (or approved equivalent) and a GPT will be required at the end of the drainage system prior to discharging to the Council network to ensure the development meets the environmental requirements set out by the Council.

3.3 Servicing

3.3.1 Sewer

SEW was contacted for preliminary servicing advice. The advice from SEW regarding the sewer was to connect to the existing manhole in the south east corner of the site. A total of approximately 67 existing and proposed lots will discharge into the existing 225mm diameter sewer which runs south from this Manhole. This appears to be satisfactory capacity wise.

There are two options available for the design of the sewer reticulation network within the site. These will be designed to different standards. The standards are:

1. WSAA standards
2. AS3500 – this allows for the WSAA standard to be used in its place.

Internally if the WSAA standards are used a 150mm diameter reticulation system will be adequate. If an AS3500 system is required, the minimum grade for a 150mm diameter pipe is 1 in 60. A 150mm diameter sewer with a grade of 1 in 60 will only have capacity for approximately 60 lots. This would require a second connection to the existing main, one to the maintenance hole next to the end of Teddy Crescent, the other to the maintenance hole identified in the south east corner of the site.

The existing sewer easement on the western boundary is proposed to be maintained. This will mean that there will be limits to what is constructed in these areas, including fences.

Figure 2 below shows the initial concept, based on the most recent layout plan.

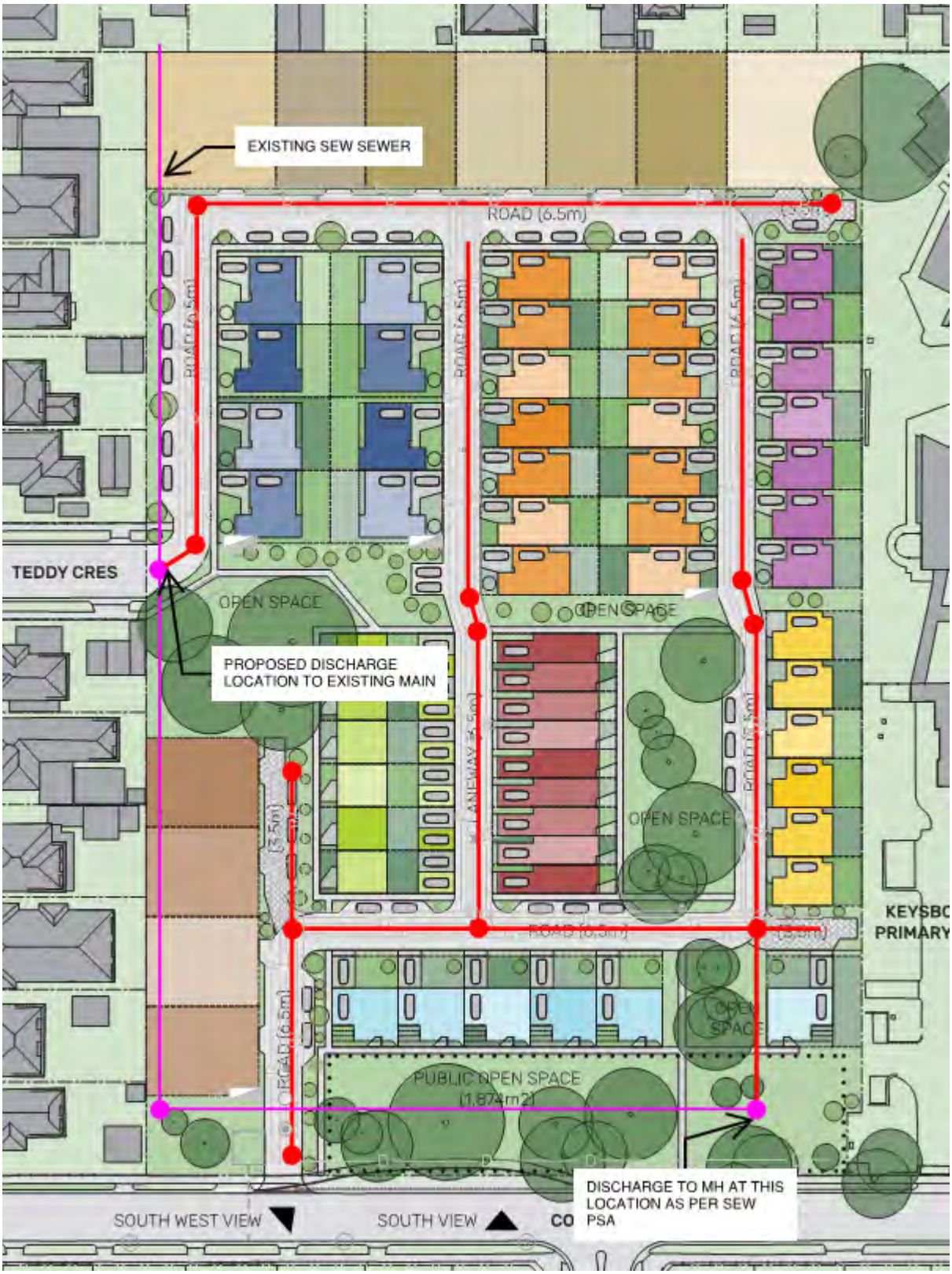


Figure 2: Proposed WSAA sewer layout.

Consideration will have to be given to lots adjacent to the western sewer easement which could impact the design of building slabs.

The sewer along the northern boundary should not be impacted by this layout, although the footings will need to be checked, and the easement for the sewer will need to be maintained through the gardens of the properties.

3.3.2 Water

The preliminary advice from SEW is to connect to the 150mm diameter spur on Teddy Crescent as a single point of connection. It is recommended that a second point of connection on Coomoora Road is considered as this will give greater security of supply and mean that any shutdowns of the network will impact fewer properties.

The design of the water network for a Body Corporate development will involve the following:

- A mains meter will be required at each point of connection to the SEW network (requires approximately 1m x 4m of space), each property will then have an individual check meter.
- The responsibility for the maintenance of the network will be with the body corporate.
- The applications and fees will be provided with a plumbing application.

Figure 3 below shows the initial concept, based on the most recent layout plan, of what a the arrangement for a water network designed to be adopted by a body corporate.

A combined fire and drinking water service would be the preferred option for this development. The advantages of this will be there is only one service to reticulate the site rather than two. Hydrants for firefighting purposes will be required around the site. This is a CFA site and they require there is no point in a building envelope greater than 120m from a hydrant.

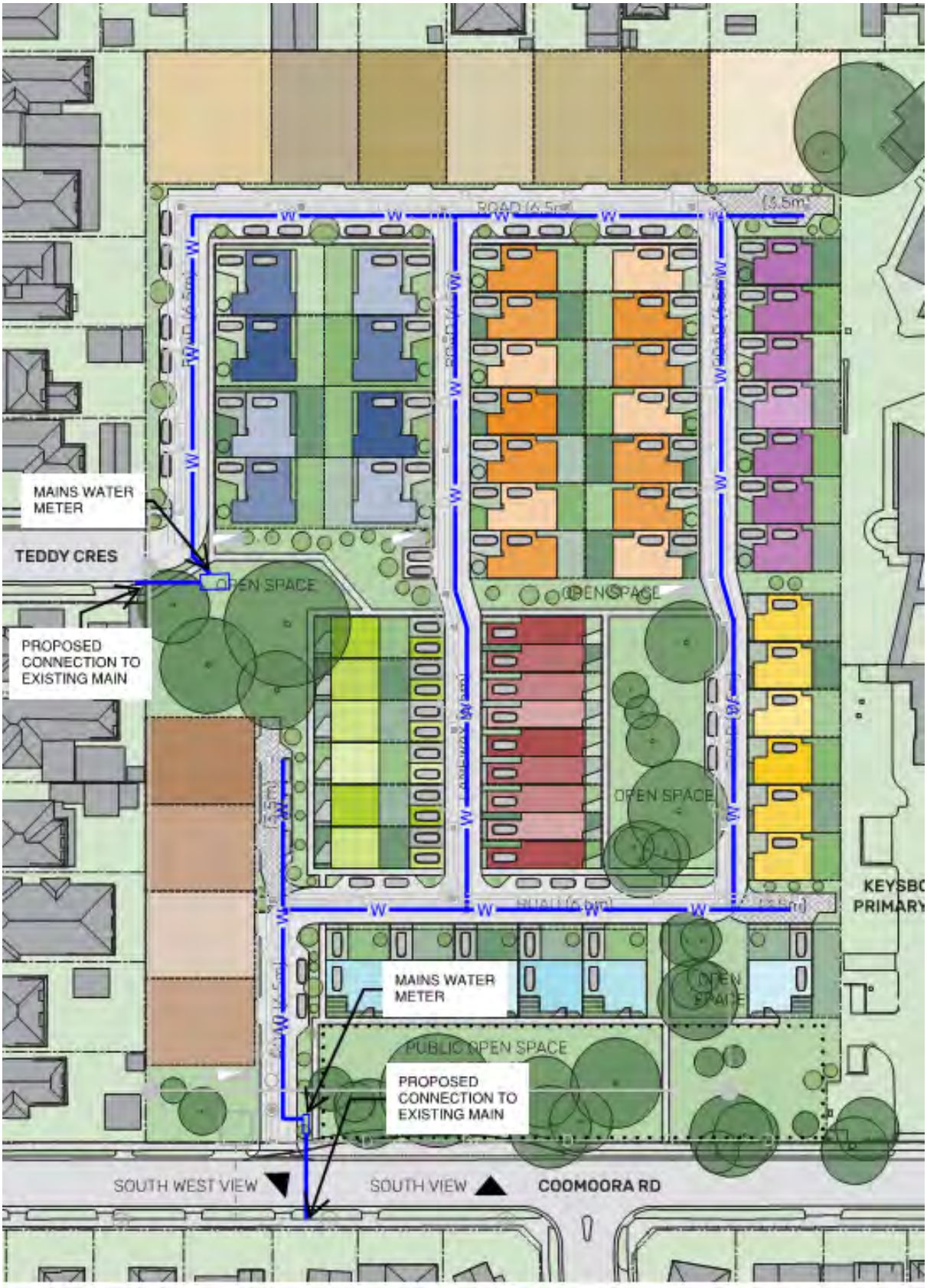


Figure 3: Proposed Water Network arrangement.

3.3.3 Recycled Water

A preliminary servicing advice request was made to SEW. The advice received from SEW did not include recycled water. As there are no recycled water assets in the area there is no requirement to make a connection.

3.3.4 Power

As the road network is going to be designed to be owned by a body corporate the electrical network will have to be an AS3000 network.

The details of the AS 3000 Network are as follows:

- Requirement for an on-site kiosk substation to be confirmed by United Energy. Initial discussions with UE have been undertaken and a substation will likely be required. This will be 6.2m x 6.2m and will be fed from the HV overhead on Coomoora Road.
- We will require a LV point of supply from the United Energy network to the point of supply to the main switch board.
- Metering panel and metering to the 67 allotments are to be managed and maintained by the body corporate.
- Public lighting can be standard council poles and lanterns or non-standard (customised) poles and lanterns if preferred as they are the responsibility and are to be maintained by the body corporate
- The availability of like-for-like non-standard poles and lanterns is high risk and costly due to long term maintenance.
- No United Energy Standards (VESI) or restrictions will be required on the positioning of Underground Electrical and Public lighting services allowing for flexibility to run cables in conduits under the road in areas where there is limited space available under the nature strips.
- NBN/Comms network can run in the same trench with the Underground electrical network, reducing excavation costs.
- The long term, ongoing maintenance, electrical metering, billing and costs are to be the responsibility of the body corporate.
- United Energy's responsibility stops at the point of supply to the main switch board.
- Does not necessarily lock client into a single retailer.

3.3.5 Communications

An application with Telstra will be required to facilitate the relocation and disconnection/removal of this equipment.

The current communications legislation details for developments of greater than 100 dwellings NBN are the Wholesale Provider of Last Resort. Recent amendments to the Communications act have encouraged competition within the wholesale sector; as such the developer has the option to sign up with an alternative provider for a Broadband solution.

Due to these recent amendments to the act, NBN has changed its policy to encourage developers to place applications where the development is less than 100 lots in instances where NBN is in the Vicinity. As this development is 67 lots and within proximity to existing NBN infrastructure it is expected that NBN will take on the development.

Developers are required to install and fund a pit and pipe system to NBN requirements and then transfer ownership of the infrastructure to NBN via the execution of a Master Developer's agreement in exchange for the provision of data infrastructure within that pit and pipe.

A pit and pipe system are extended within the communications corridor inside the development area with communications pits strategically located to enable the connection of two lots from one pit. This pit and pipe system can be designed and installed at the same time as the other services to NBN specifications and handed over to NBN to reticulate their cabling as required.

NBN do not allow pits to be installed within driveways and as such all pits are to be located within the verge inside the communications corridor away from driveway locations.

NBN have recently phased out the installation of above ground Fibre Distribution Hubs (FDH's). New Technology has enabled this equipment to be replaced with an underground system with Fibre Joint Locations (FJL's) installed within the developer provided underground pit system.

Disclaimer

It should be noted that due to the dynamic nature of NBN's network, infrastructure requirements and connection points referred above may differ when applications are placed.

It is encouraged to place an application early to determine if the development is eligible to connect to the NBN network.

3.3.6 Gas

Gas supply is anticipated to be connected to the existing reticulation in either Coomoora Road or Teddy Crescent.

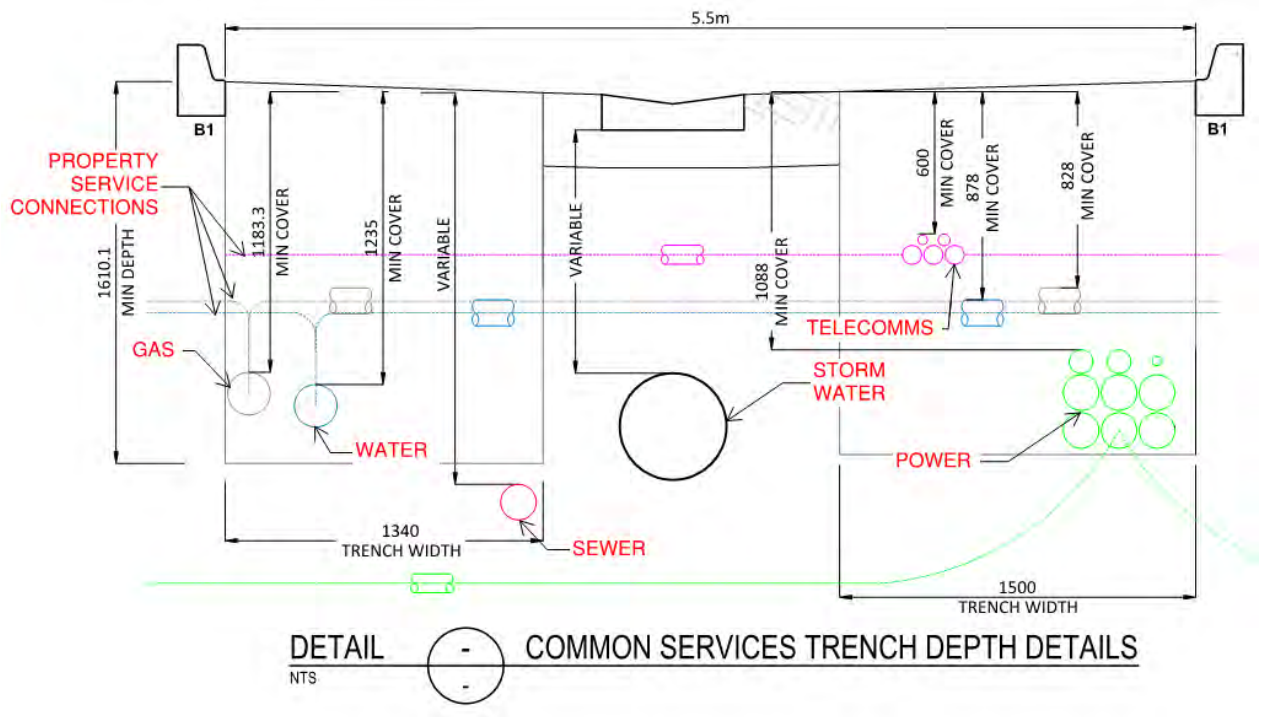
Allowance will need to be made for a metering location within the site.

3.4 Roadworks

There are no specific standards that govern the design of private roads. It is advised to use AustRoads part 2 as a guide.

The roads in a body corporate development are going to be the main corridor for services to be constructed. It is therefore advised that they are designed to have a suitable width to allow for as much room as possible for services.

The cross section below in Figure 4 is an example from a similar project within the same Council area. It demonstrates the number of services and how they will typically be arranged. This example is of a 5.5m wide road, the proposed current site layout plan has 6.5m roads which should provide sufficient space for services.



4. Constraints

The existing sewer on the site runs along the northern, western and southern boundaries. These run in existing easements that cannot be built over. The sewer along the western and northern boundaries cannot be diverted as they are servicing the neighboring properties and would not be able to relocate the sewer without providing a new service to these properties.

There are existing Council drainage assets in the southern section of the site running from east to west. These assets service the neighboring school site. This link to the Council drainage from the school site must be maintained and a diversion will be required with the current site masterplan.

Existing optic fibre cabling is present in the southern section of the site which is currently designated to be green space. If the layout changes and construction is required in this area the optical fibre will be a major constraint as it will have to be diverted, which can be very expensive due to the nature of diverting fibre cables.

There are several high value trees that are required to be kept. The proposed service alignments may clash with some of these trees so alternative methods of construction may be required, such as boring. It is recommended that any tree that is to be bored under is analysed by an arborist to ensure that the bore is not going to interfere with the root system and that it will not impact the asset in the future. Tree roots can be very destructive to pipes, roads and footpaths, careful consideration will need to be given when deciding on which trees to retain as to what future impacts they may have on the infrastructure of the development.

The site is subject to an SBO, this means that there is a risk of flooding during a 1 in 100 year storm. This impacts the levels of the lots and the design of the road in the section of the site impacted by this overlay.

The existing drainage that is anticipated to be the sites LPD is approximately 1.3m below existing surface level.

The sewer and drainage systems will be gravity systems and therefore require a fall to be achieved across the site. The ideal scenario is to have the sewer and drainage outfall locations as deep as possible to have flexibility to avoid the risk of service clashes in the design. The sewer outfall level is 18.27m.

Appendix A – Existing Conditions Plan

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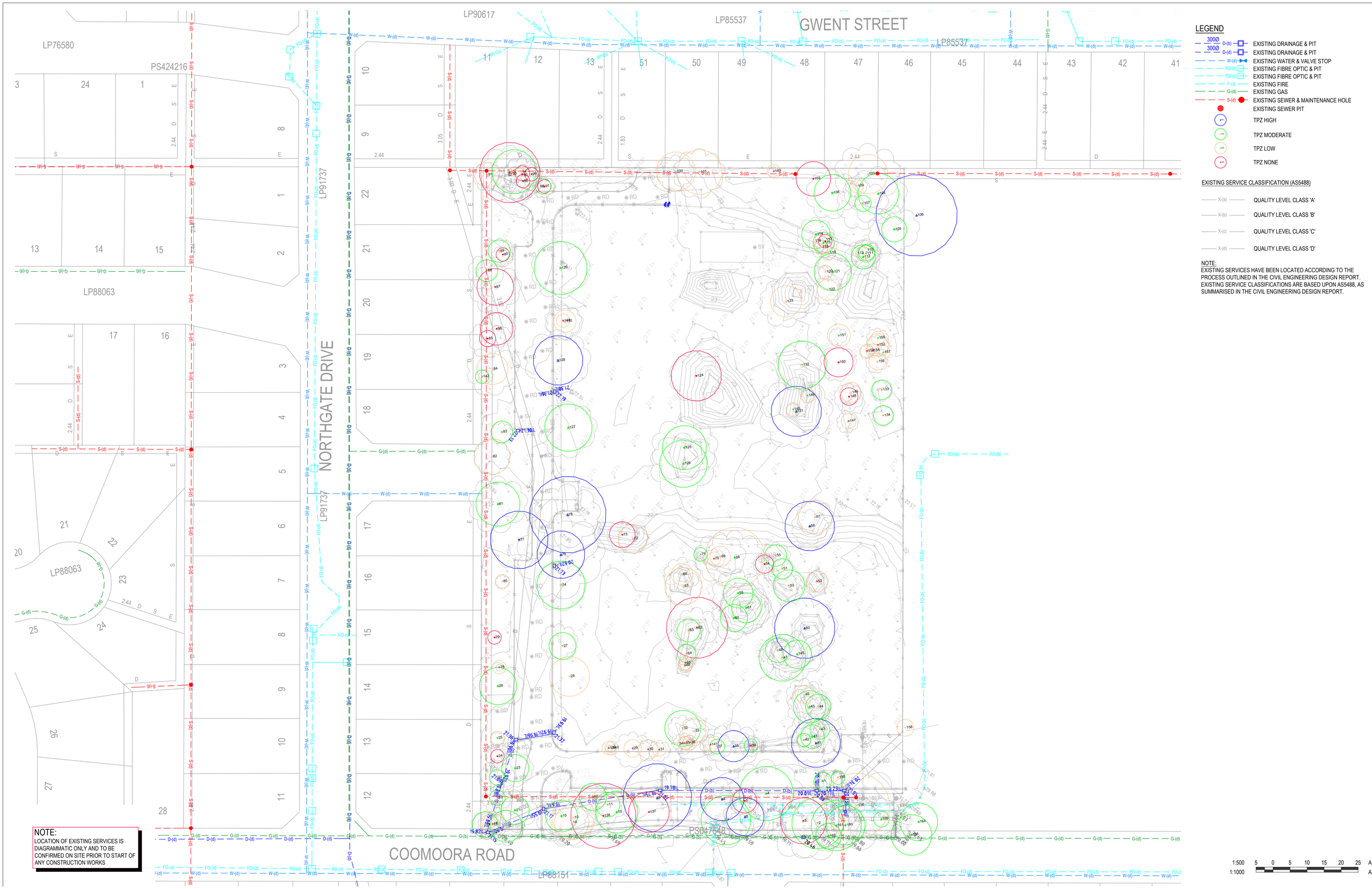

LEGEND

- EXISTING DRAINAGE & PIT
- EXISTING DRAINAGE & PIT
- EXISTING WATER & VALVE STOP
- EXISTING FIBRE OPTIC & PIT
- EXISTING FIBRE OPTIC & PIT
- EXISTING FIRE
- EXISTING GAS
- EXISTING SEWER & MAINTENANCE HOLE
- EXISTING SEWER PIT
- TPZ HIGH
- TPZ MODERATE
- TPZ LOW
- TPZ NONE

EXISTING SERVICE CLASSIFICATION (AS5488)

- QUALITY LEVEL CLASS 'A'
- QUALITY LEVEL CLASS 'B'
- QUALITY LEVEL CLASS 'C'
- QUALITY LEVEL CLASS 'D'

NOTE:
EXISTING SERVICES HAVE BEEN LOCATED ACCORDING TO THE PROCESS OUTLINED IN THE CIVIL ENGINEERING DESIGN REPORT. EXISTING SERVICE CLASSIFICATIONS ARE BASED UPON AS5488, AS SUMMARISED IN THE CIVIL ENGINEERING DESIGN REPORT.

NOTE:
LOCATION OF EXISTING SERVICES IS DIAGRAMMATIC ONLY AND TO BE CONFIRMED ON SITE PRIOR TO START OF ANY CONSTRUCTION WORKS

1:500 5 0 5 10 15 20 25 A1
1:1000 A3

REV	DESCRIPTION	DRAWN	APP'D	DATE
A	PRELIMINARY ISSUE	DM	JZ	NYI

ARCHITECT/CLIENT

PROJECT: SPRINGVALE SOUTH
TITLE: EXISTING CONDITIONS SKETCH

WOOD & GRIEVE ENGINEERS

PRELIMINARY
NOT FOR CONSTRUCTION
CIVIL

SCALE @ A1	PROJECT No	DRAWING No	REV
1:500	38195	CI-SK-001	A

CAD FILE: CI-SK-001.DWG

SPRINGVALE SOUTH
COOMOORA ROAD, SPRINGVALE SOUTH
(LOT 1) 15-29 COOMOORA ROAD, SPRINGVALE SOUTH
DEVELOPMENT PLAN- LANDSCAPE DRAWINGS
MARCH 2020

PREPARED BY:

MALA STUDIO

1/11 AMSTERDAM STREET. RICHMOND. VICTORIA 3121

FOR:

DEVELOPMENT VICTORIA
8 EXHIBITION STREET
MELBOURNE VIC 3000

LANDSCAPE PLANS

No	Title	Sheet	Scale
LD00	Title Sheet	Title	N/A
LD01	Context Plan	Plans	NTS
LD02	Landscape Plan	Plans	1:500
LD03	New and Existing Trees Plan	Plans	1:500
LD04	Typical plan - Roadside parking deterrent planting	Sections	1:50
LD05	Section AA - Coomoora Road	Sections	1:250
LD06	Section BB - Communal Green Connection	Sections	1:250
LD07	Planting Palette 01 - Landscape Buffer (Residential)	Planting Palette	N/A
LD08	Planting Palette 02 - Street Trees	Planting Palette	N/A
LD09	Planting Palette 03 - Green Links	Planting Palette	N/A
LD10	Planting Palette 04 - Landscape Buffer	Planting Palette	N/A
LD11	Planting Palette 05 - Coomoora Road	Planting Palette	N/A
LD12	Planting Palette 06 - Communal Garden	Planting Palette	N/A
LD13	Planting Matrix	Planting Matrix	N/A
LD14	Precedent Imagery - Streets	Imagery	N/A
LD15	Precedent Imagery - Communal Gardens	Imagery	N/A
LD16	Precedent Imagery - Planting	Imagery	N/A
LD17	Precedent Imagery - Landscape Elements	Imagery	N/A

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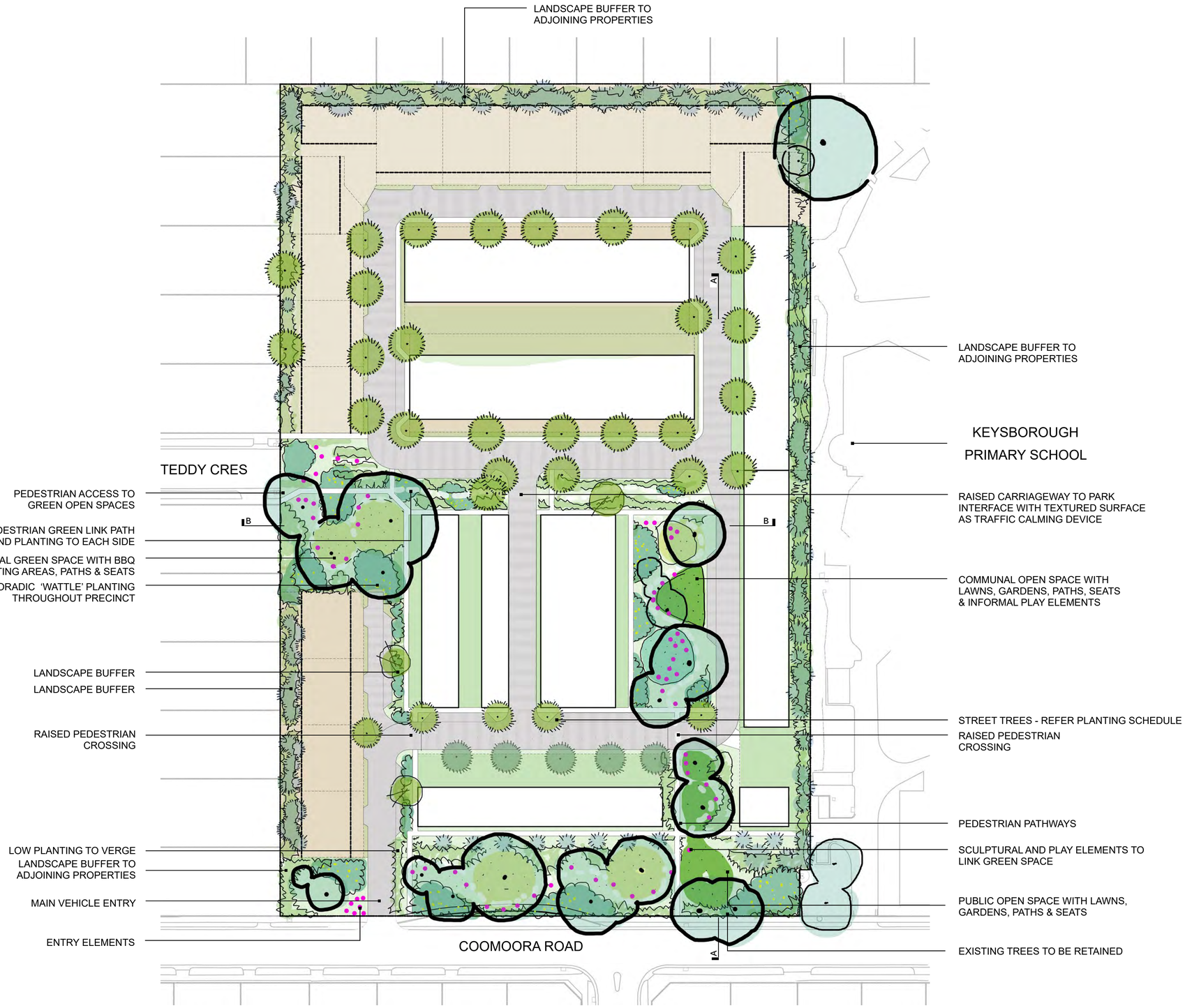
Springvale South
Victoria 3172

Drawing Title:	CONTEXT PLAN
Drawing No:	LD01
Issue:	DEVELOPMENT PLAN
Date:	05/03/2020

Scale:	NTS
Rev No:	3
Drawn by:	MW
Approved:	CM



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(Lot 1) 15-29 Coomoora Road
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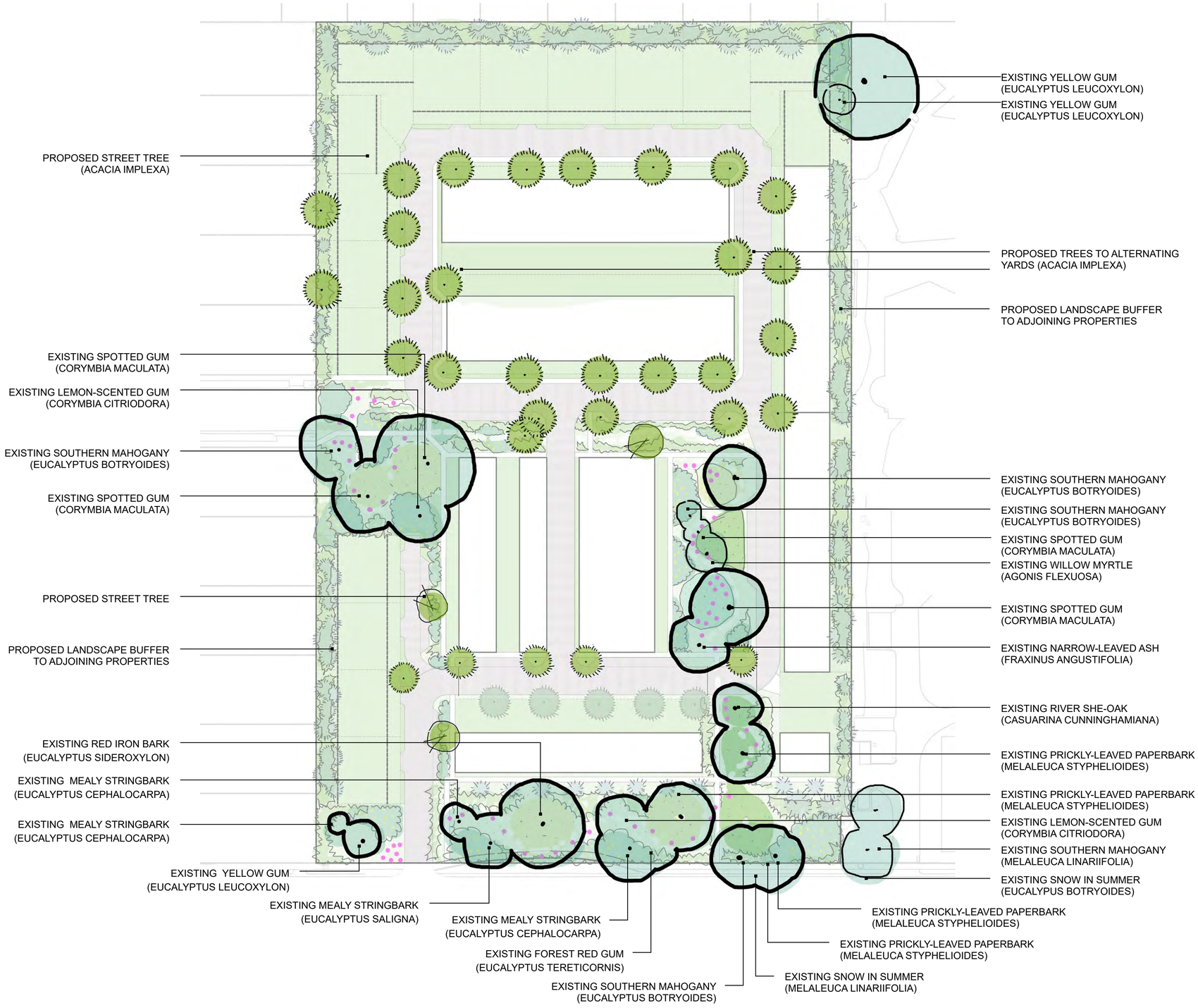
Drawing Title:	LANDSCAPE PLAN
Drawing No:	LD02
Issue:	DEVELOPMENT PLAN
Date:	05/03/2020

Scale:	1:500 @ A1
Rev No:	3
Drawn by:	MW
Approved:	CM



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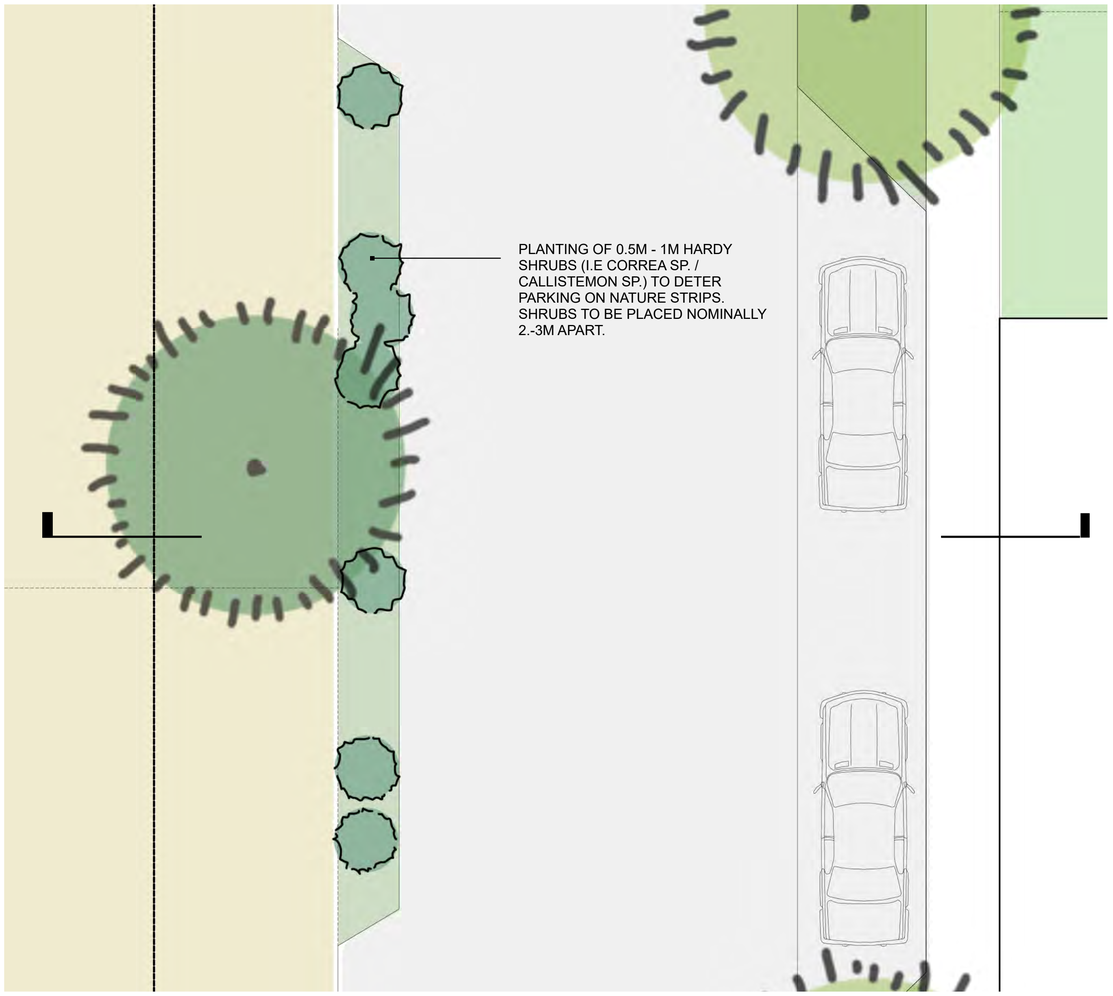
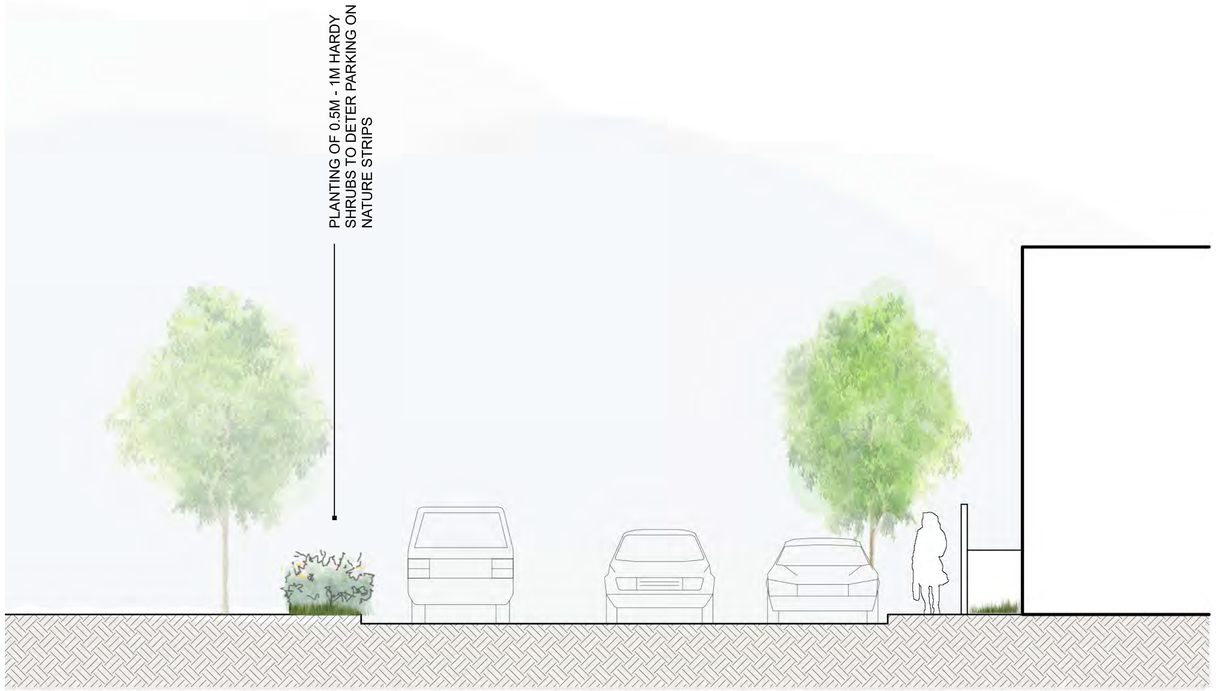
Drawing Title:	NEW AND EXISTING TREES PLAN
Drawing No:	LD03
Issue:	DEVELOPMENT PLAN
Date:	05/03/2020

Scale:	1:500 @ A1
Rev No:	3
Drawn by:	MW
Approved:	CM





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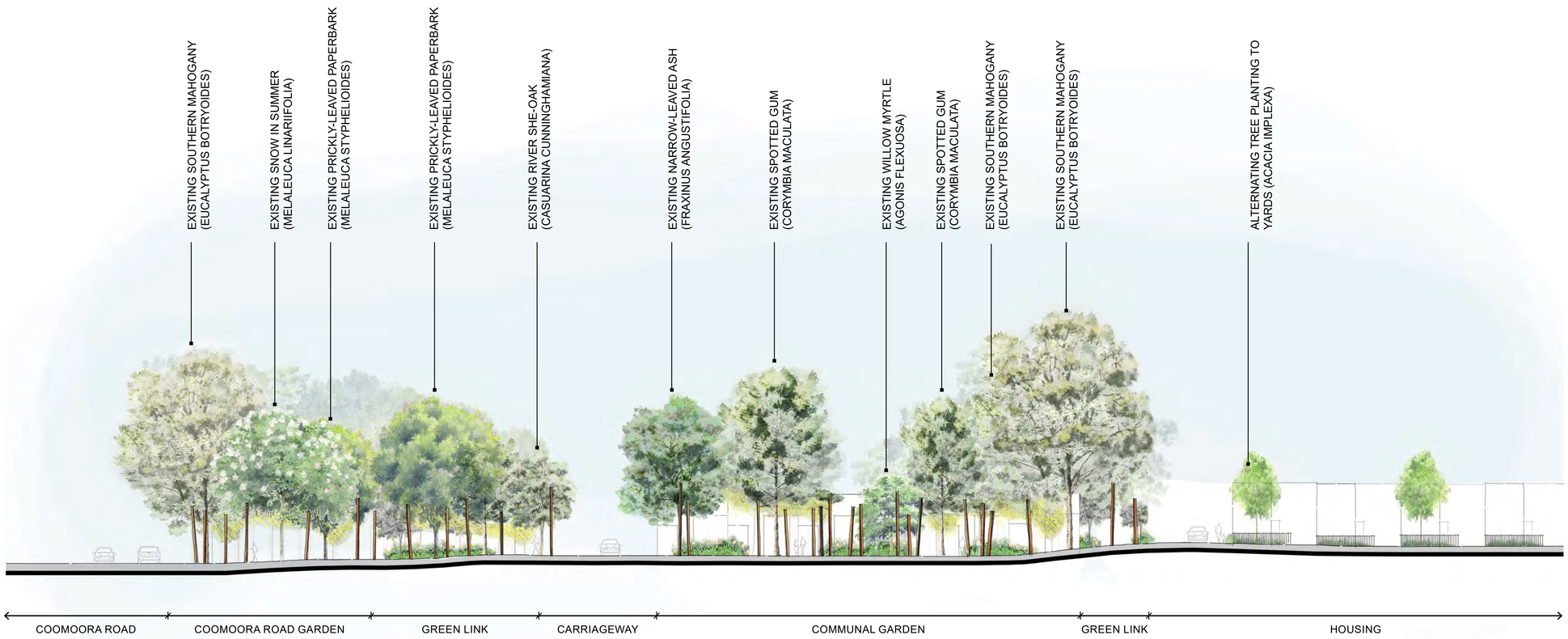
Victoria 3172

Drawing Title:	TYPICAL PARKING DETERRENT PLANTING
Drawing No:	LD04
Issue:	DEVELOPMENT PLAN
Date:	23/05/2019

Scale:	1:50 @A1
Rev No:	-
Drawn by:	BB
Approved:	CM



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SPRINGVALE SOUTH
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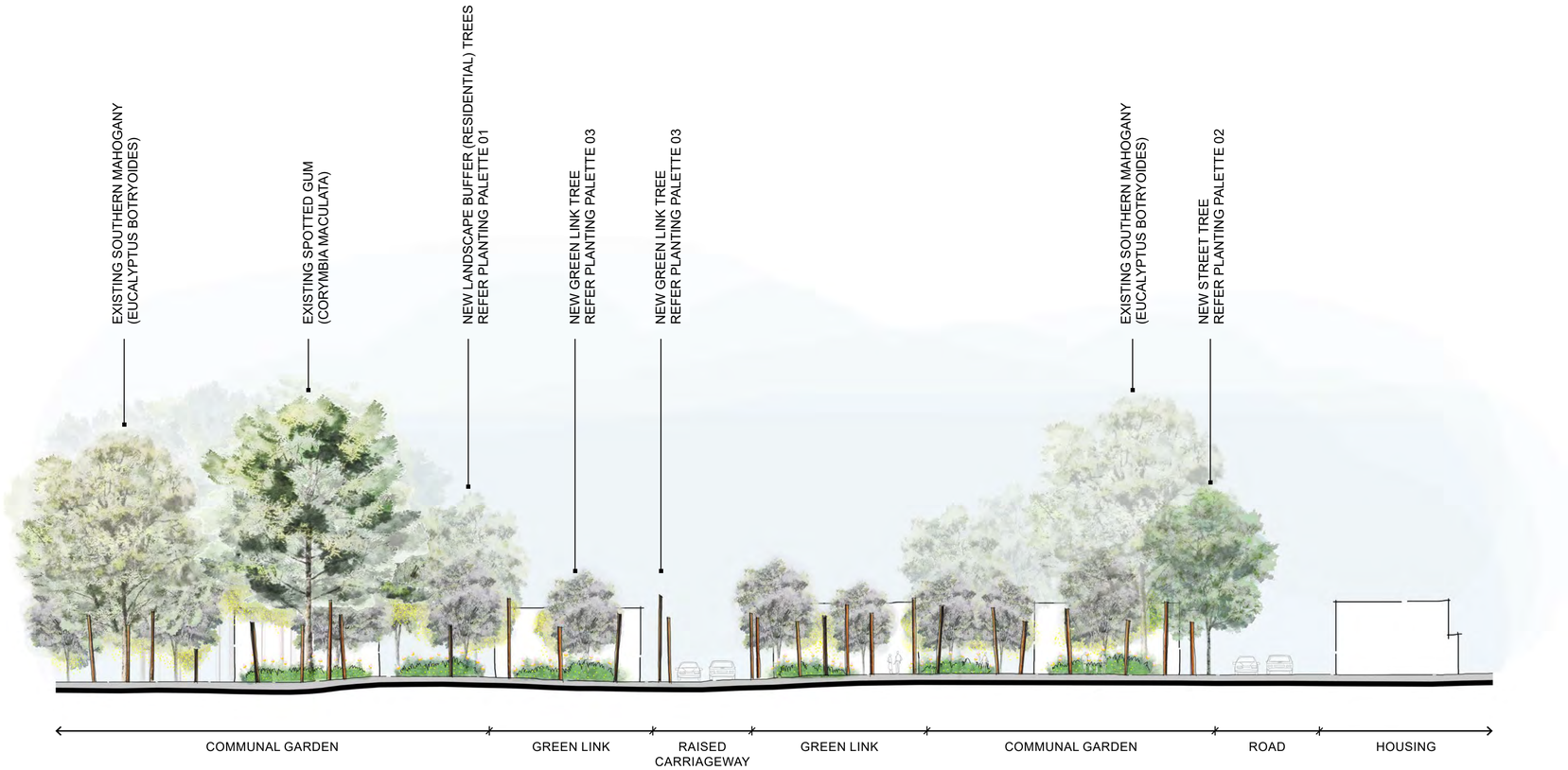
Drawing Title:	SECTION AA
Drawing No:	LD05
Issue:	DEVELOPMENT PLAN
Date:	05/03/2020

Scale:	1:250 @ A1
Rev No:	3
Drawn by:	MW
Approved:	CM



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SPRINGVALE SOUTH
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Drawing Title:	SECTION BB
Drawing No:	LD06
Issue:	DEVELOPMENT PLAN
Date:	05/03/2020

Scale:	1:250 @ A1
Rev No:	3
Drawn by:	MW
Approved:	CM

PLANTING PALETTE 01 - LANDSCAPE BUFFER (RESIDENTIAL)

Corymbia Maculata
Spotted Gum

Eucalyptus pryoriana
Rough-barked Manna Gum

Bursaria spinosa
Sweet Bursaria

Exocarpus cupressiformis
Cherry Ballart

Hakea laurina
Pin Cushion Hakea

Acacia implexa
Lightwood

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SPRINGVALE SOUTH
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Drawing Title:	PLANTING PALETTE 01
Drawing No:	LD07
Issue:	DEVELOPMENT PLAN
Date:	05/03/2020

Scale:	N/A
Rev No:	3
Drawn by:	MW
Approved:	CM

PLANTING PALETTE 02 - STREET TREES AND SHRUBS

Agonis flexuosa
Willow Myrtle

Banksia integrifolia
Coastal Banksia

Banksia marginata
Silver Banksia

Callistemon 'All Aglow'
Bottlebrush

Geijera parviflora
Australian Willow

Eucalyptus camaldulensis
River Red Gum

Corymbia Maculata
Spotted Gum

Correa reflexa nummularifolia
Roundleaf Correa

Callistemon pityoides
Alpine bottlebrush

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SPRINGVALE SOUTH
(Lot 1) 15-29 Coomoora Road
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Victoria 3172

Drawing Title:	PLANTING PALETTE 02
Drawing No:	LD08
Issue:	DEVELOPMENT PLAN
Date:	05/03/2020

Scale:	N/A
Rev No:	3
Drawn by:	MW
Approved:	CM

PLANTING PALETTE 03 - GREEN LINKS

Acacia baileyana 'Purpurea'
Cootamundra Wattle (purple leaf)

Acacia melanoxylon
Lightwood

Eucalyptus radiata
Narrow-leafed Peppermint

Eucalyptus pauciflora
Snow Gum

Acacia acinacea
Gold Dust Wattle

Stylidium graminifolium
Grass Trigger

Eucalyptus pulverulenta
Silver Leaved Mountain Gum

Microlaena stipoides
Weeping Grass

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Drawing Title:	PLANTING PALETTE 03
Drawing No:	LD09
Issue:	DEVELOPMENT PLAN
Date:	05/03/2020

Scale:	N/A
Rev No:	3
Drawn by:	MW
Approved:	CM

PLANTING PALETTE 04 - LANDSCAPE BUFFER

Boronia anemonifolia
Sticky Boronia

Banksia prionotes 'dwarf'
'Little Kalbarri Candles'

Acacia baileyana 'prostrate'
Cootamundra Wattle prostrate

Pultenaea scabra
Rough Bush Pea

Epacris impressa
Common Heath

Themeda triandra 'mingo'
Kangaroo Grass

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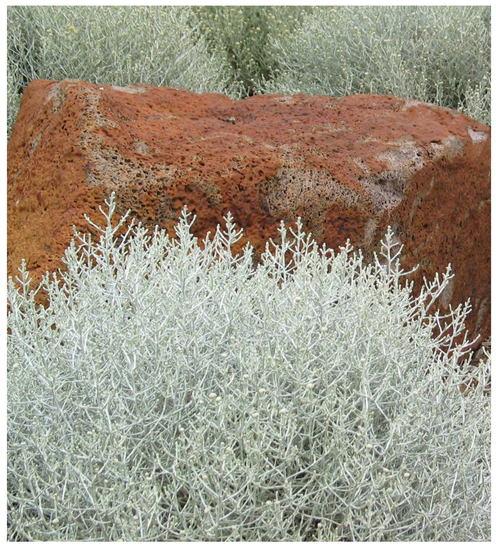
Drawing Title:	PLANTING PALETTE 04
Drawing No:	LD10
Issue:	DEVELOPMENT PLAN
Date:	05/03/2020

Scale:	N/A
Rev No:	3
Drawn by:	MW
Approved:	CM

PLANTING PALETTE 05 - COOMOORA ROAD

Acacia melanoxylon
Blackwood

Kunzea ericoides
Burgan



Leucophyta brownii
Cushion Pin Bush

Stackhousia monogyna
Creamy Stackhousia

Acacia genistifolia 'prostrate'
Spreading Wattle prostrate

Lomandra filiformis
Wattle Matrush

Microlaena stipoides
Weeping Grass

Kennedia prostrata
Running Postman

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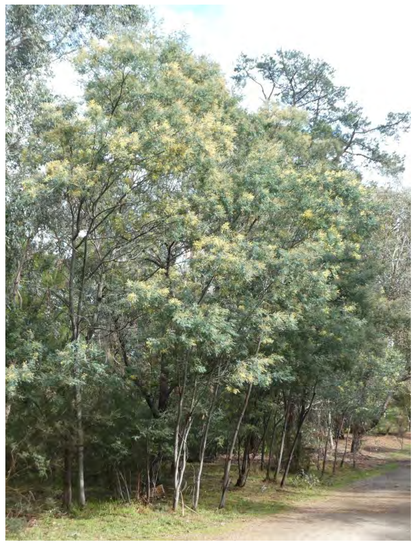
Drawing Title:	PLANTING PALETTE 05
Drawing No:	LD11
Issue:	DEVELOPMENT PLAN
Date:	05/03/2020

Scale:	N/A
Rev No:	3
Drawn by:	MW
Approved:	CM

PLANTING PALETTE - COMMUNAL GARDENS



Acacia dealbata
Silver Wattle

Acacia mearnsii
Black Wattle

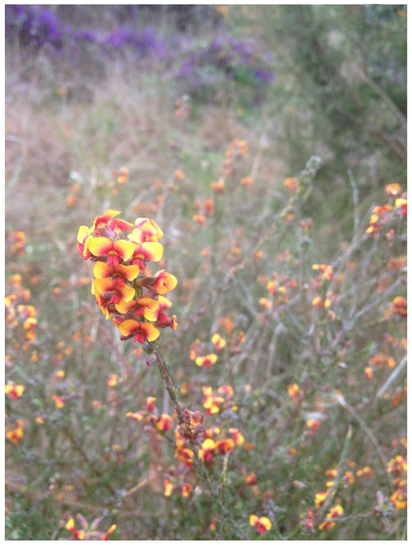
Melaleuca squarrosa
Scented Paper Bark

Leptospermum continentale
Prickly Tea-tree

Acacia acinacea
Gold Dust Wattle

Themeda triandra
Kangaroo Grass

Stylidium graminifolium
Grass Trigger



Dillwynia cinerascens
Grey Parrot-pea

Dichondra repens
Kidney Week

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Drawing Title:	PLANTING PALETTE 06
Drawing No:	LD12
Issue:	DEVELOPMENT PLAN
Date:	05/03/2020

Scale:	N/A
Rev No:	3
Drawn by:	MW
Approved:	CM

PLANTING MATRIX

	BOTANICAL NAME	COMMON NAME
LANDSCAPE BUFFER (RESIDENTIAL)		
TREE	*Corymbia Maculata*	Spotted Gum
	Eucalyptus pryoriana	Rough-barked Manna Gum
	Bursaria spinosa	Sweet Bursaria
	Exocarpus cupressiformis	Cherry Ballart
	Hakea laurina	Pin Cushion Hakea
STREET TREES		
TREE	*Agonis flexuosa*	Willow Myrtle
	Banksia integrifolia	Coastal Banksia
	Banksia marginata	Silver Banksia
	Callistemon 'All Aglow'	Bottlebrush
	Corymbia Maculata	Spotted Gum
	Eucalyptus camaldulensis	River Red Gum
	Geijera parviflora	Australian Willow
GREEN LINKS		
TREE	*Acacia baileyana 'Purpurea'*	Cootamundra Wattle
	Acacia implexa	Lightwood
	Eucalyptus radiata	Narrow-leafed Peppermint
	Eucalyptus pauciflora subsp. niphophila	Snow Gum
MEDIUM SHRUB	*Eucalyptus pulverulenta* (coppiced)	Silver-leaved Mountain Gum
LOW SHRUB <1M	*Acacia acinacea*	Gold Dust Wattle
	Stylidium graminifolium	Grass Trigger
TUFTS	*Microlaena stipoides*	Weeping Grass
GROUND COVER/CLIMBER	*Amyema pendulum**	Drooping Mistletoe
LANDSCAPE BUFFER		
LARGE SHRUB	*Boronia anemonifolia*	Sticky Boronia
MEDIUM SHRUB	*Banksia prionotes 'dwarf'*	Acorn Banksia
	Acacia baileyana 'prostrate'	Cootamundra Wattle 'prostrate'
LOW SHRUB <1M	*Epacris impressa*	Common Heath
	Pultenaea scabra	Rough Bush Pea
GROUND COVER/CLIMBER	*Themeda triandra 'mingo'*	Kangaroo Grass
COORMOORA ROAD		
TREE	*Acacia melanoxylon*	Blackwood
LARGE SHRUB	*Kunzea ericoides*	Burgan
MEDIUM SHRUB	*Acacia genistifolia*	Spreading Wattle
	Leucophyta brownii	Cushion Pin Bush
LOW SHRUB <1M	*Acacia genistifolia 'prostrate'*	Spreading Wattle
	Stackhousia monogyna	Creamy Stackhousia
TUFTS	*Lomandra filiformis*	Wattle Matrush
	Microlaena stipoides	Weeping Grass
GROUND COVER/CLIMBER	*Kennedia prostrata*	Running Postman
COMMUNAL GARDEN		
TREE	*Acacia dealbata*	Silver Wattle
	Acacia mearnsii	Black Wattle
LARGE SHRUB	*Melaleuca squarrosa*	Scented Paper Bark
MEDIUM SHRUB	*Leptospermum continentale*	Prickly Tea-tree
LOW SHRUB <1M	*Acacia acinacea*	Gold Dust Wattle
	Stylidium graminifolium	Grass Trigger
	Dillwynia cinerascens	Grey Parrot-pea
TUFTS	*Themeda triandra*	Kangaroo Grass
	Microlaena stipoides	Weeping Grass
GROUND COVER/CLIMBER	*Dichondra repens*	Kidney Weed

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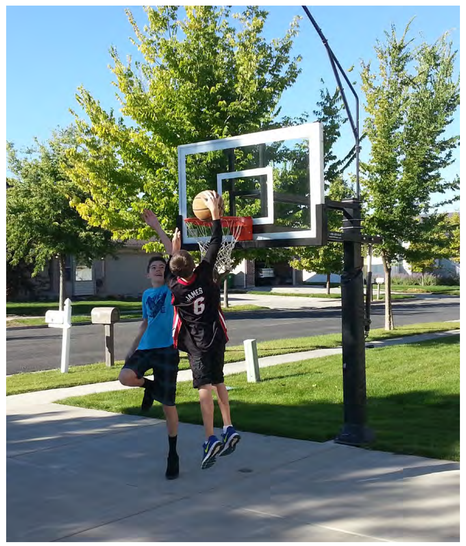
Victoria 3172

Drawing Title:	PLANTING MATRIX
Drawing No:	LD13
Issue:	DEVELOPMENT PLAN
Date:	05/03/2020

Scale:	N/A
Rev No:	3
Drawn by:	MW
Approved:	CM

PRECEDENT IMAGES - STREETS

Local street feel



Pathway trees with understorey planting

Raised carriageways to park interface

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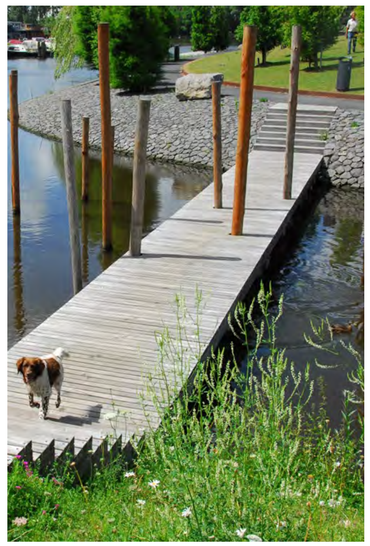
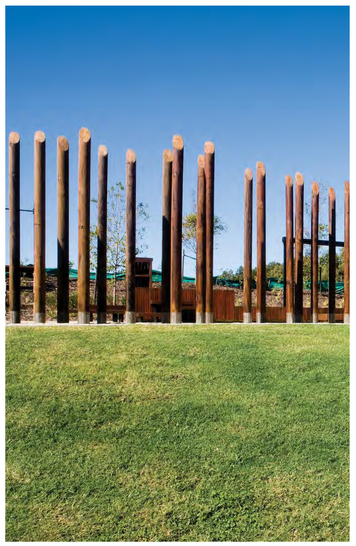
Drawing Title:	PRECEDENT IMAGERY - STREETS
Drawing No:	LD14
Issue:	DEVELOPMENT PLAN
Date:	05/03/2020

