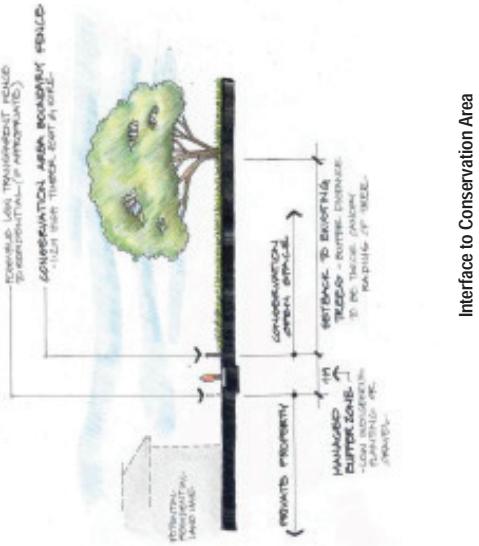


5.5 OPEN SPACE AND RECREATION	5.5.1 Objectives	5.5.2 Public Open Space - Active / Structured Recreation
	<p>The objective of the provision of open space and recreation at Aurora is to create an open space system that:</p> <ul style="list-style-type: none"> • provides a diversity of recreation opportunity within the context of Epping North; • protects sites of greatest ecological and cultural value; • provides a wide range of public open spaces, ranging from local to neighbourhood to district; • complies with the Scheme requirements. <p>The public open space strategy for Aurora responds directly to the forecast number and needs of the expected population. Provision, in terms of quality, quantum, variety and distribution will be in accordance with Scheme requirements. An open space system is proposed that protects and enhances natural and cultural features within a series of highly accessible open spaces that provide a diverse range of recreation opportunities for both passive / unstructured and active / structured recreation.</p>	<p>The open space network within Aurora comprises active open space, passive open space and conservation areas, which preserve sites of cultural and ecological significance. These spaces are linked by the local and regional walking and cycling network.</p> <p>Recreation facilities established on active open spaces are strongly influenced by the principles of co-location and shared use, walking and cycling access, safety, attractive design and maximising opportunities for the community to enhance health through sport and activity.</p> <p>Active open spaces (total of approximately 19 hectares unencumbered) are used primarily for organised sporting activities and include playing fields and hard surface courts, including pavilions in some locations. The ovals are located in pairs for ease of match scheduling and to maximise the use of pavilions and car parking. Active open spaces are located to provide an equitable distribution of facilities used at a district level as a minimum. Wherever possible, the peripheral areas of these spaces will be developed as passive open space to provide for less formal recreation needs.