Scale:	N/A
Rev No:	3
Drawn by:	MW
Approved:	CM

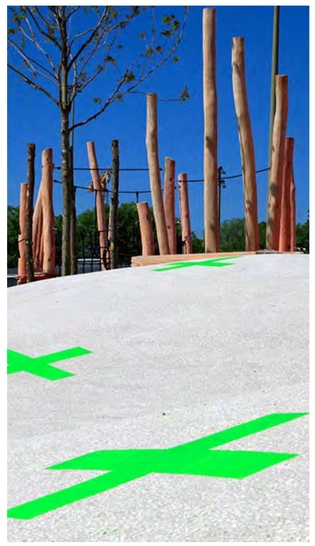
PRECEDENT IMAGES - COMMUNAL GARDENS

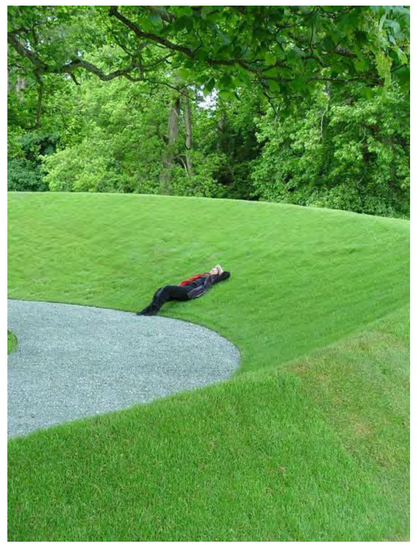


Sculptural elements

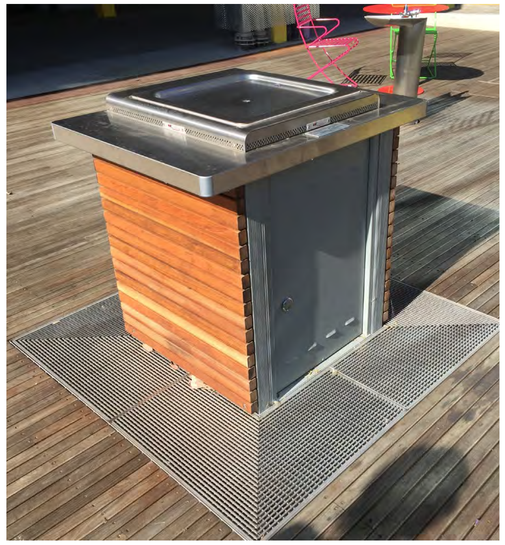


Informal play elements





Lawns



Park furniture

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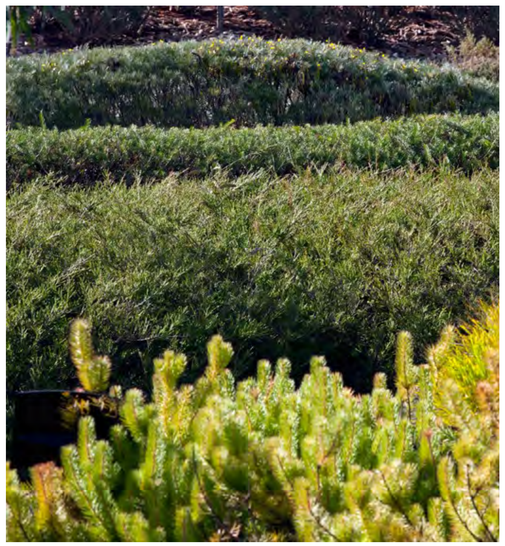
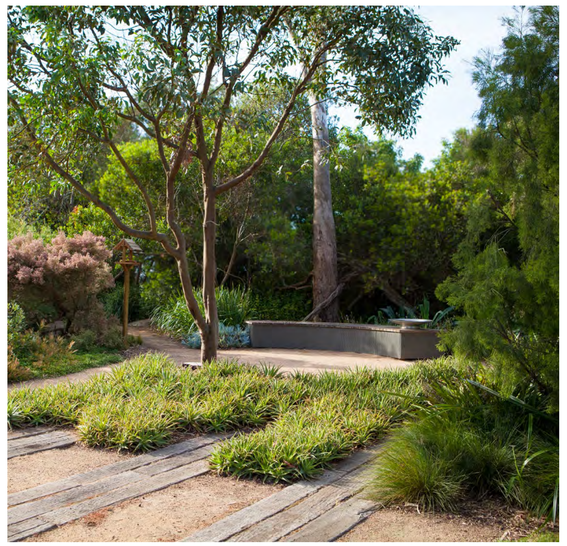
Drawing Title:	PRECEDENT IMAGERY - SCULPTURAL ELEMENTS
Drawing No:	LD15
Issue:	DEVELOPMENT PLAN
Date:	05/03/2020

Scale:	N/A
Rev No:	3
Drawn by:	MW
Approved:	CM

PRECEDENT IMAGES - PLANTING

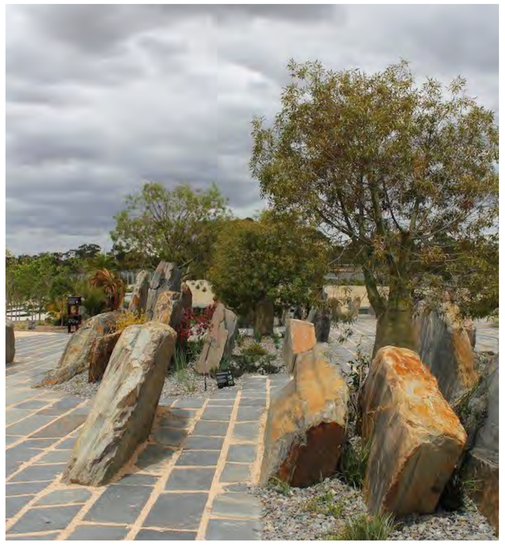
Native and exotic planting mixes





Informal pathways

Formal pathways



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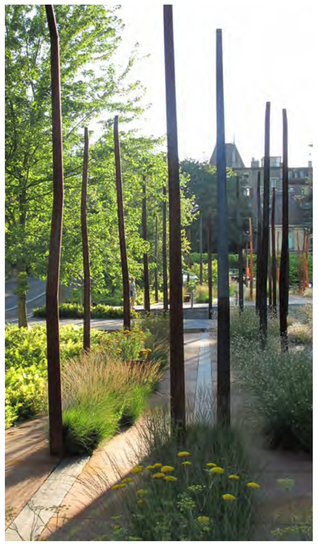
Victoria 3172

Drawing Title:	PRECEDENT IMAGERY - PLANTINGS
Drawing No:	LD16
Issue:	DEVELOPMENT PLAN
Date:	05/03/2020

Scale:	N/A
Rev No:	3
Drawn by:	MW
Approved:	CM

PRECEDENT IMAGES - LANDSCAPE ELEMENTS






Sculptural elements




Unstructured play

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SPRINGVALE SOUTH
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Victoria 3172

Drawing Title:	PRECEDENT IMAGERY - LANDSCAPE ELEMENTS
Drawing No:	LD17
Issue:	DEVELOPMENT PLAN
Date:	05/03/2020

Scale:	N/A
Rev No:	3
Drawn by:	MW
Approved:	CM

WOOD & GRIEVE ENGINEERS

Springvale South

Civil

Stormwater Management Plan

Prepared for:

Tim Miller
Development Victoria

Prepared by:

Justin Zelones
Project No. 38195
\\WGE-MEL-FS-01\PROJECTS\38195\PROJECT DOCUMENTATION\CIVIL\DOCUMENTS & REPORTS\SWMP\38195-CI-RE-STORMWATER MANAGEMENT PLAN_004.DOCX

Date:
30 April 2020

Level 22, 570 Bourke Street, Melbourne VIC 3000
T: (03) 8554 7000 **E:** melbourne@wge.com.au **W:** www.wge.com.au

Revision

REVISION	DATE	COMMENT	APPROVED BY
A	10/07/2018	DRAFT	**JZ**
B	23/05/2019	DRAFT	**JZ**
C	29/05/2019	DRAFT	**JZ**
D	07/11/2019	DRAFT	**JZ**
E	11/03/2020	REVISED FOR NEW LAYOUT	**JZ**
F	30/04/2020	COUNCIL COMMENTS REVISION	**JZ**

_____

Justin Zelones
For and on behalf of
Wood & Grieve Engineers

Contents

1. Introduction

Wood & Grieve Engineers have been commissioned by Development Victoria to prepare a Stormwater Management Plan (SWMP) for the proposed development at 15-29 Coomoora Road, Springvale South. The SWMP outlines the conceptual Town Planning stormwater design for the proposed residential townhouse development containing 45 townhouses and 16 land lots.

This SWMP demonstrates the application of Water Sensitive Urban Design (WSUD) principles and illustrates that the proposed development complies with the City of Greater Dandenong Council Planning Scheme Clause 53.18.

The SWMP is based on Preliminary Council Advice.

2. Requirements

There is a requirement that all new development applications, provide for the achievement of the best practice water quality performance objectives as set out in the Urban Stormwater Best Practice Environmental Management Guidelines, CSIRO 1999. This requires the use of stormwater treatment measures that both improve the quality and reduce the flow of water discharged to waterways. Pollution reduction targets are outlined in Table 1 below in accordance to these guidelines.

POLLUTANT	POLLUTION REDUCTION TARGET
Total Suspended Solids (TSS)	80%
Total Phosphorous (TP)	45%
Total Nitrogen (TN)	45%
Total Gross Pollutants >5mm (GP)	70%
Design criteria	
Minor Design storm	10 YR ARI
Major Design storm	100 YR ARI
Stormwater Detention	1.5 YR ARI

Table 1 – Stormwater Design Criteria

3. Purpose

The purpose of this SWMP is to evaluate the quantity and quality of stormwater associated with the proposed development plan to demonstrate to the City of Greater Dandenong that an appropriate stormwater management strategy has been adopted.

The SWMP specifically addresses the following items for both the construction and operational phases of the development:

- Stormwater runoff volumes and detention (Stormwater Quantity);
- Stormwater quality treatment measures (Stormwater Quality); and
- Maintenance of the water quality treatment devices employed.

4. Property Site Details

The property site details are provided in Table 2 below.

Site Address	15-29 Coomoora Road
Lat & Long	-37.982417, 145.151120
Lot & Plan Number	Lot 1 PS647548
Proposed Development	45 Town Houses and 16 Land Lots
Local Authority	City of Greater Dandenong
Directory Ref	88 K6
Wood & Grieve Ref	38195

Table 2 - Property Site Details

As can be seen in the site location plan below, the site is bounded by Coomoora Street to the south and Keysborough Primary School to the east and existing residential properties to the north and west.

Figure 1 - Site Location Plan

5. Special Building Overlay

The site is impacted by the Special Building Overlay as can be seen below.

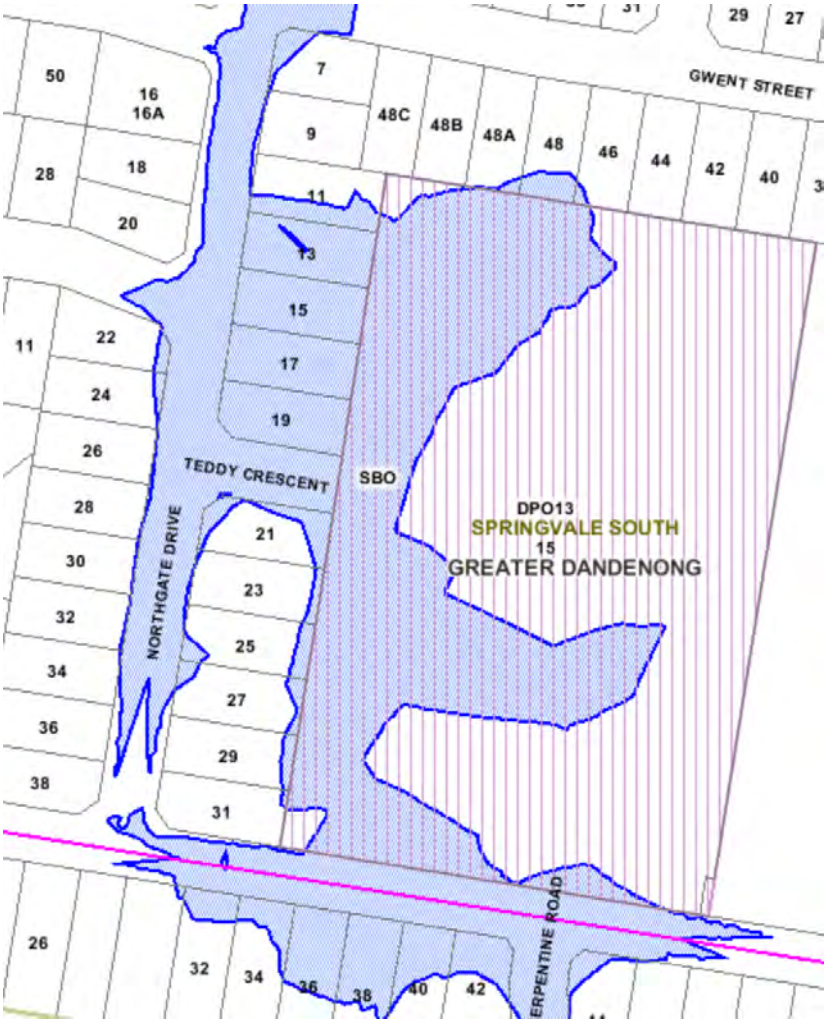


Figure 2 - Special Building Overlay

Melbourne Water have been contacted to get predevelopment advice. As per the advice received by Melbourne Water the following conditions have been received from Melbourne Water and considered as part of the development of this Stormwater Management Plan:

1. *A stormwater management and drainage strategy must be submitted and approved by Melbourne Water. This strategy must provide details of the outfall/s for the development and calculate the appropriate flow volumes and flood levels for the 100-year ARI storm event and demonstrates how stormwater runoff from the subdivision will achieve State Environment Protection Policy (Waters of Victoria) objectives for environmental management of stormwater.*
2. *Stormwater runoff from the subdivision must achieve State Environment Protection Policy (Waters of Victoria) objectives for environmental management of stormwater as set out in the 'Urban Stormwater Best Practice Environmental Management Guidelines (CSIRO) 1999'.*
3. *Unless otherwise agreed in writing by the relevant drainage authority, the development must retard stormwater back to pre-development levels before entering the downstream drainage system and/or retard stormwater back to the sufficient capacity of the downstream drainage system, whichever is appropriate.*
4. *The development is to make provision for overland flows from the upstream catchment utilising roads and/or reserves.*
5. *Any road or access way intended to act as a stormwater overland flow path must be designed and constructed to comply with the floodway safety criteria as specified by Melbourne Water.*

6. *All new lots are to be filled to a minimum of 300mm above the 1 in 100 year flood levels associated with any existing or proposed Melbourne Water pipeline or to a minimum of 600mm above the 1 in 100 year flood level associated with any existing or proposed Melbourne Water wetland, retarding basin or waterway.*
7. *A separate application direct to Melbourne Water must be made for any new, temporary or modified storm water connection to Melbourne Water's drains or watercourses.*

This site is located within the Edith vale Road Drainage Scheme. No further payment of contributions is required as part of this scheme. Melbourne Water assesses development applications in accordance with our Guidelines for Development in Flood-prone Areas. Under these guidelines, development in or adjacent to a floodplain may only be acceptable where the new development is protected from flooding, has safe access to and around the development and does not interfere with the passage and storage of floodwaters.

The road network will be designed to become the flow path for the 1 in 100-year flood. The 1 in 10-year event will be captured by the proposed pit and pipe network shown in Appendix C.

Preliminary Stormwater design has been undertaken so that overland flows can enter the site on Teddy Crescent and exit to the south of the site on the proposed new access road onto Coomoora Road. This will be conveyed through the site via the roadways and a small overland flow path.

The flood path currently enters the site at Teddy Crescent. In the current site plan, there is no direct road link between Teddy Crescent and the point the flood waters will discharge from site as there is an area of public open space. This area will require grading of the open space to ensure that the flood water will get to the road to the south.

The levels along the western boundary will be maintained so that flows can enter the site from neighbouring properties and the flow diverted to the proposed access road that connects to Teddy Crescent, while not adversely affecting the neighbouring properties. Please see Figure 3 below:

Indicative development layout for stormwater assessment purposes only

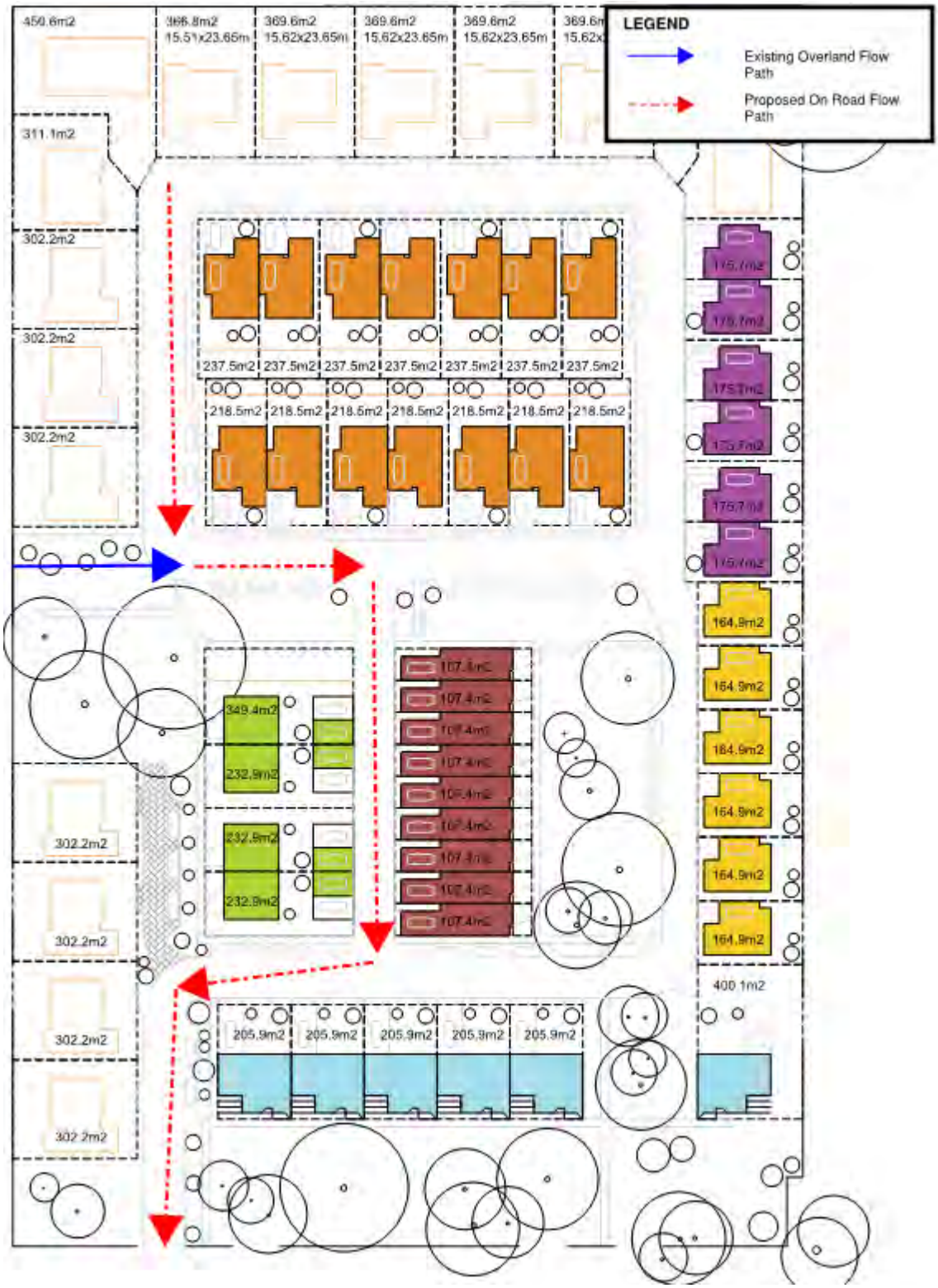


Figure 3 - Overland Flow Paths

The lot levels in the site will be designed to ensure they are greater than 300mm above the 1 in 100-year flood levels as per condition 6.

Flood modelling is to be undertaken using XP SWMM, or similar, to ensure that the conditions above are achievable. This will also ensure that the lots are at a sufficient level and are above the 300mm requirement. The road network will also be included in the model to ensure that it can contain the 1 in 100-year flow.

The flood modelling is to be delayed in agreement with Melbourne Water so that the final development plan can be confirmed. The flood model will be completed prior to the Planning Permit application.

The cross section below shows an example of how the road will be designed to accommodate the 1 in 100-year flow. This cross section is typical of the road network where the 1 in 100-year event will overtop the kerb and be controlled back to the proposed road network, maintaining a minimum of 300mm freeboard to the proposed houses.

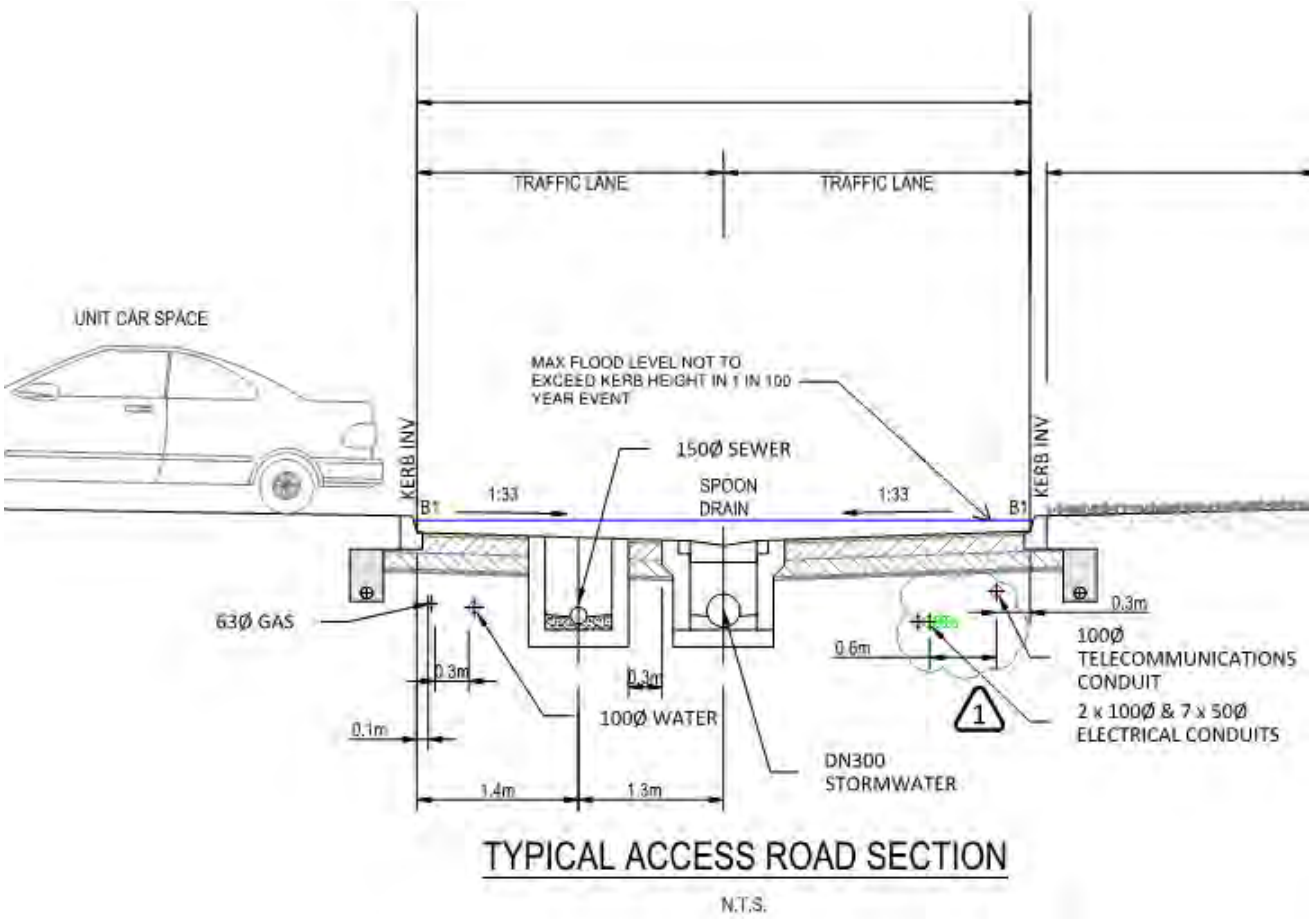


Figure 4 - Typical Proposed Access Road Section at Coomoora Road Intersection

6. Legal Point of Discharge

A Legal Point of Discharge has been provided by City of Greater Dandenong for a new stormwater connection to an existing council pit located in the nature strip along the front of the property, approximately 2m from the south-west corner, refer below.

The City of Greater Dandenong have advised that the maximum allowable discharge for the site is 189L/s and the storage required is 191m^3.

Figure 5 - Proposed Legal Point of Discharge Location

7. Stormwater Quantity

For the purposes of determining the requirements to achieve stormwater quality, the magnitude of the increase in stormwater runoff from the pre and post-developed site is based on comparing the peak discharge flow rates for the 1.5yr Average Recurrence Interval (ARI) storm event. A stormwater attenuation device will be proposed and modelled to confirm that the resultant post-development flows are no greater than the established pre-development flows for the 1.5yr ARI event. For the calculations the ultimate purpose of the development has been taken into consideration, thus it has been assumed that all land only lots will ultimately be developed as per Appendix A – post development.

7.1 Catchment Analysis

The pre and post-development catchment areas are seen in Table 3 below. For environmental purposes, although the existing site is a developed property, the pre-development site is being treated as a landscape area with a runoff coefficient of 0.3. For the post-development site, the assumption that the land lots will be ultimately be developed into townhouses has been made, an indicative development layout for stormwater assessment purposes only has been utilised.

CATCHMENT NAME	RUNOFF COEFFICIENT (C)	PRE-DEVELOPMENT (M^2)	POST-DEVELOPMENT (M^2)	CHANGE (M^2)
ROOF	1.0	**0**	**5610**	**+5610**
PAVEMENT	0.9	**2990**	**5631**	**+2641**
LANDSCAPE	0.3	**21010**	**12759**	**-8251**
TOTAL	-	**24000**	**24000**	

Table 3 - Catchment Analysis

7.2 Peak Flow Analysis

The rainfall intensities utilised in the stormwater calculations are taken from the BOM IFD tables. The 5min rainfall intensity for a 1.5yr ARI ($^1I_{1.5}$) for this site location is 62.15 mm/hr.

Using the Rational Method, the pre-development and post-development peak flows for development are provided in Table 4 below

PEAK FLOW ANALYSIS (m^3/s)				
TIME OF CONCENTRATION (5min)	Q5	Q10	Q20	Q100
PRE-DEVELOPMENT	0.24	0.28	0.33	0.45
POST-DEVELOPMENT	0.39	0.46	0.54	0.73

Table 4 - Peak Flow Analysis

7.3 Stormwater Attenuation

An increase in the density of development will increase the amount of impervious area, reduce the time of concentration, decrease infiltration and will thus increase the amount of stormwater runoff created by the site. In order to ensure that a non-worsening stormwater discharge from the post-development site can be achieved, attenuation is required to mitigate peak stormwater flows.

This hydraulic assessment will demonstrate that through the use of stormwater attenuation devices the proposed development has no adverse effect external to the site and that the proposed lots will be flood free for all storm events up to and including the 1.5yr ARI event

To determine the attenuation storage volumes needed to ensure a non-worsening post-development scenario is achieved, the stormwater drainage system design and analysis program OSD has been utilised. The following parameters have been used.

PARAMETER	DESIGN CRITERIA
RAINFALL ZONE	Dandenong
SITE AREA	2.4ha
EXISTING RUNOFF COEFFICIENT	0.37
PROPOSED RUNOFF COEFFICIENT	0.60
ARI FLOW	5 YEAR
ARI STORAGE	10 YEAR
PERMISSIBLE SITE DISCHARGE (PSD)	189L/s (Nominated)
STORAGE VOLUME	133.21m^3

Table 5 – OSD Parameters

Preliminary calculations indicate the requirement to provide 133.21m^3 of stormwater detention. This assumes a permissible site discharge of 189L/s which has been provided by the City of Greater Dandenong as part of the Legal Point of Discharge requirements received on 25 September 2018.

These calculations represent a **minimum** attention requirement to balance pre and post development flow rates. However, council have advised that they require attenuation in excess of the above calculation, thus the minimum storage prior to discharge off-site is set to be 191m^3.

The proposed stormwater attenuation devices to be utilised for this catchment will be rainwater tanks to be within each lot (113kL) to retain water from roofs, and underground detention tanks (82.5kL) for communal landscape areas and roads.

7.4 Rainwater Tanks & Re-use

In accordance with best practice water quality performance objectives each lot will be constructed with on-site storage consisting of 1kL for re-use and the balance for detention prior to discharge off-site. As such, a total of 61kL is provided as rainwater storage within these re-use tanks but has not been included in the calculated detention requirements.

As there are a number of different sized lots a summary of the storage proposed for each lot type and communal spaces is provided in the table below.

LOT DESCRIPTION	NO. OF LOTS	TANK SIZE (kL)	RE-USE COMPONENT (kL)	RE-USE VOLUME (kL)	DETENTION COMPONENT (kL)	DETENTION VOLUME (kL)
TOWNHOUSE < 110m^2	9	2	1	9	1	9
TOWNHOUSE > 110m^2	52	3	1	52	2	104
COMMUNAL SPACES	-	82.5	-	-	82.5	82.5
TOTAL	**61**	**-**	**-**	**61**	**-**	**195.5**

Table 6 – Lots Rainwater Tank Summary

8. Stormwater Quality

It is a requirement that the proposed development manage stormwater in such a way that in the long term, the development achieves industry standard Water Quality Objectives thus reducing the impact the development has on receiving waters.

The stormwater treatment train schematic for each catchment is shown below:

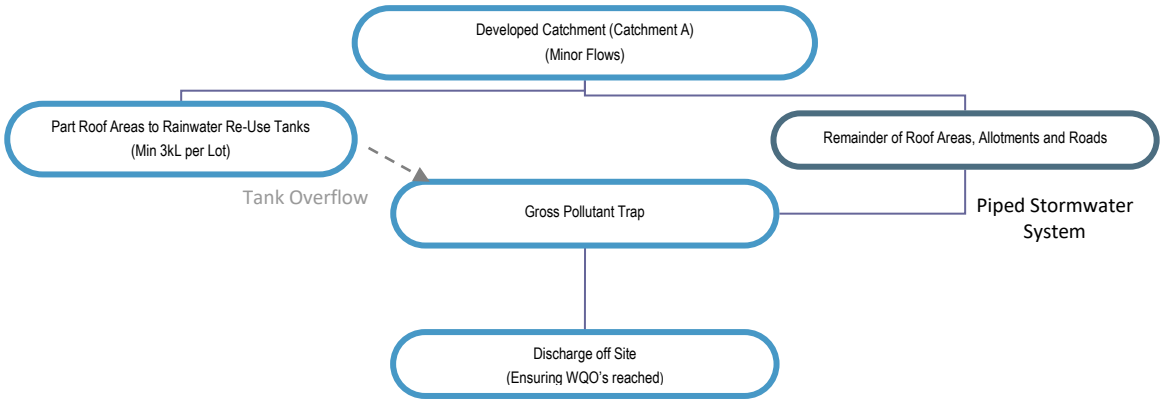


Figure 6 - Treatment Train Strategy

Water Quality Objectives pollutant export modelling software (e.g. MUSIC) has been used to confirm the proposed treatment measures and average pollutant load reduction from the site.

8.1 Stormwater Treatment

A number of management measures have been considered with a focus on reducing polluted runoff volumes from the site. The WSUD principals proposed for stormwater treatment includes the following Stormwater Quality Improvement Devices (SQID's):

- Rainwater Tanks: use to collect stormwater run-off from roofs on site, reducing the amount of stormwater entering the drainage system.
- Humeceptor (or approved equivalent): to be installed at the end of line to remove Total Suspended Solids (TSS) and entrained hydrocarbons from stormwater run-off from pavement and other impervious areas.
- Gross Pollutant Trap (GPT): to be installed at the end of line to remove solids greater than 5mm that are conveyed by runoff from pavement and other impervious areas on site.

A summary is provided in Table 7.

Catchment	TREATMENT SYSTEM	CAPACITY/AREA	QTY	DISCHARGE TO
ROOF (5,610m^2)	RAINWATER TANK	61kL	61	LPD VIA PIT, PIPE AND TREATMENT DEVICE
PAVEMENT (5,631m^2)	HUMECEPTOR/GPT	-	1	TO LPD
LANDSCAPE (12,759m^2)	HUMECEPTOR/GPT	-	1	TO LPD

Table 7 – Runoff Treatment Scheme

8.2 Stormwater Treatment Train Effectiveness

The effectiveness of the treatment devices proposed in the above section has been modelled using MUSIC with the overall treatment train efficiency results shown in Table 8 below.

OUTPUT DATA FROM MUSIC SOFTWARE					
	SOURCES	RESIDUAL LOAD	REDUCTION (%)	TARGET (%)	TARGET ACHIEVED
FLOW (ML/YR)	8.23	8.17	0.7	-	-
TOTAL SUSPENDED SOLIDS (KG/YR)	1270.00	149.00	88.30	80.00	YES
TOTAL PHOSPHORUS (KG/YR)	2.70	1.24	54.20	45.00	YES
TOTAL NITROGEN (KG/YR)	18.50	9.46	48.80	45.00	YES
GROSS POLLUTANTS (KG/YR)	321.00	21.90	93.20	70.0	YES

Table 8 – Runoff Treatment Scheme

From the results presented in Table 8 the proposed SQID's mitigate the water quality impacts of the development and meet the required Water Quality Objectives thus ensuring stormwater quality is appropriately managed.

9. Site Management Plan

It is expected that the construction phase works will comprise of:

- Clearing
- Bulk Earthworks
- Trimming and Profiling
- Road boxing and construction
- Site Drainage & Services construction
- Landscaping and associated drainage

During the construction phase, the management of stormwater runoff from the exposed earthworks surfaces will be based on containment, diversion and retention. Throughout the stages of construction these include:

- Erosion controls such as sediment fences surrounding stripped earth
- Sediment fences surrounding stockpiles of soil and debris
- Construction of perimeter bunding at toe and/or top of earthworks batters
- Catch drains, including check dams, though the site to catch direct runoff.
- The containment of runoff from the site into a temporary sediment basin during the construction works.
- Diversion drains to re-direct clean water around the site.

An Erosion and Sediment Control plan will be included with the Contractor's building permit application and will be implemented during the construction phase. This will be prepared in accordance with the latest International Erosion Control Association (IECA) standards and applicable Council standards. A suitably qualified person will inspect construction works to ensure compliance.

During the construction phase the maintenance and monitoring of erosion and sediment control measures remains the responsibility of the Contractor. Details of the inspection frequency expected will be noted within the Contractor's Erosion and Sediment Control Drawings. If during the construction phase it is deemed required, monitoring will also be undertaken by qualified consultants to determine the impact of activities on the subject site.

10. Maintenance Program

Table 9 provides the maintenance summary proposed for the various SQID's to ensure they continue to operate as planned.

Stormwater Quality Improvement Devices	Maintenance Responsibility	
	On Maintenance period	Off Maintenance period
Rainwater Tanks	Individual house owners	Individual house owners
Detention Tanks	Developer	Body Corporate
Humeceptor or approved equivalent	Developer	Body Corporate
Gross Pollutant Trap	Developer	Body Corporate

Table 9 - Summary of SQID Maintenance Responsibility

Rainwater Tanks and Detention Tanks

The responsibility to maintain water tanks to the manufacturer's specifications will be the responsibility of the individual house owners or the body corporate.

An example of rainwater tank types and maintenance are included in Appendix D.

Humeceptor (or Approved Equivalent)

Humeceptors require servicing at intervals of approximately 3-12 months depending upon site characteristics and storm frequency. Maintenance should be conducted by experienced and qualified personnel in accordance with the manufacturer's specifications. Regular maintenance prevents failure of the device due to excess loads or blockages. Further device maintenance requirements can be found in Appendix E.

Gross Pollutant Trap (GPT)

GPT's should be maintained in accordance with the manufacturers' specifications, but in general will include 3 monthly inspections with annual maintenance for full cleaning recommended. GPT's are generally (depending on model) cleaned as outlined below:

- A vacuum truck lowers its suction hose to the surface of the water in the holding chamber and skims across the surface to capture the floating litter.
- Once this has been achieved then the hose should be lowered to the bottom of the holding chamber to remove sediments, organic matter and litter, which have sunk.
- It is sometimes appropriate to de-water the system before attempting to suck the pollutants out of the holding chamber. This can be done onto adjacent ground or into council's sewer systems, with the authority's consent.

Generally, the need for maintenance can be determined easily by opening the unit from the surface and inspecting it. A dip stick to determine how much sediment and gross pollutants have been caught in the holding chamber.

11. Conclusion

This Stormwater Management Plan has been prepared for the proposed development at 15-29 Coomoora Road, Springvale South. The proposed development comprises the construction of 45 townhouses and 16 land only lots. If unmitigated, the proposed development will increase the volume of stormwater runoff from the site due to the new impervious surfaces. Furthermore, the development would influence runoff water quality from the site.

Stormwater attenuation and treatment devices have been proposed in this report to minimise the impact the development has on the external environment. Moreover, as the site is impacted by the Special Building Overlay, the lot levels in the site will be designed to ensure they are greater than 300mm above the 1 in 100 year flood levels as per condition 6 of the Melbourne Water recommendations. Detailed modelling of the flooding shall be conducted prior to the application for a Planning Permit.

This report has demonstrated that the recommended devices exceed the required best practice water quality performance objectives by incorporating Water Sensitive Urban Design into the proposed stormwater drainage system for Total Suspended Solids, Total Phosphorous, Total Nitrogen and Gross Pollutants.

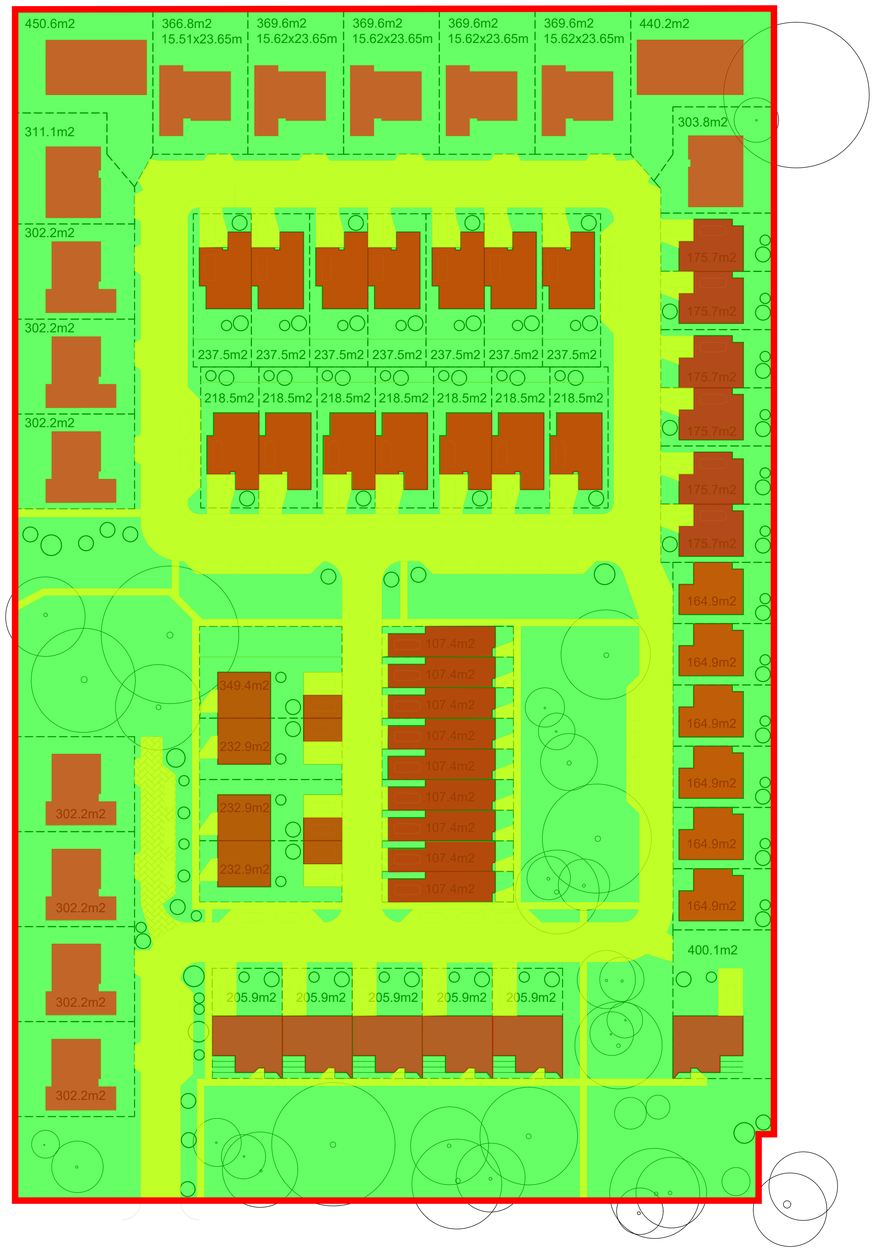
Furthermore, the report has shown that the proposed detention methods ensure a non-worsening effect in runoff volumes for all flows up to and including the 10year ARI storm event.

As such from a stormwater management perspective, we believe the development complies with the City of Greater Dandenong Council Planning Scheme Clause 53.18 and should be endorsed for approval.

Appendix A – Catchments

DATE PLOTTED: 5/03/2020 11:21:47 AM BY: - ABBA, YOUSIF

INDICATIVE DEVELOPMENT LAYOUT FOR STORMWATER ASSESSMENT PURPOSES ONLY



Legend

Description	Quantity	Unit
Roof Area	5,610.10	sq m
Pavement Area	5,630.73	sq m
Landscape Area	12,823.05	sq m
Total Area	24,063.88	sq m

1:500 5 0 5 10 15 20 25 A1
1:1000 A3

CAD FILE: DRAWING2.DWG

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NOT FOR CONSTRUCTION

CI-050-SK01 A

Appendix B – OSD Calculations

*** SUMMARY OSD DESIGN REPORT ***
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Printed from *OSD4W* version 1.08.4 S/N # W1-03031
Licensed to : Wood Grieve
Prepared by : User1
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1. CLIENT DETAILS
Name : ClientName
Address line 1 : ClientDet1.....
Address line 2 : ClientDet2.....
Address line 3 : ClientDet3.....

2. JOB NAME AND REFERENCE
Job Reference : OSD4W-2008-001
Job Name : JobName.....
Job Detail 1 : JobAddress1.....
Job Detail 2 : JobAddress2.....
Job Detail 3 : JobAddress3.....

3. AREAS (sq.m.) & RUN-OFF COEFFICIENTS
Total Site area : 24000

4. EXISTING SITE DETAILS
Aes1 : 0 Ces1 : 1.00
Aes2 : 2990 Ces2 : 0.90
Aes3 : 21010 Ces3 : 0.30
Aes4 : 0 Ces4 : 0.00
Weighted C - site Cew : 0.37

5. PROPOSED SITE DETAILS
Aps1 : 5610 Cps1 : 1.00
Aps2 : 5631 Cps2 : 0.90
Aps3 : 12759 Cps3 : 0.30
Aps4 : 0 Cps4 : 0.00
Weighted C - site Cpw : 0.60
Uncontrolled portion(s) UPfrac : 0.00

6. CATCHMENT TIMES (minutes)
Time of concentration : 10.00
Travel time from discharge point
to catchment outlet : 5.00

7. OSD DESIGN
Flow Control Device : MC2 Multi-Cell
Storage type : Tank
Rainfall zone : MELBOURNE
ARI for OUTFLOW (years) : 5
ARI for STORAGE (years) : 10
Qptot (L/s) : 157.43
Qu (L/s) : 0.00
Qp (L/s) : 0.00
Calculated PSD (L/s) : 178.58
Nominated PSD (L/s) : 189.00
Adopted PSD (L/s) : 189.00

8. STORAGE DETAILS
Volume (cub.m.) : 133.21
Time to fill storage (mins) : 14.7
Time to empty storage (mins) : 39.6
Critical storm duration (mins) : 21.1

9. STORM DURATIONS & RAINFALL INTENSITIES
PSD ..... Duration : 10.0 min. Intensity : 63.0 mm/hr
MAX. STORAGE ..... Duration : 21.1 min. Intensity : 51.9 mm/hr

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Appendix C – Preliminary Stormwater Drainage Strategy

INDICATIVE DEVELOPMENT LAYOUT FOR STORMWATER ASSESSMENT PURPOSES ONLY

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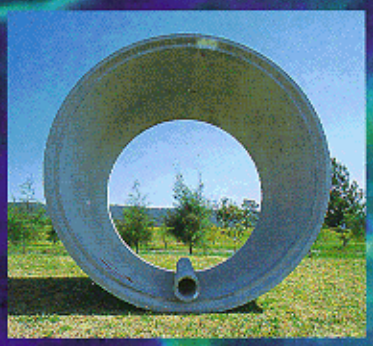
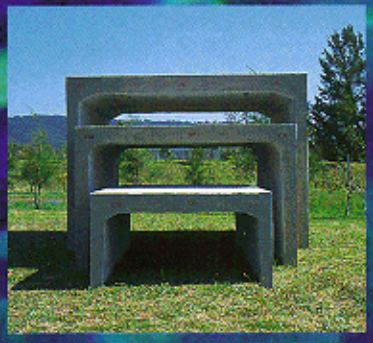
Appendix D – Detention and Rainwater Tanks

Rocla

ON SITE DETENTION SYSTEMS



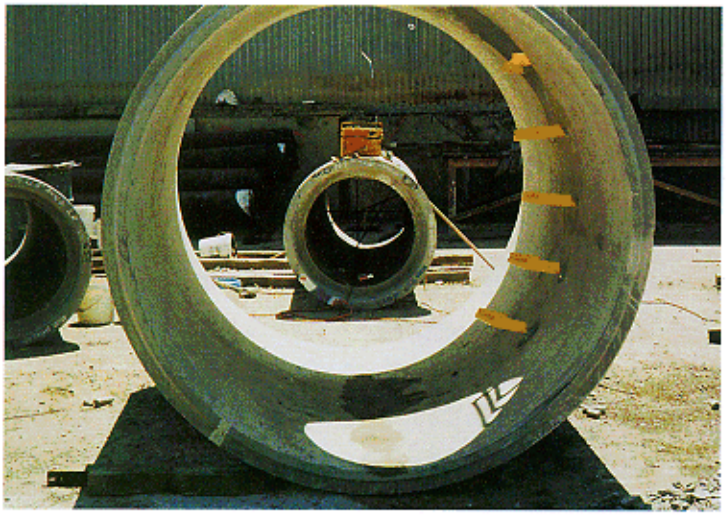


RELIEVE THE PRESSURE OF ON SITE DETENTION

On site stormwater detention helps relieve the pressure on Councils to provide retarding basins in built up areas and on overloaded drains downstream.

When you look at the slower to construct, more expensive traditional methods, such as custom made either in or above ground tanks, a system based on standard Rocla reinforced concrete box units, pipes and CPO™ Pits has many benefits. If necessary, we can also offer other specific precast solutions.

STANDARD SIZE COMPONENTS - Tailored Solutions



Different applications have different requirements. We can supply to your specification, either factory fitted or separate for site installation.

Some common options are:

- Inlet/Outlet Pipes
- Step Irons
- Access points for maintenance
- Leg Cutouts and End Blockouts
- Grates/Trash Racks
- Orifice Plates

QUALITY PRODUCTS THAT SAVE TIME AND MONEY

DURABLE

High strength, manufactured in a Quality Assured factory environment. A permanent asset with low whole of life and maintenance costs.

MODULAR

Vast range of standard sizes gives multiple choices for each design situation with the knowledge of a proven product.

Contact Rocla for tables of storage and to determine product availability.

EASY AND FAST TO INSTALL

- No formwork, shutters or props
- No expensive, continuous concrete pours
- Less over excavation and backfilling

KNOWN VOLUME

Standard volumes are easily verified for Certification by Authorities.

SAFETY

- Same day backfilling

LOAD CARRYING STRUCTURE

Products are generally designed and manufactured for highway loadings. In fact, some box culverts, designed to accommodate the zero fill condition, could have the crown used as the running surface in carparks which saves on pavement materials.

SUCCESSFUL TRACK RECORD

"We looked at a number of alternatives... Precast concrete tanks came up as the best way to go - they are long lasting, easy to install and you are very sure of the volume you are going to get. The range of sizes of box culverts means you can solve depth and cover problems" - ***Peter Lockhart, Koukourou Urban and Residential Engineers.***

"We have been working with Rocla for 5 or 6 years now and I think we have pioneered the adaptation of the culvert units for detention tanks - getting the end cast in and holes for outlet pipes, overflow and access" - ***Alan Pike, Alannette contractors.***

"Excellent service... When we get another job... we'll definitely use Rocla." - ***Mick Quinlan, South Creek Plumbing.***

Relieve the pressure of on site detention once and for all, call Rocla Pipeline Products for your individual solutions.

Rocla

On Site Detention Systems

BOX UNITS

OSD SYSTEMS VOLUMES (m^3) *Note: Standard Unit is* **2.4m** *in Length*

Nominal Size Width x Height (mm)	VOLUME (m^3) FOR UNITS				
	1 unit	2 units	4 units	10 units	20 units
300 x 150	0.1	0.2	0.4	1.1	2.2
300 x 225	0.2	0.3	0.6	1.6	3.2
375 x 150	0.1	0.3	0.5	1.4	2.7
375 x 225	0.2	0.4	0.8	2.0	4.1
375 x 300	0.3	0.5	1.1	2.7	5.4
450 x 150	0.2	0.3	0.6	1.6	3.2
450 x 225	0.2	0.5	1.0	2.4	4.9
450 x 300	0.3	0.6	1.3	3.2	6.5
600 x 225	0.3	0.6	1.3	3.2	6.5
600 x 300	0.4	0.9	1.7	4.3	8.6
600 x 375	0.5	1.1	2.2	5.4	10.8
750 x 225	0.4	0.8	1.6	4.1	8.1
750 x 300	0.5	1.1	2.2	5.4	10.8
750 x 450	0.8	1.6	3.2	8.1	16.2
750 x 600	1.1	2.2	4.3	10.8	21.6
900 x 225	0.5	1.0	1.9	4.9	9.7
900 x 300	0.6	1.3	2.6	6.5	13.0
900 x 450	1.0	1.9	3.9	9.7	19.4
900 x 600	1.3	2.6	5.2	13.0	25.9
900 x 750	1.6	3.2	6.5	16.2	32.4
1200 x 300	0.9	1.7	3.5	8.6	17.3
1200 x 450	1.3	2.6	5.2	13.0	25.9
1200 x 600	1.7	3.5	6.9	17.3	34.6
1200 x 750	2.2	4.3	8.6	21.6	43.2
1200 x 900	2.6	5.2	10.4	25.9	51.8
1500 x 300	1.1	2.2	4.3	10.8	21.6
1500 x 600	2.2	4.3	8.6	21.6	43.2
1500 x 900	3.2	6.5	13.0	32.4	64.8
1500 x 1200	4.3	8.6	17.3	43.2	86.4
1800 x 300	1.3	2.6	5.2	13.0	25.9
1800 x 600	2.6	5.2	10.4	25.9	51.8
1800 x 900	3.9	7.8	15.6	38.9	77.8
1800 x 1200	5.2	10.4	20.7	51.8	103.7
1800 x 1500	6.5	13.0	25.9	64.8	129.6

BOX UNITS ... *continued*

OSD SYSTEMS VOLUMES (m^3) *Note: Standard Unit is* **2.45m** *in Length*

Nominal Size Width x Height (mm)	VOLUME (m^3) FOR UNITS				
	1 unit	2 units	4 units	10 units	20 units
2100 x 600	3.1	6.3	12.6	31.4	62.8
2100 x 900	4.7	9.4	18.8	47.1	94.2
2100 x 1200	6.3	12.6	25.1	62.8	125.5
2100 x 1500	7.8	15.7	31.4	78.5	156.9
2100 x 1800	9.4	18.8	37.7	94.2	188.3
2100 x 2100	11.0	22.0	43.9	109.8	219.7
2400 x 600	3.6	7.2	14.3	35.8	71.6
2400 x 900	5.4	10.7	21.5	53.7	107.4
2400 x 1200	7.2	14.3	28.6	71.6	143.2
2400 x 1500	8.9	17.9	35.8	89.5	179.0
2400 x 1800	10.7	21.5	43.0	107.4	214.8
2400 x 2100	12.5	25.1	50.1	125.3	250.6
2400 x 2400	14.3	28.6	57.3	143.2	286.4
2700 x 600	4.0	8.0	16.1	40.2	80.4
2700 x 900	6.0	12.1	24.1	60.3	120.6
2700 x 1200	8.0	16.1	32.2	80.4	160.8
2700 x 1500	10.1	20.1	40.2	100.5	201.0
2700 x 1800	12.1	24.1	48.2	120.6	241.2
2700 x 2100	14.1	28.1	56.3	140.7	281.4
2700 x 2400	16.1	32.2	64.3	160.8	321.6
3000 x 600	4.5	8.9	17.8	44.6	89.2
3000 x 900	6.7	13.4	26.8	66.9	133.8
3000 x 1200	8.9	17.8	35.7	89.2	178.5
3000 x 1500	11.2	22.3	44.6	111.5	223.1
3000 x 1800	13.4	26.8	53.5	133.8	267.7
3000 x 2100	15.6	31.2	62.5	156.2	312.3
3000 x 2400	17.8	35.7	71.4	178.5	356.9
3300 x 600	4.9	9.8	19.6	49.0	98.0
3300 x 900	7.4	14.7	29.4	73.5	147.1
3300 x 1200	9.8	19.6	39.2	98.0	196.1
3300 x 1500	12.3	24.5	49.0	122.6	245.1
3300 x 1800	14.7	29.4	58.8	147.1	294.1
3300 x 2100	17.2	34.3	68.6	171.6	343.2
3300 x 2400	19.6	39.2	78.4	196.1	392.2
3600 x 600	5.3	10.7	21.4	53.4	106.9
3600 x 900	8.0	16.0	32.1	80.2	160.3
3600 x 1200	10.7	21.4	42.7	106.9	213.7
3600 x 1500	13.4	26.7	53.4	133.6	267.2
3600 x 1800	16.0	32.1	64.1	160.3	320.6
3600 x 2100	18.7	37.4	74.8	187.0	374.0
3600 x 2400	21.4	42.7	85.5	213.7	427.5

Rocla

On Site Detention Systems

PIPES

OSD SYSTEMS VOLUMES (m^3) *Note: Standard Unit is* 2.44m *in Length*

Nominal Diameter (mm)	VOLUME (m^3) FOR LENGTHS				
	1 length	2 lengths	4 lengths	10 lengths	20 lengths
225	0.1	0.2	0.4	1.0	1.9
300	0.2	0.3	0.7	1.7	3.4
375	0.3	0.5	1.1	2.7	5.4
450	0.4	0.8	1.6	3.9	7.8
525	0.5	1.1	2.1	5.3	10.6
600	0.7	1.4	2.8	6.9	13.8
675	0.9	1.7	3.5	8.7	17.5
750	1.1	2.2	4.3	10.8	21.6
825	1.3	2.6	5.2	13.0	26.1
900	1.6	3.1	6.2	15.5	31.0
1050	2.1	4.2	8.5	21.1	42.3
1200	2.8	5.5	11.0	27.6	55.2
1350	3.5	7.0	14.0	34.9	69.9
1500	4.3	8.6	17.2	43.1	86.2
1650	5.2	10.4	20.9	52.2	104.3
1800	6.2	12.4	24.8	62.1	124.2

SALES LOCATIONS FOR PIPELINE PRODUCTS

For further information on our range of Pipeline products, contact your local sales office on our national number 131 004.

Mobile phones in country areas may need to ring the office numbers.

For further information on our range of Pipeline products contact your local sales office. Sydney, Brisbane, Melbourne, Adelaide, Perth, Dapto, Newcastle, Glen Innes and Toowoomba can be reached on our national number 131 004

Sydney:	Old Bathurst Road, Emu Plains 2750 Phone (02) 4735 5100 Fax (02) 4735 2608
Dapto:	Hamilton Street, Dapto 2530 Phone (02) 4261 1044 Fax (02) 4262 1589
Dubbo:	Jannali Road, West Dubbo 2830 Phone (02) 6882 2166 Fax (02) 6882 6243
Newcastle:	Neilson Street, Edgeworth 2285 Phone (02) 4958 1633 Fax (02) 4958 4207
Glenn Innes:	Ferguson Street, Glen Innes 2370 Phone (02) 6732 3160 Fax (02) 6732 4097
Narrandera:	Middle Road, Narrandera 2700 Phone (02) 6959 1377 Fax (02) 6959 3098
Canberra:	14 Tennant Street, Fyshwick 2609 Phone (02) 6280 7655 Fax (02) 6239 1184
Melbourne:	Bolinda Road, Campbellfield 3061 Phone (03) 9292 0300 Fax (03) 9292 0399
Avoca:	Rowe Street, Avoca 3467 Phone (03) 5465 3355 Fax (03) 5465 3530
Traralgon:	Princes Highway, Traralgon 3844 Phone (03) 5174 7477 Fax (03) 5174 8319
Wodonga:	Yackandandah Road, PO Box 301, Wodonga 3690 Phone (02) 6024 1488 Fax (02) 6024 5029
Brisbane:	Ipswich Road, Gailes 4300 Phone (07) 3335 1011 Fax (07) 3335 1099
Cairns:	Scott Street, Cairns 4870 Phone (07) 4054 3888 Fax (07) 4054 7439
Mackay:	Archibald Street, Mackay 4740 Phone (07) 4952 1066 Fax (07) 4952 3878
Toowoomba:	Cnr MacDougall St & Hursley Road, Toowoomba 4350 Phone (07) 4634 3188 Fax (07) 4634 5397
Adelaide:	Cavan Road, PO Box 74, Dry Creek 5094 Phone (08) 8262 2032 Fax (08) 8260 5599
Perth:	3 Newburn Road, Kewdale 6105 Phone (08) 9353 2288 Fax (08) 9353 3658
Head Office:	Rocla Pipeline Products 6 - 8 Thomas Street, Chatswood NSW 2067 Phone (02) 9928 3500 Fax (02) 9928 3580

Quality System
Quality Endorsed Company
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Aquatanks™

STRATCO

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AQUATANKS™

Aqua-Mod™ Tank

The innovative Stratco Aqua-Mod Tank is unmatched in quality and value for money. Designed especially for homes, units and townhouses where space is limited, its clean, smooth lines will create a seamless blend with your home's architecture. Available in un-painted galvanised or painted in your choice of a broad spectrum of colours, a Stratco Aqua-Mod will complement any outdoor environment.

With four sizes to choose from, there is an Aqua-Mod Tank for every requirement. The range includes a 500 litre One Module, a 1000 litre Two Module, an 870 litre Three Module, and a 2000 litre Four Module Tank. The One, Two and Four Module Tanks are supplied with a 3/4" outlet and tap, while the Three Module Tank has a 1/2" outlet and tap. All Aqua-Mods are supplied with an inbuilt filter, a 400mm x 400mm inspection point with a cover, and all inlets and outlets are protected with mosquito proof wire.

Optional extras include a different sized outlet and tap, a factory fitted flushing plug, and a tank stand tailored to your tank size. The stands are 500mm high, engineered for strength and made from galvanised steel. Optional adjustable feet kits are available with your stand to provide a stable footing on uneven ground.

Model	Capacity	Length	Width	Height
1 Module	500 litres	700mm	570mm	1420mm
2 Module	1000 litres	1400mm	570mm	1420mm
3 Module	870 litres	1760mm	570mm	1030mm
4 Module	2000 litres	2750mm	570mm	1420mm

Availability	Model	QLD	NSW	ACT	VIC	SA	WA	NT
	1 Module	–	–	–	•	–	–	–
	2 Module	–	•	•	•	•	•	–
	3 Module	–	•	•	•	•	•	–
	4 Module	–	•	•	•	•	•	–

Aqua-Barrel® Tank

Form and function come together in the Aqua-Barrel Tank. It is a strong, modern tank with a slim design and stylish rounded curves. Designed to sit closely against an existing wall, the slim 560mm* width makes it ideal for installation under eaves and other narrow spaces. Available in a choice of colours, the Aqua-Barrel Tank will blend seamlessly with your outdoor environment.

The Aqua-Barrel Tank is manufactured from Aquaplate® steel to ensure your water tastes clean and fresh. The inside surface of Aquaplate steel is coated with a food grade polymer skin that provides clear, healthy rainwater, and has a very long, useable life.

The range has six sizes with five capacities to choose from depending on your State. The sizes are; a 500 litre, 1000 litre, 2000 litre, 3000 litre and a 5000 litre tank. The larger tanks have external bracing for added strength. All tanks are supplied with a 3/4" outlet and tap. A 300mm diameter mosquito proof inlet is fitted which doubles as an inspection point when removed.

Optional extras include a different sized outlet and a heavy-duty tank stand. The stands are 450mm high, engineered for strength and made from galvanised steel. The tank stands have rounded ends to match the tank. Adjustable feet kits are available with your stand to provide a stable footing on uneven ground.

Model	Capacity	Length	Width	Height
500 Low	500 litres	1400mm	560mm	810mm
1000 Low	1000 litres	2700mm	560mm*	810mm
1000	1000 litres	1400mm	560mm*	1550mm
2000	2000 litres	2700mm	560mm*	1550mm
3000	3000 litres	3000mm	760mm*	1550mm
5000	5000 litres	3420mm	1270mm*	1570mm

*50x50mm tubular steel external bracing used, which makes the actual total width of the tank an extra 100mm.

Availability	Model	QLD	NSW	ACT	VIC	SA	WA	NT
	500 Low	–	–	–	•	–	–	–
	1000 Low	–	–	–	•	–	•	–
	1000	–	–	–	•	–	•	–
	2000	–	–	–	•	–	•	–
	3000	•	–	–	•	–	–	–
	5000	•	–	–	–	–	–	–

Benefit from environmentally friendly cost savings.

Aqua-Quad™ Tank

New forms offer a fresh outlook on a traditional design in the Aqua-Quad Tank. Aqua-Quad Tanks provide the style of a round corrugated design, yet maximise their water holding capacity and the floor space they occupy through their square form. The Stratco Aqua-Quad Tank will fit neatly into corners and against walls, making it the perfect solution in situations where space is limited.

Aqua-Classic™ Tank

Embodying the traditional character of a round corrugated tank, the Aqua-Classic Tank has a timeless style that complements both traditional and modern homes. The round form of the Aqua-Classic Tank is not only attractive, but also very strong. The Aqua-Classic Tank is available in a 3000 litre or a 5000 litre size.

Aqua-Quad and Aqua-Classic Tanks are manufactured from Aquaplate® steel. The inside surface of Aquaplate steel is coated with a food grade polymer skin that provides clear, healthy rainwater, and has a long, useable life. The bottom of the tank features a second layer of Aquaplate steel with the polymer side facing outwards to protect the base of the tank from the elements.

Aqua-Quad and Aqua-Classic Tanks are supplied with a 1" outlet and tap and have an inbuilt 300mm diameter filter that doubles as an inspection point when removed. They can be placed on a suitable concrete slab, with the best results achieved when bitumen saturated felt is laid between the tank and base. Other options include a different sized outlet and tap.

Model	Capacity	Length	Width	Height
Aqua-Quad	2000 litres	1360mm	1360mm	1550mm
Aqua-Classic	3000 litres	-	1530mm	2030mm
Aqua-Classic	5000 litres	-	1950mm	2030mm

Availability	Model	QLD	NSW	ACT	VIC	SA	WA	NT
	**Aqua-Quad:**							
	2000 litres	•	•	•	•	•	•	-
	Aqua-Classic:							
	3000 litres	•	•	•	•	•	•	-
	5000 litres	•	•	•	•	•	•	-

Aqua-Link™ Tank

Smooth, rounded curves are a feature of the Stratco Aqua-Link™ system; the next generation of modular rainwater tanks. The modern, stylish 1100 litre modules can be linked together to provide maximum water catchment where space is limited.

The strong modules are only 800mm wide, 1900mm long and 1340mm high, making Aqua-Link Tanks easy to manoeuvre, even into difficult locations. Each module has a convex end and a concave end. The concave end is designed to accommodate another module, or an optional overflow moulding that can be included to complete the rounded curves of the tank.

Manufactured from food grade polyethylene that is protected against ultraviolet rays. The tank is formed in one piece from rotomoulded plastic that forms a thick wall. It will not corrode and has excellent impact resistance. This advanced manufacturing method delivers one of the strongest, cleanest and most durable tanks available. Stratco Aqua-Link Tanks are designed, engineered and tested to meet all relevant Australian Standards.

Aqua-Link Tanks come standard with a moulded brass outlet, 300mm mosquito proof inlet that also acts as a leaf strainer and inspection point, and an integrated overflow outlet.

Component	Capacity	Length	Width	Height
Tank	1100 litres	1900mm	800mm	1340mm
Optional Overflow	N/A	350mm	800mm	1340mm

Availability	QLD	NSW	ACT	VIC	SA	WA	NT
	-	•	-	•	•	-	-

Hydrate your home and budget by harvesting rainwater.

Aqua-Line™ Tank

Modern and contemporary style is embodied in the extremely durable and practical Stratco Aqua-Line Tank. Manufactured from food grade polyethylene they feature a clean, smooth surface with thin, attractive strengthening ribs. With their combination of style and appealing colours, Aqua-Line Tanks are designed to be an attractive addition to your home.

Manufactured in one piece from rotomoulded plastic, Aqua-Line Tanks use this advanced manufacturing method to deliver one of the strongest, cleanest and most durable tanks available. The polyethylene used is protected against ultraviolet rays and forms a thick wall that has excellent impact resistance and will not corrode. The tank is maintenance free and easy to move and relocate. Aqua-Line Tanks are engineered and tested to meet all relevant Australian Standards.

Two sizes are available; a 3000 and 5000 litre round design. Brass outlets are moulded into the tank at the time of manufacture for a watertight seal. The outlets are available in either 1" or 2" diameters and can be located in one of four locations around the tank. The tanks come standard with a 300mm inlet that also acts as a leaf strainer and inspection point. An optional 400mm inlet with light guard is also available. The 90mm overflow can be positioned on either side of the tank. All the fittings are protected with mosquito proof mesh.

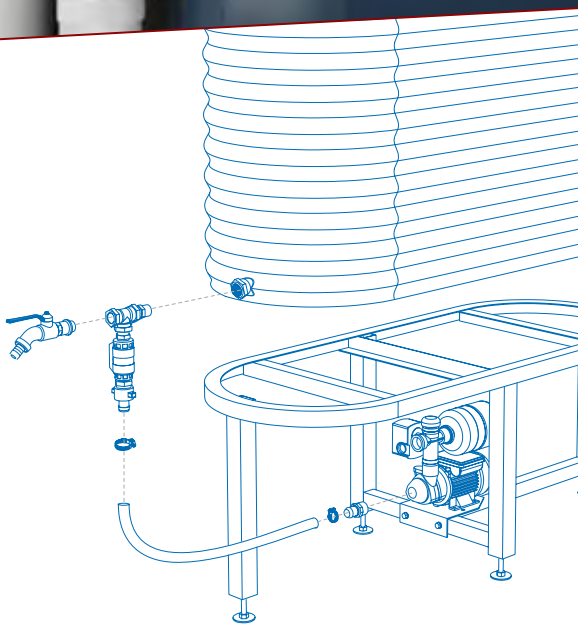
Model	Capacity	Width	Height
3000L Squat	3000 litres	1860mm	1780mm
3000L	3000 litres	1500mm	2250mm
5000L Squat	5000 litres	2060mm	2000mm
5000L	5000 litres	1860mm	2380mm

Availability	Model	QLD	NSW	ACT	VIC	SA	WA	NT
	3000L Squat	–	–	–	–	•	–	–
	3000L	•	–	–	–	–	–	–
	5000L Squat	–	–	–	–	•	–	–
	5000L	•	–	–	–	–	–	–

Harvesting Rainwater

Rainwater is a valuable natural resource that can be collected as an environmentally responsible way to provide real cost savings to any home or business. Homeowners and urban planning authorities are recognising the benefits of rainwater collection with new legislation being introduced in many areas.

A rainwater tank can save up to 100,000 litres of water a year in an average home. Collected rainwater can be used to water the garden, wash the car, or as drinking water. With additional plumbing and a pump, a tank can be used to flush the toilet, fill a washing machine, fill a water heater or be used through a cold water tap.



Pumps and Accessories

Get the full potential out of your rainwater tank with a complete range of pumps and accessories from Stratco. A wide range of pumps are available. The pump you choose will depend on the tank size, the requirements of the appliance that will feed from the tank, the diameter of the plumbing pipes and the pressure required.

If you choose to run your appliances solely from tank water, you may need a top-up facility to fill part of the tank with mains water when the rainwater gets low. When connecting to mains water, a backflow prevention device is needed to prevent the reverse flow of polluted water from contaminating drinking water. Some pumps have backflow and top-up devices built into their design. Stratco can supply separate top-up devices, backflow prevention devices and any pipes and fittings needed to complete the system.

Talk to Stratco when making a decision about what tank, pumps and accessories are required for the application. When installing a rainwater tank, never attempt to install a tank to mains water without a qualified plumber.

Maintenance

When installing your tank, ensure it is on a level, solid base. Do not store the tank on its side. Flush the tank before use, this is very important when connecting a pump. Do not stand on the top of the tank as the lid is not designed to support weight. When attaching the tap, use thread tape on the tap fitting and do not over tighten it. While the inlet filter provided with your tank will stop sticks and leaf debris entering the tank, it is also important to ensure the runoff area to the tank is free of debris. Clean the gutters every two months, or more regularly if trees overhang the roof. Remove any sludge from inside the tank when necessary. Do not scrub or scratch the interior surface of the tank because it has a protective coating covering the walls. Stratco tanks are produced from the highest quality materials and will provide many years of service if the important recommendations set out in the Stratco ‘Selection, Use and Maintenance’ brochure are followed.

STRATCO

CONTACT

1300 165 165

ZY-BRO-RT

www.stratco.com.au

Appendix E – Storm Water Treatment Device Specifications

Humes

Strength. Performance. Passion.

HumeCeptor® system Technical manual

Issue 5

Contents

enviro DEVELOPMENT™ PROFESSIONAL

HumeCeptor® system

The HumeCeptor® system is a patented hydrodynamic separator, specifically designed to remove hydrocarbons and suspended solids from stormwater runoff, preventing oil spills and minimising non-point source pollution entering downstream waterways.

The HumeCeptor® system is an underground, precast concrete stormwater treatment solution that utilises hydrodynamic and gravitational separation to efficiently remove Total Suspended Solids (TSS) and entrained hydrocarbons from runoff. First designed as an 'at source' solution for constrained, commercial and industrial sites it has been improved and expanded to service large catchments, mine and quarry sites, inundated drainage systems, and capture large volume emergency spill events. The system is ideal for hardstands/wash bays, car parks, shopping centres, industrial/commercial warehouses, petrol stations, airports, major road infrastructure applications, quarries, mine sites and production facilities.

Independently tested, and installed in over 30,000 projects worldwide, the HumeCeptor® system provides effective, and reliable secondary treatment of stormwater for constrained sites.

- **The system reliably removes a high level of TSS and hydrocarbons**
  The HumeCeptor® system was developed specifically to remove fine suspended solids and hydrocarbons from stormwater, and has been certified to achieve high pollutant removal efficiencies for TSS (>80%) and Total Nutrients (TN) (>30%) on an annual basis.
- **It captures and retains hydrocarbons and TSS down to 10 microns**
  Each system is specifically designed to maintain low treatment chamber velocities to capture and retain TSS down to 10 microns. It also removes up to 98% of free oils from stormwater.
- **Each device is sized to achieve the necessary Water Quality Objectives (WQO) on an annual basis**
  Utilising the latest build-up and wash-off algorithms, PCSWMM software for the HumeCeptor® system ensures that the device chosen achieves the desired WQO (e.g. 80% TSS removal) on an annual basis.
- **Its performance has been independently verified**
  The HumeCeptor® system's technology has been assessed by independent verification authorities including the New Jersey Department of Environmental Protection (NJDEP), The Washington Department of Environment (USA), and by the Canadian Environmental Technology Verification program (ETV).

Right:
The bypass chamber of a HumeCeptor® system

- **The system is proven**
  The HumeCeptor® system was one of the first stormwater treatment devices introduced to Australia, and now after 30,000 installations worldwide, its popularity is testament to its performance, quality and value for money.
- **High flows won't scour captured sediment**
  The unique design of HumeCeptor® units ensures that as flows increase and exceed the treatment flow, the velocity in the storage chamber decreases.
- **Nutrients are captured along with the sediment**
  The effective capture of TSS results in the capture of particulate nutrients shown to be >30% of TN and Total Phosphorous (TP).
- **Fully trafficable to suit land use up to class G**
  The HumeCeptor® system is a fully trafficable solution, it can be installed under pavements and hardstands to maximise above ground land use (loading up to class D as standard).
- **Custom designs allow for emergency oil spill storage, directional change, multiple pipes, tidal inundation and class G traffic loads**
  A range of HumeCeptor® systems are available, built specifically to manage emergency spills (50,000 L storage), change of pipe directions, the joining of multiple pipes, high tail water levels as a result of tides or downstream water bodies, and high levels of hydrocarbons with auxiliary storage tanks.
- **We are experienced in the provision of world class treatment solutions**
  Humes has a team of water specialists dedicated to the advancement of economical sustainable solutions, and the provision of expert advice and support.

System operation

The HumeCeptor® stormwater treatment system slows incoming stormwater to create a non-turbulent treatment environment, allowing free oils and debris to rise and sediment to settle. Each HumeCeptor® system maintains continuous positive treatment of TSS, regardless of flow rate, treating a wide range of particle sizes, as well as free oils, heavy metals and nutrients that attach to fine sediment.

The HumeCeptor® system's patented scour prevention technology ensures pollutants are captured and contained during all rainfall events.

Bypass chamber

1. Stormwater flows into the inlet (weir) area of the bypass chamber.
2. Design flows are diverted into the offline treatment chamber by a weir, orifice and drop pipe arrangement (refer to Figure 1).
3. The weir and orifice have been developed to create a vortex that sucks floating oils and sediment down into the treatment chamber.
4. During high flow conditions, stormwater in the bypass chamber overflows the weir and is conveyed to the stormwater outlet directly (refer to Figure 2).
5. Water which overflows the weir stabilises the head between the inlet drop pipe and outlet decant pipe ensuring that excessive flow is not forced into the treatment chamber, protecting against scour or re-suspension of settled material. The bypass is an integral part of the HumeCeptor® unit since other oil/grit separators have been found to scour during high flow conditions (Schueler and Shepp, 1993).

Figure 1 – HumeCeptor® system operation during design flow conditions

Figure 2 – HumeCeptor® system operation during high flow conditions

Treatment chamber

1. Once diverted into the treatment chamber through the weir and orifice, the drop pipe beneath the orifice is configured to discharge water tangentially around the treatment chamber wall.
2. Water flows through the treatment chamber to the decant pipe which is submerged similar to the drop pipe.
3. Hydrocarbons and other entrained substances with a specific gravity less than water will rise in the treatment chamber and become trapped beneath the fibreglass insert since the decant pipe is submerged.
4. Sediment will settle to the bottom of the chamber by gravity forces. The large volume of the treatment chamber assists in preventing high velocities and promoting settling.
5. Water flows up through the decant pipe based on the head differential at the inlet weir, and is discharged back into the bypass chamber downstream of the weir.

Independent verification testing

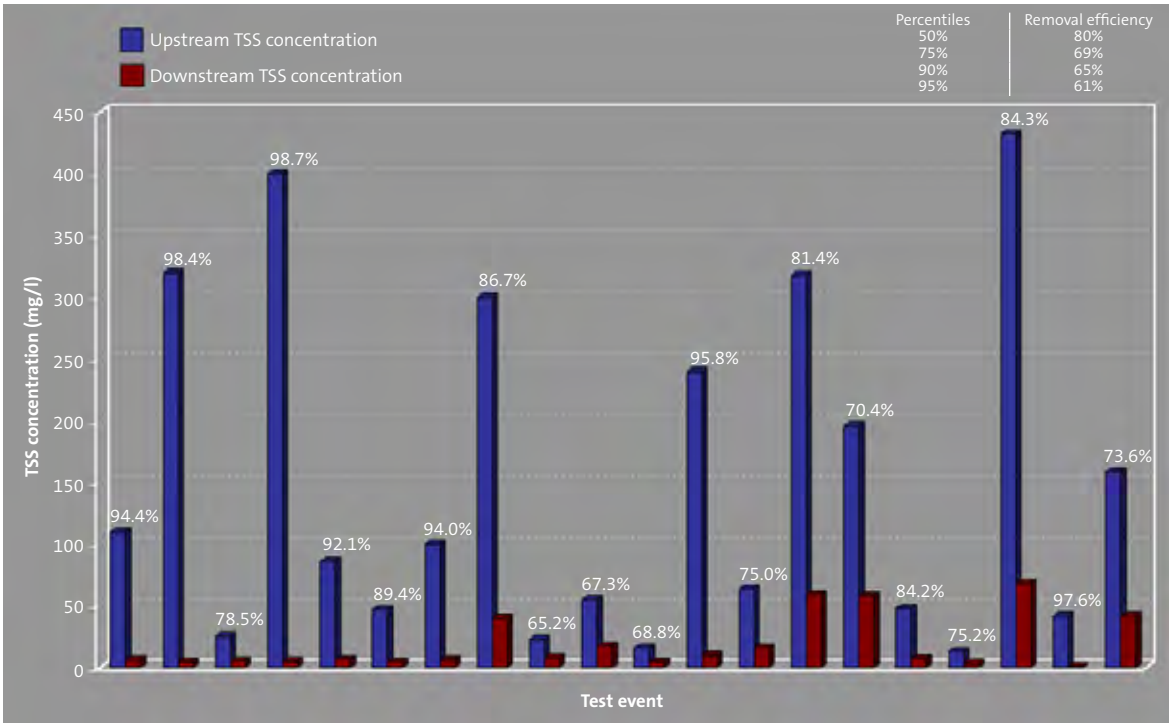
HumeCeptor® systems have been extensively researched by more than 15 independent authorities to validate its performance; it has now gained Environmental Technology Verification (ETV) certificates from ETV Canada, New Jersey Department of Environmental Protection (NJDEP) and Washington Department of Environment (WDOE).

A number of agencies have conducted independent studies; their results from these studies (over 100 test events) have been summarised in Table 1 below.

Table 1 – HumeCeptor® system performance summary

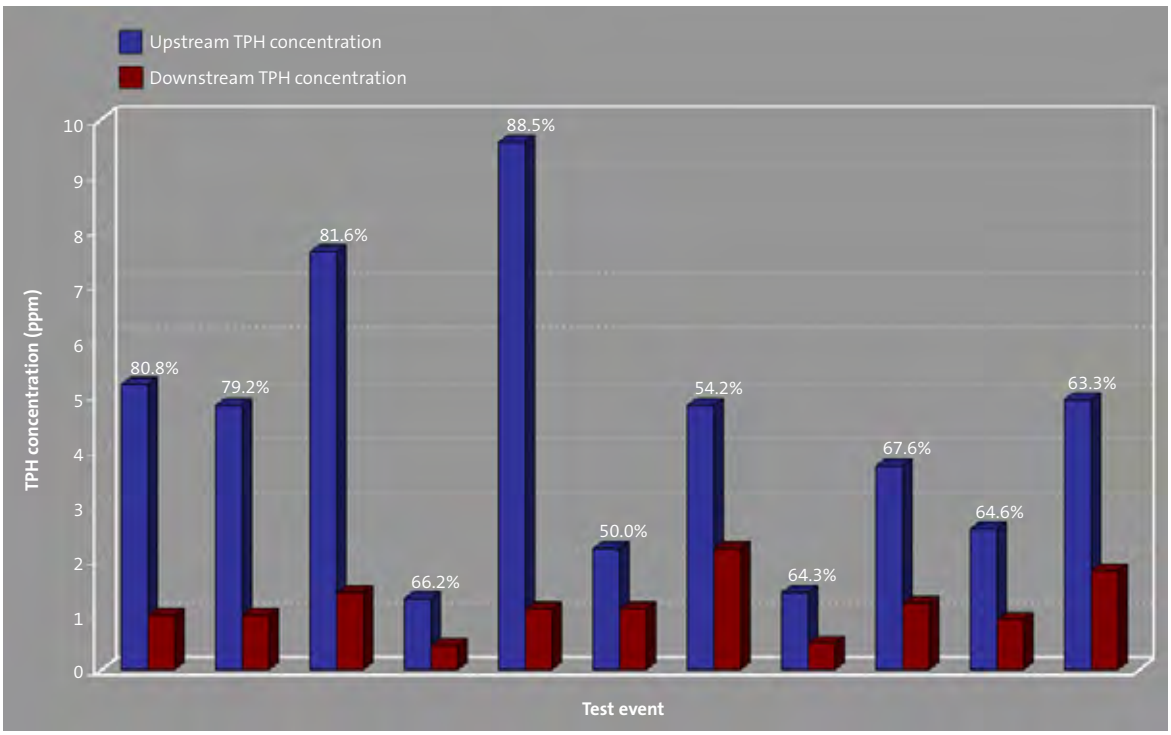
Pollutant	Average removal efficiency	Details
TSS	80%	Laboratory and field results, stable, hardstand, roads, commercial and industrial sites
TN	37%	Field results
TP	53%	Field results
Chromium	44%	Field results
Copper	29%	Field results
TPH	65%	<10 ppm inflow concentration
	95%	10 ppm - 50 ppm inflow concentration (typical stormwater)
	99%	>500 ppm inflow concentration (emergency spills)

Figure 3 – HumeCeptor® system field performance results for Total Suspended Solids (TSS) removal



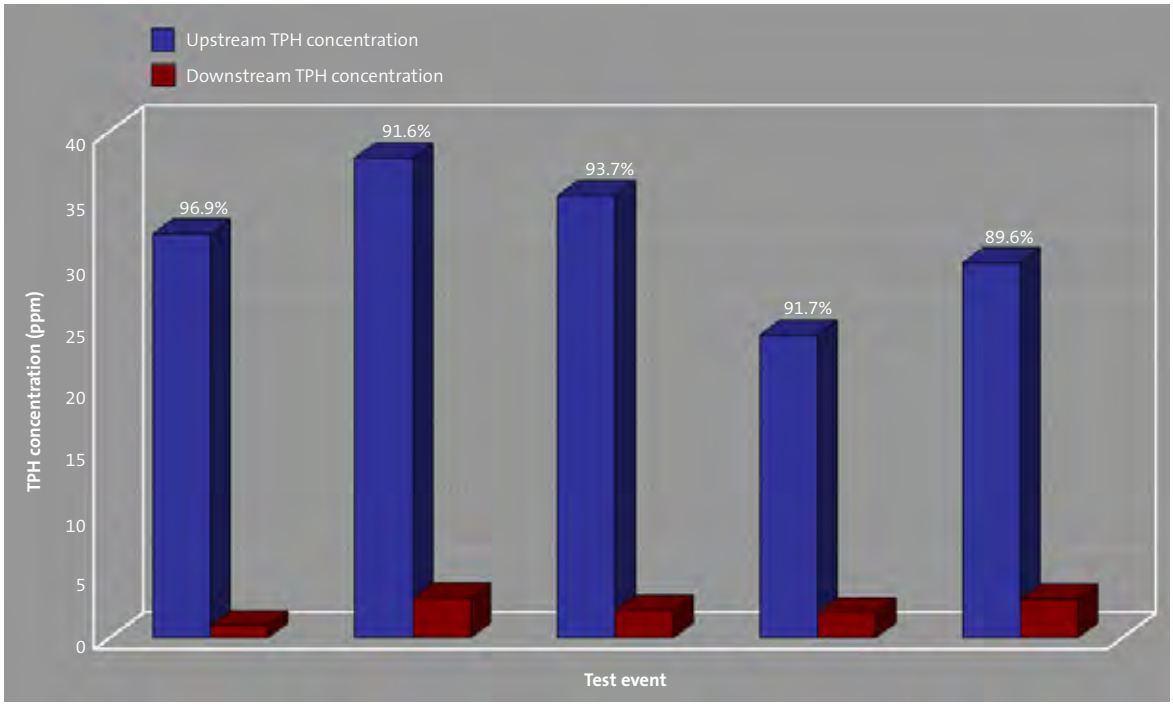
Note: Percentage values represent removal efficiencies

Figure 4 – HumeCeptor® system field performance for Total Petroleum Hydrocarbon (TPH) removal (influent concentration <10 ppm)



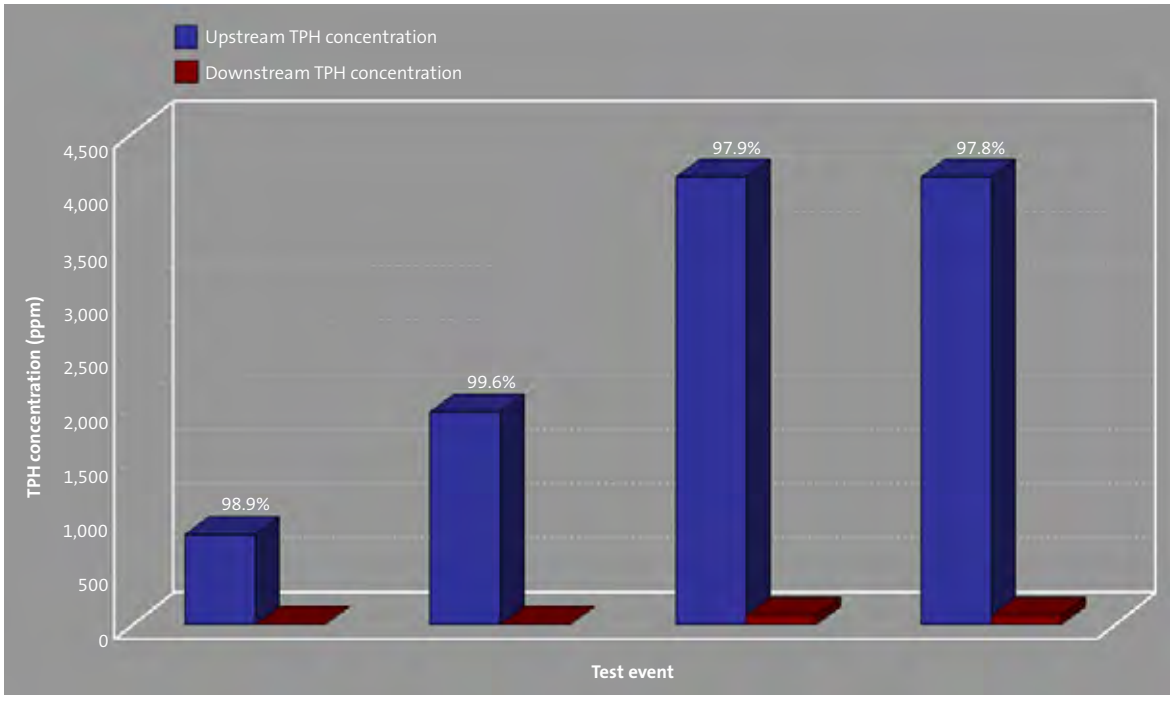
Note: Percentage values represent removal efficiencies

Figure 5 – HumeCeptor® system field performance for Total Petroleum Hydrocarbon (TPH) removal (influent concentration >10 ppm)



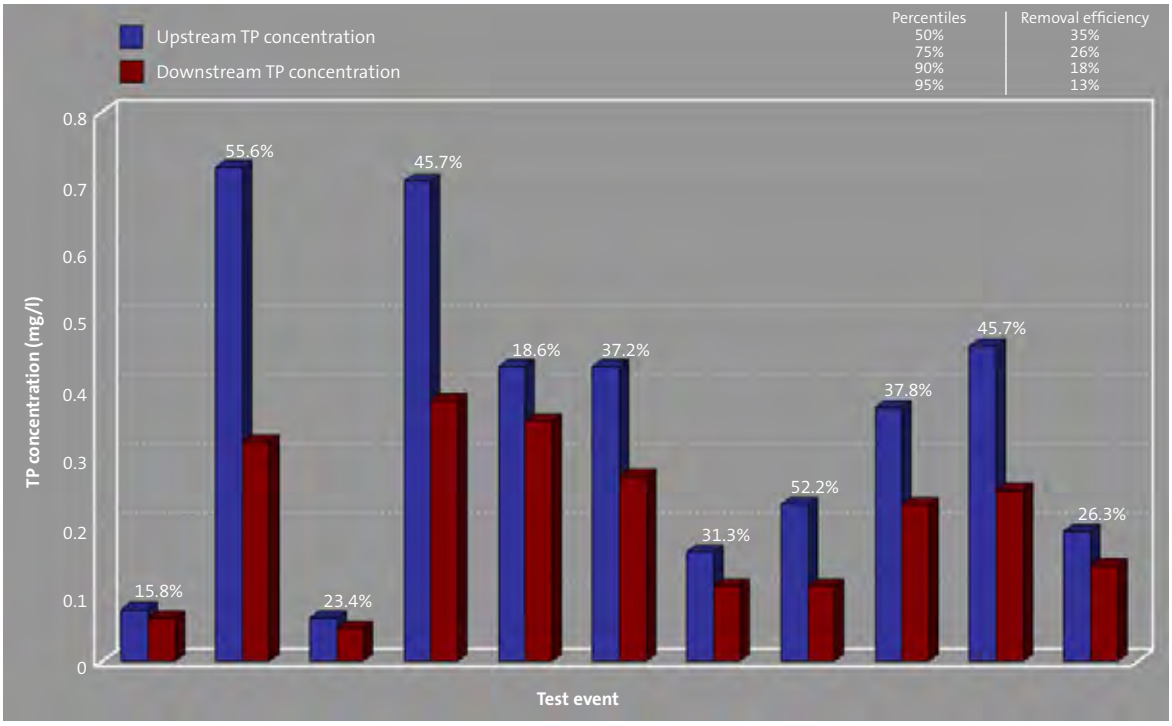
Note: Percentage values represent removal efficiencies

Figure 6 – HumeCeptor® system field performance for Total Petroleum Hydrocarbon (TPH) removal (influent concentration >1,000 ppm)



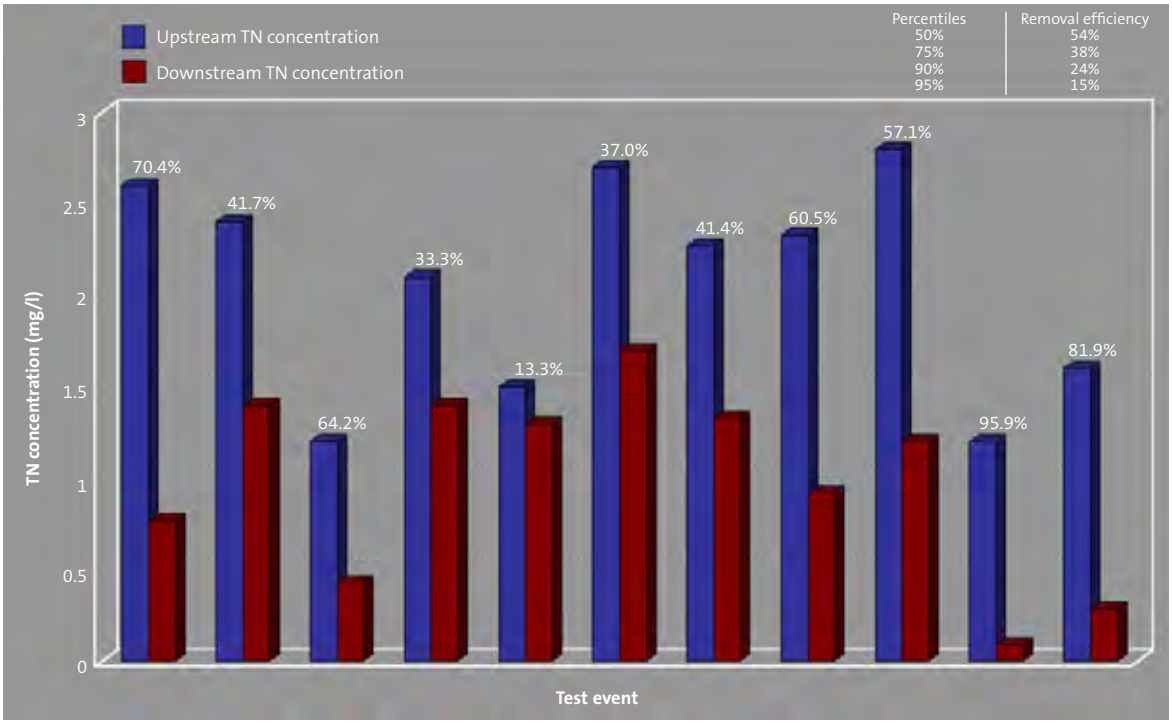
Note: Percentage values represent removal efficiencies

Figure 7 – HumeCeptor® system field performance for Total Phosphorous (TP) removal



Note: Percentage values represent removal efficiencies

Figure 8 – HumeCeptor® system field performance for Total Nitrogen (TN) removal



Note: Percentage values represent removal efficiencies

System options

There are a number of HumeCeptor® systems available to meet the requirements of various WQO for maintaining catchments and local hydrology. The standard range is detailed in Table 2 below.

Table 2 – HumeCeptor® model range and details

HumeCeptor® model	Pipe diameter (mm)	Device diameter (mm)	Depth from pipe invert* (m)	Sediment capacity (m^3)	Oil capacity (l)	Total storage capacity (l)
STC 2 (inlet)	100 - 600	1,200	1.7	1	350	1,740
STC 3	100 - 1,350	1,800	1.68	2	1,020	3,410
STC 5			2.13	3		4,550
STC 7			3.03	5		6,820
STC 9		2,440	2.69	6	1,900	9,090
STC 14			3.69	10	2,980	13,640
STC 18		3,060	3.44	14		18,180
STC 23			4.04	18		22,730
STC 27		3,600	3.84	20	4,290	27,270

Note:
*Depths are approximate.

Variants

Continual improvement over the last 14 years of HumeCeptor® system installations has provided a number of enhancements to address specific treatment and design requirements.

- **HumeCeptor® STC 2 (inlet) model**
  This model features a grated inlet to directly capture runoff from hardstand areas, replacing the need for a stormwater pit (refer to Figure 9).

Figure 9 – HumeCeptor® STC 2 (inlet) model

- **AquaCeptor™ model**

  This model has been designed with a weir extension to increase the level at which flows bypass the treatment chamber, and accommodate downstream tail water levels or periodic inundation (e.g. tidal situations). This weir extension is provided in standard heights of 100 mm intervals, up to a maximum of 500 mm.

  To maintain the hydrocarbon capture capabilities, an additional "high level" inlet pipe is also fitted. This facilitates the formation of the surface vortex from the bypass chamber into the treatment chamber and draws floating hydrocarbons into the unit.

  The selection of the appropriate weir extension height is undertaken in conjunction with the downstream engineering design and/or tidal range charts for the specific location. The AquaCeptor™ model is available in the same sizes as the standard HumeCeptor® units (refer Table 2 on the previous page).

Figure 10 – AquaCeptor™ model

- **MultiCeptor™ model**

  The MultiCeptor™ model (refer to Figure 11) was developed to facilitate the replacement of junction pits while still providing the treatment abilities of the original HumeCeptor® system and reducing time and costs during installation. These units reverse the weir structure to allow for:

  - change of pipe direction
  - multiple inlet pipes
  - differing invert levels of multiple inlet pipes
  - grated inlets.

  The MultiCeptor™ model is available in the same sizes as the standard HumeCeptor® units (refer to Table 3 below) and a 2,440 mm diameter MultiCeptor™ unit is also available to accommodate drainage pipes up to 1,800 mm diameter.

  The larger insert diameter allows for larger pipe connections that are more common where pipes are laid on very flat grades.

Figure 11 – MultiCeptor™ model

Table 3 – MultiCeptor™ model range and details

HumeCeptor® model	Pipe diameter (mm)	Device diameter (mm)	Depth from pipe invert (m)	Sediment capacity (m^3)	Oil capacity (l)	Total storage capacity (l)
MI3	100 - 1,350	1,800	1.68	2	1,020	3,410
MI5			2.13	3		4,550
MI7			3.03	5		6,820
MI9		2,440	2.69	6	1,900	9,090
MI14			3.69	10	2,980	13,640
MI18		3,060	3.44	14		18,180
MI23			4.04	18		22,730
MI27		3,600	3.84	20	4,290	27,270
MI9 - MI27 (2,440)	100 - 1,800	2,440 top up to 3,600 base	2.69 - 3.84	6 - 20	1,900 - 4,290	9,090 - 27,270

- **DuoCeptor™ model**

  The DuoCeptor™ model has been developed to treat larger catchments (2 Ha - 6 Ha) because some constrained developments can only accommodate a single, large device instead of several smaller devices.

  The unit operates by splitting the flow and treating half of the design flow through the first chamber. The untreated half of the design flow bypassed from the first chamber then passes through the split connection pipe into the second chamber for treatment. Treated flow from the first chamber exits and flows through the other side of the split connection pipe, and bypasses the second chamber to join the treated flow from the second chamber at the outlet of the DuoCeptor™ model.

  Figure 12 displays the DuoCeptor™ model and Table 4 details the range of capacities available.

Figure 12 – DuoCeptor™ model

Table 4 – DuoCeptor™ model range and details

DuoCeptor™ model	Pipe diameter (mm)	Device footprint (L x W)	Depth from pipe invert (m)	Sediment capacity (m^3)	Oil capacity (l)	Total storage capacity (l)
STC 40	600 - 1,500	7,750 x 3,500	3.41	27	10,585	42,370
STC 50			4.01	35	10,585	50,525
STC 60		9,150 x 4,200	3.89	42	11,560	60,255

- **HumeCeptor® MAX model**

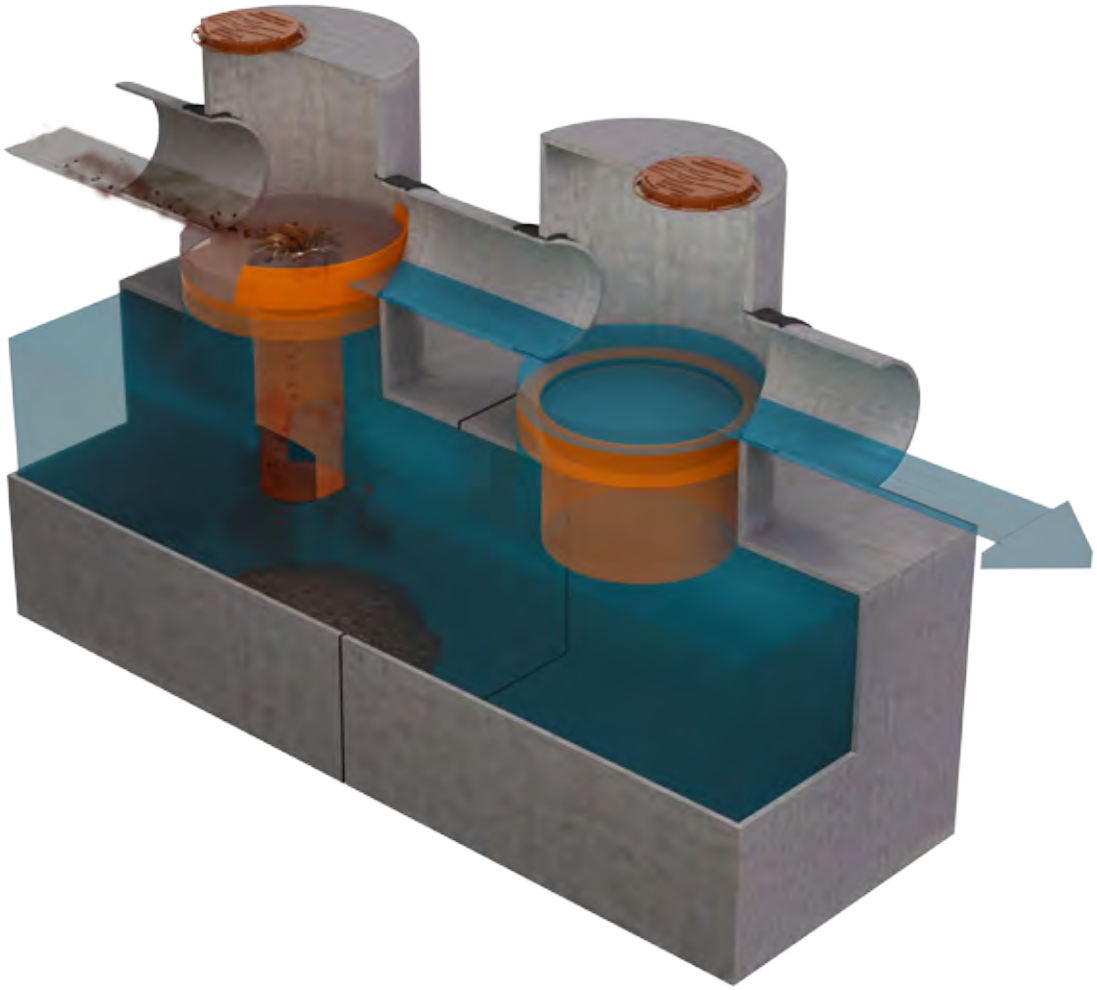
  The HumeCeptor® MAX model (refer to Figure 13) was developed to meet the market need for a single, large, end-of-pipe solution for TSS and hydrocarbon removal. Utilising the HumeCeptor® system's proven capture and scour prevention technology, it is ideal for very large commercial and industrial sites (>6 Ha) (eg. quarries, mine sites and stockpile areas) that need to achieve at least 50% TSS removal and hydrocarbon capture. The HumeCeptor® MAX model can be expanded to almost any capacity required.

  As the HumeCeptor® MAX model uses two 2,400 mm diameter inserts, sizing must be calculated separately from the PCSWMM software for the HumeCeptor® system. Contact Humes Water Solutions for assistance.

- **HumeCeptor® EOS model**

  The HumeCeptor® EOS (Emergency Oil Spill) system provides you with the maximum protection against hydrocarbon spills at petrol stations, highway interchanges and intersections. It combines the passive, always-operating functions of the HumeCeptor® system, with additional emergency storage to capture the volume of spill required by your road authority. Standard designs include 30,000 litres and 50,000 litres of total hydrocarbon storage but these can be modified to suit any specified volume.

Figure 13 – HumeCeptor® MAX model



Design information

To design a system suitable for your project it is necessary to review the configuration of the stormwater system, the location and purpose of other stormwater management (WSUD) controls, traffic loading, and the catchment area and hydrology.

Configuration of the stormwater system

As a cylindrical system, HumeCeptor® hydrodynamic separators are much more flexible for accommodating inlet and outlet pipes on angles than rectangular systems.

Location in the stormwater system

Specifically designed for capturing fine sediment and hydrocarbons, the HumeCeptor® system is best suited to "at source" applications. Therefore, it should be located immediately downstream of the catchment area to be treated, e.g. car parks, loading bays, refuelling stations, wash bays.

Catchment area

As a general rule, larger catchment areas require larger HumeCeptor® units. If the catchment area is unstable (e.g. exposed soil) or contributes unusually high pollutant loads (e.g. landscape supply yards), larger units are more appropriate. This can be modelled in PCSWMM software using the "Power Wash-off" or "Event Mean Concentration" TSS loading function.

Sizing HumeCeptor® systems

PCSWMM software for the HumeCeptor® system is the decision support tool used for identifying the appropriate model. A lite version of PCSWMM software is available to identify the HumeCeptor® system which best meets treatment criteria for conventional urban stormwater quality applications (commercial, industrial, residential etc).

Conventional sites typically have stable land cover, paved surfaces, or landscaped areas that do not easily erode during rainfall events. Please contact Humes for further assistance and modeling for unique or unconventional sites. Examples of unconventional sites are as follows:

1. Sites that exhibit unstable wash-off characteristics such as construction sites and sites with material storage. For example, council works depots, landscape supply yards, gravel surfaces etc.
2. Sites with specific suspended solids characteristics such as coal manufacturing facilities, cement manufacturers (sites with a particle size finer or coarser than what is identified in the program).
3. Sites with altered post-development annual hydrology. Alterations to the annual hydrology result from the implementation of stormwater detention upstream of the proposed HumeCeptor® system. Infiltration or detention of small storms (< 1 year) result in alterations to the annual hydrology. Sites with flood control (2 to 100 year detention facilities) will not significantly alter the annual hydrology since detention occurs infrequently. Upstream flood control facilities do not preclude the use of the software for water quality design.

The software calculates continuous runoff from rainfall and simulates sediment accumulation and sediment transport for the design area. Annual TSS removal rates are estimated from the particle size distribution with settling rates calculated using Stoke's Law, corrected for drag. Assumptions for slope, depression storage, evaporation rates, build-up and wash-off parameters as well as the particle size distribution and settling rates are given in the description of the model calculations.

Users of the software should become familiar with these calculations and parameter values to ensure that they understand the software application. For sites that differ from the assumptions made in the software, please contact your local Humes Water Solutions representative for assistance.

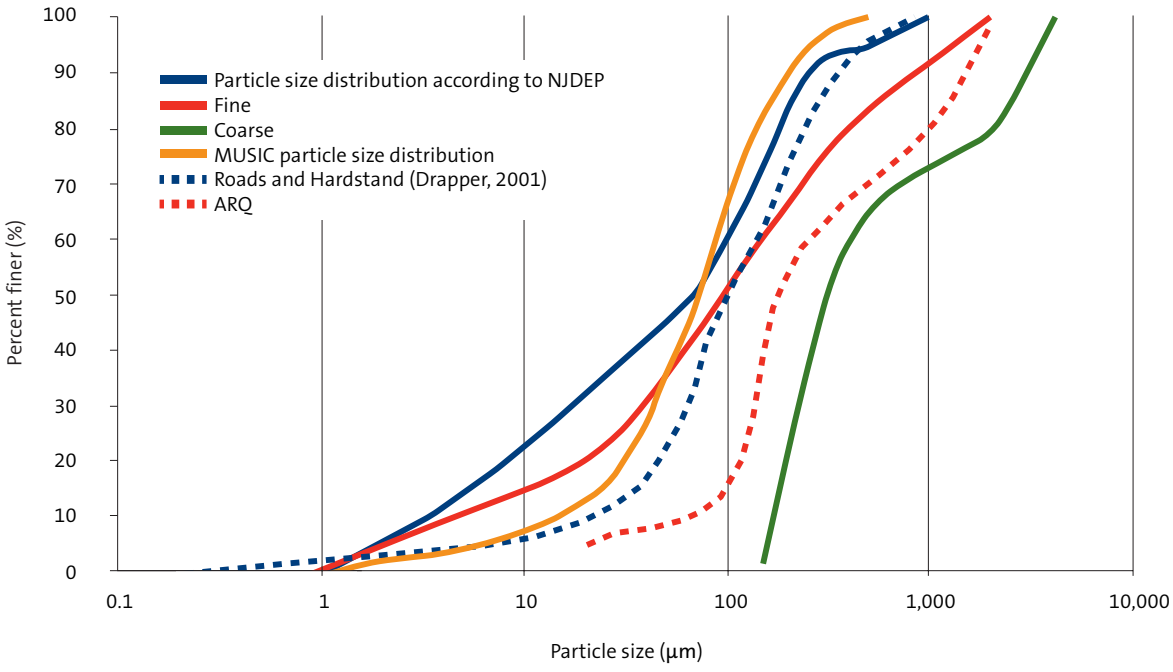
In order to size a unit using the lite version of PCSWMM software, the following six design steps should be followed.

- **Step 1 – Project details and WQOs**
  Enter the project details in the appropriate cells, clearly identifying the water quality objectives (WQO) for the development. It is recommended that a level of annual sediment (TSS) removal be identified and defined by a Particle Size Distribution (PSD). In most Australian situations, this WQO is for 80% TSS removal, but a PSD is not defined. This can be determined from relevant research data or from site monitoring.
- **Step 2 – Site details**
  Identify the site development by the drainage area and the level of imperviousness. It is recommended that imperviousness be calculated based on the actual area of paved surfaces, sidewalks and rooftops.
- **Step 3 – Upstream detention/retention**
  HumeCeptor® systems are designed as a water quality device and is sometimes used in conjunction with on site water quantity control such as ponds or underground detention systems. Where possible, it is more beneficial to install a HumeCeptor® unit upstream of a detention system, as the sediment load is reduced and the maintenance interval between cleaning is maximised.

  Where the HumeCeptor® system is installed downstream of a detention system it will alter the hydrology of the catchment and will influence the size of the unit selected by the software. For those projects, enter the footprint area and flow characteristics into the model.
- **Step 4 – Particle Size Distribution (PSD)**
  It is critical that the PSD is defined as part of the WQO. The design of the treatment system relies on a Stoke's Law settling (and floating) process, and selection of the target PSD influences the model outcomes.

  If the objective is for long term removal of 80% of TSS on a given site, the PSD should be representative of the expected sediment on the site. For example, a system designed to remove 80% of coarse particles (>150 microns) only provides relatively poor removal efficiency of finer particles (<75 microns) that may be naturally present in site runoff. PCSWMM software allows the user to enter their own PSD or select from a range of options in the program (refer to Figure 14 below).

Figure 14 – PCSWMM for HumeCeptor® system - PSD



- **Step 5 – Rainfall records**
  The rainfall data provided with PCSWMM software provides an accurate storm hydrology estimation by modelling actual historical storm events including duration, intensities and peaks. Local historical rainfall has been acquired from the Bureau of Meteorology. Select the nearest rainfall station from the list.
- **Step 6 – Summary**
  At this point, the software is able to predict the level of TSS removal from the site. Once the simulation has been completed, a table is generated identifying the TSS removal of each unit. Based on the WQO identified in Step 1, the recommended HumeCeptor® system unit will be highlighted.

MUSIC/pollutant export model inputs

Many local authorities utilise MUSIC or other pollutant export models to assist in stormwater treatment train selection, and recommend generic inputs for GPTs and hydrodynamic separators.

Considering these against the independent research results in Table 1 on page 4, and PCSWMM modelling used to size a HumeCeptor® unit, the conservative removal efficiencies in Table 5 below are recommended on an annual basis (i.e. no bypass). Humes Water Solutions can optimise the values to suit your specific site.

Table 5 – MUSIC inputs for HumeCeptor® system

Pollutant	Removal efficiency
TSS	80%
TN	30%
TP	30%

System installation

Top:
Installation of the base section (step 3)

Middle:
Installation of the bypass chamber (step 6)

Bottom:
System ready for connection of the inlet and outlet pipes (step 8)

The installation of HumeCeptor® units should conform in general to local authority's specifications for stormwater pit construction. Detailed installation instructions are dispatched with each unit.

The HumeCeptor® system is installed as follows:

1. Excavate and stabilise the site.
2. Prepare the geotextile and aggregate base.
3. Install the treatment chamber base section.
4. Install the treatment chamber section/s (if required).
5. Prepare the transition slab (if required).
6. Install the bypass chamber section.
7. Fit the inlet drop pipe and decant pipe (if required).
8. Connect inlet and outlet pipes as required.
9. Backfill to transition slab level.
10. Install the maintenance access chamber section (if required).
11. Install the frame and access cover/grate.
12. Backfill to finished surface/base course level and complete surface pavement.

System maintenance

The design of the HumeCeptor® system means that maintenance is conducted with a vacuum truck which avoids entry into the unit.

If the HumeCeptor® unit is sized using the PCSWMM guidelines, a maximum interval of annual maintenance is recommended.

A typical maintenance procedure includes:

1. Open the access cover.
2. Insert the vacuum hose into the top of the treatment chamber via the decant (outlet) pipe.
3. Remove the oily water until the level is just below the lower edge of the decant pipe.
4. Lower a sluice gate into the nearest upstream junction pit and decant the water from the treatment chamber into the upstream pit until the sediment layer is exposed.
5. Remove the sediment layer into the vacuum truck for disposal.
6. Raise the upstream sluice gate and allow water to return into the HumeCeptor® unit.
7. Replace the access cover.

FAQs

- **Will it capture litter?**
  The HumeCeptor® system is primarily designed for hydrocarbon and fine sediment removal, so if litter is expected from the catchment an upstream GPT is recommended. However, items such as cigarette butts, plastic bags and smaller gross pollutants will be captured by the system.
- **Do I need to model a bypass flow for the HumeCeptor® system in MUSIC?**
  No, PCSWMM software for the HumeCeptor® system analyses all flows from the catchment to determine 80% TSS removal on an annual basis. Therefore, the output efficiency of PCSWMM for the selected model can be incorporated into a MUSIC treatment node without a bypass flow.
- **How often do I need to undertake maintenance?**
  A maximum interval of 12 months is recommended, with 3 months ideal, however, these systems are designed with a factor of safety, so it will continue to retain sediment until it is completely full.
- **What if the PSD from my site is different to those in the software?**
  Humes Water Solutions has the ability to model a user-defined PSD in PCSWMM software for the HumeCeptor® system. If you have PSD results contact us for assistance.
- **Do I have to use the model that PCSWMM software highlights?**
  No, in most stormwater treatment trains, there are other measures upstream and/or downstream. Select the unit size that you need to achieve your desired removal efficiency in the context of your overall concept. Remember that selecting a model that removes less TSS will also remove less TN and TP.
- **Is it possible to change the hydrology model defaults in PCSWMM?**
  Yes, Humes Water Solutions has the ability to vary these inputs. Please contact us for further assistance.
- **Will the HumeCeptor® system's treatment chamber release nutrients?**
  Over time, captured organic material will break down and release nutrients in all treatment measures whether natural or manufactured. As part of a treatment train, downstream natural measures can remove the small portion of nutrients released during dry weather flows. A regular maintenance program will reduce the amount of break down occurring (Ball and Powell, 2006).

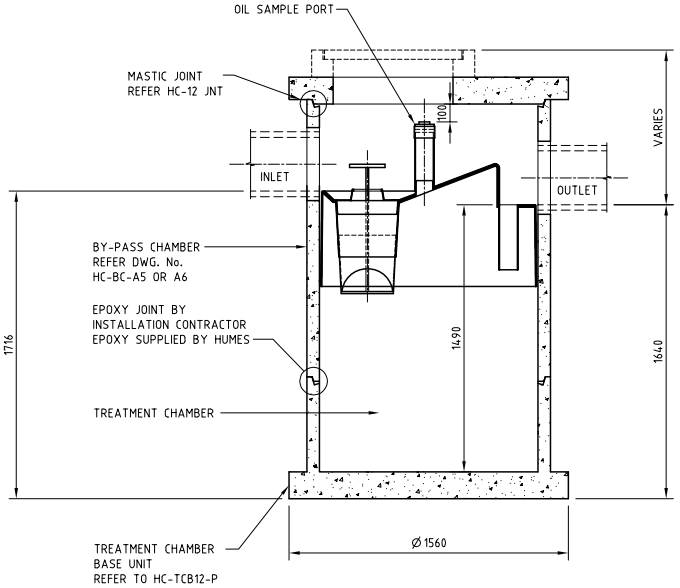
- **Why is the HumeCeptor® system not sized on flow rate?**
  The HumeCeptor® system is sized using actual historical rainfall and an algorithm based on research (Novotny and Chesters 1981, Charbeneau and Barrett, 1988, Ball and Abustan 1995, Sartor and Boyd 1972) showing that pollutants build up and wash off a catchment which is influenced by time, Particle Size Distribution (PSD), rainfall volume and intensity. These form a pollutograph that the software uses to calculate the HumeCeptor® system performance for all flows in every event over the rainfall period. The software then recommends the model that will remove a user selected removal target (usually set to 80%) of TSS load from all of these events.
- **How is the HumeCeptor® system different to a GPT?**
  The HumeCeptor® system is specifically designed to target fine sediment and hydrocarbons. Therefore, it is designed to maintain velocities through the treatment chamber <0.02 m/s. A GPT is designed to capture gross pollutants (>1 mm). For a GPT to function in an equivalent way to a HumeCeptor® system, the treatment chamber velocity must be <0.02 m/s.
- **Why would I use a HumeCeptor® system upstream of a biofilter?**
  Using a HumeCeptor® system upstream of a biofilter acts as a non- scouring sediment forebay, containing sediment to a confined location for easy removal. This protects the biofilter and lengthens its lifespan.

References

- Novotny, V and Chesters, G (1981) "Handbook of Non-Point Pollution Sources and Management", John Wiley and Sons, New York.
- Charbeneau ,RJ and Barrett, M.E (1998) "Evaluation of Methods for Estimating Stormwater Pollutant Loads", Water environment research 70 (7): 1,295 - 1,302.
- Ball, J and Abustan, I (1995) "An Investigation of the Particle Size Distribution During Storm Events on an Urban Catchment", Prol. the 2nd Int. Symposium on Urban Stormwater Management 1995 pp 531 - 535, IEAUST, Melbourne, Nat. Conf. Pub. 95/3.
- Sartor, J.D and Boyd, G.B (1972) "Water Pollutant Aspects of Street Surface Contaminants", US EPA (EPA - R2 - 72 - 081) Washington, DC.
- Ball, J and Powell, M (2006) "Influence of Anaerobic Breakdown on the Selection of Appropriate Urban Stormwater Management Measures", SIA Annual Conference.
- Schueler, Tom and David Shepp (1993) "The Quality of Trapped Sediments and Pool Water Within Oil Grit Separators in Suburban Maryland", Metropolitan Council of Governments.

Appendix

HumeCeptor® system technical drawings



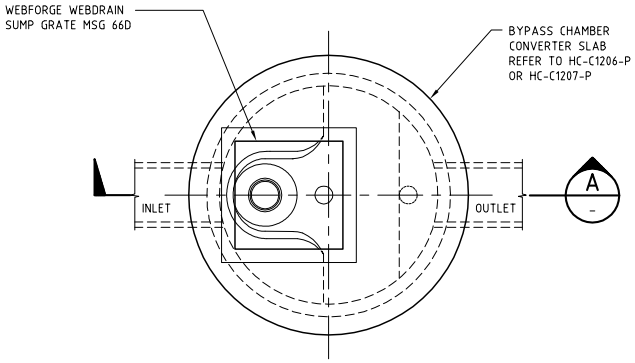
NOTE: STANDARD DROP INLET TO OUTLET IS 76mm

SECTION A – SCALE 1:20

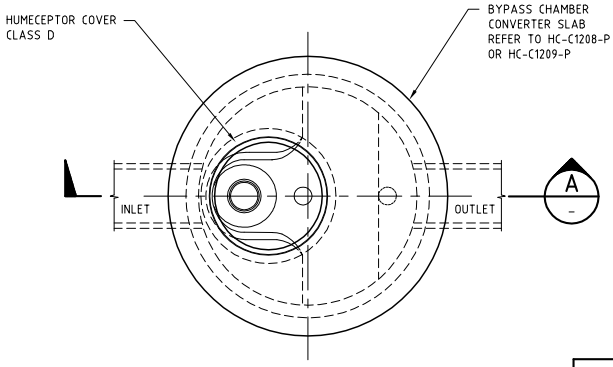
ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
0	ISSUED FOR MANUFACTURE	RGE	15.05.02	SO'C
1	UPDATED AND REISSUED FOR MANUFACTURE	M.Z.	23-01-03	DFW
2	GENERAL UPGRADE	RM	07-08-03	DFW

NOTES:

1. TYPICAL ASSEMBLY DETAIL ONLY - REFER TO PROJECT DRAWING FOR ACTUAL REQUIREMENTS
2. DIMENSIONS INCLUDED ARE STANDARD
3. STORAGE VOLUMES
   TOTAL = 1740 LITRES
   OIL STORAGE VOLUME = 350 LITRES
   SEDIMENT STORAGE VOLUME = 1.34m3
4. COMPONENT MASSES
   TREATMENT CHAMBER BASE UNIT (INCL. SHAFT) = 1130 kg
   BYPASS CHAMBER = VARIES
   BYPASS CHAMBER CONVERTER SLAB = 575 kg
5. REFER TO BYPASS CHAMBER ASSEMBLY DRAWING FOR FIXING DETAILS FOR FIBREGLASS INSERT.
6. FOR OUTLET PIPE CONNECTION DETAILS
   REFER HC-BC-A5 OR A6 AND KOR-N-SEAL INSTALLATION INSTRUCTIONS
7. SWIFTLIFT LIFTING ANCHORS PROVIDED FOR LIFTING ALL COMPONENTS (REFER PRODUCT DRAWING)
8. JOINT SEALANT AS PER MANUFACTURERS RECOMMENDATIONS.



PLAN - SQUARE OPENING (PREFERRED) – SCALE 1:20



PLAN - CIRCULAR OPENING (ALTERNATIVE) – SCALE 1:20

Humes TECHNICAL (DESIGN) SERVICES BRISBANE, QUEENSLAND

Readymix Holdings Pty Limited ABN 87 099 732 297

DSN.	SO'C	23-04-02
DWN.	RGE	23-04-02
CKD.	SO'C	23-04-02
APP.	DFW	23-04-02

SUPERSEDES

HUMECEPTOR™ STANDARD DRAWING

STC-2 HUMECEPTOR™ c/w INLET AND OUTLET PIPES

ASSEMBLY DRAWING

PLOT SCALE	SIZE	DRG. NO.	ISSUE
1:20	A2	HC-STC2-B	2

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
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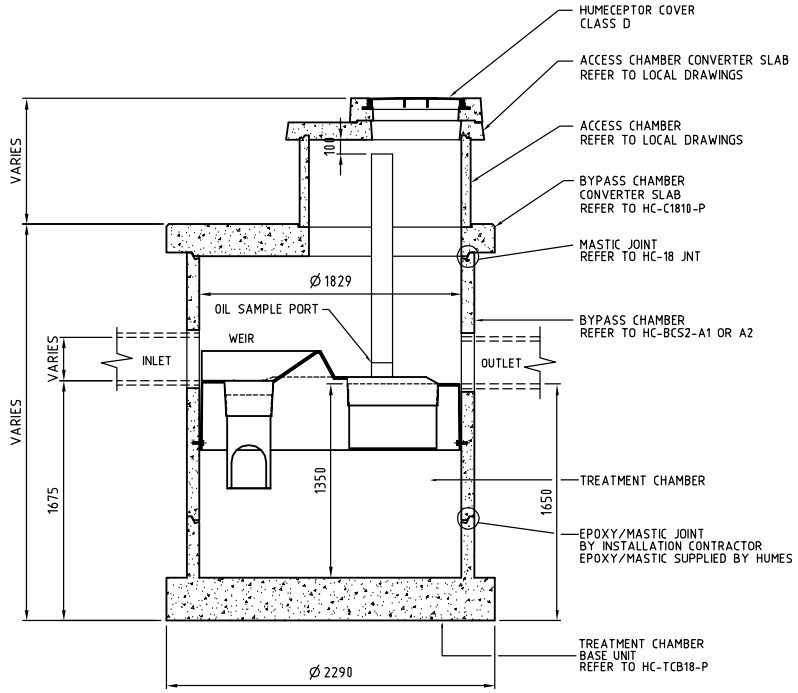
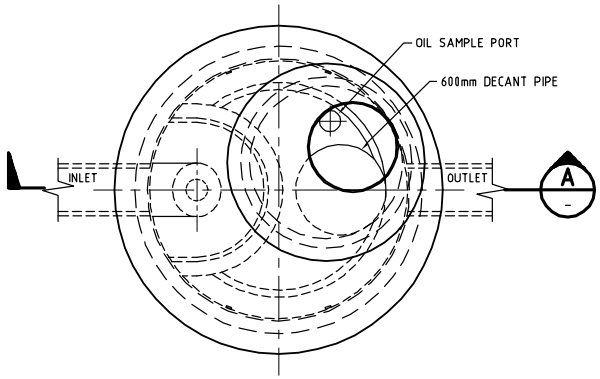
1	STORAGE VOLUMES REVISED	M.Z.	03-09-03	DFW



SECTION A
SCALE 1:25



PLAN
SCALE 1:25

NOTES:

1. TYPICAL ASSEMBLY DETAIL ONLY - REFER TO PROJECT DRAWING FOR ACTUAL REQUIREMENTS
2. DIMENSIONS INCLUDED ARE STANDARD
3. STORAGE VOLUMES
   TOTAL = 3540 LITRES (1)
   OIL STORAGE VOLUME = 1020 LITRES
   SEDIMENT STORAGE VOLUME = 2.20m3 (1)
4. COMPONENT MASSES
   TREATMENT CHAMBER BASE UNIT (INCL. SHAFT) = 3.9 TONNE
   BYPASS CHAMBER = VARIES
   BYPASS CHAMBER CONVERTER SLAB = 1.9 TONNE
5. REFER TO BYPASS CHAMBER ASSEMBLY DRAWING FOR FIXING DETAILS FOR FIBREGLASS INSERT.
6. BYPASS CHAMBER CONVERTER SLAB TO SUIT LOCAL ACCESS CHAMBER UNITS.
7. FOR INLET AND OUTLET PIPE CONNECTION DETAILS REFER HC-BCS2-A1 OR A2 AND KOR-N-SEAL INSTALLATION INSTRUCTIONS
8. SWIFTLIFT LIFTING ANCHORS PROVIDED FOR LIFTING ALL COMPONENTS (REFER PRODUCT DRAWING)
9. NOTE MARKINGS - INLET & OUTLET OVER EACH
10. JOINT SEALANT AS PER MANUFACTURERS RECOMMENDATIONS.
11. OIL SAMPLE PORT AND DECANT PIPE TO BE VISIBLE AS PER PLAN VIEW.

Humes TECHNICAL (DESIGN) SERVICES BRISBANE, QUEENSLAND

DSN.	DFW	28-01-03
DWN.	M.Z.	28-01-03
CKD.	DFW	07-08-03
APP.	DFW	07-08-03

HUMECEPTOR™
STANDARD DRAWING
STC-3 HUMECEPTOR
ASSEMBLY DRAWING

SUPERSEDES	PLOT SCALE	SIZE	DRG. NO.	ISSUE
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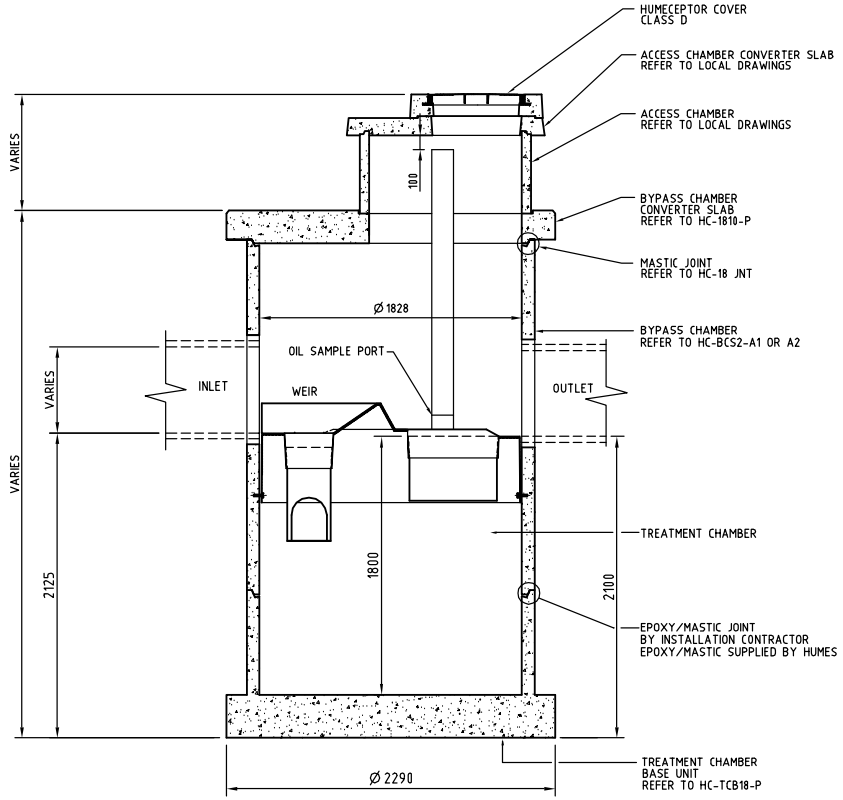
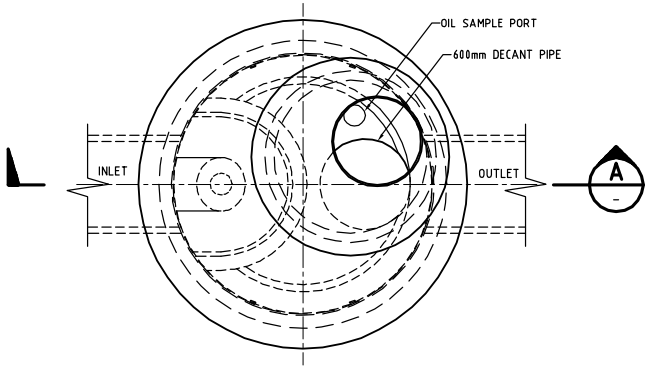


SECTION A – SCALE 1:25



PLAN SCALE 1:25

NOTES:

1. TYPICAL ASSEMBLY DETAIL ONLY - REFER TO PROJECT DRAWING FOR ACTUAL REQUIREMENTS
2. DIMENSIONS INCLUDED ARE STANDARD
3. STORAGE VOLUMES
   TOTAL = 4720 LITRES
   OIL STORAGE VOLUME = 1020 LITRES
   SEDIMENT STORAGE VOLUME = 3.38m3
4. COMPONENT MASSES
   TREATMENT CHAMBER BASE UNIT (INCL. SHAFT) = 4.4 TONNE
   BYPASS CHAMBER = VARIES
   BYPASS CHAMBER CONVERTER SLAB = 1.9 TONNE
5. REFER TO BYPASS CHAMBER ASSEMBLY DRAWING FOR FIXING DETAILS FOR FIBREGLASS INSERT.
6. BYPASS CHAMBER CONVERTER SLAB TO SUIT LOCAL ACCESS CHAMBER UNITS.
7. FOR INLET AND OUTLET PIPE CONNECTION DETAILS REFER HC-BCS2-A1 OR A2 AND KOR-N-SEAL INSTALLATION INSTRUCTIONS
8. SWIFTLIFT LIFTING ANCHORS PROVIDED FOR LIFTING ALL COMPONENTS (REFER PRODUCT DRAWING)
9. NOTE MARKINGS - INLET & OUTLET OVER EACH
10. JOINT SEALANT AS PER MANUFACTURERS RECOMMENDATIONS.
11. OIL SAMPLE PORT AND DECANT PIPE TO BE VISIBLE AS PER PLAN VIEW.

Humes

TECHNICAL (DESIGN) SERVICES
BRISBANE, QUEENSLAND

DSN.	DFW	28-01-03
DWN.	M.Z.	28-01-03
CKD.	DFW	03-09-03
APP.	DFW	03-09-03

HUMECEPTOR™

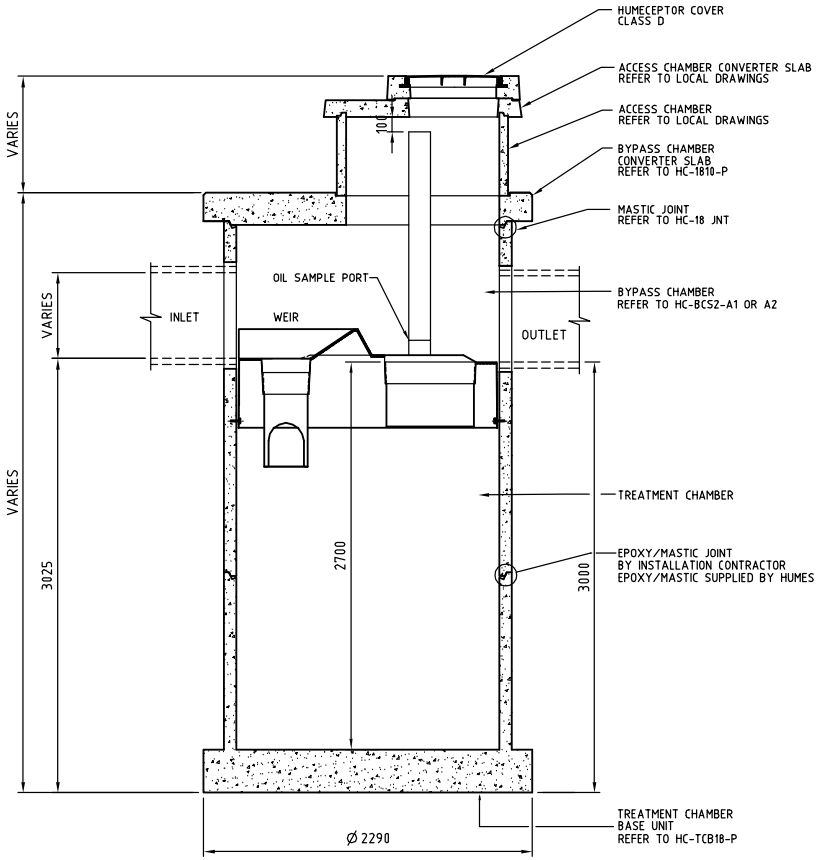
STANDARD DRAWING

STC-5 HUMECEPTOR

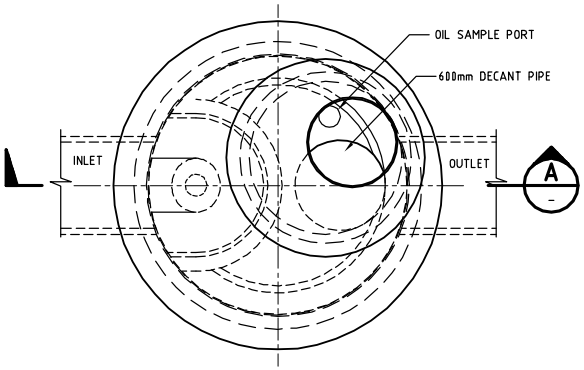
ASSEMBLY DRAWING

SUPERSEDES	PLOT SCALE	SIZE	DRG. NO.	ISSUE
	1:25	A2	HC-STC5-A	0

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
0	UPDATED AND ISSUED FOR MANUFACTURE	M.Z.	03-09-03	DFW



SECTION A
SCALE 1:25



PLAN
SCALE 1:25

NOTES:

1. TYPICAL ASSEMBLY DETAIL ONLY - REFER TO PROJECT DRAWING FOR ACTUAL REQUIREMENTS
2. DIMENSIONS INCLUDED ARE STANDARD
3. STORAGE VOLUMES
   TOTAL = 7080 LITRES
   OIL STORAGE VOLUME = 1020 LITRES
   SEDIMENT STORAGE VOLUME = 5.74m3
4. COMPONENT MASSES
   TREATMENT CHAMBER BASE UNIT (INCL. SHAFT) = 5.1 TONNE
   BYPASS CHAMBER = VARIES
   BYPASS CHAMBER CONVERTER SLAB = 1.9 TONNE
5. REFER TO BYPASS CHAMBER ASSEMBLY DRAWING FOR FIXING DETAILS FOR FIBREGLASS INSERT.
6. BYPASS CHAMBER CONVERTER SLAB TO SUIT LOCAL ACCESS CHAMBER UNITS.
7. FOR INLET AND OUTLET PIPE CONNECTION DETAILS REFER HC-BCS2-A1 OR A2 AND KOR-N-SEAL INSTALLATION INSTRUCTIONS
8. SWIFTLIFT LIFTING ANCHORS PROVIDED FOR LIFTING ALL COMPONENTS (REFER PRODUCT DRAWING)
9. NOTE MARKINGS - INLET & OUTLET OVER EACH
10. JOINT SEALANT AS PER MANUFACTURERS RECOMMENDATIONS.
11. OIL SAMPLE PORT AND DECANT PIPE TO BE VISIBLE AS PER PLAN VIEW.

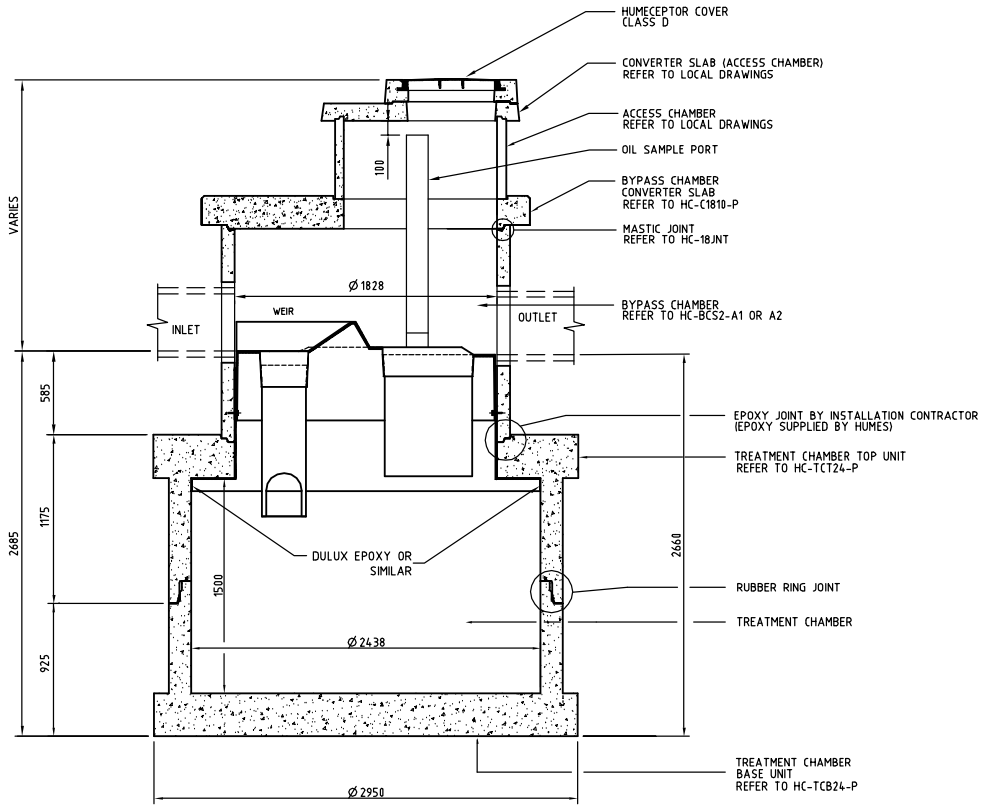
Humes TECHNICAL (DESIGN) SERVICES BRISBANE, QUEENSLAND

DSN.	DFW	28-01-03
DWN.	M.Z.	28-01-03
CKD.	DFW	03-09-03
APP.	DFW	03-09-03

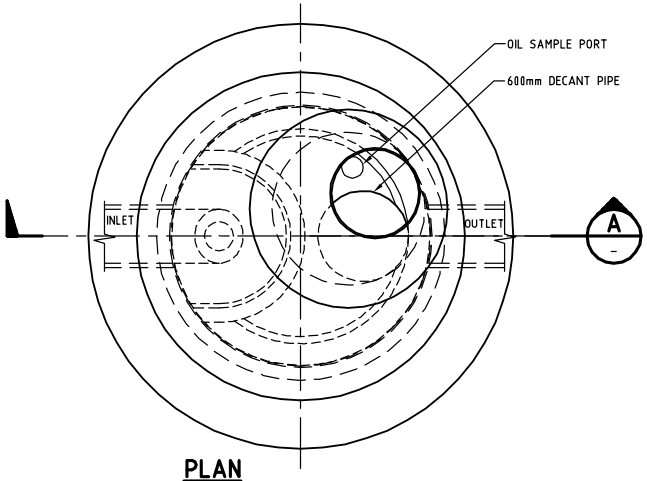
SUPERSEDES

HUMECEPTOR™
STANDARD DRAWING
STC-7 HUMECEPTOR
ASSEMBLY DRAWING

PLOT SCALE	SIZE	DRG. NO.	ISSUE
1:25	A2	HC-STC7-A	0



SECTION A – A
SCALE 1:25



PLAN
SCALE 1:10

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
0	UPDATED AND ISSUED FOR MANUFACTURE	M.Z.	03-09-03	DFW

NOTES:

1. TYPICAL ASSEMBLY DETAIL ONLY - REFER TO PROJECT DRAWING FOR ACTUAL REQUIREMENTS
2. DIMENSIONS INCLUDED ARE STANDARD
3. STORAGE VOLUMES
   TOTAL = 9260 LITRES
   OIL STORAGE VOLUME = 1900 LITRES
   OIL SEDIMENT STORAGE VOLUME = 6.81 m3
4. COMPONENT MASSES
   TREATMENT CHAMBER BASE UNIT (INCL. SHAFT) = 7.7 TONNE
   TREATMENT CHAMBER TOP UNIT (CONV. SLAB + SHAFT) = 6.0 TONNE
   BYPASS CHAMBER = VARIES
5. REFER TO BYPASS CHAMBER ASSEMBLY DRAWING FOR FIXING DETAILS FOR FIBREGLASS INSERT.
6. BYPASS CHAMBER CONVERTER SLAB TO SUIT LOCAL ACCESS CHAMBER UNITS.
7. FOR INLET AND OUTLET PIPE CONNECTION DETAILS REFER HC-BCS2-A1 or A2 AND KOR-N-SEAL INSTALLATION INSTRUCTIONS.
8. SWIFTLIFT LIFTING ANCHORS PROVIDED FOR LIFTING ALL COMPONENTS. (REFER PRODUCT DRAWING)
9. NOTE MARKINGS - INLET AND OUTLET OVER EACH.
10. JOINT SEALANT AS PER MANUFACTURERS RECOMMENDATIONS.
11. OIL SAMPLE PORT AND DECANT PIPE TO BE VISIBLE AS PER PLAN VIEW.

RUBBER RING JOINT SPECIFICATION

MATERIAL	: NITRILE
HARDNESS:	: 43 ± 3 IRHD (AS 1646)
PROFILE	: L25 (REFER Dwg. J1001-01)
ID	: 2225 ± 16mm

Humes TECHNICAL (DESIGN) SERVICES BRISBANE, QUEENSLAND

DSN.	DFW	28-01-03
DWN.	M.Z.	28-01-03
CKD.	DFW	03-09-03
APP.	DFW	03-09-03

HUMECEPTOR™
STANDARD DRAWING
STC-9 HUMECEPTOR
ASSEMBLY DRAWING

SUPERSEDES	PLOT SCALE	SIZE	DRG. NO.	ISSUE
	1:25	A2	HC-STC-9-A	0

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
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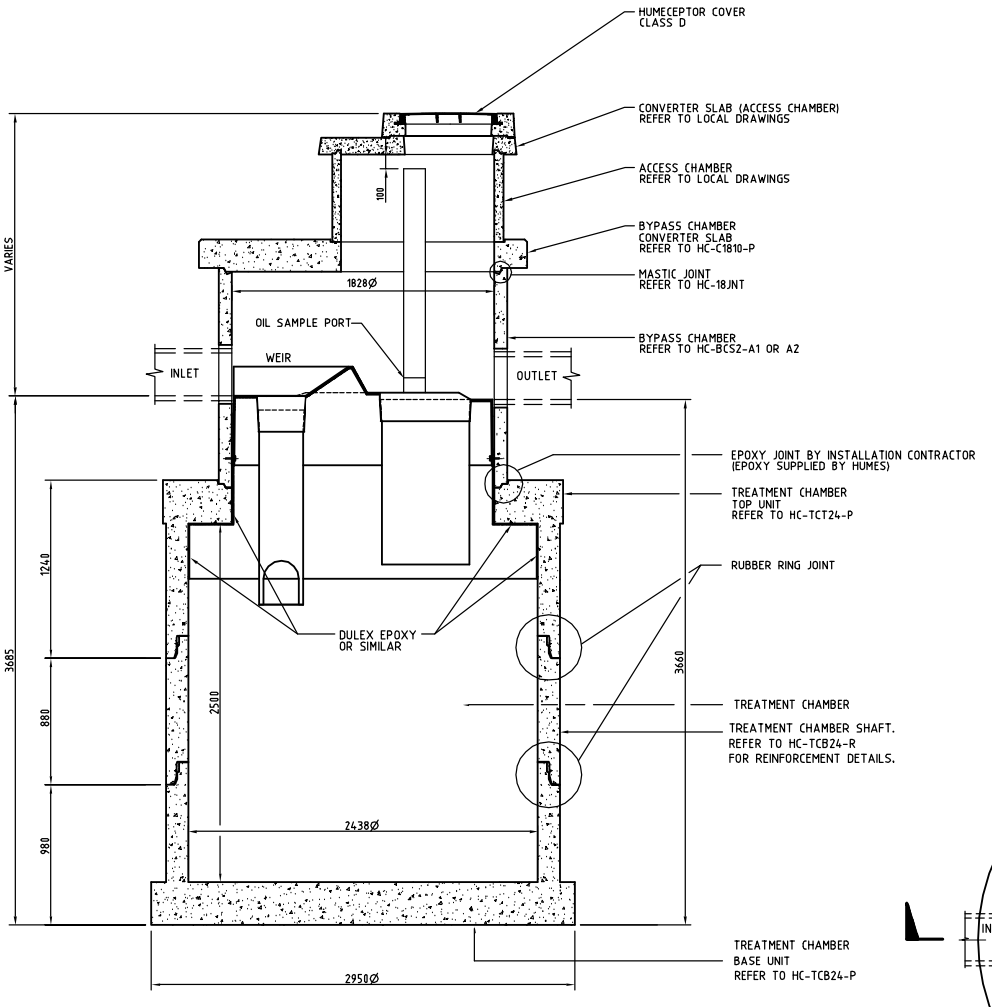
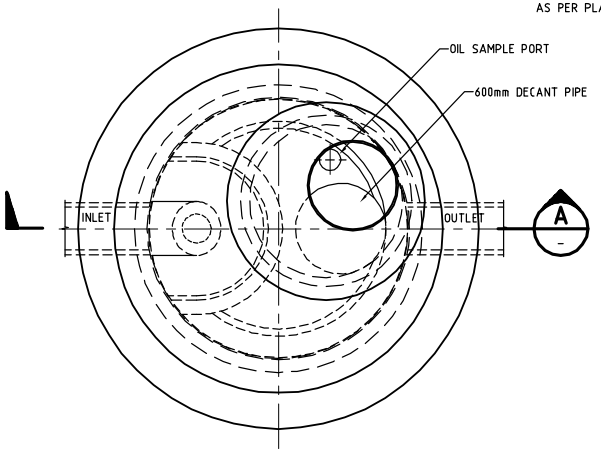


SECTION A
SCALE 1:25

NOTES:

1. TYPICAL ASSEMBLY DETAIL ONLY - REFER TO PROJECT DRAWING FOR ACTUAL REQUIREMENTS
2. DIMENSIONS INCLUDED ARE STANDARD
3. STORAGE VOLUMES
   TOTAL = 13920 LITRES
   OIL STORAGE VOLUME = 2980 LITRES
   SEDIMENT STORAGE VOLUME = 10.27 m3
4. COMPONENT MASSES
   TREATMENT CHAMBER BASE UNIT (INCL. SHAFT) = 7.9 TONNE
   TREATMENT CHAMBER TOP UNIT (CONV. SLAB + SHAFT) = 6.1 TONNE
   BYPASS CHAMBER = VARIES
   TREATMENT CHAMBER SHAFT = 2.8 TONNE
5. REFER TO BYPASS CHAMBER ASSEMBLY DRAWING FOR FIXING DETAILS FOR FIBREGLASS INSERT.
6. BYPASS CHAMBER CONVERTER SLAB TO SUIT LOCAL ACCESS CHAMBER UNITS.
7. FOR INLET AND OUTLET PIPE CONNECTION DETAILS REFER HC-BCS2-A1 OR A2 AND KOR-N-SEAL INSTALLATION INSTRUCTIONS
8. SWIFTLIFT LIFTING ANCHORS PROVIDED FOR LIFTING ALL COMPONENTS (REFER PRODUCT DRAWINGS)
9. NOTE MARKINGS - INLET AND OUTLET OVER EACH.
10. JOINT SEALANT AS PER MANUFACTURERS RECOMMENDATIONS.
11. OIL SAMPLE PORT AND DECANT PIPE TO BE VISIBLE AS PER PLAN VIEW.



PLAN
SCALE 1:25

RUBBER RING JOINT SPECIFICATION

MATERIAL : NITRILE
HARDNESS : 43 ± 3 IRHD (AS1646)
PROFILE : L25 (REFER Dwg. J1001-01)
ID : 2225 ± 16mm

Humes TECHNICAL (DESIGN) SERVICES BRISBANE, QUEENSLAND

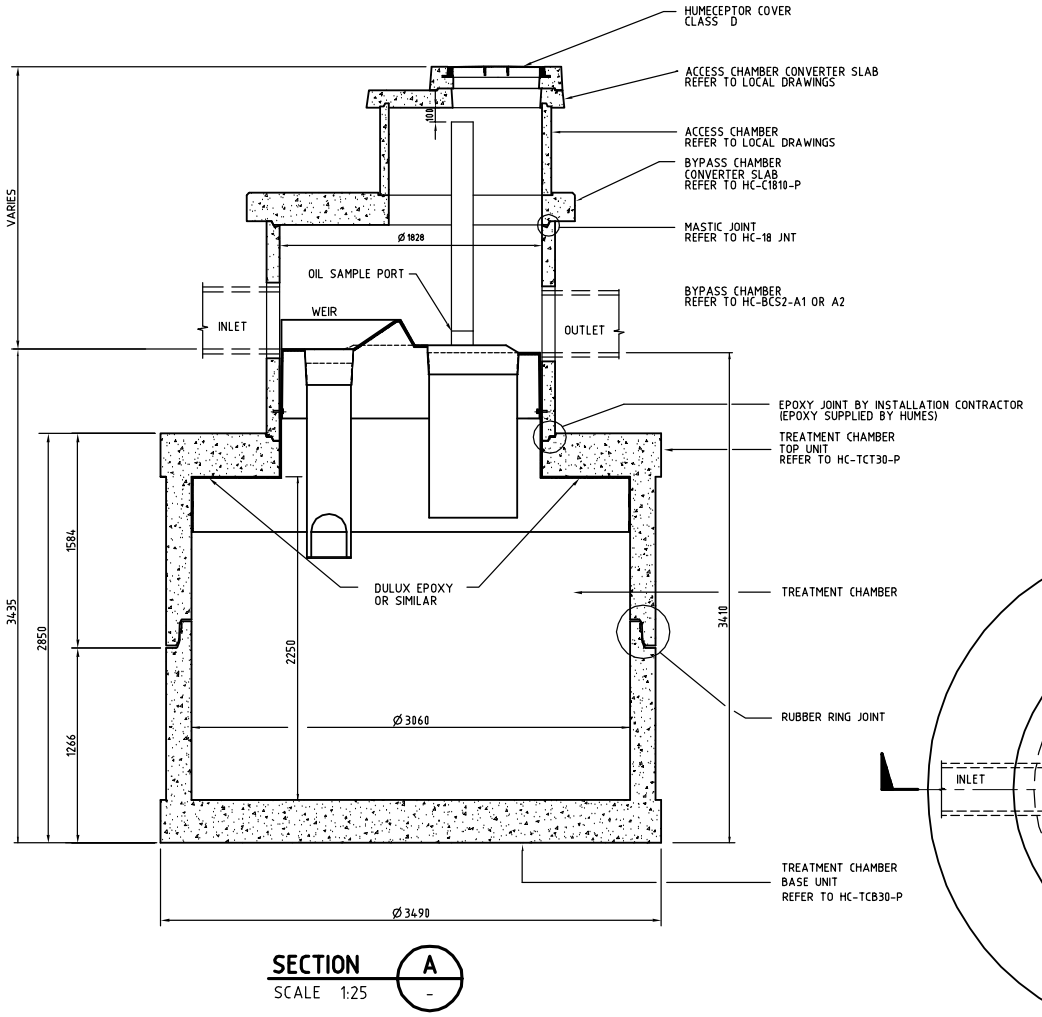
DSN.	DFW	28-01-03
DWN.	M.Z.	28-01-03
CKD.	DFW	03-09-03
APP.	DFW	03-09-03

HUMECEPTOR™
STANDARD DRAWING
STC-14 HUMECEPTOR
ASSEMBLY DRAWING

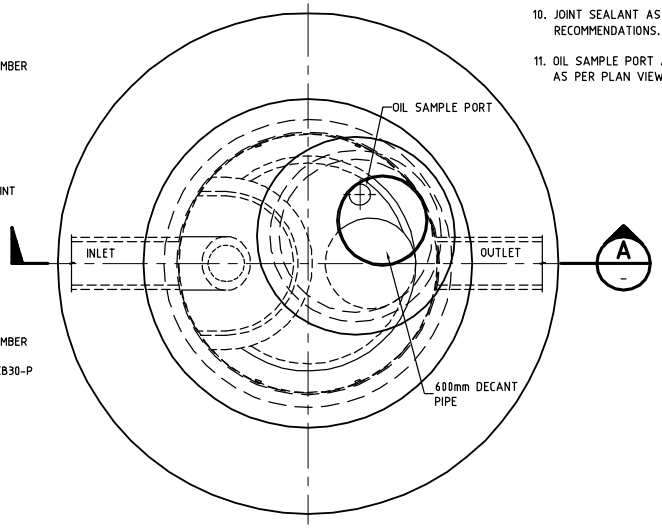
SUPERSEDES

PLOT SCALE	SIZE	DRG. NO.	ISSUE
1:25	A2	HC-STC14-A	0

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
0	UPDATED AND ISSUED FOR MANUFACTURE	M.Z.	03-09-03	DFW



SECTION A
SCALE 1:25



PLAN
SCALE 1:25

NOTES:

1. TYPICAL ASSEMBLY DETAIL ONLY - REFER TO PROJECT DRAWING FOR ACTUAL REQUIREMENTS
2. DIMENSIONS INCLUDED ARE STANDARD
3. STORAGE VOLUMES
   TOTAL = 18790 LITRES
   OIL STORAGE VOLUME = 2980 LITRES
   SEDIMENT STORAGE VOLUME = 14.04 m3
4. COMPONENT MASSES
   TREATMENT CHAMBER BASE UNIT (INCL.SHAFT) = 12.1 TONNE
   TREATMENT CHAMBER TOP UNIT (CONV. SLAB + SHAFT) = 11.2 TONNE
   BYPASS CHAMBER = VARIES
5. REFER TO BYPASS CHAMBER ASSEMBLY DRAWING FOR FIXING DETAILS FOR FIBREGLASS INSERT.
6. BYPASS CHAMBER CONVERTER SLAB TO SUIT LOCAL ACCESS CHAMBER UNITS.
7. FOR INLET AND OUTLET PIPE CONNECTION DETAILS REFER HC-BCS2-A1 OR A2 AND KOR-N-SEAL INSTALLATION INSTRUCTIONS
8. SWIFTLIFT LIFTING ANCHORS PROVIDED FOR LIFTING ALL COMPONENTS (REFER PRODUCT DRAWINGS)
9. NOTE MARKINGS - INLET AND OUTLET OVER EACH.
10. JOINT SEALANT AS PER MANUFACTURERS RECOMMENDATIONS.
11. OIL SAMPLE PORT AND DECANT PIPE TO BE VISIBLE AS PER PLAN VIEW.

RUBBER RING SPECIFICATION

MATERIAL	:	NITRILE
HARDNESS	:	43 ± 3 IRHD (AS1646)
PROFILE	:	L25 (REFER Dwg. J1001-01)
ID	:	2775 ± 16mm

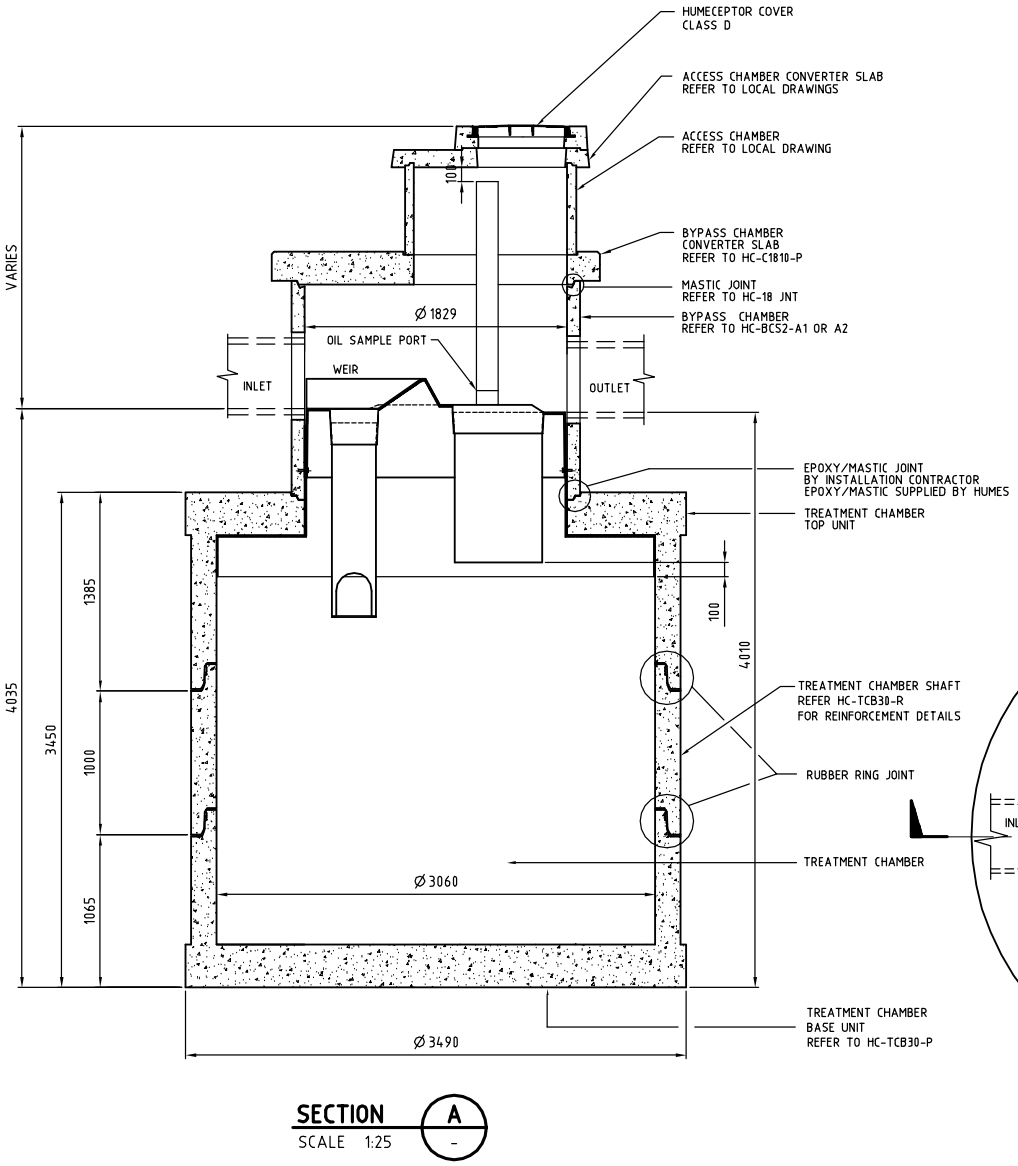
Humes TECHNICAL (DESIGN) SERVICES BRISBANE, QUEENSLAND

DSN.	DFW	28-01-03
DWN.	M.Z.	28-01-03
CKD.	DFW	03-09-03
APP.	DFW	03-09-03

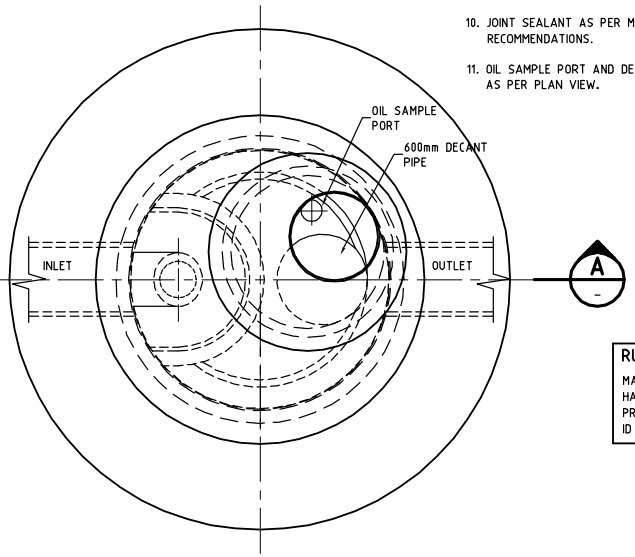
HUMECEPTOR™
STANDARD DRAWING
STC-18 HUMECEPTOR
ASSEMBLY DRAWING

SUPERSEDES	PLOT SCALE	SIZE	DRG. NO.	ISSUE
	1:25	A2	HC-STC18-A	0

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
0	UPDATED AND ISSUED FOR MANUFACTURE	M.Z.	03-09-03	DFW



SECTION A
SCALE 1:25



PLAN
SCALE 1:25

NOTES:

1. TYPICAL ASSEMBLY DETAIL ONLY - REFER TO PROJECT DRAWING FOR ACTUAL REQUIREMENTS
2. DIMENSIONS INCLUDED ARE STANDARD
3. STORAGE VOLUMES
   TOTAL = 23200 LITRES
   OIL STORAGE VOLUME = 2980 LITRES
   SEDIMENT STORAGE VOLUME = 18.45 m3
4. COMPONENT MASSES
   TREATMENT CHAMBER BASE UNIT (INCL. SHAFT) = 11.2 TONNE
   TREATMENT CHAMBER TOP UNIT (CONV. SLAB + SHAFT) = 10.1 TONNE
   BYPASS CHAMBER = VARIES
   TREATMENT CHAMBER SHAFT = 4.6 TONNES
5. REFER TO BYPASS CHAMBER ASSEMBLY DRAWING FOR FIXING DETAILS FOR FIBREGLASS INSERT.
6. BYPASS CHAMBER CONVERTER SLAB TO SUIT LOCAL ACCESS CHAMBER UNITS.
7. FOR INLET AND OUTLET PIPE CONNECTION DETAILS REFER HC-BCS2-A1 OR A2 AND KOR-N-SEAL INSTALLATION INSTRUCTIONS.
8. SWIFTLIFT LIFTING ANCHORS PROVIDED FOR LIFTING ALL COMPONENTS (REFER PRODUCT DRAWINGS)
9. NOTE MARKINGS - INLET AND OUTLET OVER EACH.
10. JOINT SEALANT AS PER MANUFACTURERS RECOMMENDATIONS.
11. OIL SAMPLE PORT AND DECANT PIPE TO BE VISIBLE AS PER PLAN VIEW.

RUBBER RING SPECIFICATION

MATERIAL	:	NITRILE
HARDNESS	:	43 ± 3 IRHD (AS1646)
PROFILE	:	L25
ID	:	2775 ± 16mm

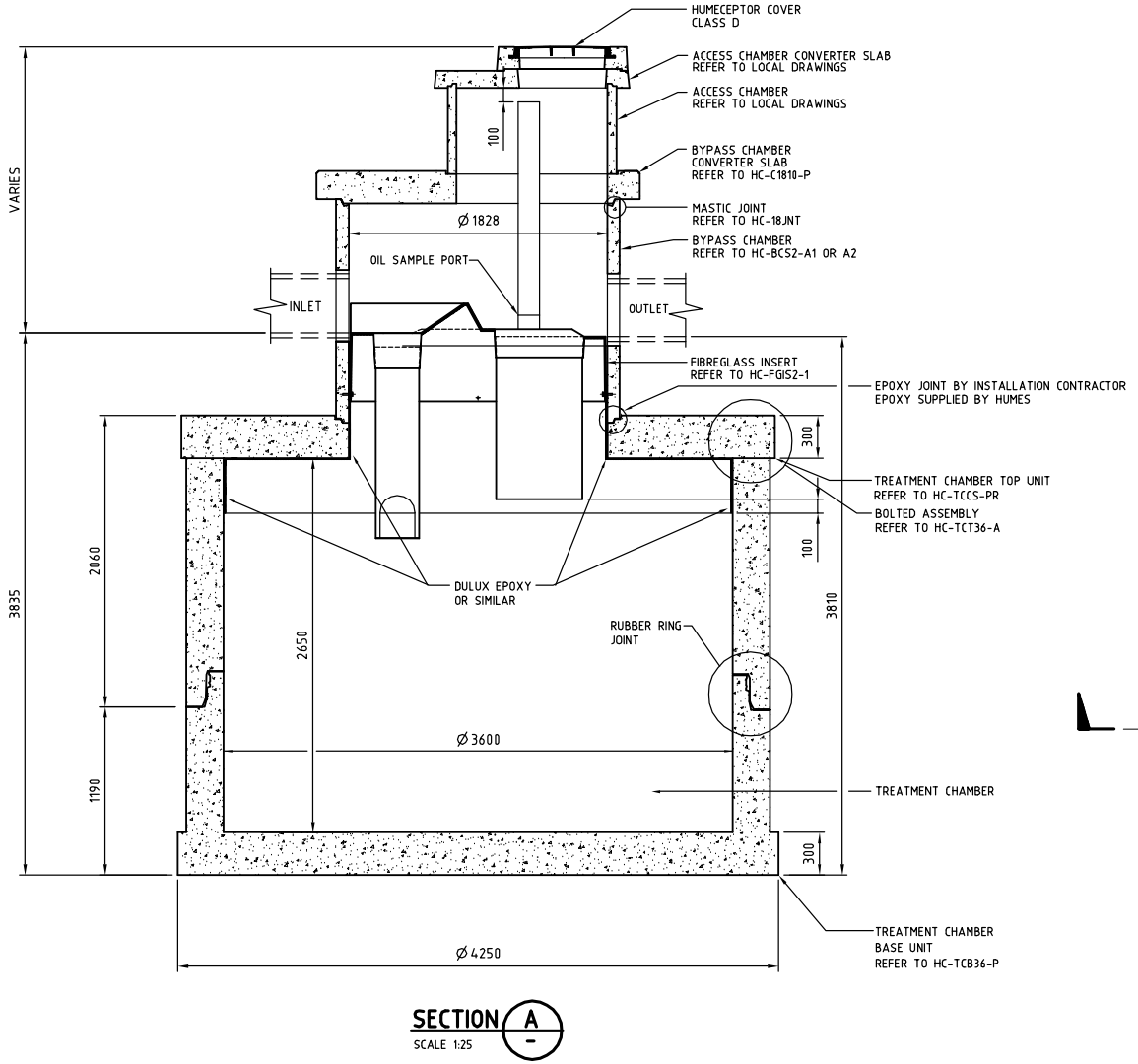
Humes TECHNICAL (DESIGN) SERVICES BRISBANE, QUEENSLAND

DSN.	DFW	28-01-03
DWN.	M.Z.	28-01-03
CKD.	DFW	03-09-03
APP.	DFW	03-09-03

HUMECEPTOR™
STANDARD DRAWINGS
STC-23 HUMECEPTOR
ASSEMBLY DRAWING

SUPERSEDES	PLOT SCALE	SIZE	DRG. NO.	ISSUE
	1:25	A2	HC-STC23-A	0

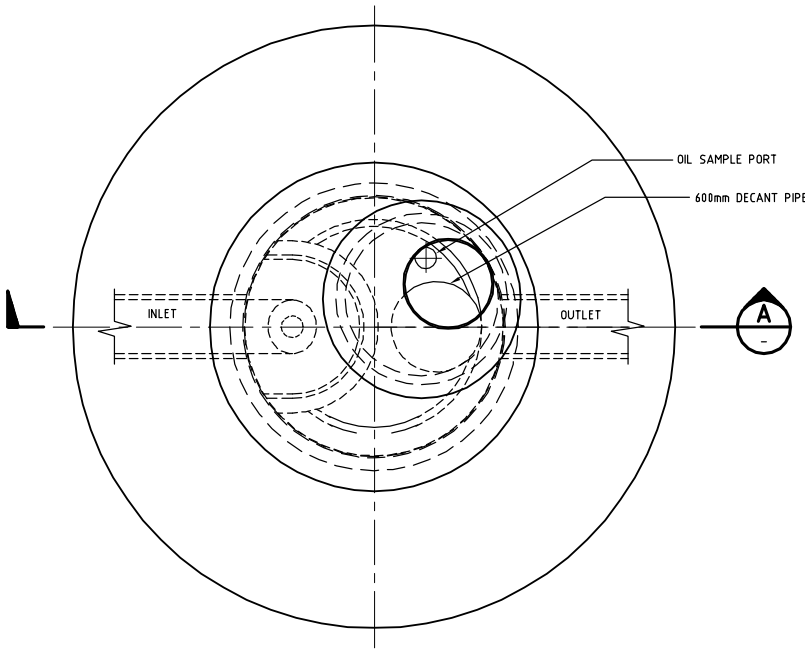
ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
0	UPDATED AND REISSUED FOR MANUFACTURE	RM	22-04-04	DFW



SECTION A-A
SCALE 1:25

NOTES:

1. TYPICAL ASSEMBLY DETAIL ONLY - REFER TO PROJECT DRAWING FOR ACTUAL REQUIREMENTS.
2. DIMENSIONS INCLUDED ARE STANDARD.
3. STORAGE VOLUMES TOTAL = 29220 LITRES OIL
   STORAGE VOLUME = 4290 LITRES
   SEDIMENT STORAGE VOLUME = 23.50 m3
4. COMPONENT MASSES TREATMENT CHAMBER BASE UNIT (INCL. SHAFT) = 18.3 t
   TREATMENT CHAMBER TOP UNIT (CONV. SLAB + SHAFT) = 23.2 t
5. BYPASS CHAMBER = VARIES REFER TO BYPASS CHAMBER ASSEMBLY DRAWING FOR FIXING DETAILS FOR FIBREGLASS INSERT.
6. BYPASS CHAMBER CONVERTER SLAB TO SUIT LOCAL ACCESS CHAMBER UNITS.
7. FOR INLET AND OUTLET PIPE CONNECTION DETAILS REFER HC-BCS2-A1 OR A2 AND KOR- N-SEAL INSTALLATION INSTRUCTIONS.
8. SWIFTLIFT LIFTING ANCHORS PROVIDED FOR LIFTING ALL COMPONENTS (REFER PRODUCT DRAWINGS)
9. NOTE MARKINGS - INLET AND OUTLET OVER EACH.
10. JOINT SEALANT AS PER MANUFACTURERS RECOMMENDATIONS.
11. VENT PIPE AND DECANT PIPE TO BE VISIBLE AS PER PLAN VIEW.



PLAN
SCALE 1:25

Humes TECHNICAL (DESIGN) SERVICES BRISBANE, QUEENSLAND

IMPORTANT INSTALLATION INFORMATION

1. FOUNDATION REQUIREMENTS - MIN. ALLOWABLE BEARING CAPACITY REQUIRED 200 kPa
2. UNIT TO BE PLACED ON 150mm THICK BED ZONE MATERIAL IN ACCORDANCE WITH AS3725 REQUIREMENTS
3. TREATMENT CHAMBER SHOULD BE FILLED WITH WATER TO 2/3 DEPTH IMMEDIATELY AFTER INSTALLATION (UNIT MAY FLOAT PRIOR TO BACKFILLING)

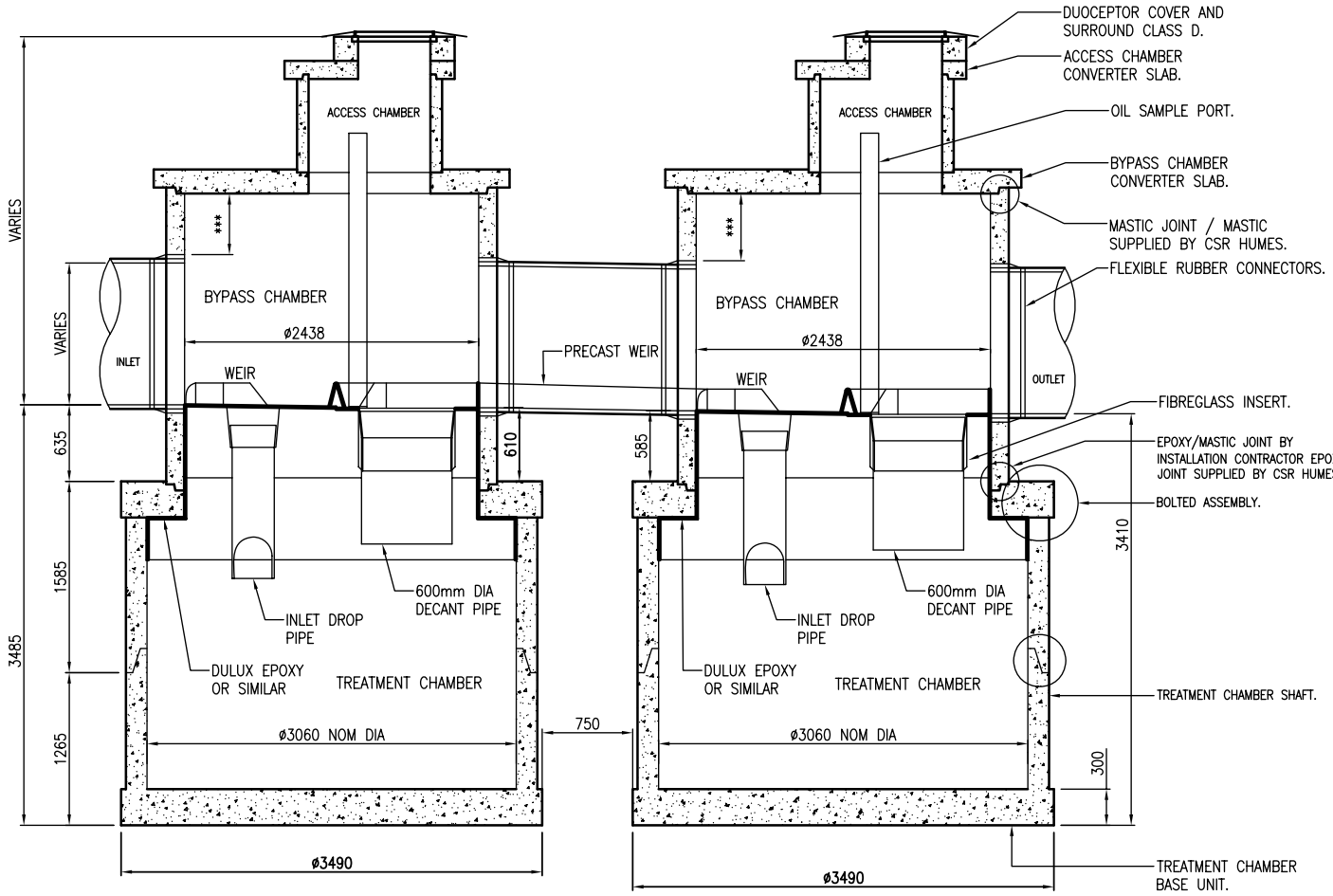
RUBBER RING JOINT SPECIFICATION

MATERIAL	: NITRILE
HARDNESS	: 43 (± 3) IRHD (AS1646)
PROFILE	: L 38 (REFER Dwg. J1002-01)
ID	: 3400 ± 16mm

DSN.	DFW	19-04-04
DWN.	RM	19-04-04
CKD.	DFW	19-04-04
APP.	DFW	19-04-04

HUMECEPTOR™
STANDARD DRAWING
STC-27 HUMECEPTOR
ASSEMBLY DRAWING

SUPERSEDES	PLOT SCALE	SIZE	DRG. NO.	ISSUE
	1:25	A2	HC-STC27-A	0



FOR INFORMATION

*150 MIN FOR INLET /OUTLET PIPE < 675 DIA
*300 MIN FOR INLET /OUTLET PIPE > 750 DIA

1. TYPICAL ASSEMBLY DETAIL ONLY – REFER TO PROJECT DRAWING FOR ACTUAL REQUIREMENTS.

2. DIMENSIONS INCLUDED ARE STANDARD.

3. STORAGE VOLUMES
   TOTAL = 42,370 LITRES
   OIL STORAGE VOLUME = 10,585 LITRES
   SEDIMENT STORAGE VOLUME = 27 m3

4. COMPONENT MASSES
   TREATMENT CHAMBER BASS UNIT (INC. SHAFT) = 11.92 TONNE
   TREATMENT CHAMBER TOP UNIT (CONV. SLAB AND SHAFT) = 8.95 TONNE
   BYPASS CHAMBER = 9.74 TONNE

5. REFER TO INSTALLATION GUIDE FOR RECOMMENDED INSTALLATION PROCEDURE.

6. SWIFTLIFT LIFTING ANCHORS PROVIDED FOR LIFTING ALL COMPONENTS THE FOLLOWING SWIFTLIFT KNUCKLES WILL BE REQUIRED:
   6 x 1.3 TONNES
   8 x 2.5 TONNES
   8 x 10.0 TONNES

7. OIL SAMPLE PORT, STEP IRONS AND DECANT PIPE TO BE VISIBLE AS PER PLAN VIEW.

8. THE ABOVE WEIGHTS ARE ONLY APPROXIMATIONS OF THE ACTUAL FINAL WEIGHTS OF COMPONENTS AND ARE NOT TO BE USED.

NOT FOR CONSTRUCTION

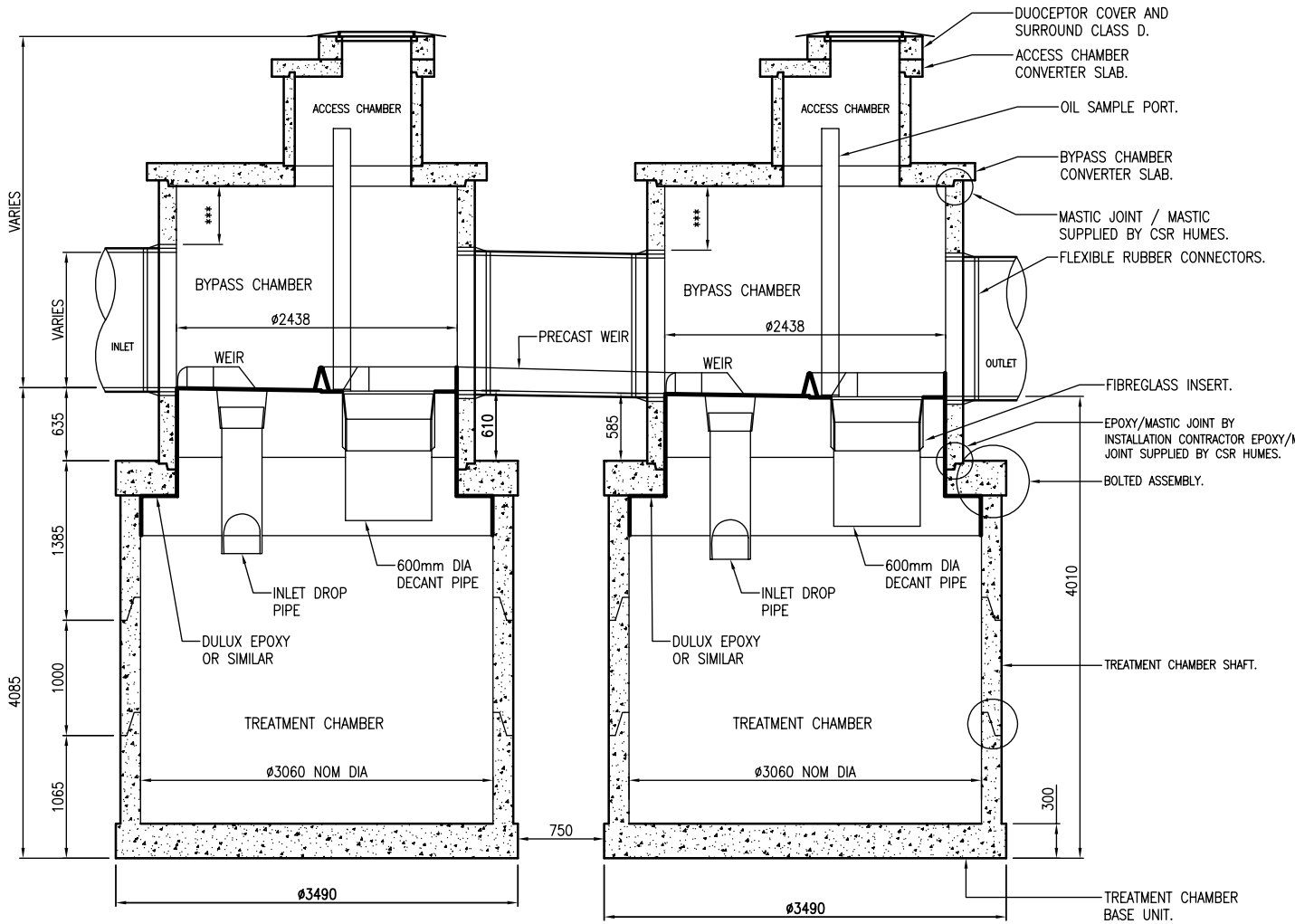
Humes

CLIENT: N/A
CLIENT NAME:

ISSUE	REVISION	INITIAL	DATE
A	ISSUE FOR CLIENT INFORMATION	JCM	25/10/07

JOB NAME: DUOCEPTOR STC40
JOB NO. N/A

DRAWING TITTLE:	GENERAL ARRANGEMENT			
DRAWING NO.	BIS-DUO-003			
DESIGNED BY:	–		MODEL:	STC60
DRAWN BY:	JCM	25/10/07	SCALE:	1:40
CHECKED BY:	CK	25/10/07	SIZE: A3	REV. A



FOR INFORMATION

*150 MIN FOR INLET /OUTLET PIPE < 675 DIA
*300 MIN FOR INLET /OUTLET PIPE > 750 DIA

1. TYPICAL ASSEMBLY DETAIL ONLY – REFER TO PROJECT DRAWING FOR ACTUAL REQUIREMENTS.

2. DIMENSIONS INCLUDED ARE STANDARD.

3. STORAGE VOLUMES
   TOTAL = 50,525 LITRES
   OIL STORAGE VOLUME = 10,585 LITRES
   SEDIMENT STORAGE VOLUME = 35 m3

4. COMPONENT MASSES
   TREATMENT CHAMBER BASS UNIT (INC. SHAFT) = 11.02 TONNE
   TREATMENT CHAMBER TOP UNIT (CONV. SLAB AND SHAFT) = 12.50 TONNE
   BYPASS CHAMBER = 9.74 TONNE

5. REFER TO INSTALLATION GUIDE FOR RECOMMENDED INSTALLATION PROCEDURE.

6. SWIFTLIFT LIFTING ANCHORS PROVIDED FOR LIFTING ALL COMPONENTS THE FOLLOWING SWIFTLIFT KNUCKLES WILL BE REQUIRED:
   6 x 1.3 TONNES
   8 x 2.5 TONNES
   8 x 10.0 TONNES

7. OIL SAMPLE PORT, STEP IRONS AND DECANT PIPE TO BE VISIBLE AS PER PLAN VIEW.

8. THE ABOVE WEIGHTS ARE ONLY APPROXIMATIONS OF THE ACTUAL FINAL WEIGHTS OF COMPONENTS AND ARE NOT TO BE USED.

NOT FOR CONSTRUCTION

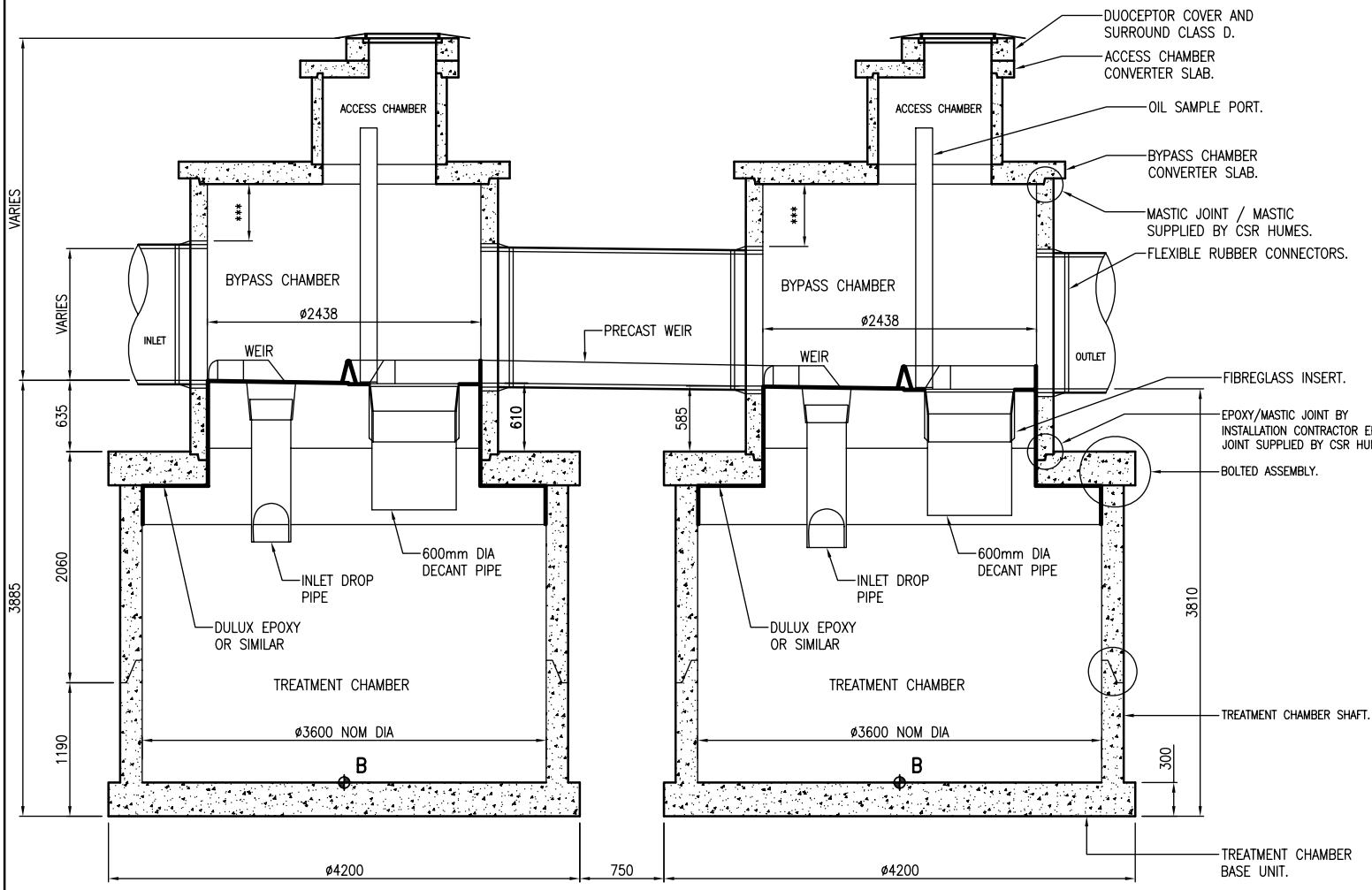
Humes

CLIENT: N/A
CLIENT NAME:

ISSUE	REVISION	INITIAL	DATE
A	ISSUE FOR CLIENT INFORMATION	JCM	25/10/07

JOB NAME: DUOCEPTOR STC50
JOB NO. N/A

DRAWING TITTLE:	GENERAL ARRANGEMENT		
DRAWING NO.	BIS-DUO-002		
DESIGNED BY:	–	MODEL:	STC60
DRAWN BY:	JCM 25/10/07	SCALE:	1:40
CHECKED BY:	CK 25/10/07	SIZE: A3	REV. A



FOR INFORMATION

*150 MIN FOR INLET /OUTLET PIPE < 675 DIA
*300 MIN FOR INLET /OUTLET PIPE > 750 DIA

1. TYPICAL ASSEMBLY DETAIL ONLY – REFER TO PROJECT DRAWING FOR ACTUAL REQUIREMENTS.

2. DIMENSIONS INCLUDED ARE STANDARD.

3. STORAGE VOLUMES
   TOTAL = 60,255 LITRES
   OIL STORAGE VOLUME = 11,560 LITRES
   SEDIMENT STORAGE VOLUME = 42 m3

4. COMPONENT MASSES
   TREATMENT CHAMBER BASS UNIT (INC. SHAFT) = 16.20 TONNE
   TREATMENT CHAMBER TOP UNIT (CONV. SLAB AND SHAFT) = 12.46 TONNE
   BYPASS CHAMBER = 9.74 TONNE

5. REFER TO INSTALLATION GUIDE FOR RECOMMENDED INSTALLATION PROCEDURE.

6. SWIFTLIFT LIFTING ANCHORS PROVIDED FOR LIFTING ALL COMPONENTS THE FOLLOWING SWIFTLIFT KNUCKLES WILL BE REQUIRED:
   6 x 1.3 TONNES
   8 x 2.5 TONNES
   8 x 10.0 TONNES

7. OIL SAMPLE PORT, STEP IRONS AND DECANT PIPE TO BE VISIBLE AS PER PLAN VIEW.

8. THE ABOVE WEIGHTS ARE ONLY APPROXIMATIONS OF THE ACTUAL FINAL WEIGHTS OF COMPONENTS AND ARE NOT TO BE USED.

NOT FOR CONSTRUCTION

Humes

CLIENT: N/A
CLIENT NAME:

ISSUE	REVISION	INITIAL	DATE
A	ISSUE FOR CLIENT INFORMATION	JCM	25/10/07

JOB NAME: DOUCEPTOR STC60
JOB NO. N/A

DRAWING TITTLE:	GENERAL ARRANGEMENT		
DRAWING NO.	BIS-DUO-001		
DESIGNED BY:	–	MODEL:	STC60
DRAWN BY:	JCM 25/10/07	SCALE:	1:40
CHECKED BY:	CK 25/10/07	SIZE: A3	REV. A

Precast solutions

Top:
StormTrap® system

Middle:
RainVault® system

Bottom:
Segmental shaft

Stormwater

Stormwater treatment

Primary treatment

- HumeGard® Gross Pollutant Trap

Secondary treatment

- HumeCeptor® hydrodynamic separator

Detention and infiltration

StormTrap® system

Soakwells

Harvesting and reuse

RainVault® system

ReserVault® system

RainVault® Mini system

Precast concrete cubes

Segmental shafts

Stormwater drainage

Steel reinforced concrete pipes – trench

Steel reinforced concrete pipes – salt water cover

Steel reinforced concrete pipes – jacking

Box culverts

Uniculvert® modules

Headwalls

Stormwater pits

Access chambers/Manholes

Kerb inlet systems

Floodgates

Geosynthetics

Sewage transfer and storage

Bridge and platform

Tunnel and shaft

Walling

Potable water supply

Irrigation and rural

Traffic management

Cable and power management

Rail

Contact information

National sales 1300 361 601
humes.com.au
info@humes.com.au

Head Office

18 Little Cribb St
Milton QLD 4064
Ph: (07) 3364 2800
Fax: (07) 3364 2963

Queensland

Ipswich/Brisbane
Ph: (07) 3814 9000
Fax: (07) 3814 9014

Rockhampton
Ph: (07) 4924 7900
Fax: (07) 4924 7901

Townsville
Ph: (07) 4758 6000
Fax: (07) 4758 6001

New South Wales

Grafton
Ph: (02) 6644 7666
Fax: (02) 6644 7313

Newcastle
Ph: (02) 4032 6800
Fax: (02) 4032 6822

Sydney
Ph: (02) 9832 5555
Fax: (02) 9625 5200

Tamworth
Ph: (02) 6763 7300
Fax: (02) 6763 7301

Victoria

Echuca
Ph: (03) 5480 2371
Fax: (03) 5482 3090

Melbourne
Ph: (03) 9360 3888
Fax: (03) 9360 3887

South Australia

Adelaide
Ph: (08) 8168 4544
Fax: (08) 8168 4549

Western Australia

Gnangara
Ph: (08) 9302 8000
Fax: (08) 9309 1625

Perth
Ph: (08) 9351 6999
Fax: (08) 9351 6977

Northern Territory

Darwin
Ph: (08) 8984 1600
Fax: (08) 8984 1614

Humes

National sales 1300 361 601
humes.com.au
info@humes.com.au

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Humes

Strength. Performance. Passion.

HumeGard® GPT
Technical manual

Issue 4

Contents

enviro DEVELOPMENT™ PROFESSIONAL

HumeGard® GPT

The HumeGard® system is a Gross Pollutant Trap (GPT) that is specifically designed to remove gross pollutants and coarse sediments ≥ 150 microns, from stormwater runoff. A wide range of models are available to provide solutions for normal and super-critical flow conditions.

The patented HumeGard® GPT incorporates a unique floating boom and bypass chamber to enable the continued capture of floating material, even during peak flows. The configuration also prevents re-suspension and release of trapped materials during subsequent storm events.

The HumeGard® GPT is designed for residential and commercial developments where litter and sediment are the target pollutants. It is particularly useful in retrofit applications or drainage systems on flat grades where low head loss requirements are critical, and in high backwater situations.

The value of the HumeGard® GPT has proven it to be one of the most successful treatment devices in Australia today:

- **The system provides high performance with negligible head loss**
  The HumeGard® GPT has a head loss 'k' factor of 0.2, important for retrofit and surcharging systems.
- **It captures and stores a large volume of pollutants**
  For pollutant export rates reported by Australia Runoff Quality (1 m^3/hectare/year), the HumeGard® GPT is sized for maintenance intervals up to annual durations.
- **It uses independently proven technology**
  The system was developed and tested by Swinburne University of Technology, Australia, in 1998, to demonstrate compliance with operational criteria from the Victorian EPA.
- **It has low operational velocities**
  Flow velocity in the storage chamber is <0.2 m/s to ensure the comb self-cleans and improves settling of coarse sediment.
- **It retains floating material even in bypass**
  All GPTs bypass at high flows. The patented floating boom will capture and retain floating materials even when bypass occurs.
- **It provides cost effective treatment for litter and coarse sediments**
  The system's large capacity and long maintenance intervals reduces the overall lifecycle costs in comparison with other treatment measures.
- **It can reduce the footprint of the stormwater treatment train**
  Installation of a HumeGard® GPT prior to vegetated treatment measures can assist in reducing their overall footprint.
- **It maximises above ground land use**
  The HumeGard® GPT is a fully trafficable solution, so it can be installed under pavements and hardstands to maximise land use on constrained sites.
- **It is easy to maintain**
  Cleanout of the HumeGard® GPT can be performed safely and effectively from the surface using a vacuum truck.
- **It is made from quality componentry**
  All internal metal components are made from 304 stainless steel or fibreglass, and the system undergoes rigorous quality control prior to dispatch.

System operation

The HumeGard® GPT utilises the processes of physical screening and floatation/sedimentation to separate the litter and coarse sediment from stormwater runoff. It incorporates an upper bypass chamber with a floating boom that diverts treatable flows into a lower treatment chamber for settling and capturing coarse pollutants from the flow.

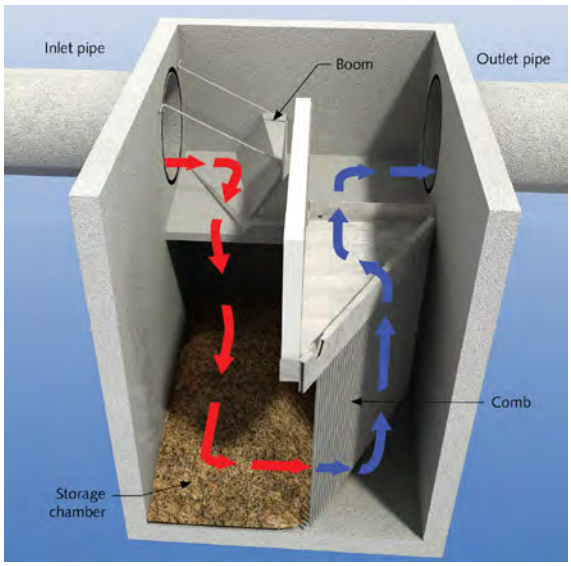
Bypass chamber

1. Stormwater flows into the inlet (boom) area of the bypass chamber (refer to Figure 1).
2. During flows up to and including the design treatment flowrate, the angled boom directs the total flow into the storage/treatment chamber.
3. During higher flow conditions, the angled boom continues to direct all floating litter from the bypass chamber into the storage/treatment chamber. The inlet area of the bypass chamber floor is angled towards the treatment chamber to ensure the bed load sediment material continues to be directed into the storage chamber even when the boom is floating.
4. At peak flows, the boom remains semi-submerged and enables excess flow to pass underneath, regulating the flow into the storage/treatment chamber. This ensures that higher flows, which could otherwise scour and re-suspend previously trapped materials, are not forced into the storage/treatment chamber. The floating boom bypass ensures previously trapped floating materials are retained. Each HumeGard® GPT is designed to achieve an operating velocity below 0.2 m/s through the storage chamber to ensure the settling of coarse sediment and keep the comb clean.

Treatment chamber

1. Once diverted into the treatment chamber, the flow continues underneath the internal baffle wall, passes through the stainless steel comb and flows over the flow controlling weir to the outlet.
2. Pollutants with a specific gravity less than water (S.G.<1) remain floating on the water surface in the storage/treatment chamber. Sediment and other materials heavier than water (S.G.>1) settle to the bottom of the chamber. The design and depth of the chamber minimises turbulent eddy currents and prevents re-suspension of settled material. The comb prevents any neutrally buoyant litter in the treatment chamber from escaping under the baffle wall.

Figure 1 – Operation during design flow conditions



Independent verification testing

Laboratory and field testing of the HumeGard® GPT for hydraulic performance and litter capture was conducted in Australia by Swinburne University of Technology, during 1996 and 1998.

Laboratory and field testing (Waste Management Council of Victoria 1998, Trinh 2007, Woods 2005, Swinburne University of Technology 2000) has proven the performance outlined in Table 1 below.

Further field testing was conducted by the University of the Sunshine Coast from 2013 to 2015, including a minimum of 15 qualifying storm events, to determine TSS, TP and TN removal efficiencies, which are also outlined in Table 1 below.

Table 1 – HumeGard® GPT performance summary

Pollutant	Removal efficiency	Details
Gross pollutants (litter, vegetation)	90%	Annually
TSS	49%	Annually (including bypass)
Hydrocarbons	90%	In an emergency spill event
TP	40%	Particulate-bound
TN	26%	Particulate-bound

Notes:

1. Nutrient removal is influenced by individual catchment characteristics and partitioning between dissolved and particulate nitrogen.
2. For further details on performance testing contact Humes.
3. Gross pollutant traps are not specifically designed to capture hydrocarbons, though may do so during emergency spill events. When this occurs, maintenance is required immediately.
4. The unique design of the HumeGard® floating boom allows it to be modified to treat higher flows and capture more gross pollutants and sediment on request.

System options

A wide range of sizes are available to suit catchment pollutant generation rates and Water Quality Objectives (WQO). Table 2 below presents the standard model dimensions and total pollutant capacities. We recommend that designers contact Humes Water Solutions for detailed sizing on each project and for advice with larger units.

Pollutant export rates detailed in Australian Runoff Quality (Engineers Australia 2006) suggests that a typical urban catchment will produce 1 m^3/hectare/year of gross pollutants and sediment. Humes Water Solutions advises that this be taken into account when selecting an appropriate model.

Table 2 – HumeGard® model range and dimensions

HumeGard® model	Pipe diameter or box culvert width (mm)	Treatment flow rate (L/s)	Total pollutant capacity (m^3)	Length (mm)	Width (mm)	Height (mm)
HG12	300	85	3	2,000	1,758	2,500
HG12A	375	100	3	2,000	1,758	2,500
HG15	450	130	3	2,000	1,758	2,500
HG15A	525	150	3	2,000	1,758	2,500
HG18	600	600	3	2,100	2,100	2,115
HG24	600 - 750	1,050	8	2,500	2,700	2,740
HG27	750 - 900	1,110	7	2,500	3,000	2,715
HG30	750 - 825	1,330	12	2,500	3,350	3,365
HG30A	900	1,160	11	2,500	3,350	3,365
HG35	900	1,540	12	2,500	3,850	3,390
HG35A	1,050	1,370	11	2,500	3,850	3,390
HG40	900	1,910	16	2,850	4,350	3,390
HG40A	1,050	1,750	14	2,850	4,350	3,390
HG40B	1,200	1,580	12	2,850	4,350	3,390
HG45	1,200	1,960	19	2,900	4,900	3,915
HG45A	1,350	1,780	19	3,200	4,900	3,915
HG50 and above	Custom					

Notes:

1. The unique design of the HumeGard® floating boom allows it to be modified to treat a wide range of flowrates. Contact Humes for details on the model to suit your project.
2. HumeGard® can be modified to suit a box culvert, larger pipe or skewed outlet. Please contact your Humes Water Solutions Manager.
3. HumeGard® should be sized for either pipe diameter or treatment flow rate.
4. Units listed are standard configurations. Custom units can be provided to meet specific project requirements.
5. For confirmation of HumeGard® sizing or to discuss project specific requirements please contact your Humes Water Solutions Manager.
6. Refer to current Humes Terms and Conditions of Sale.
7. Australian Rainfall Quality recommend a pollutant export rate for a typical residential catchment is up to 1m^3/ha/yr of mixed waste and sediment.
8. HumeGard® can be modified to suit typical tail-water effects from downstream areas such as basins. Please contact Humes for design advice.
9. HumeGard® can be modified to suit high groundwater conditions. Please contact Humes for design advice.

Variants

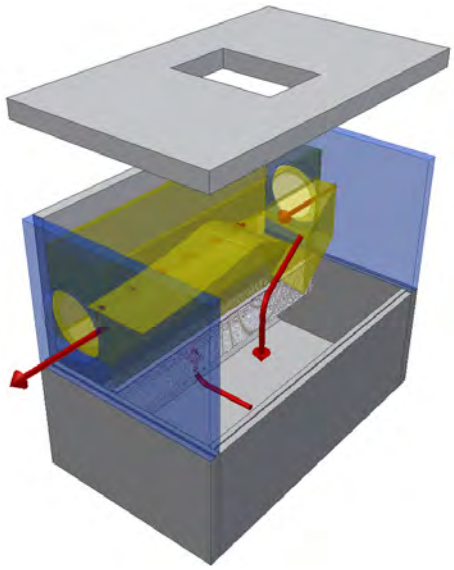
A number of additional innovations have been made to the HumeGard® GPT to facilitate their effective operation in a wider range of applications:

- Super-critical HumeGard® GPT – designed to operate under supercritical flow conditions in steep, high velocity drainage networks.
- Angled HumeGard® GPT – designed to replace a 45° or 90° junction in a drainage network.
- Dual outlet HumeGard® GPT – designed to divert the treatment flow to downstream natural Water Sensitive Urban Design (WSUD) elements such as wetlands and bio-retention whilst bypassing excess flows through a second outlet.

- **Super-critical HumeGard® GPT**
  The super-critical HumeGard® GPT (refer to Figure 2) was borne out of the original HumeGard® GPT, with modifications to deliver even greater performance under super-critical flow conditions. This model replaces the floating boom with a broad-crested weir that diverts the treatment flows into the treatment chamber under super-critical flow (Fr>1) conditions without creating hydraulic jumps and adversely impacting on performance.

  Flow into the treatment chamber passes through a stainless steel screen at a velocity <0.2 m/s and exits the device via a slot beneath the broad-crested weir (refer to the red arrows in Figure 2). The inserts in these models are manufactured from fibreglass for increased durability. The stainless steel screen can be shaped with a curved profile upon request. When the treatment flow rate is exceeded, the excess flow bypasses over the broad-crested weir to the outlet. This maintains the treatment flow into the chamber but protects against scour of captured material.

Figure 2 – Super-critical HumeGard® GPT



- **Angled HumeGard® GPT**
  The angled HumeGard® GPT (refer to Figure 3), was developed to facilitate the replacement of junction pits while still providing the treatment capabilities of the original HumeGard® device. These units simply alter the outlet location to allow for a change of pipe direction of 45° or 90°. The Angled HumeGard® GPT can be supplied in any of the standard unit sizes, however, the designer must allow for a minor head loss factor 'k' of 1.3 instead of 0.2 (which applies to the standard HumeGard® GPT design).
- **Dual Outlet HumeGard® GPT**
  The Dual Outlet HumeGard® GPT has been designed to operate as a diversion structure upstream of natural WSUD options such as constructed wetlands, ponds, lakes, and bio-retention systems.

  The units are designed such that one outlet conveys the treated flow into the natural WSUD measure and the standard outlet bypasses the excess flow around the downstream system (refer to Figure 4). Dual Outlet HumeGard® units are available in the same sizes as the standard HumeGard® units (refer Table 2 on page 4).

Figure 3 – Angled HumeGard® GPT

Figure 4 – Dual Outlet HumeGard® GPT

Inundation/tidal applications

The boom of the HumeGard® GPT enables the capture of floating pollutants even at peak flows, often when other fixed weir devices are in bypass mode. This unique feature also makes the HumeGard® GPT ideal for applications that are subject to both tidal and tail water effects.

In tidal applications the floating boom effectively traps the floating pollutants and prevents the loss of the gross pollutants from the system. In fixed weir devices, previously trapped floating litter may be backwashed out of the GPTs during the rising phase, to later bypass the GPT during the falling phase of the tide. As this happens twice daily, spring tides could quickly empty devices relying upon a fixed weir.

Marine grade 316 stainless steel is used for all internals in devices installed in tidal applications. In acidic/aggressive environments, these may also be epoxy-coated. Contact Humes Water Solutions for specific designs to suit these applications.

A plinth can also be added to the false floor under the boom to ensure sediment loads are captured during inundation.

Design information

To design a system suitable for your project it is necessary to review the configuration of the stormwater system, the location and purpose of other stormwater management (WSUD) controls, the catchment area and the hydrology.

Configuration of the stormwater system

The configuration of the stormwater system is important since the HumeGard® GPT operates with an "in-line", 45° or 90° alignment. Inlet pipe grades between 0.5% and 5% are recommended for at least five pipe diameters upstream of the HumeGard® GPT. The pipe grade and flow velocity will determine whether a super-critical unit is required.

Location in the stormwater system

Depending upon the site, the GPT can be oriented to have the treatment chamber on the left or right side of the pipe to suit constraints. Humes Water Solutions can work closely with stormwater designers to select the appropriate location and orientation for their system.

Catchment area

Research presented in Australian Runoff Quality (Engineers Australia 2006) concluded that roughly 1 m^3/hectare/year of gross pollutants and sediment could be expected from a typical residential catchment. Therefore, GPTs designed for an annual maintenance interval should have a pollutant storage capacity roughly equal to the number of hectares of catchment it treats (e.g. 10 hectare catchment = 10 m^3 pollutant storage).

Sizing HumeGard® GPTs

The large storage volumes of the HumeGard® GPT enables more pollutants to be captured before maintenance is required, which greatly reduces its lifecycle costs. In accordance with accepted hydraulic principles the larger volumes in the HumeGard® GPT results in lower velocities through the device, minimising scour and re-suspension of sediment.

Humes Water Solutions has developed a design request form (see page 30) for stormwater designers to complete and return to obtain a detailed design of the appropriate device.

MUSIC/pollutant export model inputs

Many local authorities utilise MUSIC or other pollutant export models to assist in stormwater treatment train selection, and recommend generic inputs for GPTs. Considering these against the independent research results, the following conservative removal efficiencies (refer to Table 3 below) are recommended for the HumeGard® GPT on an annual basis (i.e. no bypass).

Table 3 – MUSIC inputs for HumeGard® GPTs

Pollutant	Removal efficiency
Gross pollutants (litter, vegetation)	90%
TSS	49%
TP	40%
TN	26%

System installation

Top:
Preparing the aggregate base (Step 2)

Middle:
Installing the main bypass chamber (Step 4)

Bottom:
Placing the main chamber lid (Step 7)

The installation of the HumeGard® unit should conform to the local authority's specifications for stormwater pit construction. Detailed installation instructions are dispatched with each unit.

The HumeGard® unit is installed as follows:

1. Prepare the excavation according to plans.
2. Prepare the compacted aggregate base.
3. Install the main treatment chamber section.
4. Install the main bypass chamber section/s (if required).
5. Fit the stainless steel comb (if required).
6. Connect the inlet and outlet pipes.
7. Place the main chamber lid.
8. Install the frame and access covers.
9. Backfill to specified requirements.

System maintenance

The design of the HumeGard® GPT means that maintenance is best performed by vacuum trucks which avoids entry into the unit.

Additional access covers can be designed upon request.

A typical maintenance procedure includes:

1. Remove access covers.
2. With a vacuum hose, remove the floating litter from the treatment chamber.
3. Determine the depth of water and sediment layers.
4. Insert sluice gate into the upstream manhole.
5. Decant water from the treatment chamber into the upstream manhole until the sediment layer is exposed.
6. Remove the sediment layer with the vacuum hose; jet with a high pressure hose if required.
7. Remove sluice gate from the upstream manhole and allow water to return to the HumeGard® GPT.
8. Replace access covers.

Left:
Floating litter captured in the treatment chamber

FAQs

- **Can the boom become stuck?**
  The boom weighs up to 80 kg. Unless there is a large branch, car wheel, or other large item carried through the drainage network, the mass of the boom will ensure it returns to the floor.
- **Will the gross pollutants bypass when the boom floats?**
  All treatment measures are designed to treat a specific flow. Once this is exceeded, any entrained pollutants in the flow will bypass the treatment chamber. Often this is less than 5% of the annual load. A significant quantity of gross pollutants are buoyant when entering a GPT and, unlike fixed weir systems which bypass these floatable items, the HumeGard® boom provides continuous treatment of them, even in bypass.
- **Will the retention of water in the treatment chamber lead to the release of nutrients as pollutants break down?**
  Over time, captured organic materials will breakdown and release nutrients in all treatment measures whether natural or manufactured. As part of a treatment train, downstream vegetated measures can remove the small proportion of nutrients released during dry weather flows. A regular maintenance program will reduce the amount of breakdown occurring.
- **What is the design life of a HumeGard® GPT?**
  The entire product is designed to last a minimum of 50 years.
- **Why is the HumeGard® GPT larger than other GPTs?**
  The design of the HumeGard® GPT is to ensure a velocity through the treatment chamber <0.2 m/s to ensure the comb self-cleans. From engineering principles, a larger cross-sectional area is required to reduce the loading rate. As proven by Stokes Law, lower chamber velocities mean smaller sediment particles can be captured.
- **Why would I use a HumeGard® GPT upstream of a biofilter?**
  Using a HumeGard® GPT upstream of a biofilter acts as a sediment forebay and removes litter, containing it to a confined location for easy removal by a vacuum truck. This protects the biofilter, lengthens its lifespan and reduces the ongoing maintenance costs.

References

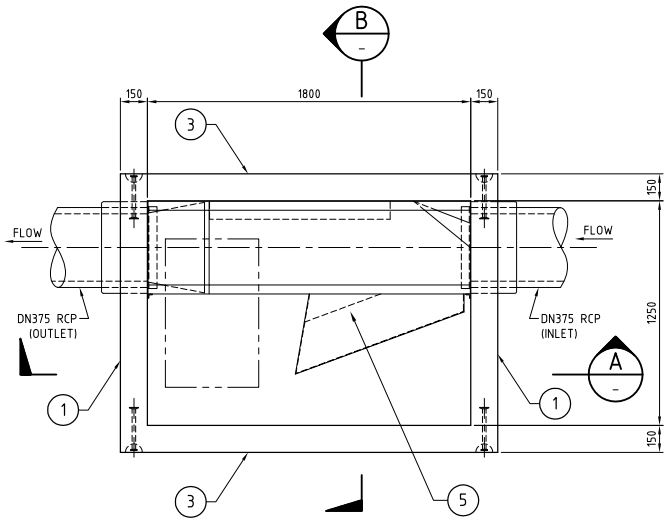
- Waste Management Council of Victoria (1998) “Inline Litter Separator: Installation and Monitoring Project”, EcoRecycle, Victoria.
- Trinh, N. An Investigation into the Trapping Efficiencies of Gross Pollutant Traps. Thesis. Brisbane, Queensland: Queensland University of Technology, 2007.
- Woods, S. Performance Evaluation of an In-Line Separator. Masters Thesis. Melbourne, Victoria: Swinburne University of Technology, 2005.
- Swinburne University of Technology (2000) “HumeGard® In-line Litter Separator Sediment Capture Testing”, School of Engineering and Science.
- Engineers Australia (2006) “Australian Runoff Quality”.
- Lucke, T. 2015, Characterisation of Water Quality Improvement Processes by GPTs at University of the Sunshine Coast (Humegard HG27 Monitoring Program), School of Science and Engineering, University of the Sunshine Coast, QLD, Australia.

Appendix

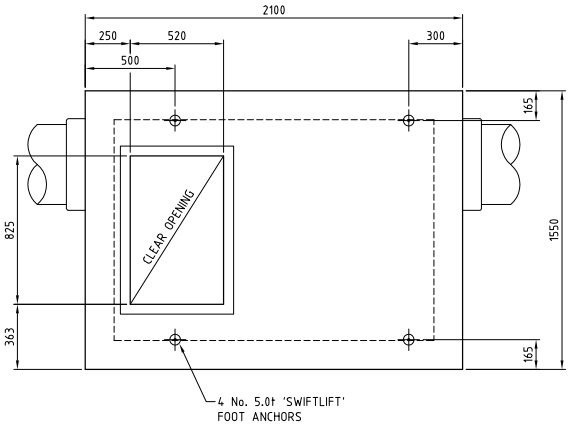
HumeGard® GPT technical drawings

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
2	GENERAL REVISION, REISSUED FOR MANUFACTURE	MZ	——	RM

ITEM No	DWG DESCRIPTIONS	DWG No
1	END WALL	HG12-20
2	BASE SLAB	HG12-21
3	SIDE WALL	HG12-22
4	PRECAST LID	HG12-07
5	GRP INSERT ASSEMBLY DETAILS	HG12A/L-08



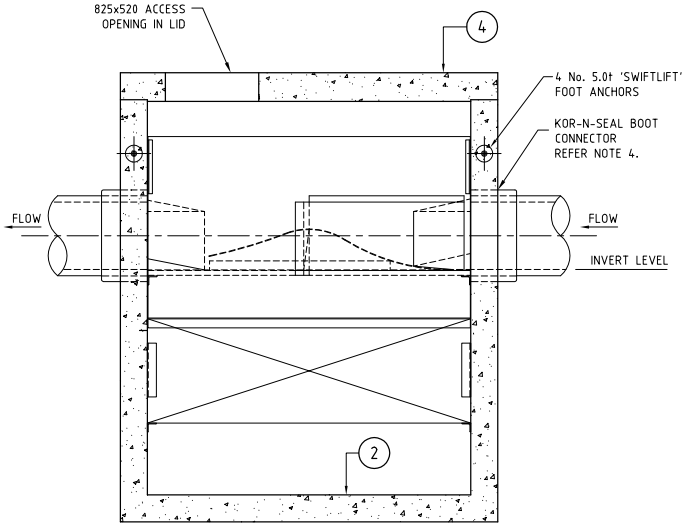
PLAN VIEW (LID REMOVED)
SCALE 1:20



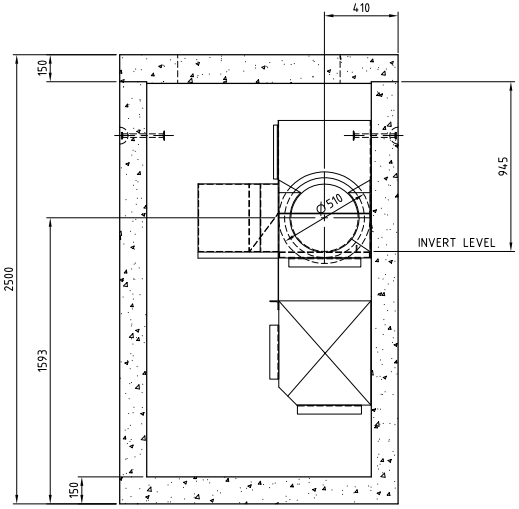
PLAN ON LID
SCALE 1:20

NOTES

1. GRP INSERT MANUFACTURED FROM 5mm GRP.
2. ALL CONCRETE COMPONENTS TO BE HANDLED VIA CAST-IN SWIFTLIFT ANCHORS AT ALL TIMES.
3. UNIT MASS: CHAMBER (ASSEMBLED) = 7.0t (WITHOUT LID) LID = 1.2t
4. KOR-N-SEAL BOOT CONNECTOR P/N = S106-20WP
5. SEE DRAWING HG-CAST 2 FOR CASTING SEQUENCE



SECTION A
SCALE 1:20



SECTION B
SCALE 1:20

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH M1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

Humes TECHNICAL SERVICES BRISBANE, QUEENSLAND

Holcim (Australia) Pty Ltd ABN 87 099 732 297

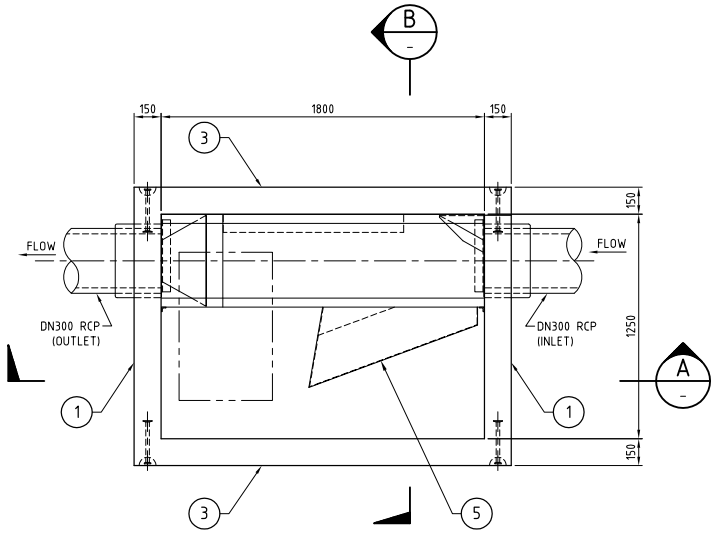
DSN.	WST	02-09-10
DWN.	MZ	02-09-10
CKD.	RM	——
APP.	WST	——

HUMES WATER SOLUTIONS
STANDARD HUMEGARD
HUMEGARD HG12A/L
DN375/DN375 RCP
GENERAL ASSEMBLY

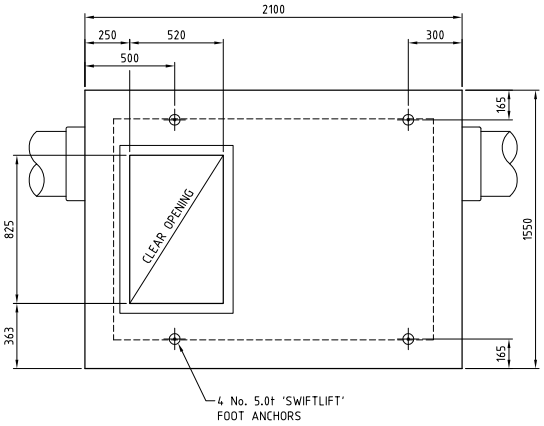
SUPERSEDES	PLOT SCALE	SIZE	DRG. NO.	ISSUE
HG12A/L-01 ISSUE 1	1:1	A2	HG12A/L-01	2

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
2	GENERAL REVISION	MZ	——	RM

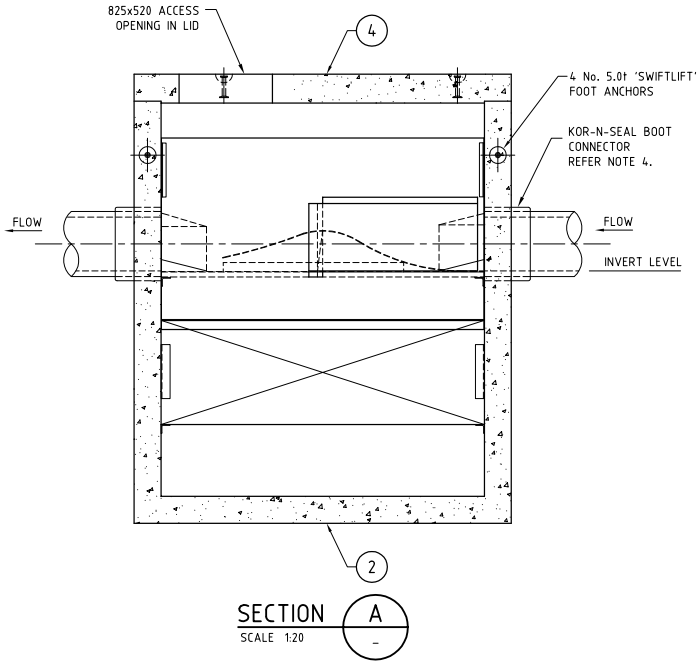
ITEM No	DRAWING DESCRIPTIONS	DWG No
1	END WALL	HG12-20
2	BASE SLAB	HG12-21
3	SIDE WALL	HG12-22
4	PRECAST LID	HG12-07
5	GRP INSERT ASSEMBLY DETAILS	HG12/L-08



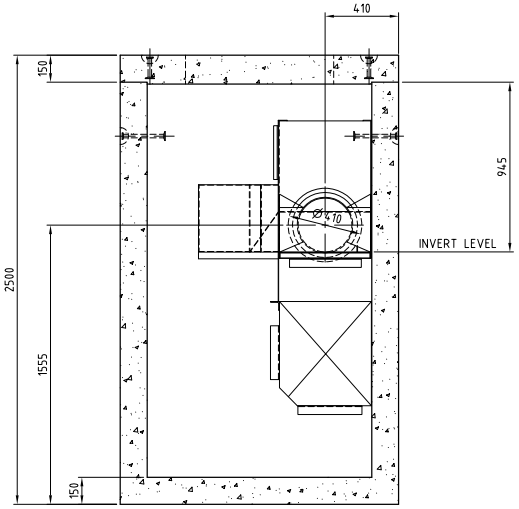
PLAN VIEW (LID REMOVED)
SCALE 1:20



PLAN ON LID
SCALE 1:20



SECTION A
SCALE 1:20



SECTION B
SCALE 1:20

NOTES

1. GRP INSERT MANUFACTURED FROM 5mm GRP.
2. ALL CONCRETE COMPONENTS TO BE HANDLED VIA CAST-IN SWIFTLIFT ANCHORS AT ALL TIMES.
3. UNIT MASS: CHAMBER (ASSEMBLED) = 7.0t (WITHOUT LID)
   LID = 1.2t
4. KOR-N-SEAL BOOT CONNECTOR P/N = S106-16WP

. SEE DRAWING HG-CAST 2 FOR CASTING SEQUENCE

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH M1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

Humes TECHNICAL SERVICES BRISBANE, QUEENSLAND

Holcim (Australia) Pty Ltd ABN 87 099 732 297

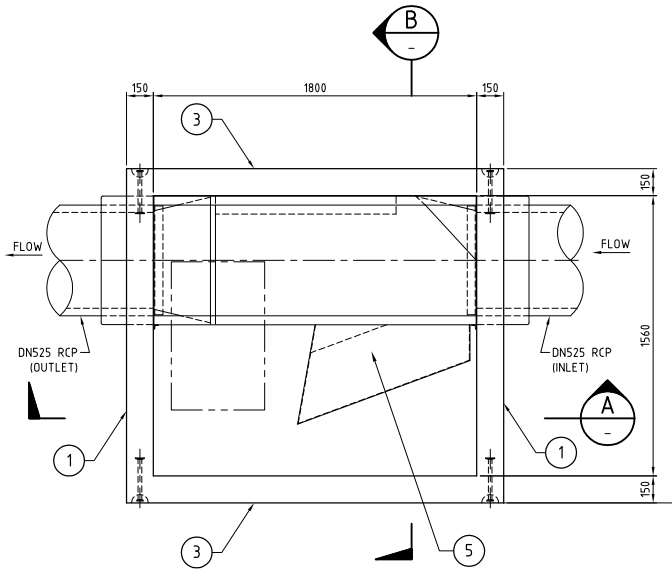
DSN.	WST	14-03-07
DWN.	MZ	14-03-07
CKD.	RM	——
APP.	WST	——

HUMES WATER SOLUTIONS
STANDARD HUMEGARD
HUMEGARD HG12/L
DN300/DN300 RCP
GENERAL ASSEMBLY

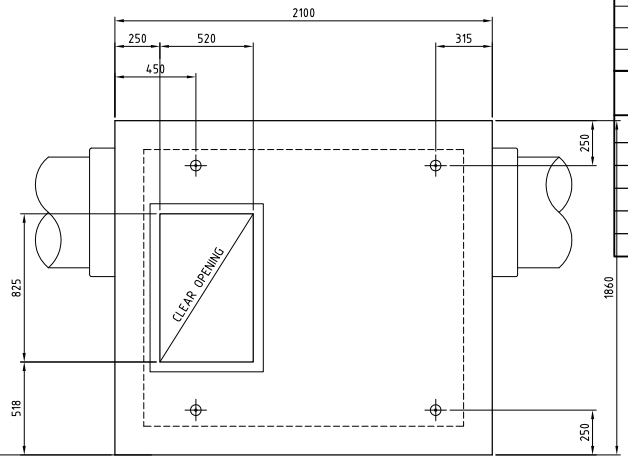
SUPERSEDES	PLOT SCALE	SIZE	DRG. NO.	ISSUE
HG12/L-01 REV 1	1:1	A2	HG12/L-01	2

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
2	GENERAL REVISION	MZ	——	RM

ITEM No	DWG DESCRIPTIONS	DWG No
1	END WALL	HG15-20
2	BASE SLAB	HG15-21
3	SIDE WALL	HG15-22
4	PRECAST LID	HG15-07
5	GRP INSERT ASSEMBLY DETAILS	HG15A/L-08



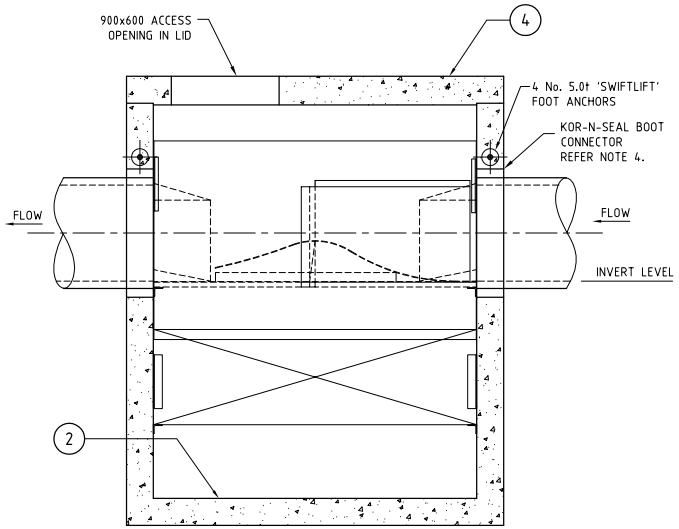
PLAN VIEW (LID REMOVED)
SCALE 1:20



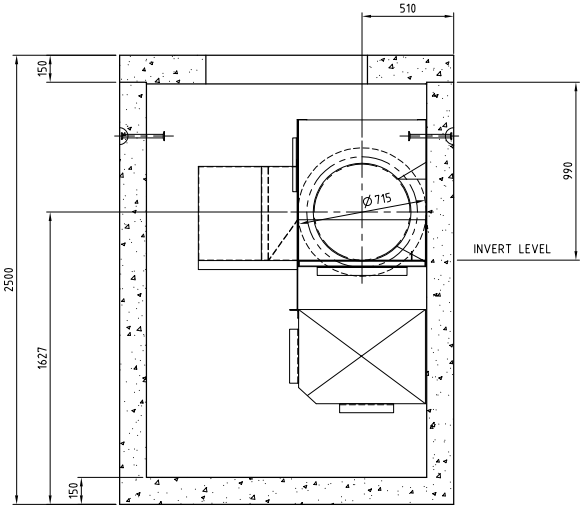
PLAN ON LID
SCALE 1:20

NOTES

1. GRP INSERT MANUFACTURED FROM 5mm .
2. ALL CONCRETE COMPONENTS TO BE HANDLED VIA CAST-IN SWIFTLIFT ANCHORS AT ALL TIMES.
3. UNIT MASS: CHAMBER (ASSEMBLED) = 7.7t (WITHOUT LID)
   LID = 1.4t
4. KOR-N-SEAL BOOT CONNECTOR P/N = S206-28
5. SEE DRAWING HG-CAST 2 FOR CASTING SEQUENCE.



SECTION A
SCALE 1:20



SECTION B
SCALE 1:20

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH SM1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

Humes TECHNICAL SERVICES BRISBANE, QUEENSLAND

Holcim (Australia) Pty Ltd ABN 87 099 732 297

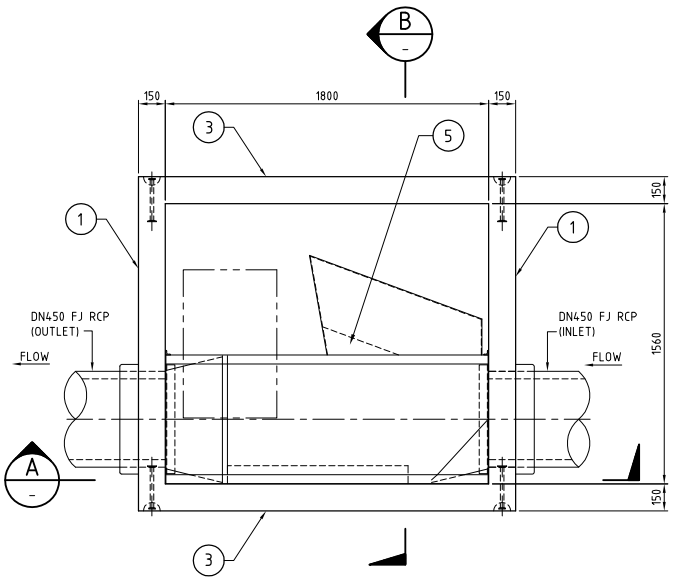
DSN.	WST	07-09-10
DWN.	MZ	07-09-10
CKD.	RM	——
APP.	WST	——

HUMES WATER SOLUTIONS
STANDARD HUMEGARD
HUMEGARD HG15A/L
DN525/DN525 RCP
GENERAL ASSEMBLY

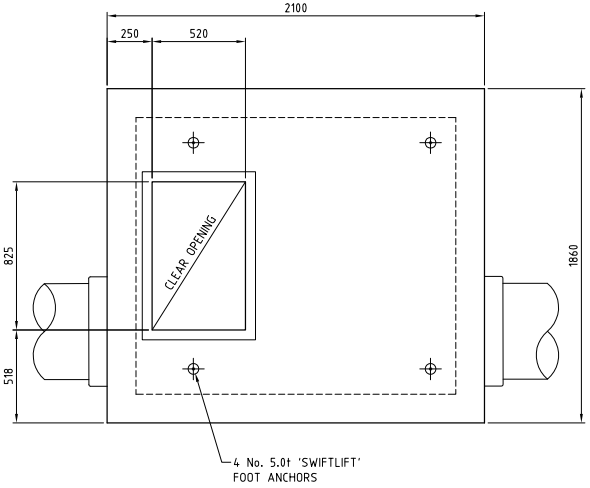
SUPERSEDES	PLOT SCALE	SIZE	DRG. NO.	ISSUE
HG15A/L-01 ISSUE 1	1:1	A2	HG15A/L-01	2

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
2	GENERAL REVISION	MZ	——	DFW

ITEM No	DWG DESCRIPTIONS	DWG No
1	END WALL	HG15-20
2	BASE SLAB	HG15-21
3	SIDE WALL	HG15-22
4	PRECAST LID	HG15-07
5	GRP INSERT ASSEMBLY DETAILS	HG15/R-08



PLAN VIEW (LID REMOVED)
SCALE 1:20



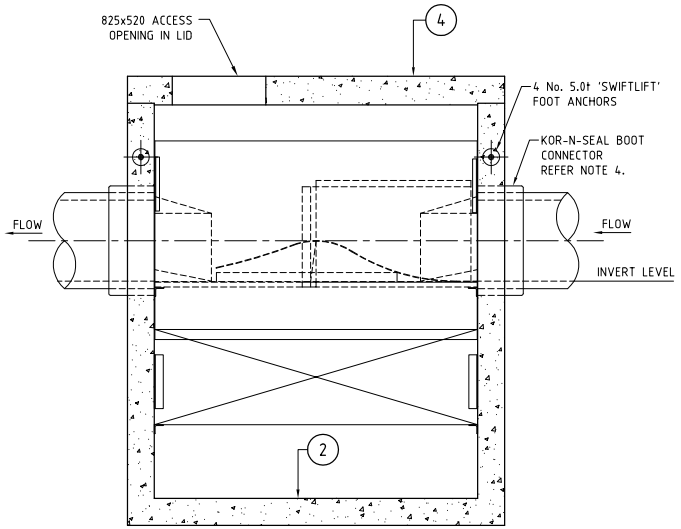
PLAN ON LID
SCALE 1:20

NOTES

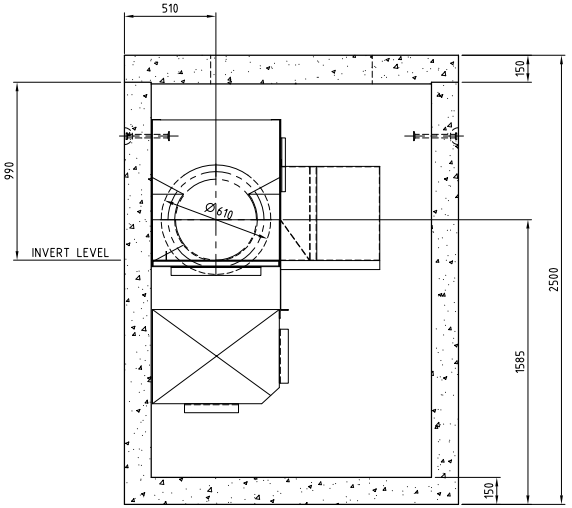
1. GRP INSERT MANUFACTURED FROM 5mm GRP.
2. ALL CONCRETE COMPONENTS TO BE HANDLED VIA CAST-IN SWIFTLIFT ANCHORS AT ALL TIMES.
3. UNIT MASS: CHAMBER (ASSEMBLED) = 7.7t (WITHOUT LID)
   LID = 1.5t
4. KOR-N-SEAL BOOT CONNECTOR P/N = S106-24WP
5. SEE DRAWING HG-CAST 2 FOR CASTING SEQUENCE

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH M1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.



SECTION A
SCALE 1:20



SECTION B
SCALE 1:20

Humes TECHNICAL (DESIGN) SERVICES
BRISBANE, QUEENSLAND

CEMEX Australia Pty Limited ABN 87 099 732 297

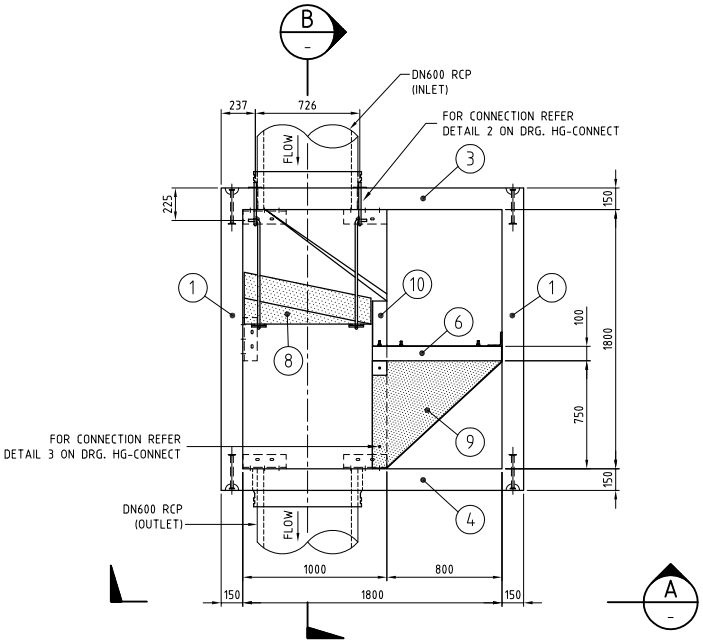
DSN.	DFW	10-07-08
DWN.	MZ	10-07-08
CKD.	DFW	——
APP.	WST	——

HUMES
STANDARD DRAWING
HUMEGARD HG15/R
DN450/DN450 FJ RCP
GENERAL ASSEMBLY

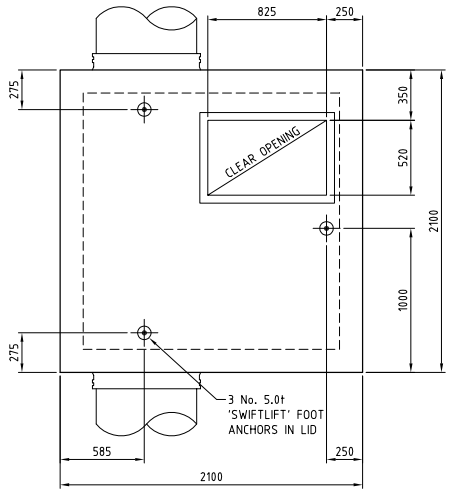
SUPERSEDES	PLOT SCALE	SIZE	DRG. NO.	ISSUE
HG15/R-01 REV 1	1:1	A2	HG15/R-01	2

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
3	REFERENCE DWG No. REVISED - REISSUED FOR MANUFACTURE	MZ	24-11-10	RM

ITEM No	DRAWING DESCRIPTION	DWG No
1	END WALL	HG18-02
2	BASE SLAB	3 HG18-03
3, 4	SIDE WALL	HG18-04
5	FALSE FLOOR	HG18/L-05
6	CONCRETE BAFFLE WALL	HG18/L-05
7	PRECAST LID	HG18/L-06
8	FLOATING BOOM	HG18/L-07
9	WEIR	HG18/L-08
10	BAFFLE SIDE WALL	HG18/L-09
11	COMB	HG18/L-10



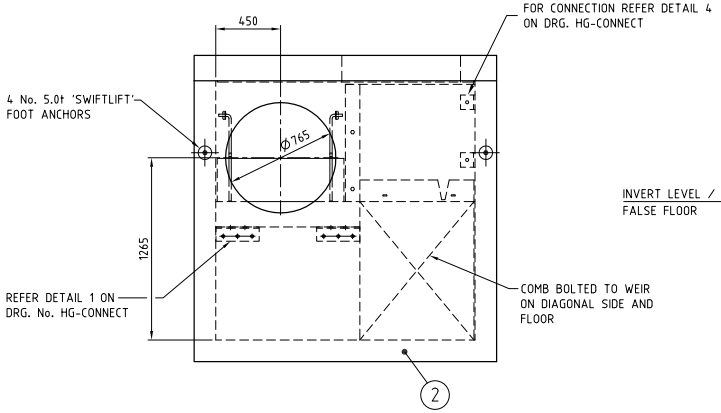
PLAN VIEW (LID REMOVED)
SCALE 1:25



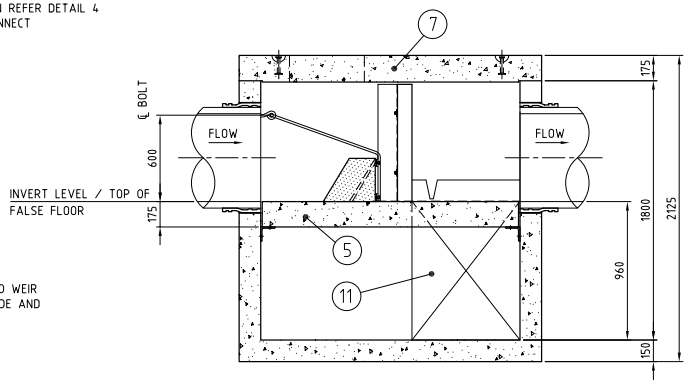
PLAN ON LID
SCALE 1:25

NOTES:

1. WHEN LIFTING ENTIRE UNIT FROM FOOT ANCHORS, SPREADER BEAM MUST BE USED TO ENSURE 4 POINT LIFT.
2. ALL METAL COMPONENTS ARE TO BE MADE FROM 304-GRADE STAINLESS STEEL.
3. SEE DRAWING HG-CAST FOR CASTING SEQUENCE.
4. SEE DRAWING HG-CONNECT FOR ALL CONNECTION DETAILS.
5. MASS OF COMPLETE UNIT = 7.8 t (WITHOUT LID).
   MASS OF LID = 1.9 t
6. KOR-N-SEAL BOOT CONNECTOR P/N = S206-30L (INLET & OUTLET)



VIEW A
SCALE 1:25



SECTION B
SCALE 1:25

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH SM1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

Humes TECHNICAL SERVICES BRISBANE, QUEENSLAND

Holcim (Australia) Pty Ltd ABN 87 099 732 297

DSN.	WST	24-11-10
DWN.	MZ	24-11-10
CKD.	RM	24-11-10
APP.	WST	24-11-10

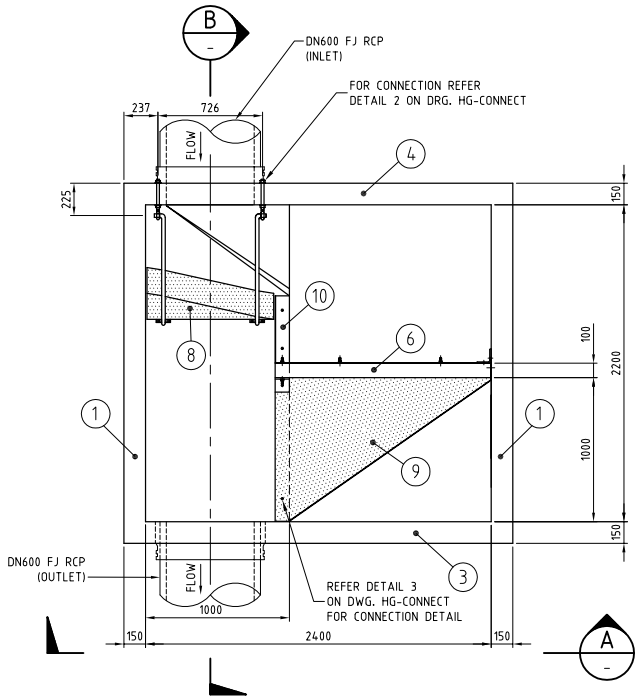
SUPERSEDES HG18/L-01 REV. 2

HUMES WATER SOLUTIONS
STANDARD HUMEGARD
HUMEGARD HG18/L DN600/DN600 RCP
GENERAL ASSEMBLY

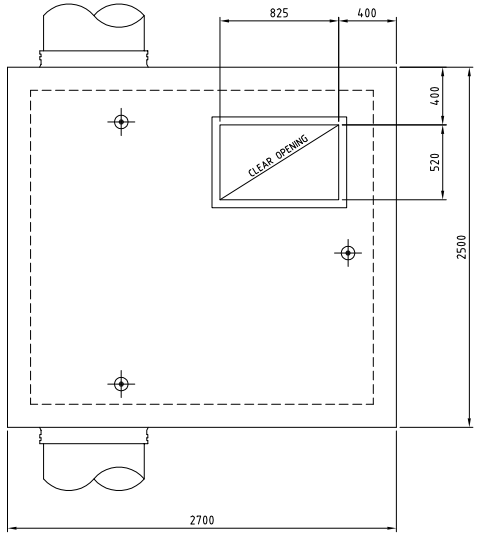
PLOT SCALE	SIZE	DRG. NO.	ISSUE
1:1	A2	HG18/L-01	3

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
1	GENERAL REVISION - ISSUED FOR MANUFACTURE	MZ	12-03-07	DFW

ITEM No	DWG DESCRIPTIONS	DWG No
1	END WALL	HG24/L-02
2	BASE SLAB	HG24/L-03
3, 4	SIDE WALL	HG24/L-04
5	FALSE FLOOR	HG24/L-05
6	CONCRETE BAFFLE WALL	HG24/L-05
7	PRECAST LID	HG24/L-06
8	FLOATING BOOM	HG24/L-07
9	WEIR	HG24/L-08
10	BAFFLE SIDE WALL	HG24/L-09
11	COMB	HG24/L-10
	SITE LAYOUT	HG24/L-11



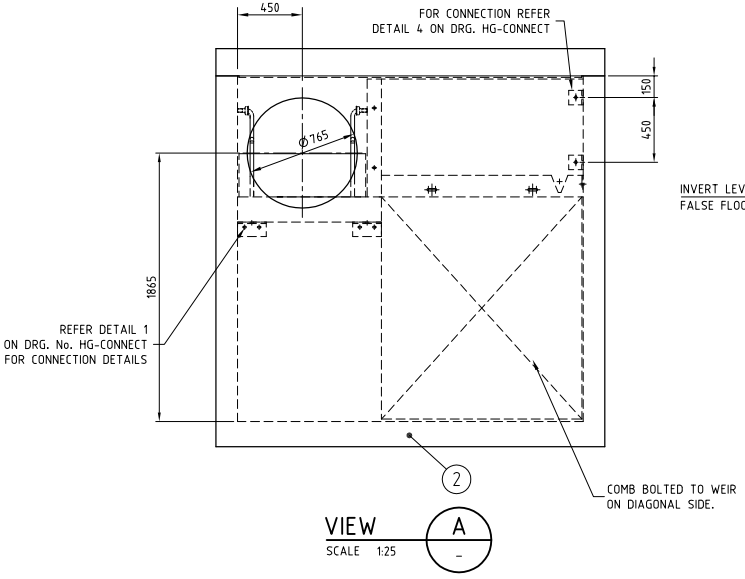
PLAN VIEW (LID REMOVED)
SCALE 1:25



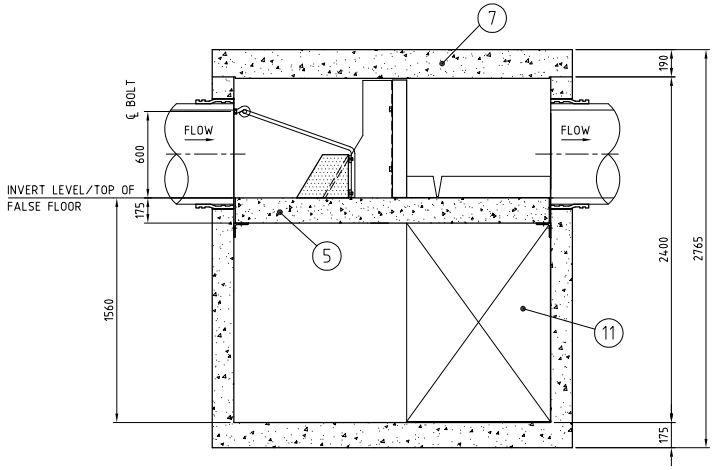
PLAN ON LID
SCALE 1:25

NOTES:

1. WHEN LIFTING ENTIRE UNIT FROM FOOT ANCHORS, SPREADER BEAM MUST BE USED TO ENSURE 4 POINT LIFT.
2. ALL METAL COMPONENTS ARE TO BE MADE FROM 304-GRADE STAINLESS STEEL.
3. SEE DRAWING HG-CAST FOR CASTING SEQUENCE.
4. SEE DRAWING HG-CONNECT FOR ALL CONNECTION DETAILS.
5. MASS OF COMPLETE UNIT = 13.0 t (WITHOUT LID).
   MASS OF LID = 3.2 t
6. KOR-N-SEAL BOOT CONNECTOR P/N = S206-30L (INLET & OUTLET)



VIEW A
SCALE 1:25



SECTION B
SCALE 1:25

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH SM1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

Humes TECHNICAL (DESIGN) SERVICES BRISBANE, QUEENSLAND

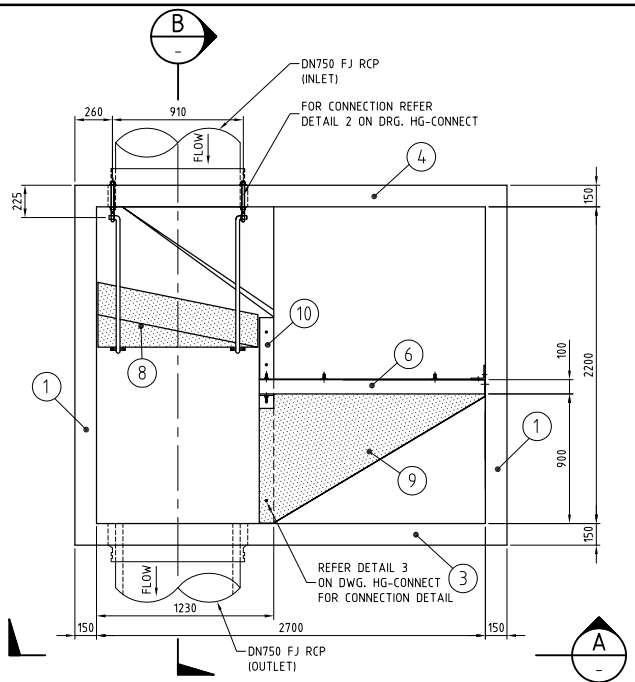
DSN.	DFW	12-03-07
DWN.	MZ	12-03-07
CKD.	DFW	12-03-07
APP.	DFW	12-03-07

HUMES
STANDARD DRAWING
HUMEGARD HG24/L
DN600/DN600 FJ RCP
GENERAL ASSEMBLY

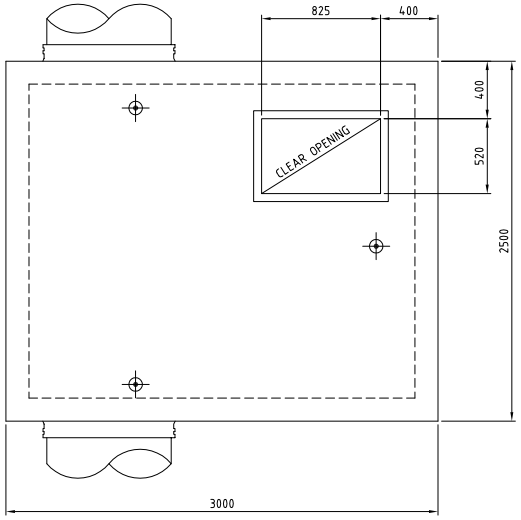
SUPERSEDES	PLOT SCALE	SIZE	DRG. NO.	ISSUE
HG24/L-01 REV. 0	1:1	A2	HG24/L-01	1

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
1	GENERAL REVISION - REISSUED FOR MANUFACTURE	MZ	12-03-07	DFW

ITEM No	DWG DESCRIPTIONS	DWG No
1	END WALL	HG27/L-02
2	BASE SLAB	HG27/L-03
3, 4	SIDE WALL	HG27/L-04
5	FALSE FLOOR	HG27/L-05
6	CONCRETE BAFFLE WALL	HG27/L-05
7	PRECAST LID	HG27/L-06
8	FLOATING BOOM	HG27/L-07
9	WEIR	HG27/L-08
10	BAFFLE SIDE WALL	HG27/L-09
11	COMB	HG27/L-10
	SITE LAYOUT	HG27/L-11



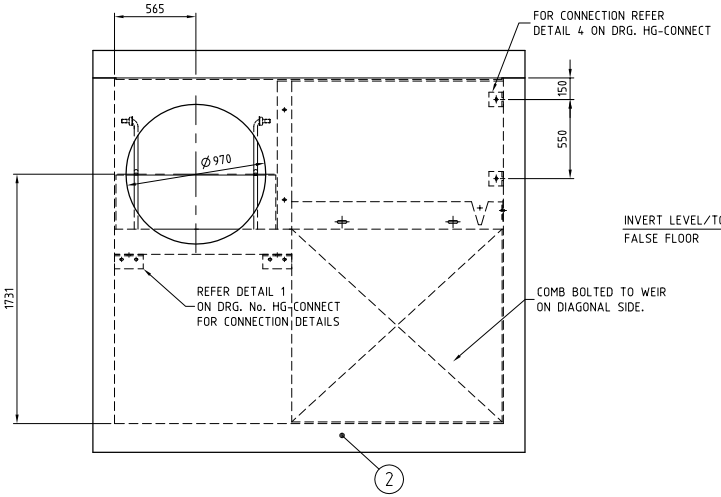
PLAN VIEW (LID REMOVED)
SCALE 1:25



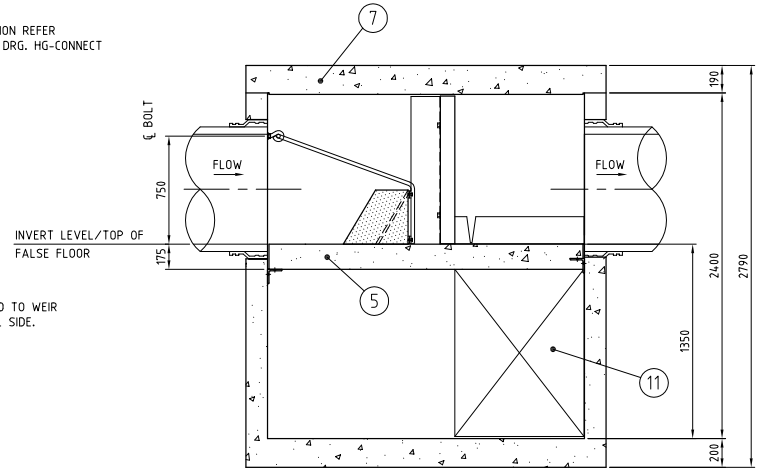
PLAN ON LID
SCALE 1:25

NOTES:

1. WHEN LIFTING ENTIRE UNIT FROM FOOT ANCHORS, SPREADER BEAM MUST BE USED TO ENSURE 4 POINT LIFT.
2. ALL METAL COMPONENTS ARE TO BE MADE FROM 304-GRADE STAINLESS STEEL.
3. SEE DRAWING HG-CAST FOR CASTING SEQUENCE.
4. SEE DRAWING HG-CONNECT FOR ALL CONNECTION DETAILS.
5. MASS OF COMPLETE UNIT = 14.4 t (WITHOUT LID).
   MASS OF LID = 3.6 t
6. KOR-N-SEAL BOOT CONNECTOR P/N = S206-38 (INLET & OUTLET)



VIEW A
SCALE 1:25



SECTION B
SCALE 1:25

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH SM1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

Humes TECHNICAL (DESIGN) SERVICES BRISBANE, QUEENSLAND

DSN.	DFW	12-03-07
DWN.	MZ	12-03-07
CKD.	DFW	12-03-07
APP.	SG	12-03-07

SUPERSEDES HG27/L-01 REV. 0

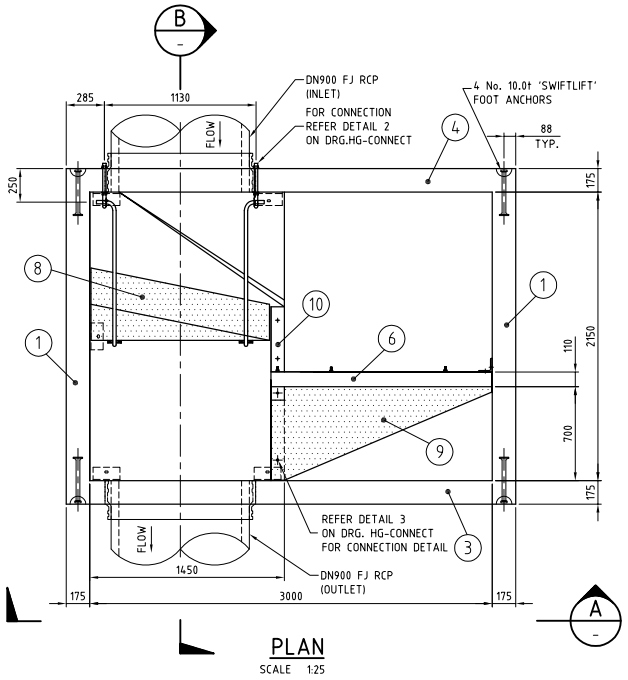
HUMES
STANDARD DRAWING
HUMEGARD HG27/L
DN750/DN750 FJ RCP
GENERAL ASSEMBLY

PLOT SCALE	SIZE	DRG. NO.	ISSUE
1:1	A2	HG27/L-01	2

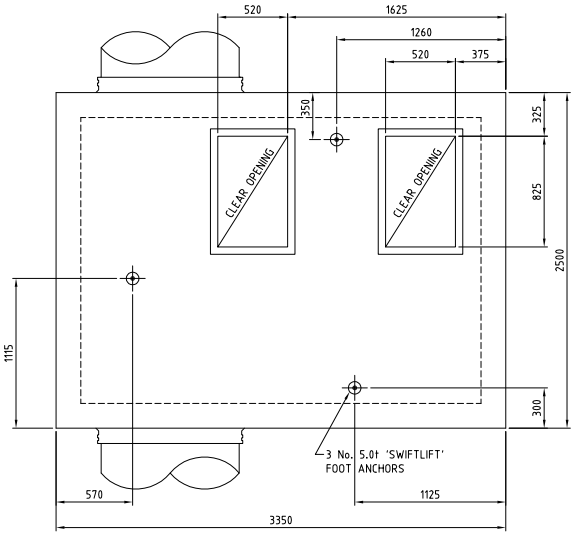
ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
2	REFERENCE DWG No. REVISED, REISSUED FOR MANUFACTURE	MZ	——	RM

ITEM No.	DRAWING DESCRIPTION	DWG No.
1	END WALL	HG30A-02 (2)
2	BASE SLAB	HG30-04
3, 4	SIDE WALL	HG30A-05
5	FALSE FLOOR	HG30A/L-07
6	CONCRETE BAFFLE WALL	HG30A/L-07
7	PRECAST LID	HG30A/L-08
8	FLOATING BOOM	HG30A/L-09
9	WEIR	HG30A/L-10
10	BAFFLE SIDE WALL	HG30A/L-11
11	COMB	HG30A/L-12
	CONNECTION DETAILS	HG-CONNECT
	CASTING SEQUENCE	HG-CAST

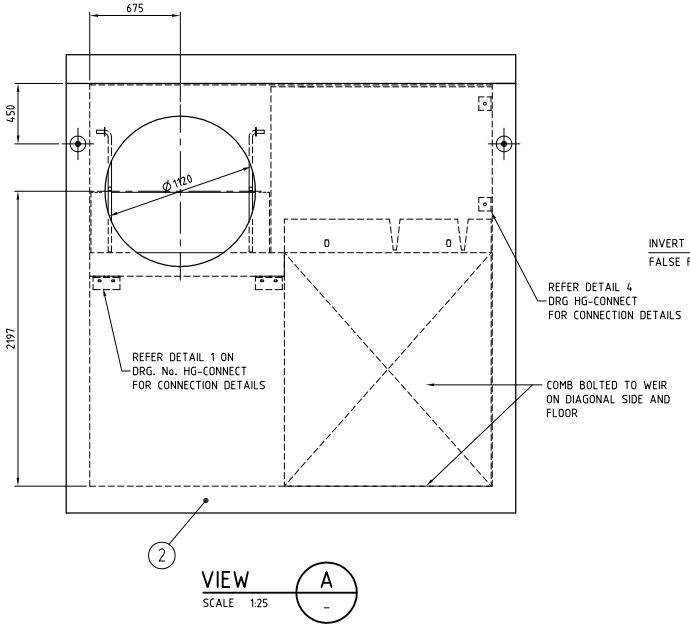
(2)



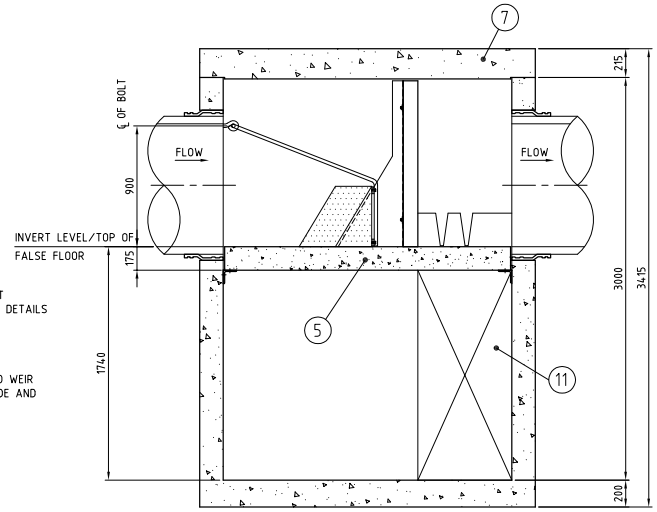
PLAN
SCALE 1:25



PLAN ON LID
SCALE 1:25



VIEW A
SCALE 1:25



SECTION B
SCALE 1:25

NOTES:

1. WHEN LIFTING ENTIRE UNIT FROM FOOT ANCHORS, SPREADER BEAM MUST BE USED TO ENSURE 4 POINT LIFT.
2. ALL METAL COMPONENTS ARE TO BE MADE FROM 304-GRADE STAINLESS STEEL.
3. SEE DRAWING HG-CAST FOR CASTING SEQUENCE.
4. SEE DRAWING HG-CONNECT FOR ALL CONNECTION DETAILS.
5. MASS OF COMPLETE UNIT = 20.2 t (WITHOUT LID).
   MASS OF LID = 4.3 t
   (SELF WEIGHT CONCRETE @ 2500 kg/m3)
6. KOR-N-SEAL BOOT CONNECTOR P/N = S206-44 (INLET & OUTLET)

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH SM1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

SITE LIFT:
LID - 3 No. 5 t SWIFTLIFT FOOT ANCHORS
HUMEGARD UNIT - 4 No. 10 t SWIFTLIFT FOOT ANCHORS

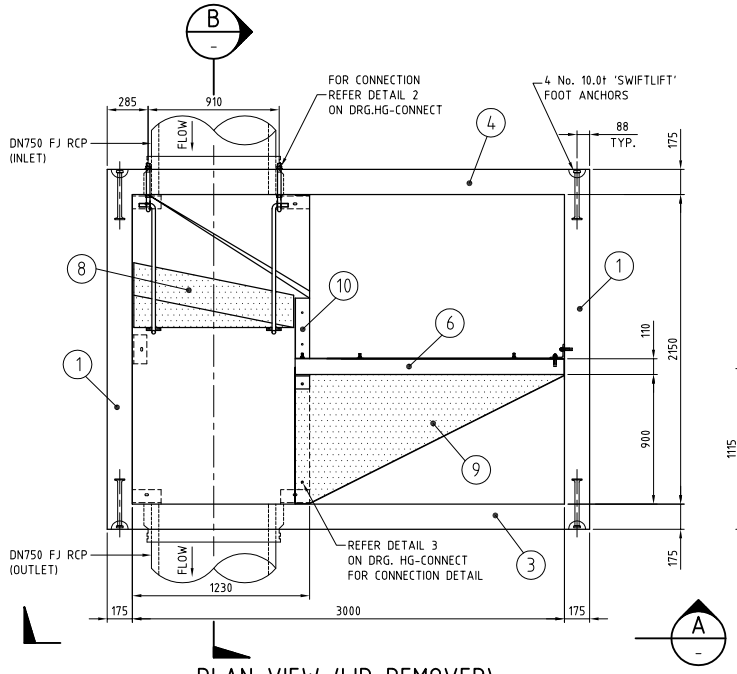
Humes TECHNICAL (DESIGN) SERVICES BRISBANE, QUEENSLAND

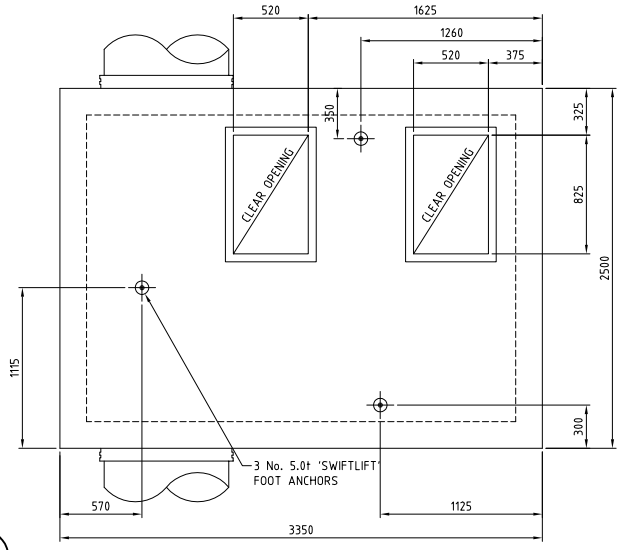
DSN.	DFW	06-08-08
DWN.	MZ	06-08-08
CKD.	DFW	——
APP.	WST	——

SUPERSEDES HG30A/L-01 REV 1

HUMES WATER SOLUTIONS
STANDARD HUMEGARD
HUMEGARD HG30A/L
DN900/DN900 FJ RCP
GENERAL ASSEMBLY

PLOT SCALE	SIZE	DRG. NO.	ISSUE
1:1	A2	HG30A/L-01	2





ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
2	REFERENCE DWG No. REVISED, REISSUED FOR MANUFACTURE	MZ	——	RM

ITEM No.	DRAWING DESCRIPTION	DWG No.
1	END WALL	HG30-02
2	BASE SLAB	HG30-04
3, 4	SIDE WALL	HG30-05
5	FALSE FLOOR	HG30/L-07
6	CONCRETE BAFFLE WALL	HG30/L-07
7	PRECAST LID	HG30-08
8	FLOATING BOOM	HG30/L-09
9	WEIR	HG30/L-10
10	BAFFLE SIDE WALL	HG30/L-11
11	COMB	HG30/L-12
	CONNECTION DETAILS	HG-CONNECT
	CASTING SEQUENCE	HG-CAST

2

NOTES:

1. WHEN LIFTING ENTIRE UNIT FROM FOOT ANCHORS, SPREADER BEAM MUST BE USED TO ENSURE 4 POINT LIFT.
2. ALL METAL COMPONENTS ARE TO BE MADE FROM 304-GRADE STAINLESS STEEL.
3. SEE DRAWING HG-CAST FOR CASTING SEQUENCE.
4. SEE DRAWING HG-CONNECT FOR ALL CONNECTION DETAILS.
5. MASS OF COMPLETE UNIT = 20.3 t (WITHOUT LID).
   MASS OF LID = 4.3 t
   (SELF WEIGHT CONCRETE @ 2500 kg/m3)
6. KOR-N-SEAL BOOT CONNECTOR P/N = S206-38 (INLET & OUTLET)

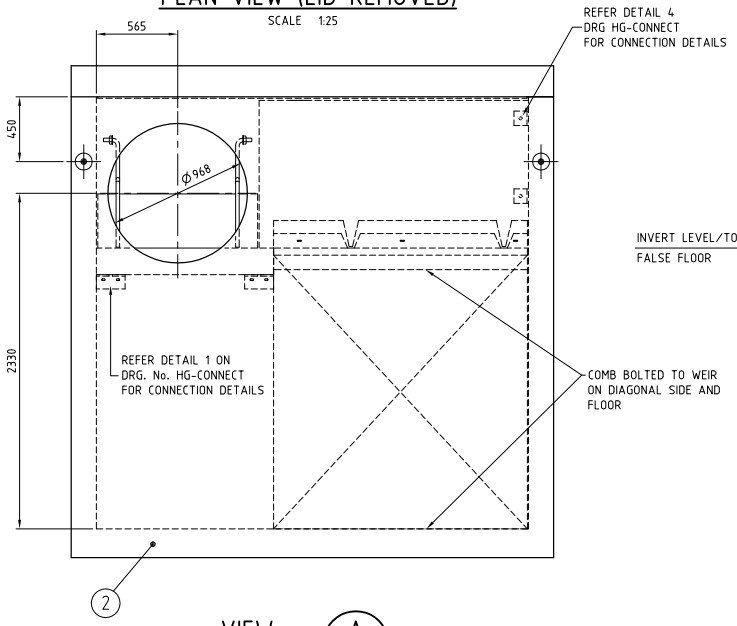
DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH SM1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

SITE LIFT:
LID - 3 No. 5 t SWIFTLIFT FOOT ANCHORS
HUMEGARD UNIT - 4 No. 10 t SWIFTLIFT FOOT ANCHORS

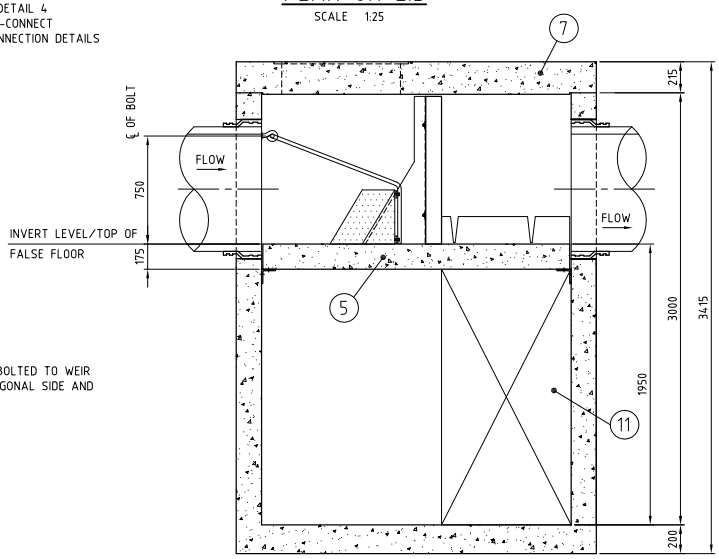
PLAN VIEW (LID REMOVED)

SCALE 1:25



PLAN ON LID

SCALE 1:25



VIEW A
SCALE 1:25

SECTION B
SCALE 1:25

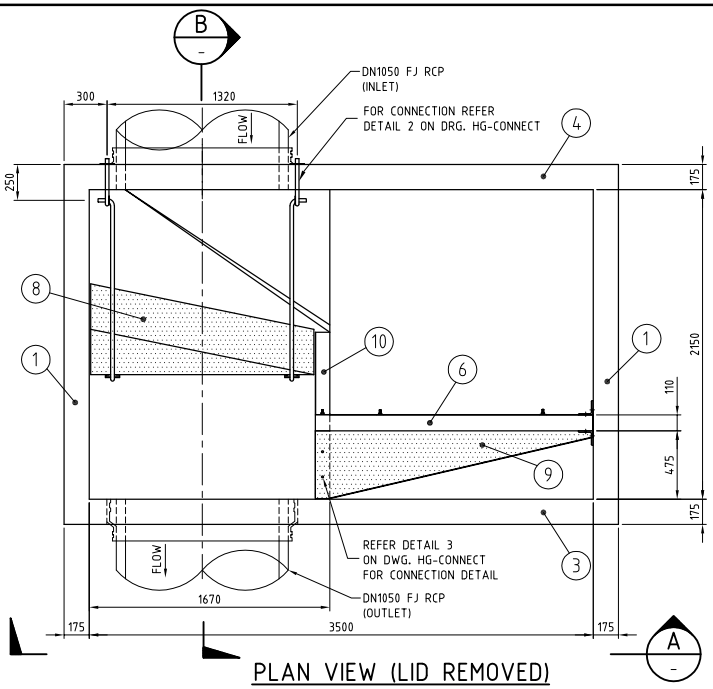
Humes TECHNICAL (DESIGN) SERVICES BRISBANE, QUEENSLAND

DSN.	DFW	12-03-07
DWN.	MZ	12-03-07
CKD.	DFW	12-03-07
APP.	DFW	12-03-07

SUPERSEDES HG30/L-01 REV 1

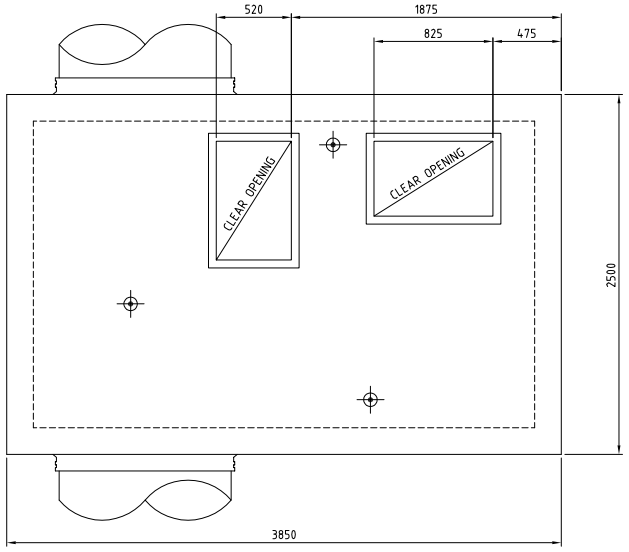
HUMES WATER SOLUTIONS
STANDARD HUMEGARD
HUMEGARD HG30/L
DN750/DN750 FJ RCP
GENERAL ASSEMBLY

PLOT SCALE	SIZE	DRG. NO.	ISSUE
1:1	A2	HG30/L-01	2



PLAN VIEW (LID REMOVED)

SCALE 1:25



PLAN ON LID

SCALE 1:25

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
1	GENERAL REVISION, REISSUED FOR MANUFACTURE	MZ	12-03-07	DFW

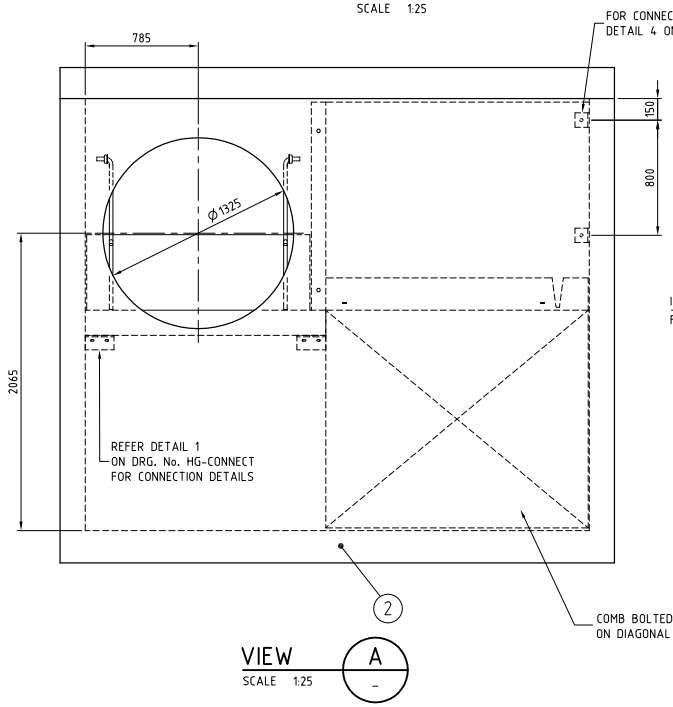
ITEM No	DWG DESCRIPTIONS	DWG No
1	END WALL	HG35A/L-02
2	BASE SLAB	HG35A/L-04
3, 4	SIDE WALL	HG35A/L-05
5	FALSE FLOOR	HG35A/L-07
6	CONCRETE BAFFLE WALL	HG35A/L-07
7	PRECAST LID	HG35A/L-08
8	FLOATING BOOM	HG35A/L-09
9	WEIR	HG35A/L-10
10	BAFFLE SIDE WALL	HG35A/L-11
11	COMB	HG35A/L-12
	SITE LAYOUT	HG35A/L-13

NOTES:

1. WHEN LIFTING ENTIRE UNIT FROM FOOT ANCHORS, SPREADER BEAM MUST BE USED TO ENSURE 4 POINT LIFT.
2. ALL METAL COMPONENTS ARE TO BE MADE FROM 304-GRADE STAINLESS STEEL.
3. SEE DRAWING HG-CAST FOR CASTING SEQUENCE.
4. SEE DRAWING HG-CONNECT FOR ALL CONNECTION DETAILS.
5. MASS OF COMPLETE UNIT = 22.9 t (WITHOUT LID).
   MASS OF LID = 5.0 t
6. KOR-N-SEAL BOOT CONNECTOR P/N = S206-52 (INLET & OUTLET)

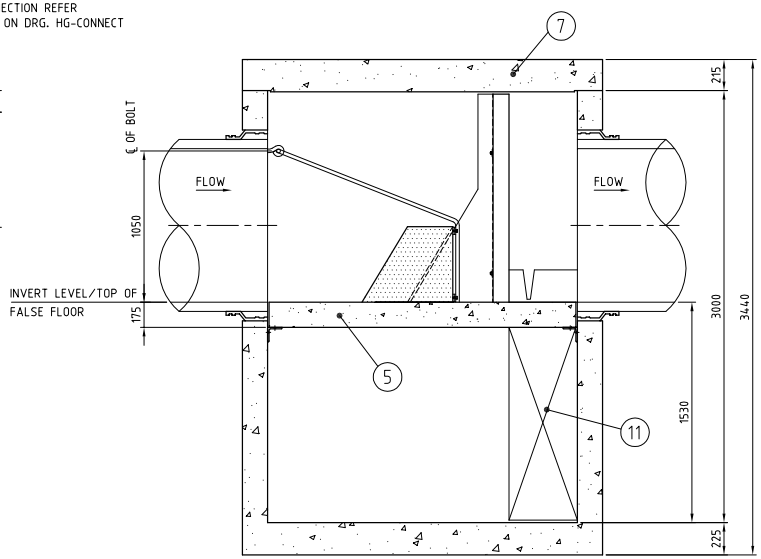
DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH SM1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.



VIEW A

SCALE 1:25



SECTION B

SCALE 1:25

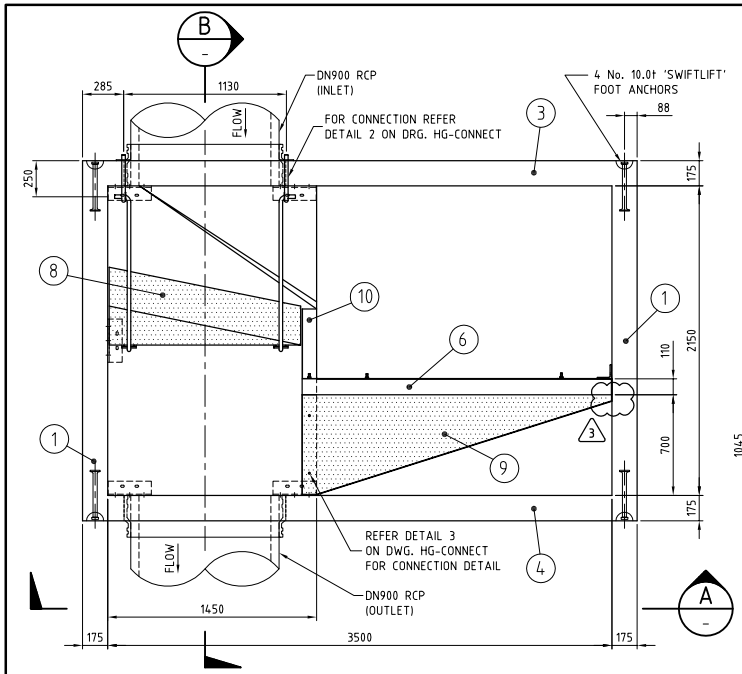
Humes TECHNICAL (DESIGN) SERVICES BRISBANE, QUEENSLAND

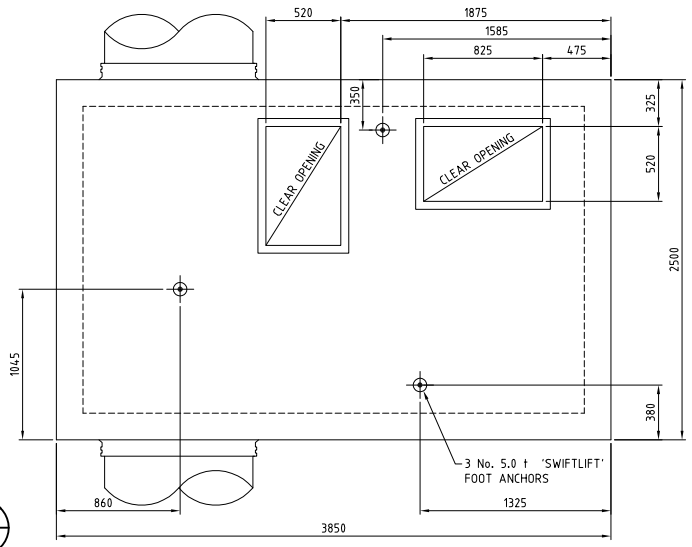
Rinker Australia Pty Limited ABN 87 099 732 297

DSN.	DFW	12-03-07
DWN.	MZ	12-03-07
CKD.	DFW	12-03-07
APP.	DFW	12-03-07

HUMES
STANDARD DRAWING
HUMEGARD HG35A/L
DN1050/DN1050 FJ RCP
GENERAL ASSEMBLY

SUPERSEDES	PLOT SCALE	SIZE	DRG. NO.	ISSUE
HG35A/L-01 REV 0	1:1	A2	HG35A/L-01	1





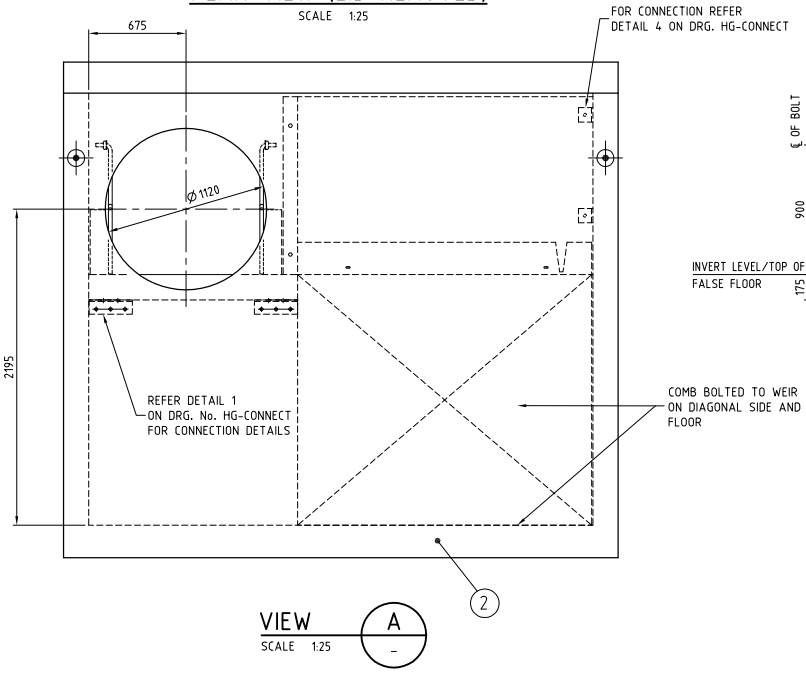
ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
3	REFERENCE DWG No. REVISED, BRACKET REMOVED, REISSUED FOR MANUFACTURE	MZ	——	RM

ITEM No.	DRAWING DESCRIPTION	DWG No.
1	END WALL	HG35-02 3
2	BASE SLAB	HG35-04
3, 4	SIDE WALL	HG35-05
5	FALSE FLOOR	HG35/L-07
6	CONCRETE BAFFLE WALL	HG35/L-07
7	PRECAST LID	HG35-08 3
8	FLOATING BOOM	HG35/L-09
9	WEIR	HG35/L-10
10	BAFFLE SIDE WALL	HG35/L-11
11	COMB	HG35/L-12
	CONNECTION DETAILS	HG-CONNECT
	CASTING SEQUENCE	HG-CAST

3

PLAN VIEW (LID REMOVED)

SCALE 1:25

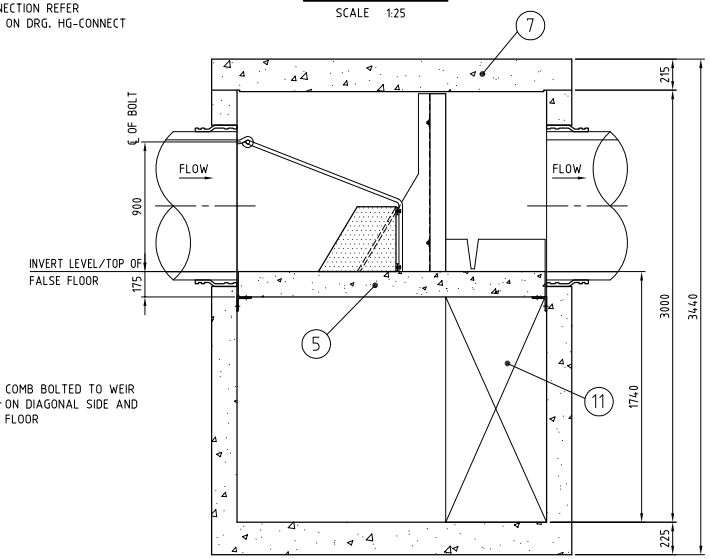


VIEW A

SCALE 1:25

PLAN ON LID

SCALE 1:25



SECTION B

SCALE 1:25

NOTES:

1. WHEN LIFTING ENTIRE UNIT FROM FOOT ANCHORS, SPREADER BEAM MUST BE USED TO ENSURE 4 POINT LIFT.
2. ALL METAL COMPONENTS ARE TO BE MADE FROM 304-GRADE STAINLESS STEEL.
3. SEE DRAWING HG-CAST FOR CASTING SEQUENCE.
4. SEE DRAWING HG-CONNECT FOR ALL CONNECTION DETAILS.
5. MASS OF COMPLETE UNIT = 22.8 t (WITHOUT LID).
   MASS OF LID = 5.0 t
   (SELF WEIGHT CONCRETE @ 2500 kg/m3
6. KOR-N-SEAL BOOT CONNECTOR P/N = S206-44

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH SM1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

SITE LIFT:
LID - 3 No. 5 t SWIFTLIFT FOOT ANCHORS
HUMEGARD UNIT - 4 No. 10 t SWIFTLIFT FOOT ANCHORS

Humes TECHNICAL SERVICES BRISBANE, QUEENSLAND

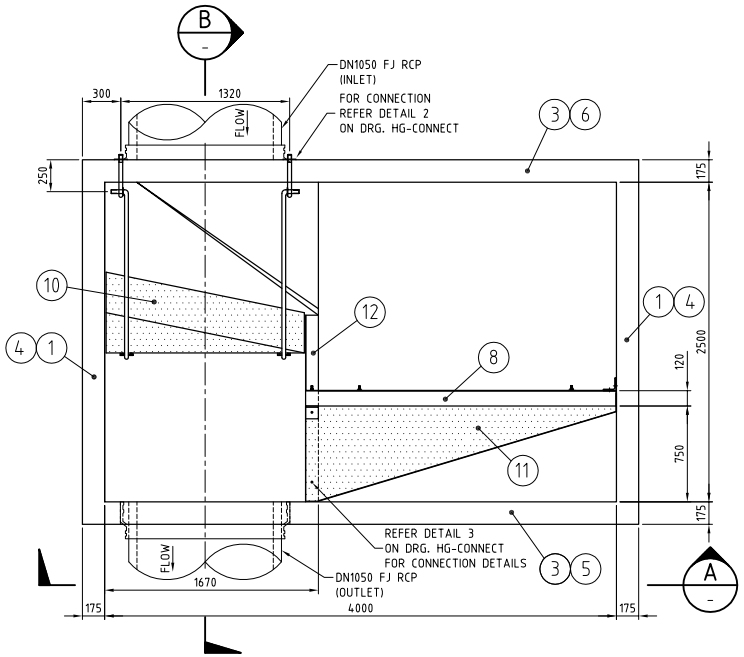
DSN.	WST	25-11-10
DWN.	MZ	25-11-10
CKD.	RM	——
APP.	WST	——

HUMES WATER SOLUTIONS
STANDARD HUMEGARD
HUMEGARD HG35/L
DN900/DN900 FJ RCP
GENERAL ASSEMBLY

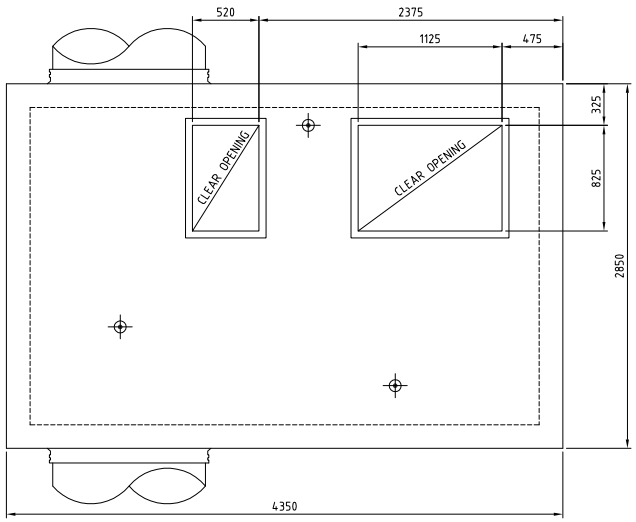
SUPERSEDES	PLOT SCALE	SIZE	DRG. NO.	ISSUE
HG35/L-01 REV 2	1:1	A2	HG35/L-01	3

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
0	ISSUED FOR MANUFACTURE	MZ	12-03-07	DFW
1	GENERAL REVISION	MZ	——	DFW

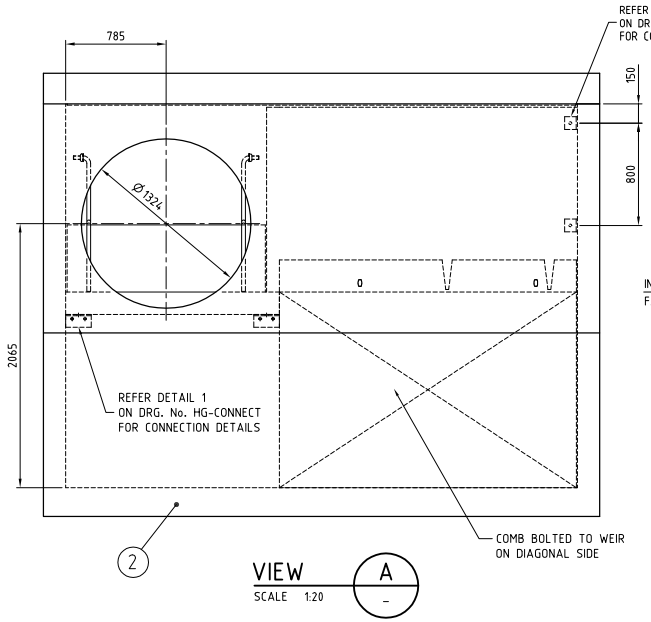
ITEM No	DWG DESCRIPTIONS	DWG No
1	END WALL - BOTTOM UNIT	HG40B/L-02
2	BASE SLAB	HG40B/L-04
3	SIDE WALL - BOTTOM UNIT	HG40B/L-05
4	END WALL - TOP UNIT	HG40B/L-03
5,6	SIDE WALL - TOP UNIT	HG40B/L-06
7	FALSE FLOOR	HG40B/L-07
8	CONCRETE BAFFLE WALL	HG40B/L-07
9	PRECAST LID	HG40B/L-08
10	FLOATING BOOM	HG40B/L-09
11	WEIR	HG40B/L-10
12	BAFFLE SIDE WALL	HG40B/L-11
13	COMB	HG40B/L-12



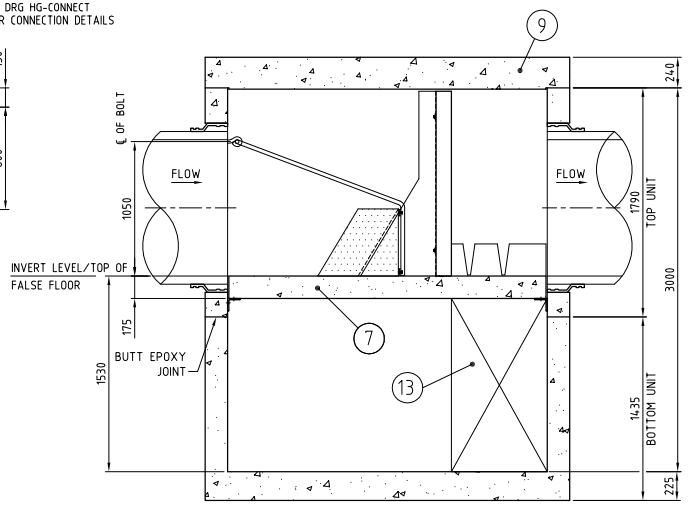
PLAN VIEW (LID REMOVED)
SCALE 1:20



PLAN ON LID
SCALE 1:20



VIEW
SCALE 1:20



SECTION
SCALE 1:20

NOTES:

1. WHEN LIFTING ENTIRE UNIT FROM FOOT ANCHORS, SPREADER BEAM MUST BE USED TO ENSURE 4 POINT LIFT.
2. ALL METAL COMPONENTS ARE TO BE MADE FROM 304-GRADE STAINLESS STEEL.
3. SEE DRAWING HG-CAST FOR CASTING SEQUENCE.
4. SEE DRAWING HG-CONNECT FOR ALL CONNECTION DETAILS.
5. MASS OF BOTTOM UNIT = 14.8 t
   MASS OF TOP UNIT = 12.9 t
   MASS OF LID = 7.0 t
6. KOR-N-SEAL BOOT CONNECTOR P/N = S206-44 (INLET & OUTLET)

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH SM1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

Humes
TECHNICAL (DESIGN) SERVICES
BRISBANE, QUEENSLAND

DSN.	DFW	12-03-07
DWN.	MZ	12-03-07
CKD.	DFW	12-03-07
APP.	DFW	12-03-07

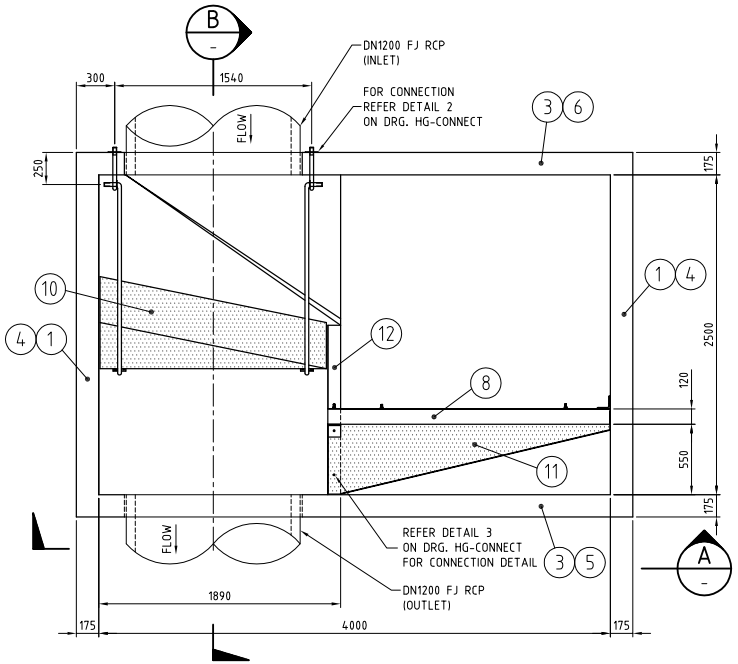
SUPERSEDES

HUMES
STANDARD DRAWING
HUMEGARD HG40A/L
DN1050/DN1050 FJ RCP
GENERAL ASSEMBLY

PLOT SCALE	SIZE	DRG. NO.	ISSUE
1:1	A1	HG40A/L-01	1

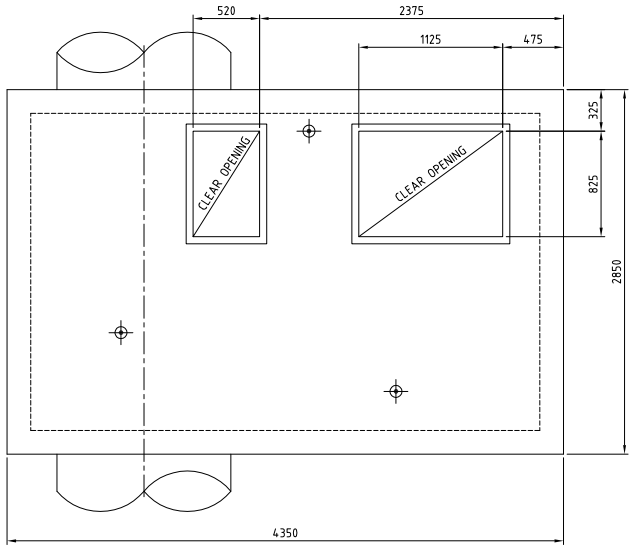
ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
0	ISSUED FOR MANUFACTURE	MZ	12-03-07	DFW
1	GENERAL REVISION	MZ	——	DFW

ITEM No	DWG DESCRIPTIONS	DWG No
1	END WALL - BOTTOM UNIT	HG40B/L-02
2	BASE SLAB	HG40B/L-04
3	SIDE WALL - BOTTOM UNIT	HG40B/L-05
4	END WALL - TOP UNIT	HG40B/L-03
5,6	SIDE WALL - TOP UNIT	HG40B/L-06
7	FALSE FLOOR	HG40B/L-07
8	CONCRETE BAFFLE WALL	HG40B/L-07
9	PRECAST LID	HG40B/L-08
10	FLOATING BOOM	HG40B/L-09
11	WEIR	HG40B/L-10
12	BAFFLE SIDE WALL	HG40B/L-11
13	COMB	HG40B/L-12



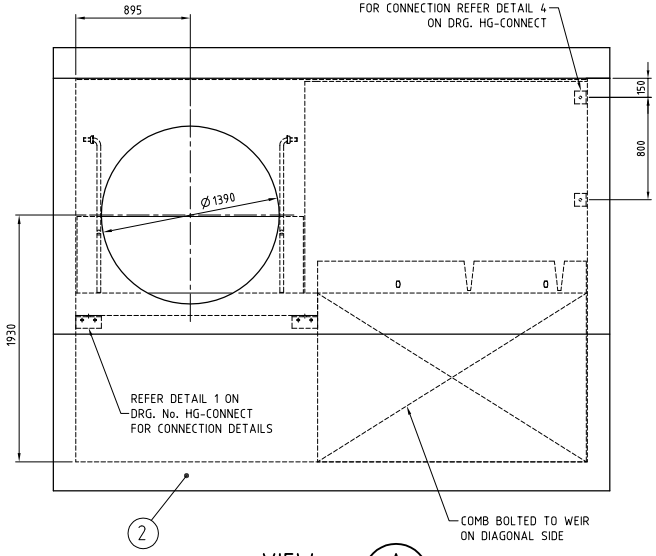
PLAN VIEW (LID REMOVED)

SCALE 1:20



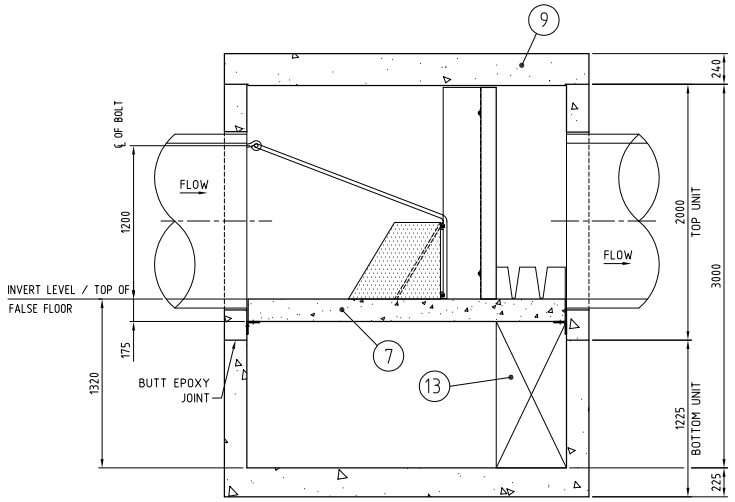
PLAN ON LID

SCALE 1:20



VIEW A

SCALE 1:20



SECTION B

SCALE 1:20

NOTES:

1. WHEN LIFTING ENTIRE UNIT FROM FOOT ANCHORS, SPREADER BEAM MUST BE USED TO ENSURE 4 POINT LIFT.
2. ALL METAL COMPONENTS ARE TO BE MADE FROM 304-GRADE STAINLESS STEEL.
3. SEE DRAWING HG-CAST FOR CASTING SEQUENCE.
4. SEE DRAWING HG-CONNECT FOR ALL CONNECTION DETAILS.
5. MASS OF BOTTOM UNIT = 13.4 t
   MASS OF TOP UNIT = 14.4 t
   MASS OF LID = 7.0 t
6. PIPE HOLE SIZE ALLOWS FOR PIPE MORTAR CONNECTION.

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH SM1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

Humes

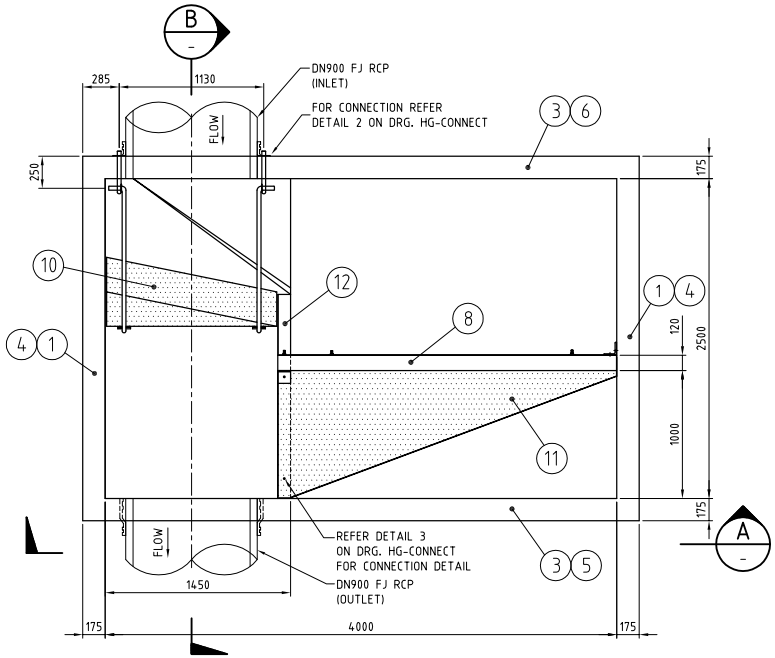
TECHNICAL (DESIGN) SERVICES
BRISBANE, QUEENSLAND

DSN.	DFW	12-03-07
DWN.	MZ	12-03-07
CKD.	DFW	12-03-07
APP.	DFW	12-03-07

SUPERSEDES HG40B/L-01 REV. C

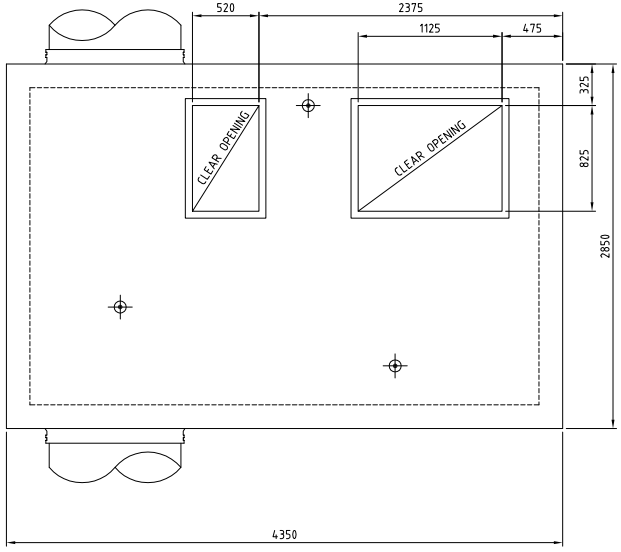
HUMES
STANDARD DRAWING
HUMEGARD HG40B/L
DN1200/DN1200 FJ RCP
GENERAL ASSEMBLY

PLOT SCALE	SIZE	DRG. NO.	ISSUE
1:1	A1	HG40B/L-01	1



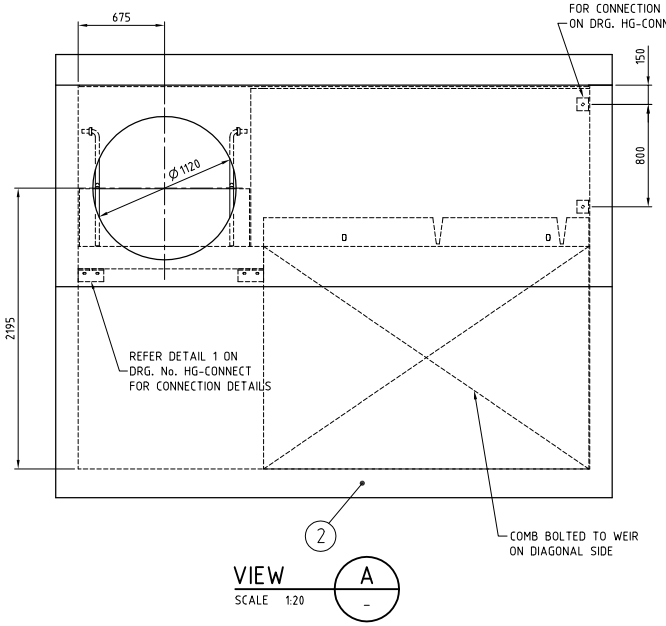
PLAN VIEW (LID REMOVED)

SCALE 1:20



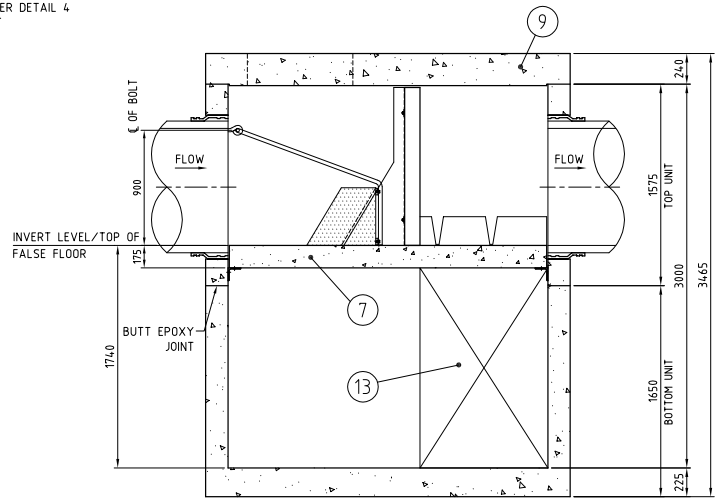
PLAN ON LID

SCALE 1:20



VIEW A

SCALE 1:20



SECTION B

SCALE 1:20

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
1	GENERAL REVISION - REISSUED FOR MANUFACTURE	MZ	12-03-07	DFW
2	ITEM NUMBERS REVISED, REISSUED FOR MANUFACTURE	MZ	——	DFW

ITEM No	DWG DESCRIPTIONS	DWG No
1	END WALL - BOTTOM UNIT	HG40B/L-02
2	BASE SLAB	HG40B/L-04
3	SIDE WALL - BOTTOM UNIT	HG40B/L-05
4	END WALL - TOP UNIT	HG40B/L-03
5,6	SIDE WALL - TOP UNIT	HG40B/L-06
7	FALSE FLOOR	HG40B/L-07
8	CONCRETE BAFFLE WALL	HG40B/L-07
9	PRECAST LID	HG40B/L-08
10	FLOATING BOOM	HG40B/L-09
11	WEIR	HG40B/L-10
12	BAFFLE SIDE WALL	HG40B/L-11
13	COMB	HG40B/L-12

NOTES:

1. WHEN LIFTING ENTIRE UNIT FROM FOOT ANCHORS, SPREADER BEAM MUST BE USED TO ENSURE 4 POINT LIFT.
2. ALL METAL COMPONENTS ARE TO BE MADE FROM 304-GRADE STAINLESS STEEL.
3. SEE DRAWING HG-CAST FOR CASTING SEQUENCE.
4. SEE DRAWING HG-CONNECT FOR ALL CONNECTION DETAILS.
5. MASS OF BOTTOM UNIT = 16.2 t
   MASS OF TOP UNIT = 11.6 t
   MASS OF LID = 7.0 t
6. KOR-N-SEAL BOOT CONNECTOR P/N = S206-44 (INLET & OUTLET)

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH SM1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

Humes

TECHNICAL (DESIGN) SERVICES
BRISBANE, QUEENSLAND

DSN.	DFW	12-03-07
DWN.	MZ	12-03-07
CKD.	DFW	12-03-07
APP.	DFW	12-03-07

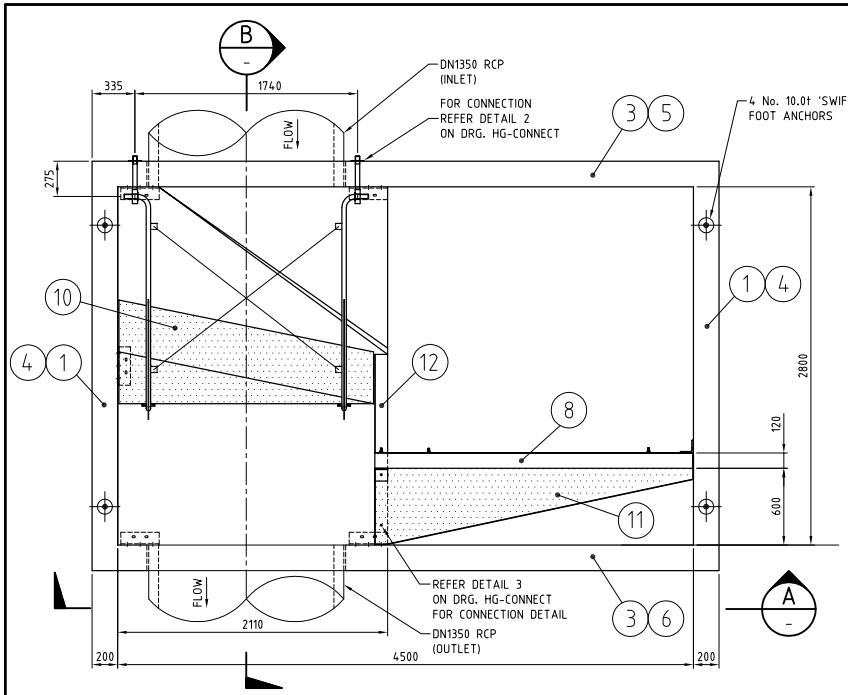
SUPERSEDES HG40/L-01 REV. 1

HUMES
STANDARD DRAWING
HUMEGARD HG40/L
DN900/DN900 FJ RCP
GENERAL ASSEMBLY

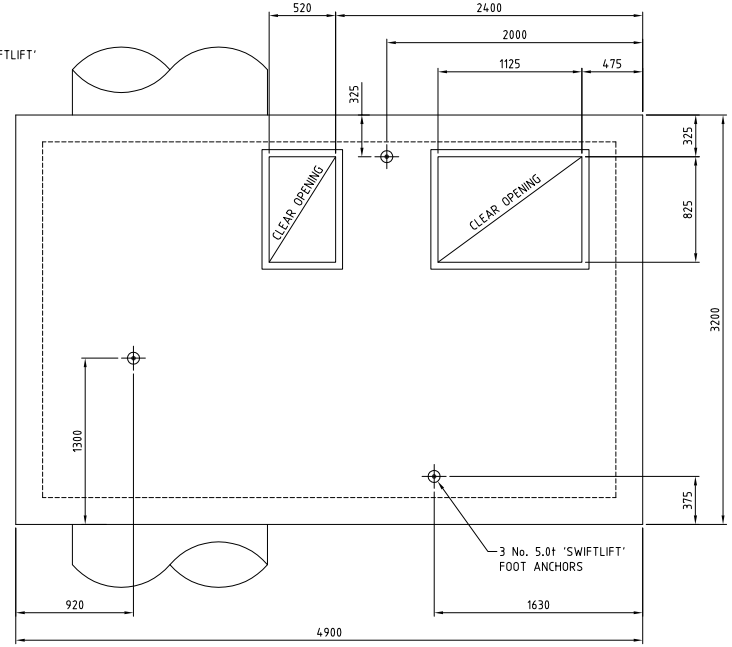
PLOT SCALE	SIZE	DRG. NO.	ISSUE
1:1	A1	HG40/L-01	2

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
1	GENERAL REVISION, REISSUED FOR MANUFACTURE	MZ	15-12-10	RM

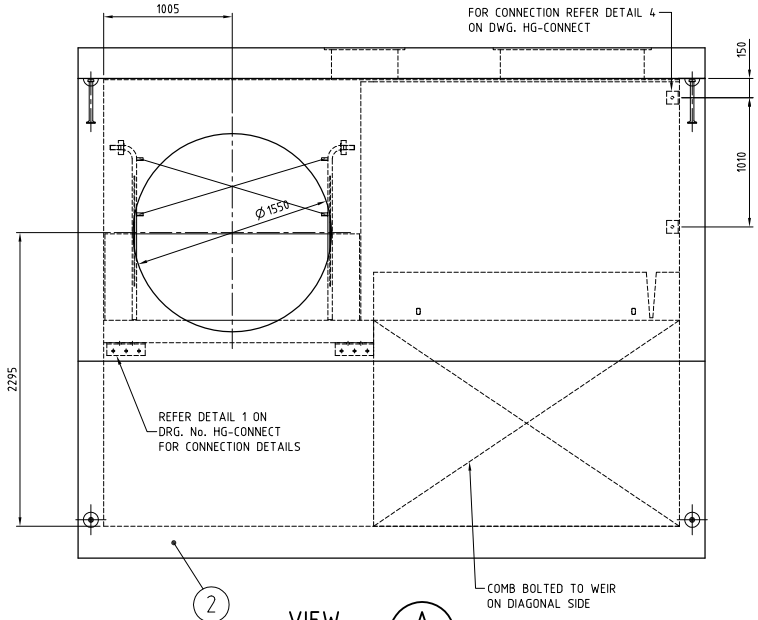
ITEM No	DWG DESCRIPTIONS	DWG No
1	END WALL - BOTTOM UNIT	HG45A-02
2	BASE SLAB	HG45A-04
3	SIDE WALL - BOTTOM UNIT	HG45A-05
4	END WALL - TOP UNIT	HG45A-03
5,6	SIDE WALL - TOP UNIT	HG45A-06
7	FALSE FLOOR	HG45A/L-07
8	CONCRETE BAFFLE WALL	HG45A/L-07
9	PRECAST LID	HG45A/L-08
10	FLOATING BOOM	HG45A/L-09
11	WEIR	HG45A/L-10
12	BAFFLE SIDE WALL	HG45A/L-11
13	COMB	HG45A/L-12



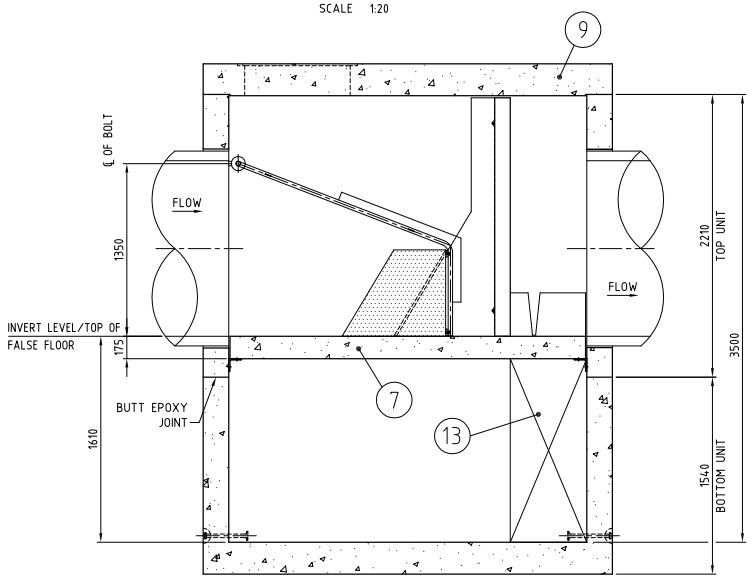
PLAN VIEW (LID REMOVED)
SCALE 1:20



PLAN ON LID
SCALE 1:20



VIEW A
SCALE 1:20



SECTION B
SCALE 1:20

NOTES:

1. WHEN LIFTING ENTIRE UNIT FROM FOOT ANCHORS, SPREADER BEAM MUST BE USED TO ENSURE 4 POINT LIFT.
2. ALL METAL COMPONENTS ARE TO BE MADE FROM 304-GRADE STAINLESS STEEL.
3. SEE DRAWING HG-CAST FOR CASTING SEQUENCE.
4. SEE DRAWING HG-CONNECT FOR ALL CONNECTION DETAILS.
5. MASS OF BOTTOM UNIT = 20.7 t
   MASS OF TOP UNIT = 19.7 t
   MASS OF LID = 9.1 t
6. PIPE HOLE SIZE ALLOWS FOR PIPE MORTAR CONNECTION.

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH SM1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

Humes

TECHNICAL SERVICES
BRISBANE, QUEENSLAND

DSN.	WST	07-12-10
DWN.	MZ	07-12-10
CKD.	RM	15-12-10
APP.	WST	15-12-10

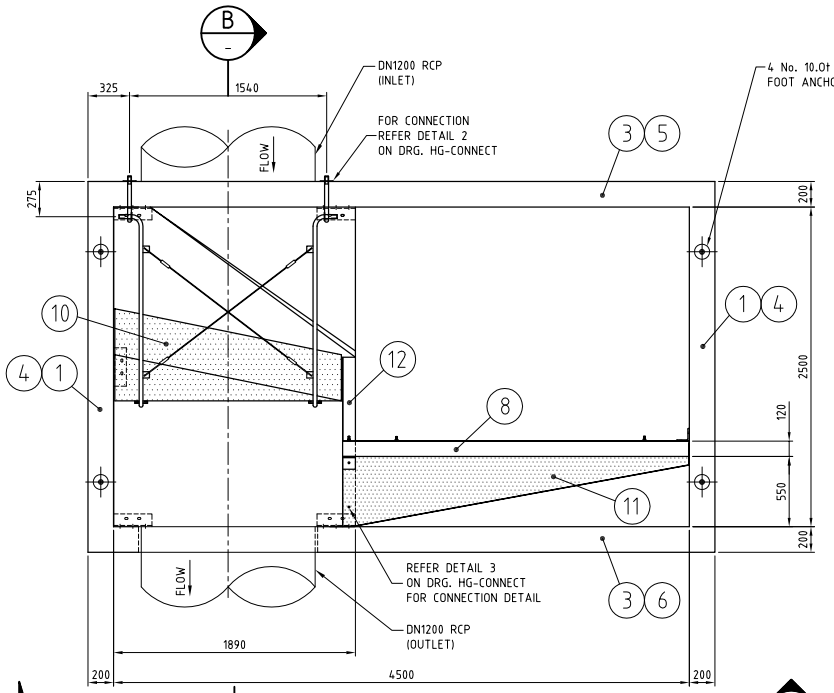
SUPERSEDES HG45A/L-01 REV. 0

HUMES WATER SOLUTIONS
STANDARD HUMEGARD
HUMEGARD HG45A/L
DN1350/DN1350 RCP
GENERAL ASSEMBLY

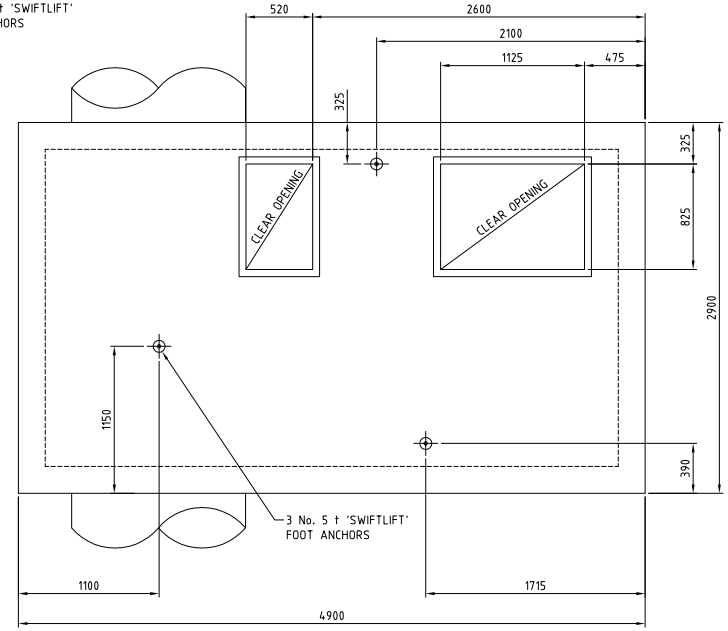
PLOT SCALE	SIZE	DRG. NO.	ISSUE
1:1	A1	HG45A/L-01	1

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
1	GENERAL REVISION, REISSUED FOR MANUFACTURE	MZ	15-12-10	RM

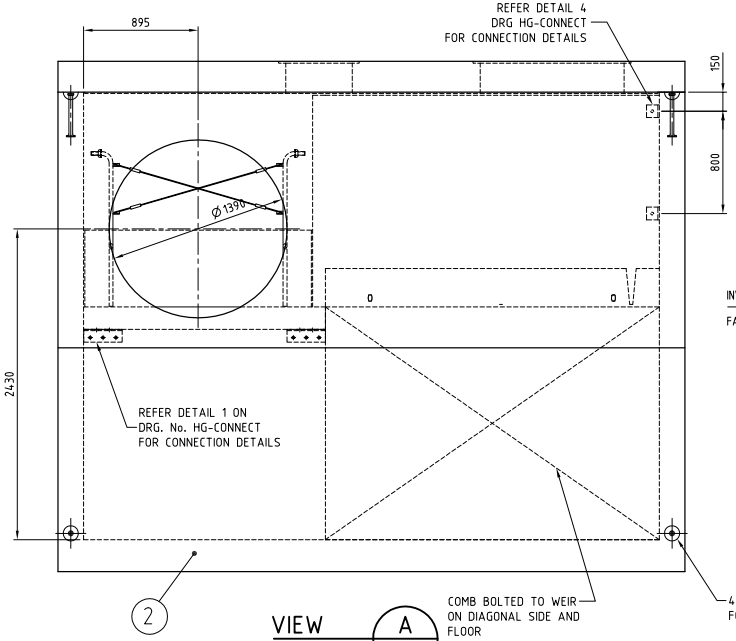
ITEM No	DWG DESCRIPTIONS	DWG No
1	END WALL - BOTTOM UNIT	HG45-02
2	BASE SLAB	HG45-04
3	SIDE WALL - BOTTOM UNIT	HG45-05
4	END WALL - TOP UNIT	HG45-03
5,6	SIDE WALL - TOP UNIT	HG45-06
7	FALSE FLOOR	HG45/L-07
8	CONCRETE BAFFLE WALL	HG45/L-07
9	PRECAST LID	HG45/L-08
10	FLOATING BOOM	HG45/L-09
11	WEIR	HG45/L-10
12	BAFFLE SIDE WALL	HG45/L-11
13	COMB	HG45/L-12



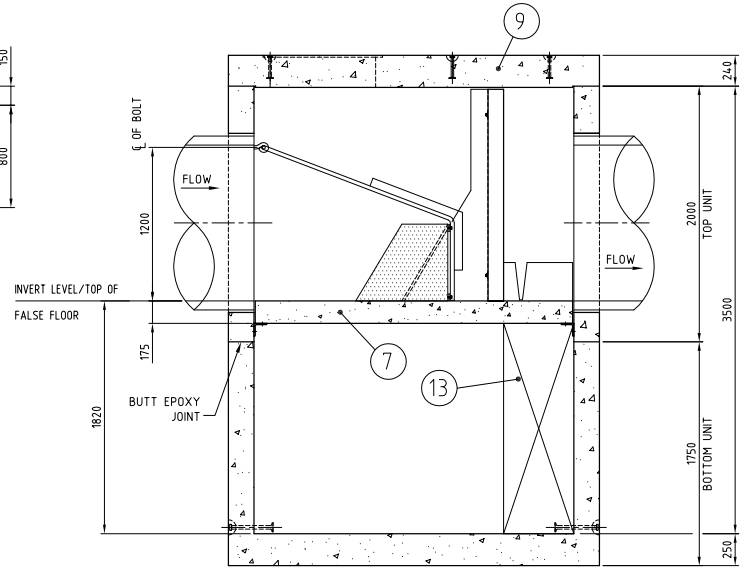
PLAN VIEW (LID REMOVED)
SCALE 1:20



PLAN ON LID
SCALE 1:20



VIEW A
SCALE 1:20



SECTION B
SCALE 1:20

NOTES:

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   MASS OF TOP UNIT = 17.3 t
   MASS OF LID = 8.1 t
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Humes
TECHNICAL SERVICES
BRISBANE, QUEENSLAND

DSN.	WST	01-12-10
DWG.	MZ	01-12-10
CHD.	RM	15-12-10
APP.	WST	15-12-10

SUPERSEDES HG45/L-01 REV 0

HUMES WATER SOLUTIONS
STANDARD HUMEGARD
HUMEGARD HG45/L
DN1200/DN1200 FJ RCP
GENERAL ASSEMBLY

PLOT SCALE 1:1 | SIZE A1 | DRG. NO. HG45/L-01 | ISSUE 1

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StormTrap® system

Middle:
RainVault® system

Bottom:
Segmental shaft

Stormwater

Stormwater treatment

Primary treatment

HumeGard® Gross Pollutant Trap

Secondary treatment

HumeCeptor® hydrodynamic separator

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Steel reinforced concrete pipes – salt water cover

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Contact information

National sales 1300 361 601
humes.com.au
info@humes.com.au

Head Office

18 Little Cribb St
Milton 4064 QLD
Ph: (07) 3364 2800
Fax: (07) 3364 2963

Queensland

Ipswich/Brisbane
Ph: (07) 3814 9000
Fax: (07) 3814 9014

Rockhampton
Ph: (07) 4924 7900
Fax: (07) 4924 7901

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New South Wales

Grafton
Ph: (02) 6644 7666
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onemilegrid
TRAFFIC ENGINEERING

15-29 Coomoora Road, Springvale South

Transport Impact Assessment
& Integrated Traffic Management Plan

180024TIA001H-F

11 March 2020

onemilegrid

ABN: 79 168 115 679

(03) 9939 8250
56 Down Street

COLLINGWOOD, VIC 3066
www.onemilegrid.com.au

DOCUMENT INFORMATION

Prepared for	Development Victoria		
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Prepared by	Jayden McClintock	Reviewed by	Ross Hill
Signature		Signature	

CONTENTS

TABLES

FIGURES

APPENDICES

1 INTRODUCTION

onemilegrid has been requested by Development Victoria to undertake a Transport Impact Assessment of the proposed residential development at 15-29 Coomoora Road, Springvale South.

As part of this assessment the subject site has been inspected with due consideration of the development proposal, traffic data has been sourced and relevant background reports have been reviewed.

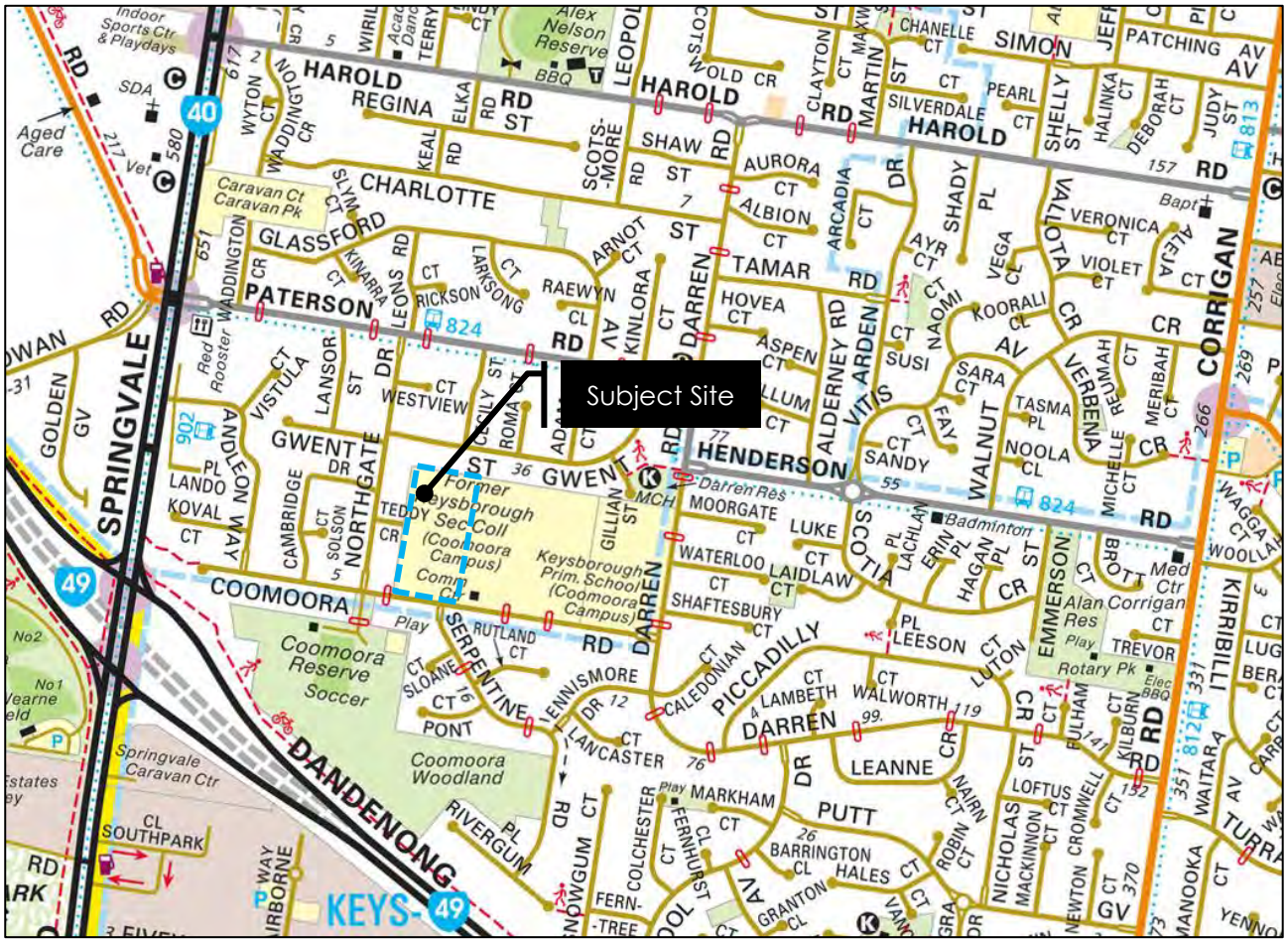
2 EXISTING CONDITIONS

2.1 Site Location

The subject site is located on the northern side of Coomoora Road, approximately 50 metres east of the intersection with Northgate Drive, as shown in Figure 1.

The site is generally rectangular in shape with a frontage to Coomoora Road of approximately 120 metres and a depth into the site of approximately 193 metres.

Figure 1 Site Location



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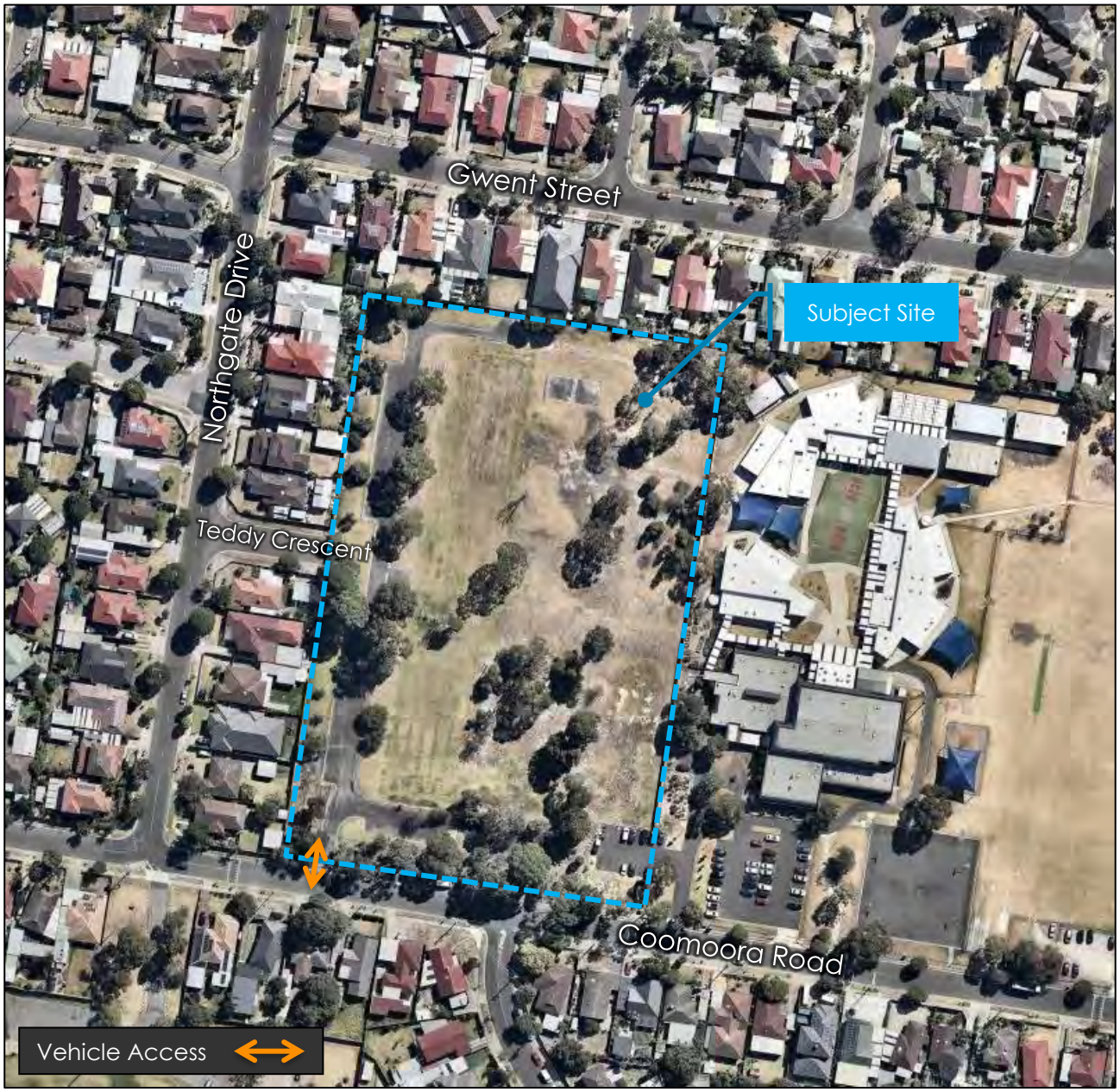
The site is currently vacant, though was previously utilised as land associated with the former Keysborough Secondary College. Vehicle access to the site is currently provided via a 6 metre wide (gated) crossover to Coomoora Road, in the south western corner of the site.

The subject site and existing vehicle access is shown below in Figure 2.

Figure 2 Aerial of Subject Site



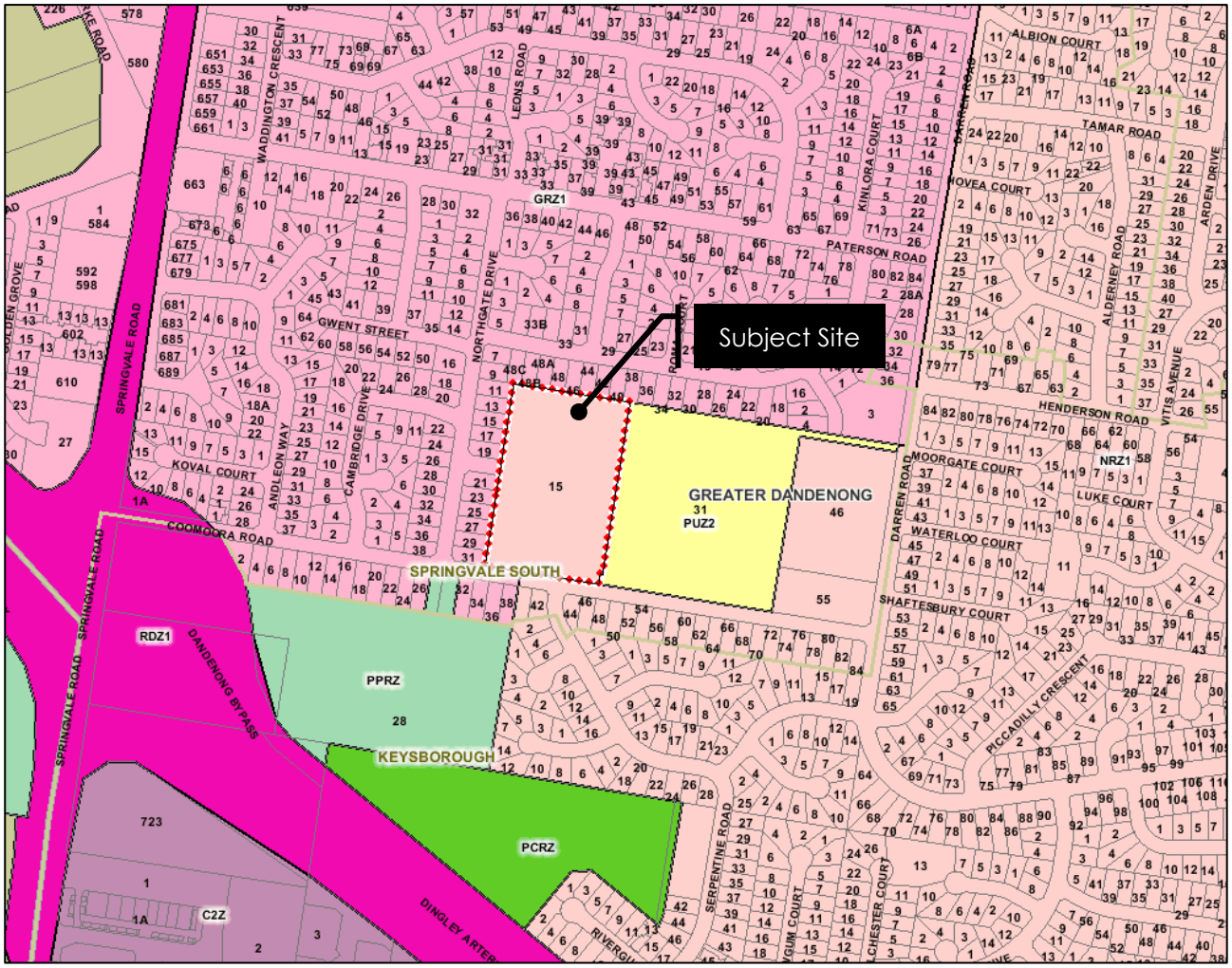
Copyright Nearmap

Land use in the immediate vicinity of the site is largely residential. Land uses of particular note include the Keysborough Primary School abutting the eastern boundary of the site and the Coomoora Reserve approximately 100 metres south.

2.2 Planning Zones and Overlays

As shown in Figure 3, the site is located within a Neighbourhood Residential Zone (NRZ1), for which the permitted uses are listed in Clause 32.07 of the Greater Dandenong Planning Scheme.

Figure 3 Planning Scheme Zones



2.3 Road Network

2.3.1 Coomoora Road

Coomoora Road a local road aligned east-west, running from Darren Road in the east and terminating in a court bowl near Springvale Road in the west. Coomoora Road provides a single traffic lane in each direction adjacent to the site. Unrestricted kerbside parking is permitted on both sides of the road, though 'No Stopping' signs are intermittently placed along the southern side of the road between the hours of 8:00AM – 9:30AM and 2:30PM – 4:00PM from Monday to Friday, commensurate with pick-up and drop-off times of the Keysborough Primary School.

A signed speed limit of 40km/h applies to Coomoora Road in the vicinity of the site.

The cross-section of Coomoora Road at the frontage of the site is shown in Figure 4.

Figure 4 Coomoora Road, looking west along the site frontage

2.3.2 Teddy Crescent

Teddy Crescent is a local road aligned east-west, running from Northgate Drive in the west and terminating approximately 40 metres east. Teddy Crescent provides a pavement width of approximately 9 metres, allowing kerbside parking and two-way traffic.

The cross-section of Teddy Crescent at the frontage of the site is shown in Figure 5.

Figure 5 Teddy Crescent, looking east towards the subject site

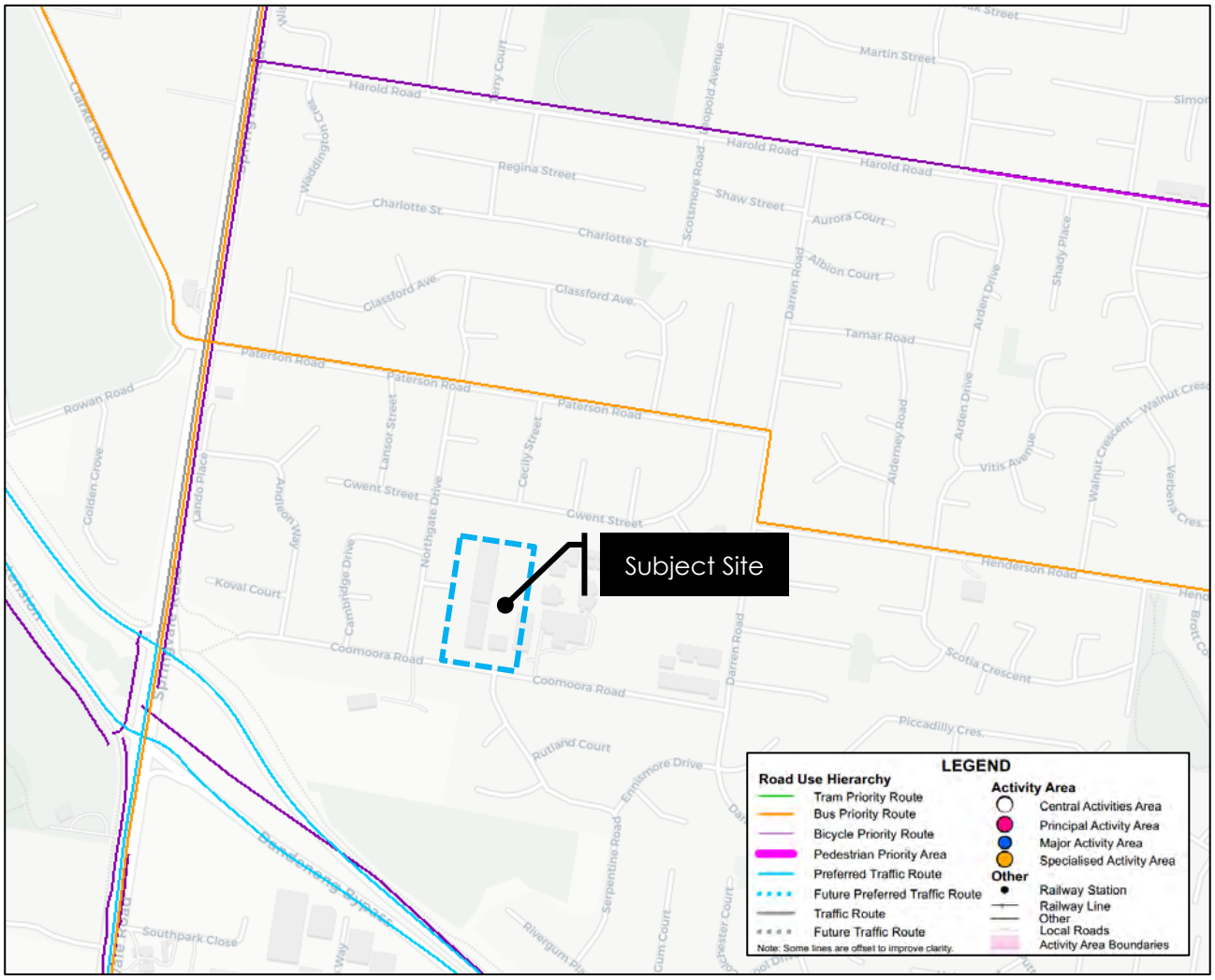
2.4 SmartRoads Road User Hierarchy Maps

In mid-2011 VicRoads developed the SmartRoads Road User Hierarchy Maps which aim to '*manage competing interests for limited road space by giving priority use of the road to different transport modes at particular times of the day.*'

The SmartRoads map, reproduced in Figure 6, identifies the following priority routes in the vicinity of the site:

- Bus Priority Route – Paterson Road and Springvale Road.
- Preferred Traffic Route – Dandenong Bypass and Springvale Road south of Dandenong Bypass.
- Traffic Route – Springvale Road north of Dandenong Bypass.
- Principle Bicycle Network – Springvale Road.

Figure 6 SmartRoads Road User Hierarchy Map



2.5 Traffic Volumes

Traffic volume surveys were undertaken by Trans Traffic Survey, on behalf of **onemilegrid** from Sunday 22nd July 2018 to Sunday 29th July 2018 inclusive. The surveys were conducted along Northgate Drive, Coomoora Road and Darren Road in the vicinity of the site, as shown in Figure 7.

The results of the surveys are summarised in Table 1 to Table 3.

Figure 7 Tube Count Location Sunday 22nd July – Sunday 29th July 2018

Table 1 Northgate Drive Weekday Average Sunday 22nd – Sunday 29th July 2018

Direction	Daily	AM Peak: 8am-9am	PM Peak: 3pm-4pm
Northbound	666	87	63
Southbound	722	74	100
Total	1,388	161	163

Table 2 Coomoora Road Weekday Average Sunday 22nd – Sunday 29th July 2018

Direction	Daily	AM Peak: 8am-9am	PM Peak: 3pm-4pm
Westbound	683	112	66
Eastbound	573	50	84
Total	1,256	162	150

Table 3 Darren Road Weekday Average Sunday 22nd – Sunday 29th July 2018

Direction	Daily	AM Peak: 8am-9am	PM Peak: 3pm-4pm
Northbound	1,022	125	127
Southbound	1,090	95	143
Total	2,112	220	270

In addition to the above, further traffic surveys were conducted by Trans Traffic Survey on behalf of onemilegrid on Thursday 26th July 2018 between 7:00am – 10:00am and 2:30pm – 5:30pm.

The surveys were undertaken at the following intersections:

- Paterson Road / Springvale Road
- Henderson Road / Corrigan Road

The morning and evening peak hour results of the surveys are shown below in Figure 8 to Figure 11.

Figure 8 Paterson Road / Springvale Road – AM Peak Hour (8:00AM-9:00AM)

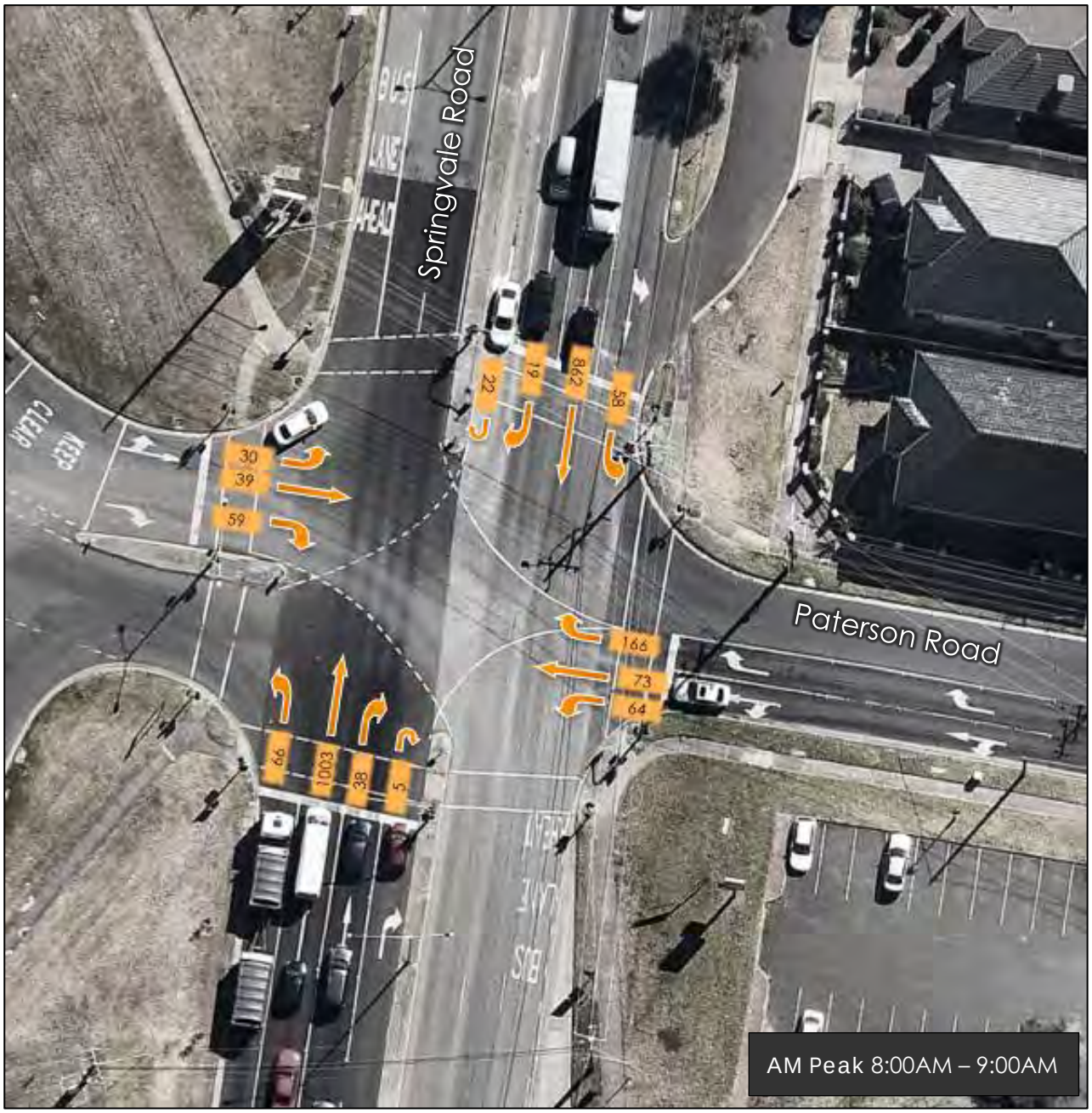


Figure 9 Paterson Road / Springvale Road – PM Peak Hour (3:15PM-4:15PM)

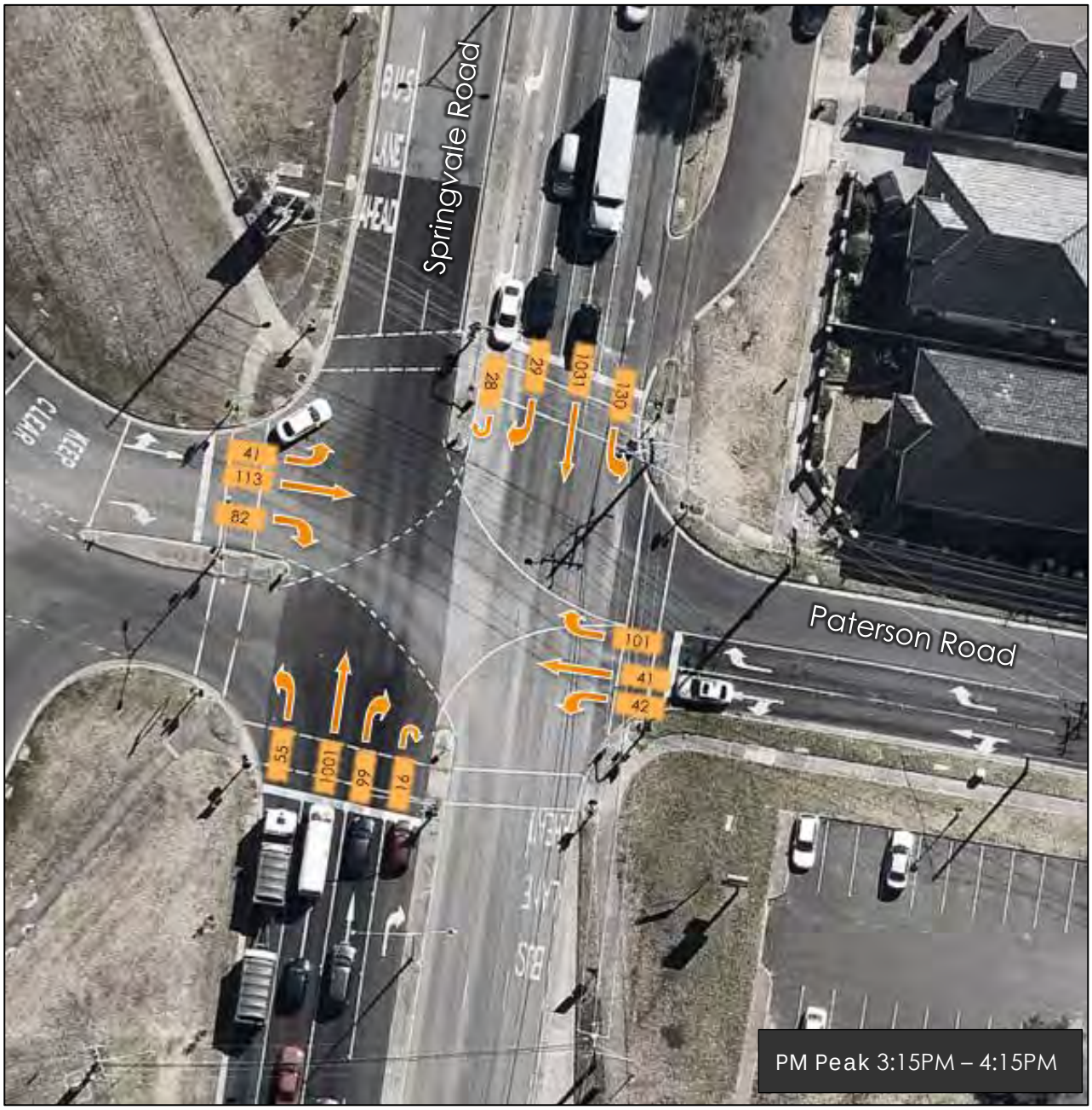


Figure 10 Henderson Road / Corrigan Road – AM Peak Hour (8:00AM-9:00AM)

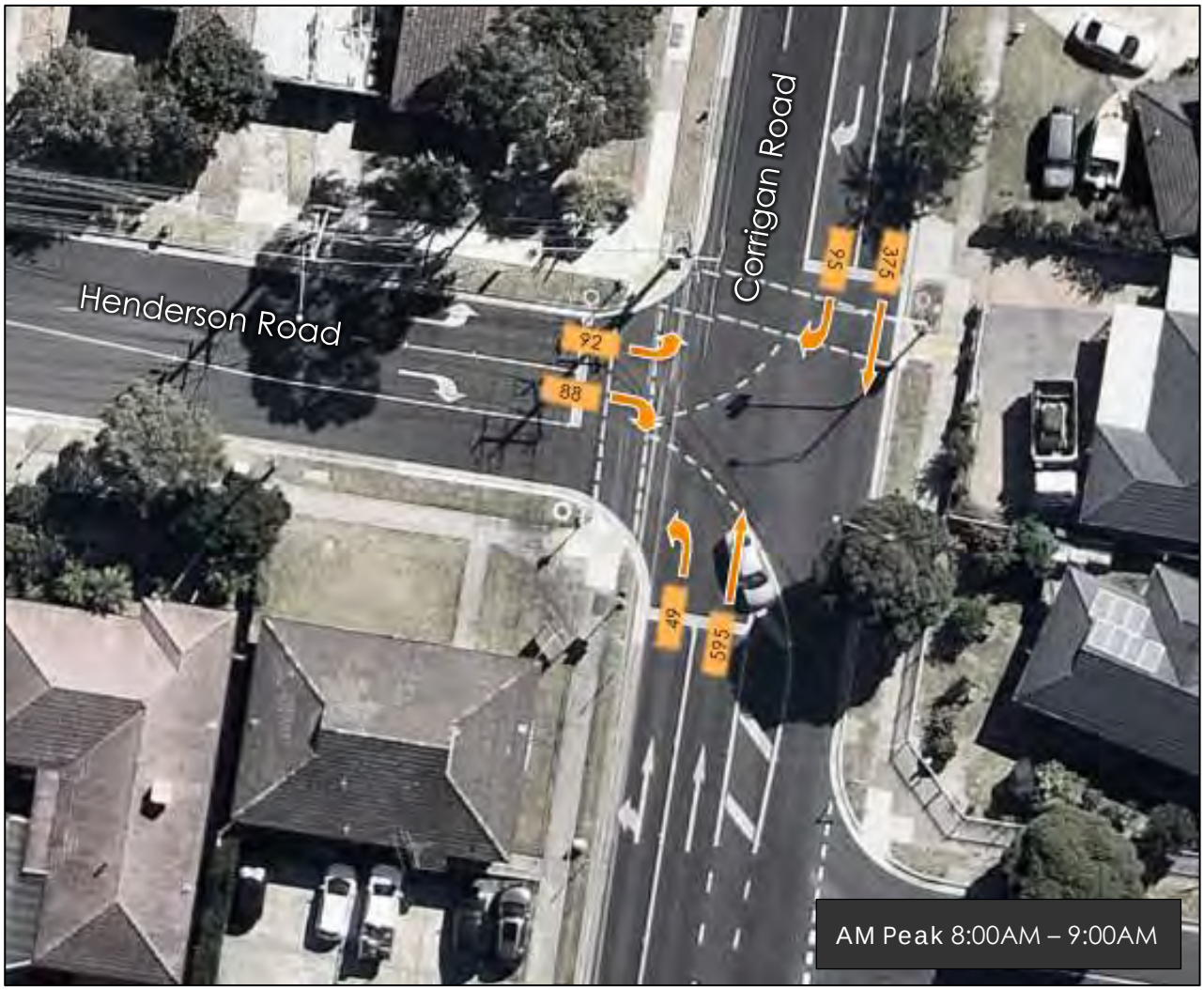
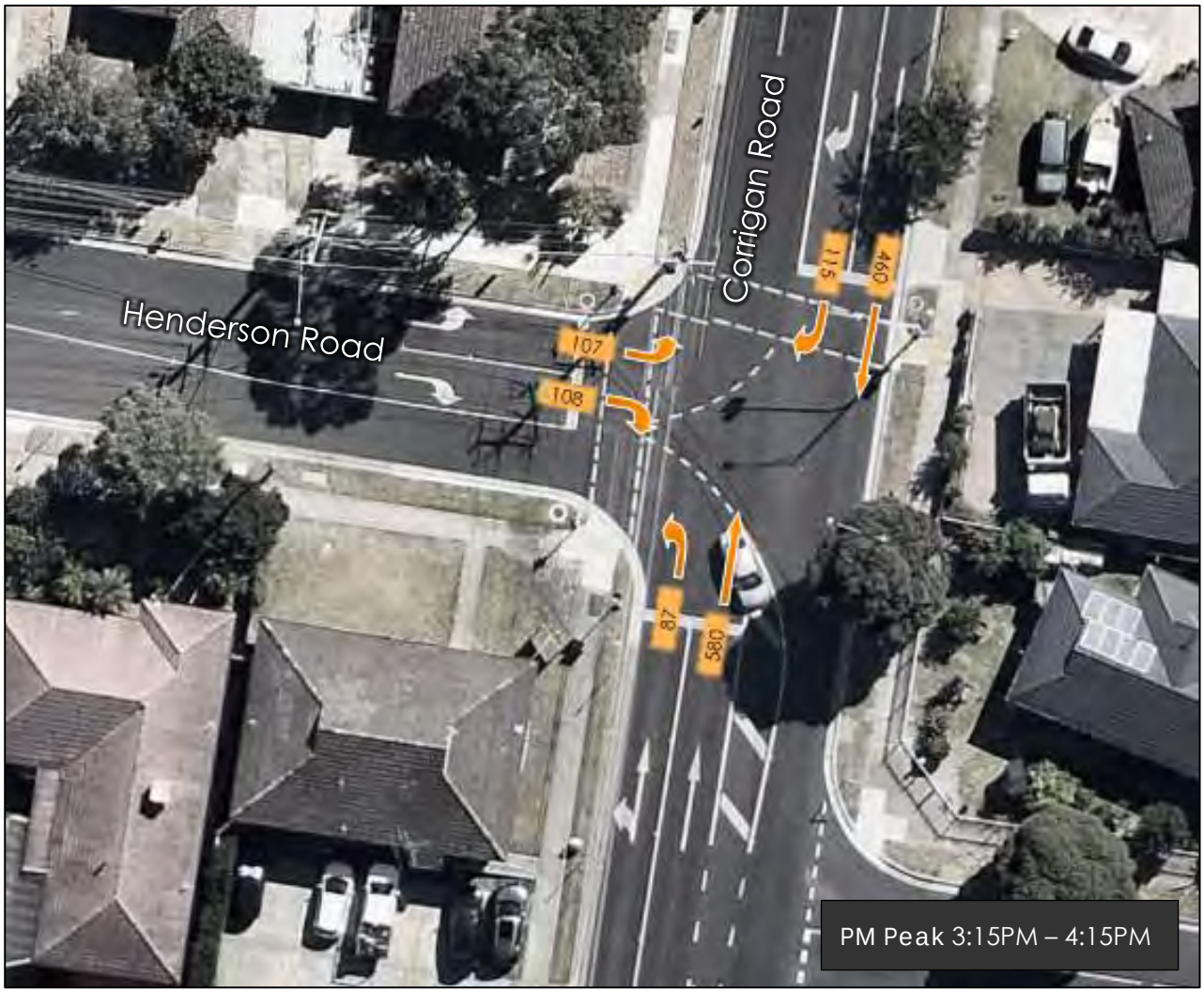


Figure 11 Henderson Road / Corrigan Road – PM Peak Hour (3:15PM-4:15PM)



2.6 Intersection Analysis

In order to determine the existing operating conditions of the intersections above, they have been analysed using SIDRA for the existing traffic volumes as shown above, with the results summarised in Table 5 and Table 6.

The SIDRA Intersection software package has been developed to provide information on the capacity of an intersection with regard to a number of parameters. Those parameters considered relevant are, Degree of Saturation (DoS), 95th Percentile Queue, and Average Delay as described below.

Table 4 SIDRA Intersection Parameters

Parameter	Description
Degree of Saturation (DoS)	The DoS represents the ratio of the traffic volume making a particular movement compared to the maximum capacity for that particular movement. The value of the DoS has a corresponding rating depending on the ratio as shown below.

Degree of Saturation	Rating
Up to 0.60	Excellent
0.61 – 0.70	Very Good
0.71 – 0.80	Good
0.81 – 0.90	Fair
0.91 – 1.00	Poor
Above 1.00	Very Poor

It is noted that whilst the range of 0.91 – 1.00 is rated as 'poor', it is acceptable for critical movements at an intersection to be operating within this range during high peak periods, reflecting actual conditions in a significant number of suburban signalised intersections.

Average Delay (seconds)	Average delay is the time delay that can be expected for all vehicles undertaking a particular movement in seconds.
95th Percentile (95%ile) Queue	95%ile queue represents the maximum queue length in metres that can be expected in 95% of observed queue lengths in the peak hour

Table 5 Existing Intersection Analysis – Springvale Road / Paterson Road

Peak	Approach	D.o.S.	Avg Delay	Queue (m)
AM Peak	Springvale Road South	0.627	25.7	160.1
	Paterson Road East	0.636	49.4	70.4
	Springvale Road North	0.481	24.4	122.4
	Clarke Road West	0.581	65.6	31.2
PM Peak	Springvale Road South	0.667	28.7	175.0
	Paterson Road East	0.633	53.2	45.1
	Springvale Road North	0.617	26.8	169.5
	Clarke Road West	0.651	56.6	66.3

Reference to Table 5 indicates that the Springvale Road / Paterson Road intersection currently operates under 'Very Good' conditions with minor queuing and delays on each approach.

Table 6 Existing Intersection Analysis – Henderson Road / Corrigan Road

Peak	Approach	D.o.S.	Avg Delay	Queue (m)
AM Peak	Corrigan Road South	0.461	8.4	96.4
	Corrigan Road North	0.259	4.9	42.0
	Henderson Road West	0.467	56.5	37.6
PM Peak	Corrigan Road South	0.558	13.6	127.5
	Corrigan Road North	0.529	15.2	57.0
	Henderson Road West	0.548	51.9	46.2

Reference to Table 6 indicates that the Henderson Road / Corrigan Road intersection operates under 'Excellent' conditions.

2.7 Public Transport

The full public transport provision in the vicinity of the site is shown in Figure 12 and detailed in Table 7.

Figure 12 Public Transport Provision

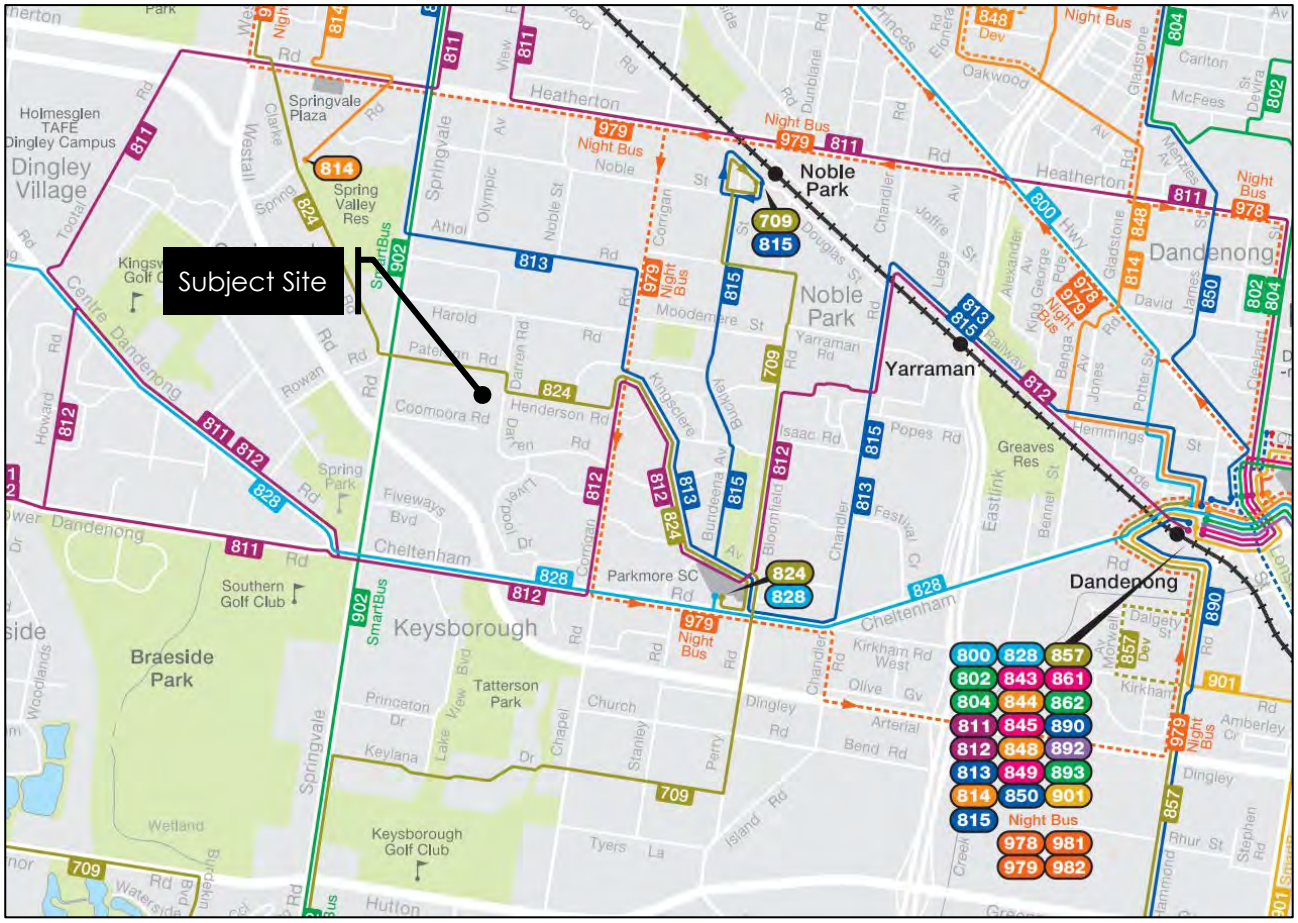


Table 7 Public Transport Provision

Mode	Route No	Route Description	Nearest Stop
Bus	824	Moorabbin - Keysborough via Clayton, Westall	Paterson Road
	902	Chelsea - Airport West (SMARTBUS Service)	Springvale Road

The site has limited public transport accessibility in the immediate vicinity, with the closest bus route (824) located within approximately 350 metres walking distance from the site, connecting Keysborough through to Moorabbin via Clayton. The other bus route in the vicinity (902) is located on Springvale Road within 500 metres from the site and is a SMARTBUS route which connects Chelsea through to Airport West.

3 DEVELOPMENT PLAN PROPOSAL

It is planned to develop the subject site for the purposes of a residential development, comprising a number of two storey dwellings and land only lots, serviced by a private internal road network.

Vehicle access will be provided via a crossover to Coomoora Road towards the south-western corner of the site. The existing crossover to Coomoora Road is proposed to be removed, with kerb, channel, nature strip and footpath fully reinstated.

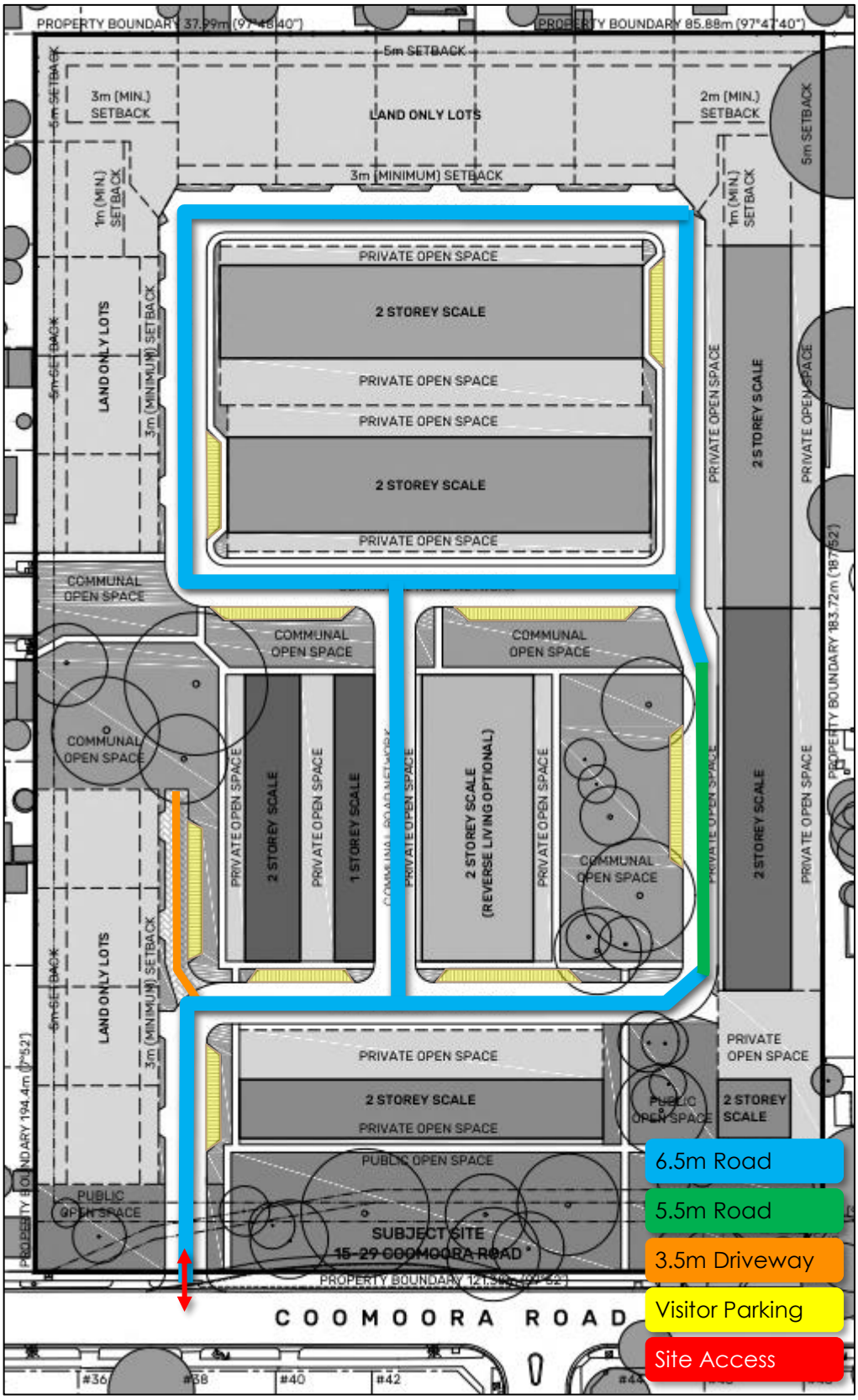
The private internal road network is proposed predominantly with 6.5 metre wide roads, capable of accommodating two-way traffic flow. A road of 5.5 metres wide is proposed towards the south-eastern corner of the site, abutting the open space area and also capable of accommodating two-way traffic flow. An extended driveway is proposed in the south-west corner of the site to service corner dwellings or lots.

A total of 24 visitor car parking spaces are provided on-site, accessed directly from the internal private road network. Visitor spaces are spread evenly throughout the site for ease of accessibility.

Furthermore, the communal road network will be managed and maintained by the owner's corporation on an ongoing basis.

A view of the proposed internal road network is provided in Figure 13 below.

Figure 13 Internal Road Network Layout



4 DESIGN CONSIDERATIONS

4.1 General

onemilegrid has undertaken an assessment of the access and internal road layout for the proposed development, with due consideration of the Design Standards detailed within Clause 52.06-9 of the Planning Scheme. A review of those relevant Design Standards is provided in the following section.

4.2 Design Standard 1 – Accessways

A summary of the assessment for Design Standard 1 is provided in Table 8.

Table 8 Clause 52.06-9 Design Assessment – Design Standard 1

Requirement	*Comments*
Be at least 3 metres wide	Satisfied
Have an internal radius of at least 4 metres at changes of direction or intersection or be at least 4.2 metres wide	Satisfied
Allow vehicles parked in the last space of a dead-end accessway in public car parks to exit in a forward direction with one manoeuvre	N/a
Provide at least 2.1 metres headroom beneath overhead obstructions, calculated for a vehicle with a wheel base of 2.8 metres	Garages should be provided with a height clearance of at least 2.1 metres
If the accessway serves four or more car spaces or connects to a road in a Road Zone, the accessway must be designed so that cars can exit the site in a forward direction	Satisfied
Provide a passing area at the entrance at least 6.1 metres wide and 7 metres long if the accessway serves ten or more car parking spaces and is either more than 50 metres long or connects to a road in a Road Zone	Satisfied
Have a corner splay or area at least 50 per cent clear of visual obstructions extending at least 2 metres along the frontage road from the edge of an exit lane and 2.5 metres along the exit lane from the frontage, to provide a clear view of pedestrians on the footpath of the frontage road. The area clear of visual obstructions may include an adjacent entry or exit lane where more than one lane is provided, or adjacent landscaped areas, provided the landscaping in those areas is less than 900mm in height.	Satisfied
If an accessway to four or more car parking spaces is from land in a Road Zone, the access to the car spaces must be at least 6 metres from the road carriageway.	N/a – does not connect to a Road Zone

Further to the above, it is noted that the proposed internal road network includes a straight stretch of road no longer than 130 metres in length and as such, speed control devices are not considered to be necessary, given that the intersections at each end of the internal road act as speed control devices themselves.

4.3 Design Standard 2 – Car Parking Spaces

Visitor spaces are largely provided through indented parallel parking spaces and are proposed with a minimum width of 2.1 metres, length of 6.3 metres for the end spaces and 6.0 metres for the inner spaces and are therefore in accordance with the Australian Standard for On-Street Parking (AS2890.5).

4.4 Waste Collection and Emergency Vehicles

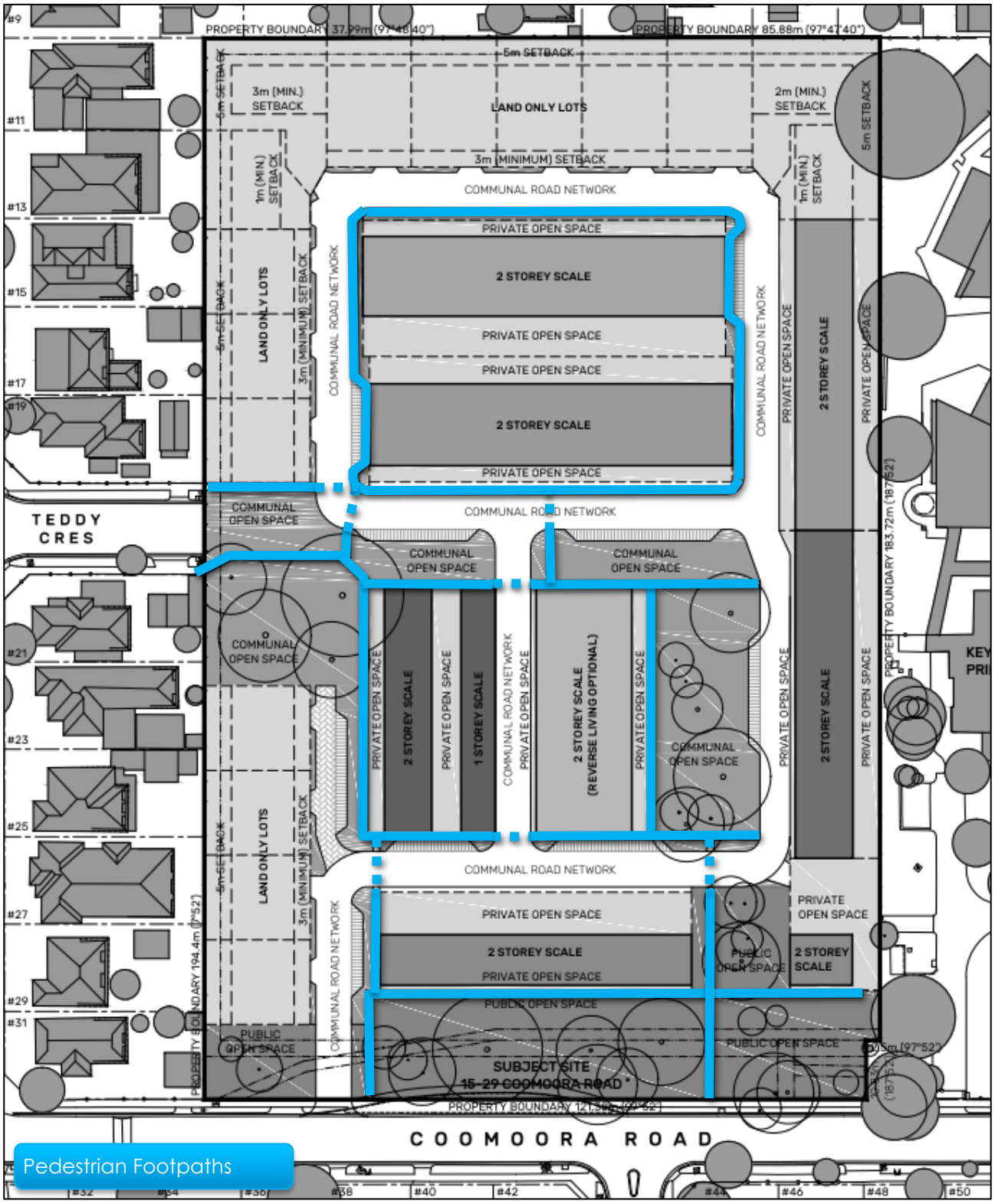
The internal road network has been designed to accommodate vehicles of up to 10.5 metres in length, as demonstrated in Appendix A, which demonstrates sufficient road design to accommodate large waste and emergency vehicles.

4.5 Pedestrian Network

Footpaths are provided throughout the proposed development, with connections to Coomoora Road at the site's southern boundary and to Teddy Crescent at the site's western boundary, as shown in Figure 14.

The proposed development is considered to provide an interconnected and continuous network of safe, efficient and convenient footpaths with natural surveillance along streets and from abutting dwellings and will be designed appropriately for people with disabilities.

Figure 14 Site Access and Circulation



Further to the above, the internal road network is expected to have minimal traffic volumes and low speeds, and is considered suitable for cyclists.

4.6 Meridian Estate Review

Following a preliminary Councillor presentation, Council expressed concerns regarding an existing residential estate (Meridian Estate), located towards the western end of Kirkham Road, in Dandenong. More specifically, Council considers the design of the Meridian Estate undesirable and wishes to identify the differences in visitor car parking, pedestrian accessibility and drainage compared to the proposed development at 15-29 Coomoora Road, Springvale South.

To provide further context, the Meridian Estate is an established residential subdivision, with public roads and conventional lot sizes. The road network throughout the estate comprises a mix of road types, though typically, the cross-section includes a narrow, sealed carriageway with flush concrete edge strips, leading to grassed or landscaped swale drains within each verge. Footpaths are provided along some roads, and paved verge visitor parking is also provided within some verge areas.

The above road design results in a number of operational and maintenance issues, including those discussed below:

- Due to their being no level difference between the carriageway and the adjacent verge, resident and visitor vehicles can be easily parked on the verge. To prevent this, bollards and signage is commonly installed to prevent (limit) vehicle parking on the verge.
- Paved visitor parking on the verge can similarly lead to vehicles being parked outside the paved area, leading to verge maintenance issues.
- Grassed verge areas can become unusable for pedestrians during periods of rain, and can be easily damaged by vehicles using the verge area.

In comparison, the proposed development at Coomoora Road, Springvale South is intended to include a road network generally comprising a standard kerbed carriageway, with sub-surface drainage, significant indented kerbside parking, and verge landscaping. This will have the following benefits when compared to the Meridian Estate:

- The provision of significant indented parking distributed around the site will limit demands for informal verge parking;
- The kerbed roadways will deter verge parking, through a physical level difference between the verge and carriageway;
- Landscaping will be utilised in verge areas to further prevent verge parking;
- Footpaths are proposed within the verge on some roads, though with a limited number of dwellings and short road lengths, vehicle volumes and speeds are expected to be minimal, and the use of a shared carriageway for pedestrians is considered to be appropriate;
- Standard drainage will ensure that verge areas remain usable for pedestrians if necessary where footpaths are not provided.

Simply, the proposed development is anticipated to operate without the issues experienced as a result of the road design at the Meridian estate.

5 BICYCLE PARKING CONSIDERATIONS

Clause 52.34 of the Greater Dandenong Planning Scheme does not specify bicycle parking provision requirements for dwellings or townhouse style developments, generally assuming that bicycles can be stored in the garage required for each dwelling.

Garage dimensions for each dwelling should therefore be provided in accordance with the Planning Scheme minimum dimensions, to ensure sufficient space is provided for bicycle parking.

6 CAR PARKING CONSIDERATIONS

The car parking requirements for the subject site are identified in Clause 52.06 of the Greater Dandenong Planning Scheme, which specifies the following requirements for residential uses, as summarised in Table 9.

Table 9 Clause 52.06 – Car Parking Requirements

Use	*Rate*	*Car Parking Measure*
Dwelling	1	to each one or two-bedroom dwelling, plus
	2	to each three or more-bedroom dwelling (with studies or studios that are separate rooms counted as bedrooms), plus
	1	For visitors to every 5 dwellings for developments of 5 or more dwellings

Based on the above requirements, each 2-bedroom dwelling will need to provide one parking space and each 3 or more bedroom dwelling 2 parking spaces.

For the purposes of this assessment, it is estimated that up to a maximum of approximately 67 dwellings will be developed on the site, thereby generating a visitor car parking requirement of 13 spaces.

The proposal includes 24 visitor spaces, dispersed throughout the development and is therefore well in excess of the Planning Scheme requirement. Furthermore, the visitor parking is well dispersed throughout the subject site, with a higher number of spaces located close to the site access point. It is therefore expected that visitor parking will easily be accommodated on-site, and no overflow of visitor parking is anticipated.

7 TRAFFIC CONSIDERATIONS

7.1 Traffic Generation

It is generally accepted that single dwellings on a lot in outer suburban areas may generate traffic at up to 10 vehicles per day, whilst in areas with good public transport, and for higher density dwellings, lower traffic generation rates are often recorded.

With consideration to the proximity of the site to public transport and amenities, it is anticipated that the proposed development may generate up to 7 vehicle trips per day per dwelling.

By applying the above traffic generation rates to the estimated maximum of up to 67 lots, the development is expected to generate up to approximately 470 vehicle trips per day, and approximately 47 vehicle trips per hour during both the AM and PM peak.

Traffic volumes generated by residential uses are typically tidal, with the majority of movements generated during the AM peak hour occurring in the outbound direction and the majority of movements during the PM peak hour occurring in the inbound direction.

For the purposes of this assessment, the following directional splits will be adopted:

- AM peak hour: 70% outbound, 30% inbound; and
- PM peak hour: 40% outbound, 60% inbound.

Peak hour traffic volumes anticipated to be generated by the proposed development are outlined in Table 10.

Table 10 Anticipated Peak Hour Traffic Generation

Period	*Outbound Volume*	*Inbound Volume*	*Two-Way Volume*
AM Peak Hour	33 movements	14 movements	47 movements
PM Peak Hour	19 movements	28 movements	47 movements

7.2 Traffic Distribution

The site is proposed to provide sole vehicle access to the south via Coomoora Road.

Turning west onto Coomoora Road from the subject site leads vehicles towards Springvale Road via Paterson Road, whilst turning east leads vehicles to Corrigan Road via Harold Road, Henderson Road or Darren Road.

The signalised intersection connecting Springvale Road to Paterson Road is expected to incur the largest traffic volumes, as vehicles will likely use this intersection to travel either north, south or west towards Nepean Highway or Princes Highway/Monash Freeway.

With consideration to the above, noting the site's location in relation to the arterial road network, public transport facilities, schools, recreation and retail and employment precincts, the directional distribution shown in Table 11 has been adopted.

Table 11 Adopted Directional Traffic Distribution

Road	*Destination*	*Percentage*
Springvale Road	North	35%
Springvale Road	South	20%
Clarke Road	North-West	10%
Corrigan Road	North	20%
Corrigan Road	South	15%

7.3 Generated Traffic Volumes

Based on the above, the traffic volumes are expected to be generated by the proposed development during the morning and afternoon peak periods is shown below in Figure 15 to Figure 18.

Figure 15 AM Peak Generated Traffic Volumes – Springvale Road / Paterson Road

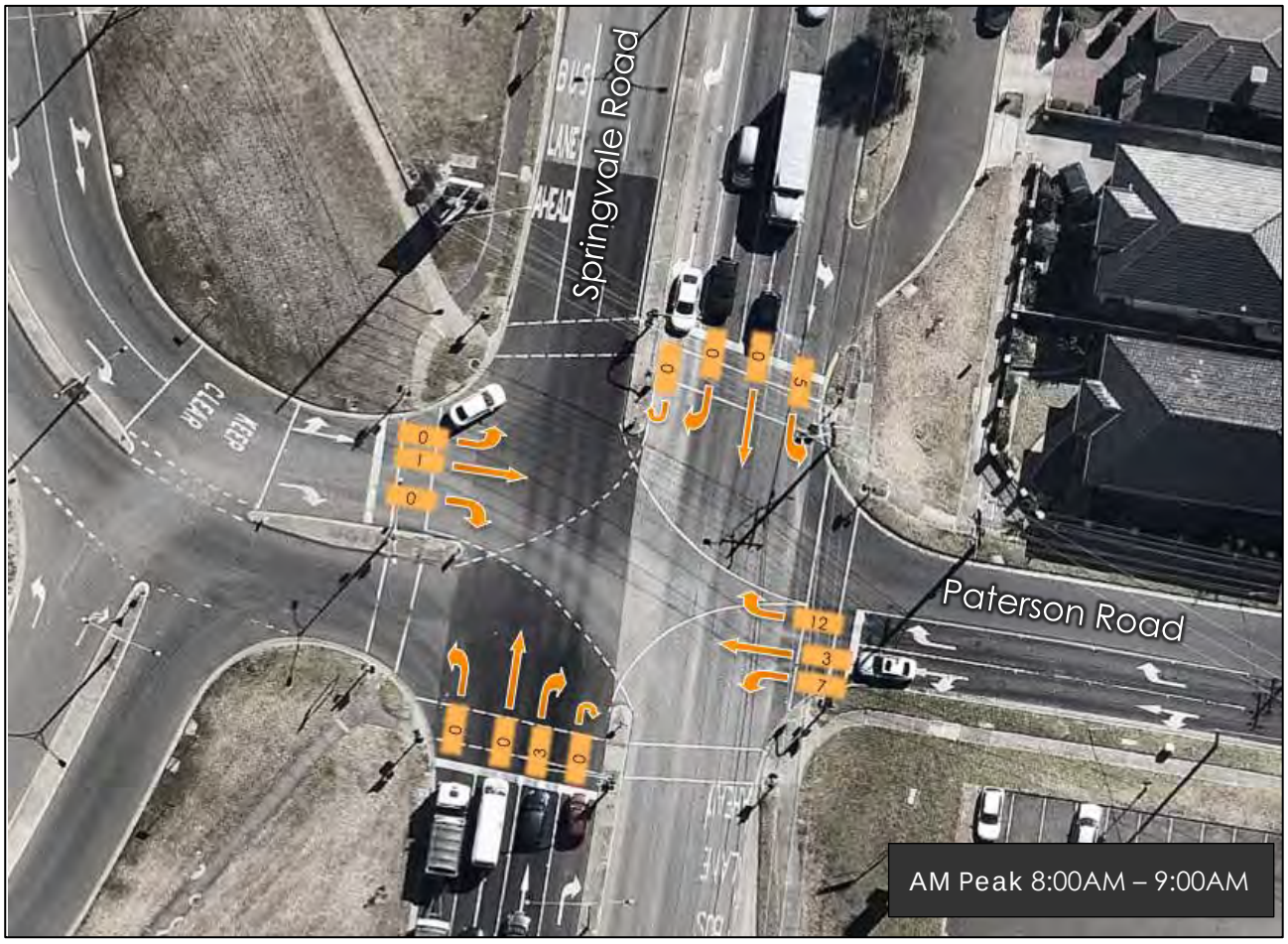


Figure 16 AM Peak Generated Traffic Volumes – Corrigan Road / Henderson Road

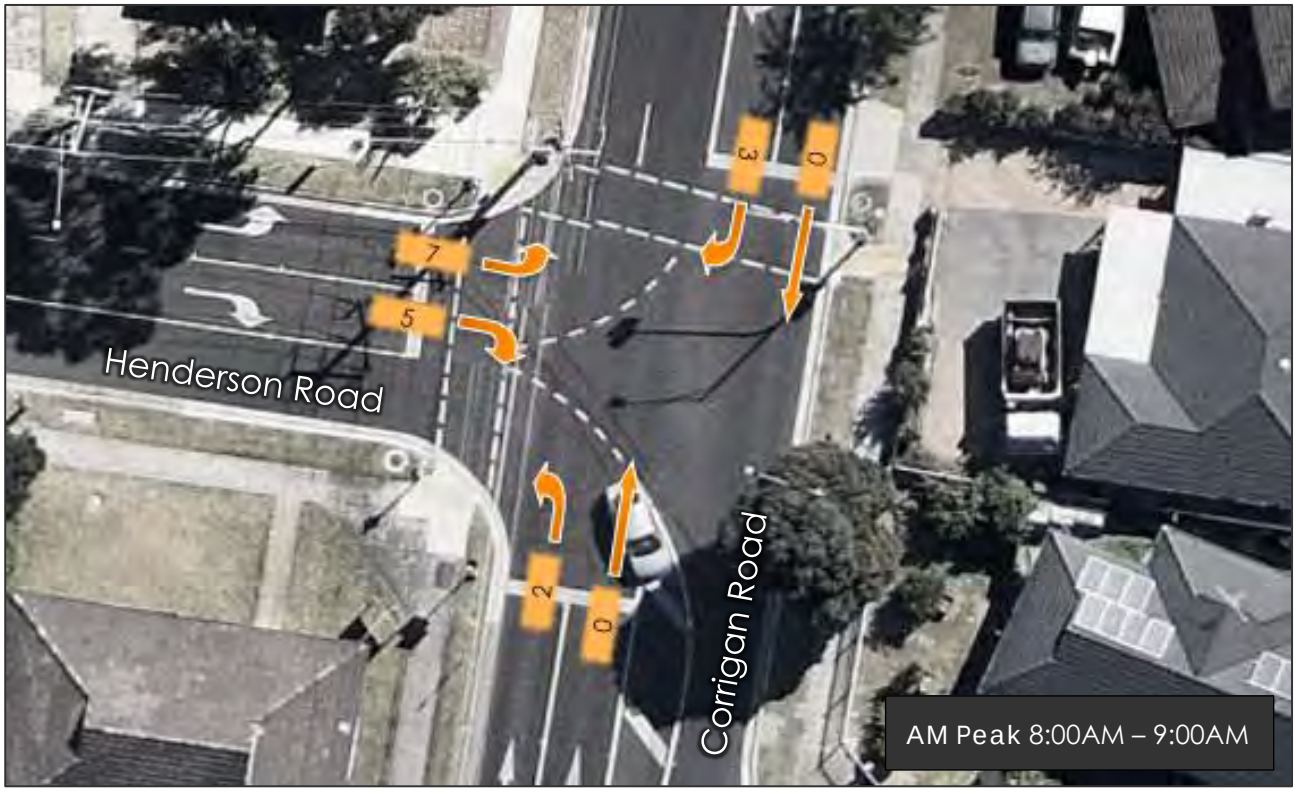


Figure 17 PM Peak Generated Traffic Volumes – Springvale Road / Paterson Road

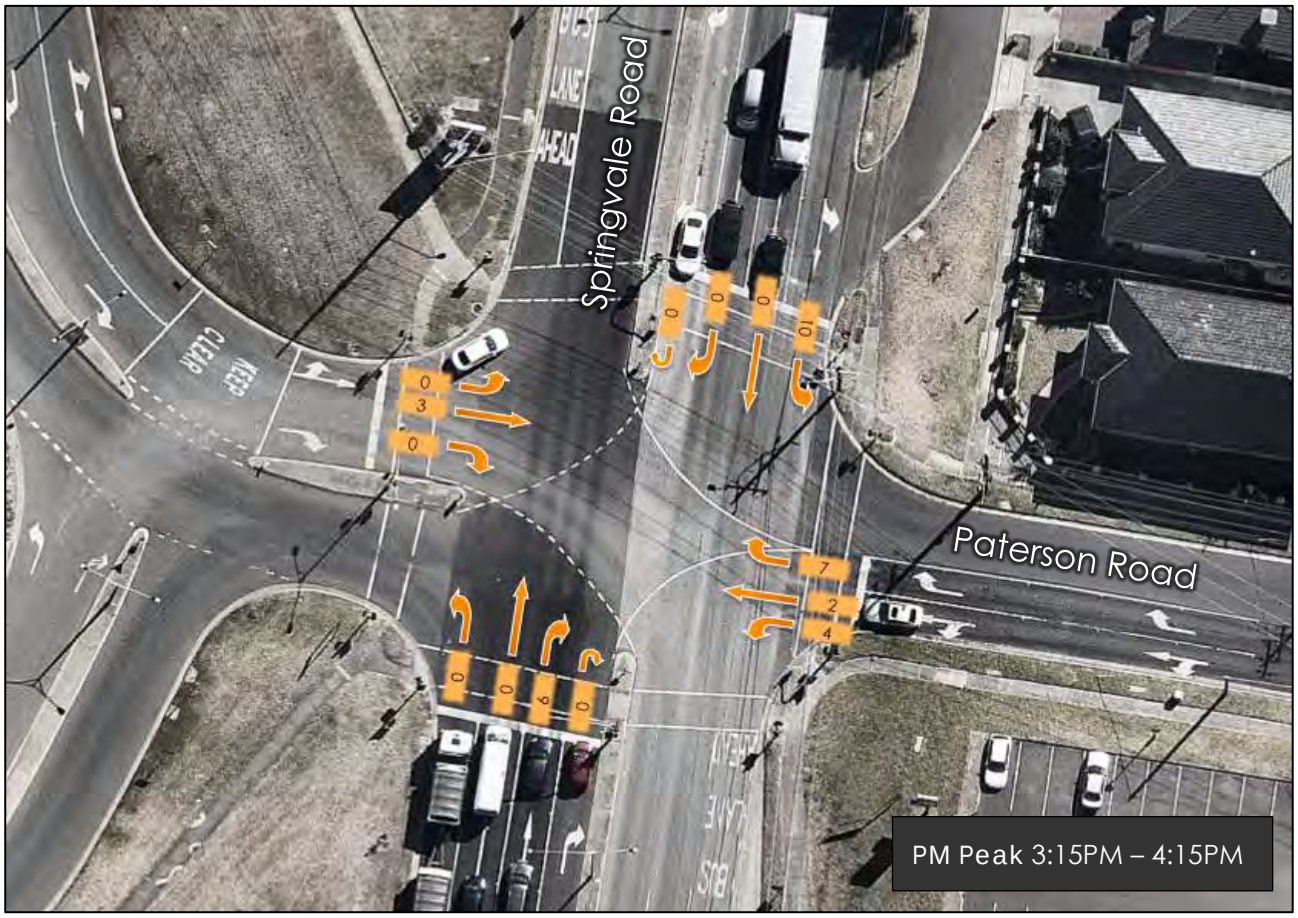


Figure 18 PM Peak Generated Traffic Volumes – Corrigan Road / Henderson Road

It is shown that traffic volumes expected to be generated by the site are minimal, and as such, the site access and external destination intersections are expected to easily accommodate the traffic volumes expected to be generated by the proposed development. Nevertheless, in order to provide for a robust assessment and to ascertain the operating conditions, further analysis has been undertaken, as follows.

7.4 Resultant Future Traffic Volumes

Based on the above, the future intersection volumes can be calculated by combining the existing volumes with the traffic anticipated to be generated by the proposed development.

The resultant peak hour traffic volumes are shown in Figure 19 and Figure 21.

Figure 19 AM Peak Resultant Future Traffic Volumes – Springvale Road / Paterson Road

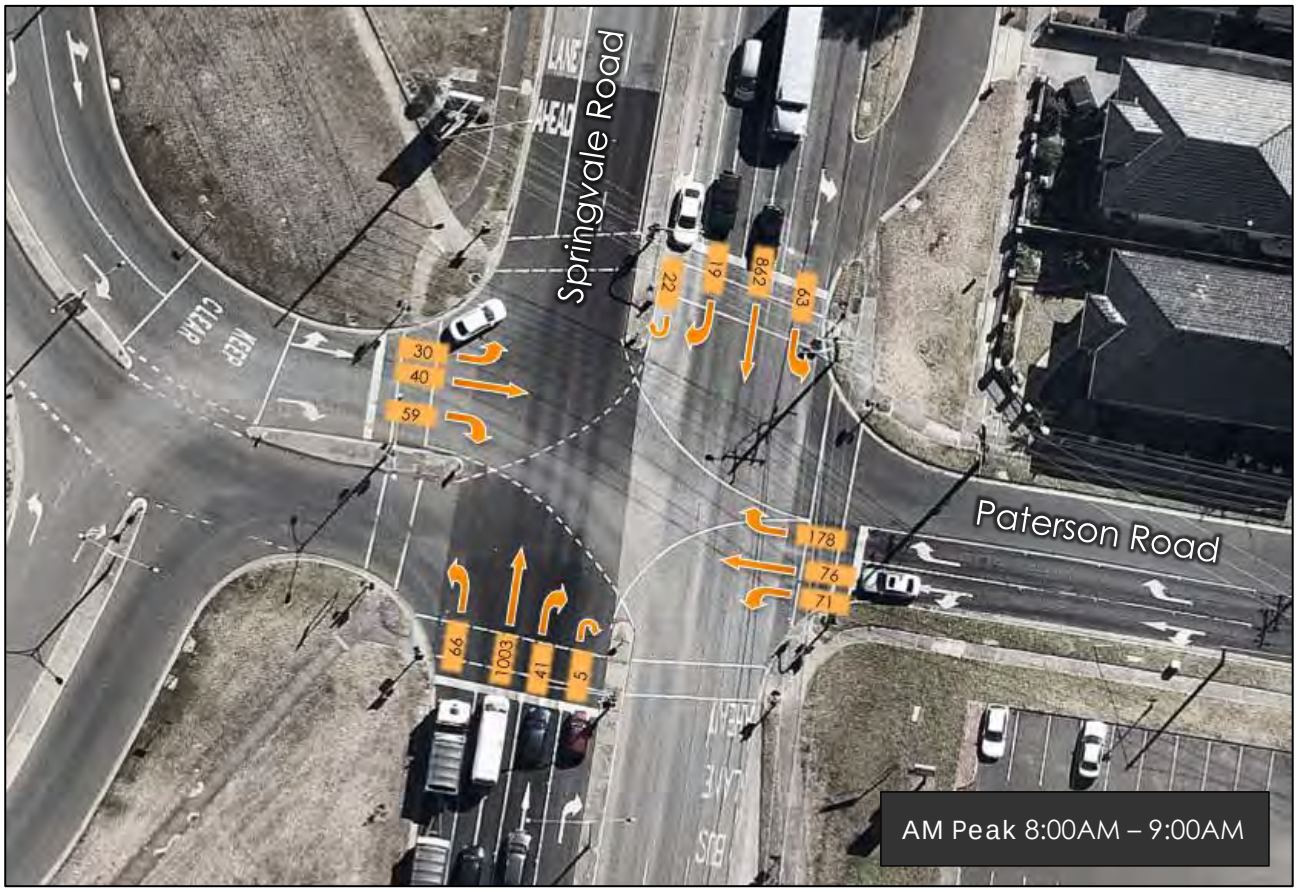


Figure 20 AM Peak Resultant Future Traffic Volumes – Corrigan Road / Henderson Road

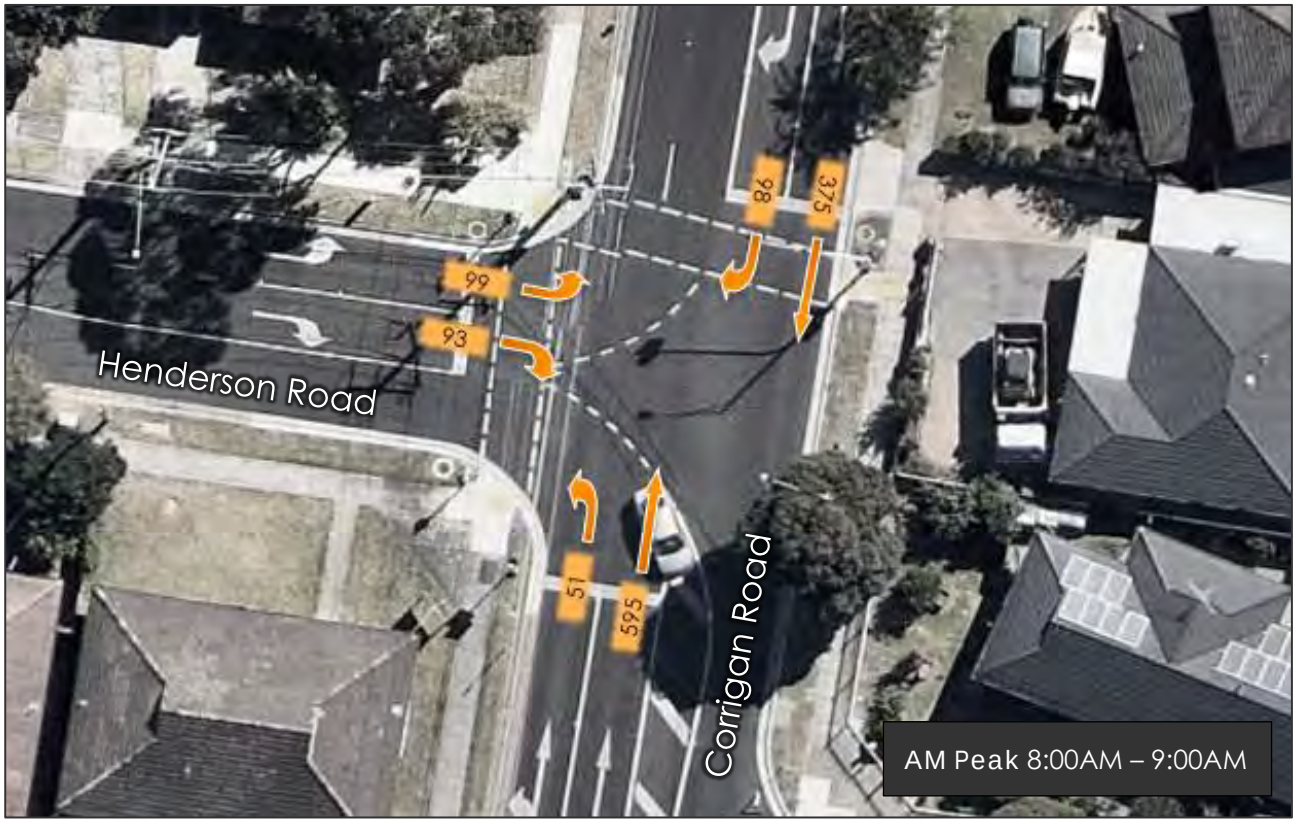


Figure 21 PM Peak Resultant Future Traffic Volumes – Springvale Road / Paterson Road

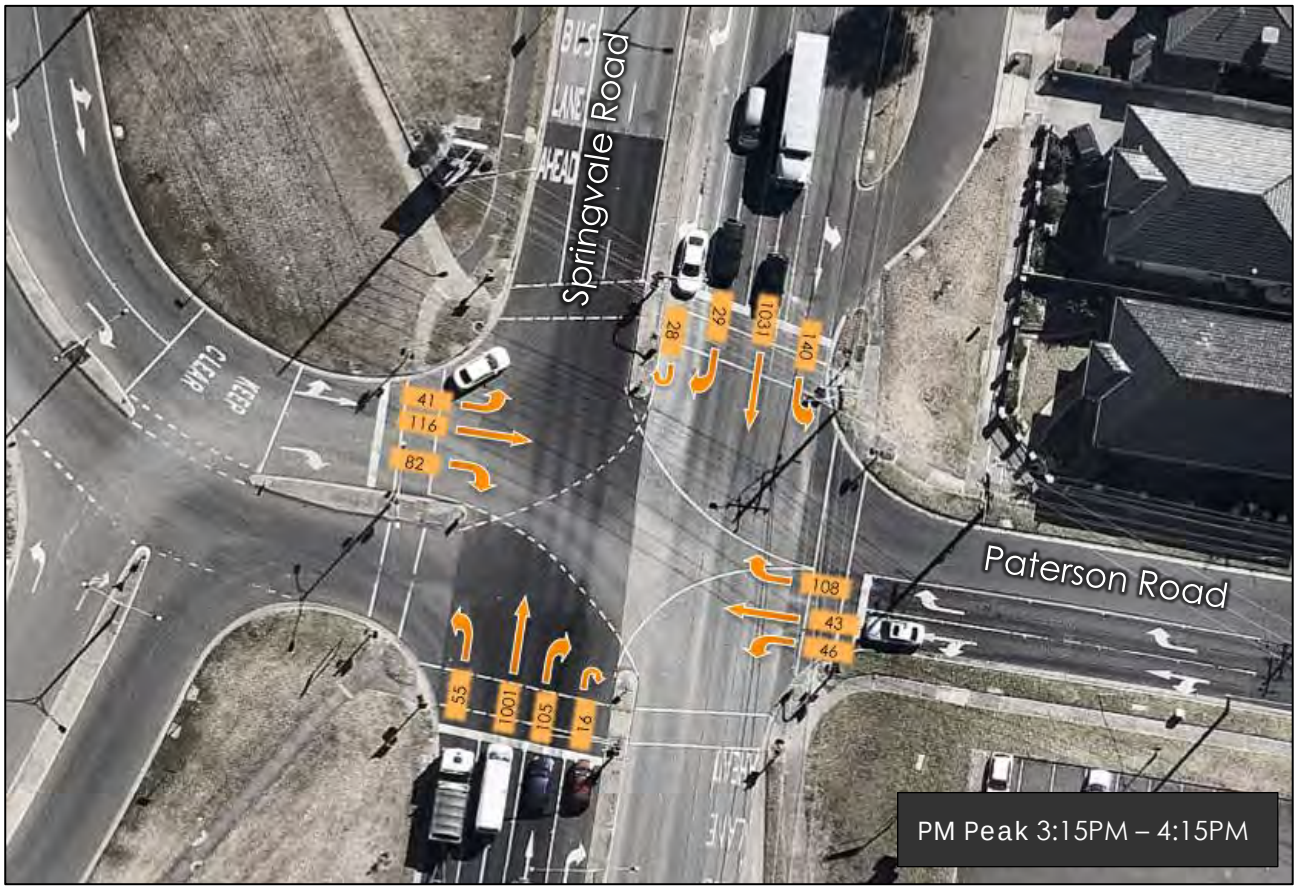
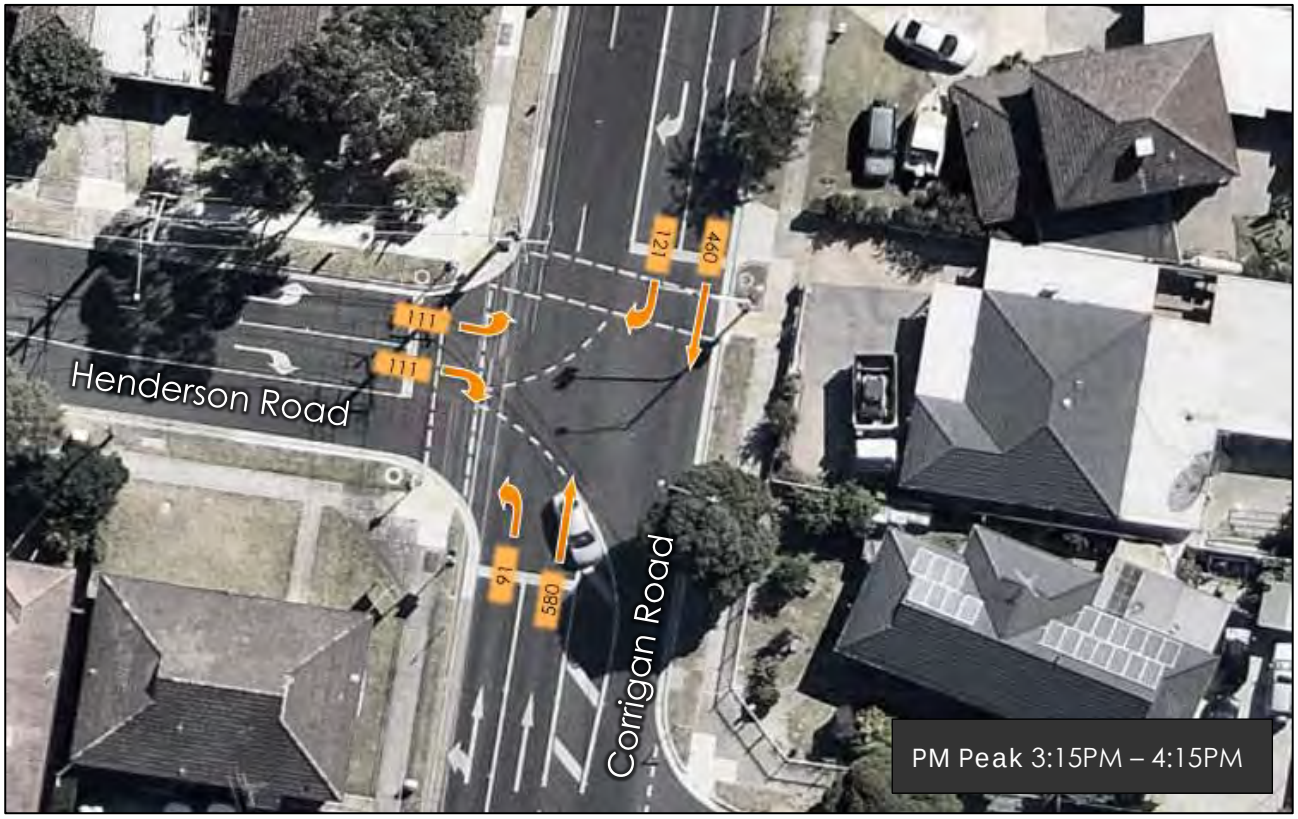


Figure 22 PM Peak Resultant Future Traffic Volumes – Corrigan Road / Henderson Road



7.5 Intersection Capacity Assessment

To assess the operation of the intersections of Springvale Road / Paterson Road, and Henderson Road / Corrigan Road, the traffic volumes have been input into SIDRA Intersection.

The results of the analysis are shown below.

Table 12 Future Intersection Analysis – Springvale Road / Paterson Road

Peak	Approach	D.o.S.	Avg Delay	Queue (m)
AM Peak	Springvale Road South	0.628	25.8	160.6
	Paterson Road East	0.682	50.1	76.8
	Springvale Road North	0.484	24.5	123.2
	Clarke Road West	0.591	65.6	31.7
PM Peak	Springvale Road South	0.669	28.9	176.0
	Paterson Road East	0.677	53.7	48.8
	Springvale Road North	0.620	26.8	170.9
	Clarke Road West	0.664	56.7	67.9

The impact of the proposed development on the signalised intersection connecting Springvale Road to Paterson Road is expected to be negligible during the morning and afternoon peak periods, with the results showing a very minor increase in the queues and delays on each approach. The intersection is expected to continue to operate under 'Very Good' conditions.

Table 13 Future Intersection Analysis – Henderson Road / Corrigan Road

Peak	Approach	D.o.S.	Avg Delay	Queue (m)
AM Peak	Corrigan Road South	0.514	11.7	114.7
	Corrigan Road North	0.259	5.1	42.0
	Henderson Road West	0.494	53.1	39.9
PM Peak	Corrigan Road South	0.571	14.2	131.1
	Corrigan Road North	0.556	16.0	59.2
	Henderson Road West	0.544	50.9	46.9

The impact of the proposed development on the signalised intersection connecting Corrigan Road to Henderson Road is expected to be negligible during the morning and afternoon peak periods, with the results showing a minor increase in the queues and delays on each approach. The intersection is expected to continue to operate under 'Excellent' conditions.

7.6 Local Road Capacity

As noted in Section 2.5, traffic volume surveys were undertaken along Northgate Drive and Coomoora Road in the vicinity of the site, which are considered to be identified as Level 1 Access Streets, with a theoretical capacity of approximately 2,000 vehicles per day.

As per Section 7.1, the proposed development is anticipated to generate approximately 469 vehicle trips per day, all of which will be generated to Coomoora Road and a portion to Northgate Drive. With existing volumes of less than 1,400 vehicles per day on each of Coomoora Road and Northgate Drive, and an expected traffic generation of 469 vehicles per day, daily traffic volumes on both Coomoora Road and Northgate Drive will remain well below their theoretical capacity.

7.7 Traffic Impact

As shown above, there has been a very minimal effect on the major intersections, with the Springvale Road / Paterson Road signalised intersection continuing to operate under 'Very Good' conditions, whilst the Henderson Road / Corrigan Road signalised intersection continues to operate under 'Excellent' conditions.

In addition, the surrounding local roads are expected to remain below the capacity of a Level 1 Access Street.

It is therefore concluded that the proposed development will have a minimal impact on the operation of the surrounding major intersections, with negligible added queues or delays to existing motorists.

8 CONCLUSIONS

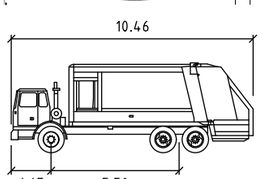
It is planned to develop the site addressed as 15-29 Coomoora Road Springvale South for the purposes of a residential development, comprising an internal private road network accessed via Coomoora Road.

Considering the analysis presented above, it is concluded that:

- The design of the internal private road network is considered appropriate;
- Visitor parking is provided well in excess of the Planning Scheme requirements, based on a maximum lot yield of up to approximately 67 dwellings;
- The internal accessway has been designed to accommodate a 10.5 metre service vehicle to allow for waste collection;
- The surrounding local roads are expected to remain below the capacity for a Level 1 Access Street and are therefore considered appropriate; and
- Based on a maximum lot yield of up to approximately 67 dwellings, planned development will have a minimal effect on the operation of the Springvale Road / Paterson Road signalised intersection and the Henderson Road / Corrigan Road intersection, with negligible added queues or delays to existing motorists.

Appendix A Swept Path Diagrams

SUBJECT SITE
15-29 COOMOORA ROAD



SUPERIOR PAK 10.5M

	meters
Width	: 2.50
Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 38.5

LEGEND

- – – – – – DESIGN VEHICLE SWEPT PATHS SHOWN DASHED
- ---------- 300mm CLEARANCE ENVELOPE SHOWN DOTTED

CAD File: N:\Projects\2018\180024\Drawings\180024SPA100.dgn

Date Plotted: 10-03-202011:15:59

onemilegrid
TRAFFIC ENGINEERING
56 Down Street, Collingwood, VIC 3066
Email: info@onemilegrid.com.au Web: www.onemilegrid.com.au
Phone (03) 9939 8250

Scale
1:500 @ A3
0 2.5 5 10

Drawing Title
15-29 COOMOORA ROAD, SPRINGVALE SOUTH
WASTE VEHICLE SITE ACCESS
SWEPT PATH ANALYSIS

Designed	Approved	Melway Ref
RG	RBH	88 K3

Project Number	Drawing Number	Revision
180024	SPA100	F