</p> <p>The ASR report identifies a range of active / structured recreation facilities required at Aurora. The following table outlines the recommendations of the ASR report and the provision of facilities at Aurora. The costs and obligations for the delivery of the facilities are specified in the agreement in accordance with Section 173 of the Planning and Environment Act 1987 signed by the relevant parties before the subject land was rezoned.</p>

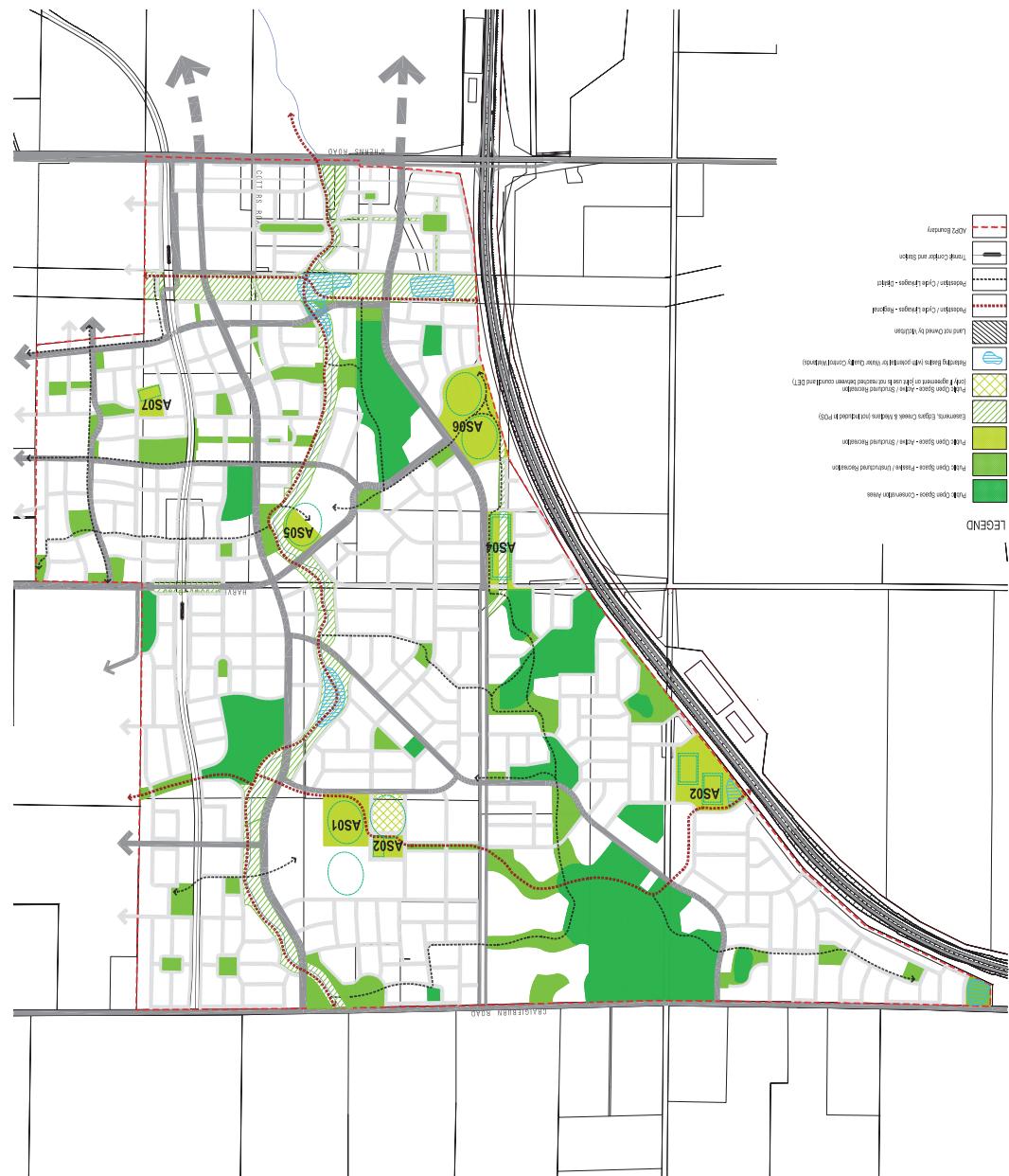
FACILITY	ASR REPORT	PROVISION AT AURORA	COMMENT	FACILITY	ASR REPORT	PROVISION AT AURORA	COMMENT
Active / structured open spaces							
Cricket / football ovals	5	5	One oval is intended to be provided on the primary / secondary school site in the north of Aurora, in partnership with DET. One junior shared oval is provided predominantly on a DET primary school in the centre of the subject land between Harvest Home Road and O'Herns Road. Three ovals are provided on land to be transferred to Whittlesea. Two of these ovals are in the south west portion of Aurora adjacent to the Craigieburn Bypass. The other oval lies between the DET primary / secondary school and the independent primary school. Facilities co-located with DET schools will be subject to a joint use agreement to ensure community access.	Fitness / aquatic centre	0.4	0	The regional aquatic centre identified in the ASR report will be provided at the main recreational precinct near the intersection of Harvest Home Road and Epping Road. A site for a commercial fitness / learn-to-swim centre has been identified adjacent to the northern primary activity centre with delivery subject to commercial interest. This facility will respond to local demand for an indoor fitness facility and will operate independently from the regional aquatic centre.
Indoor recreation facilities							
Miscellaneous sporting fields	1.25	0	As only two miscellaneous sporting fields (for example, for baseball and softball) are proposed in the entire ENSP area, the ASR report recommends that these fields are best located together in the main recreational precinct near the intersection of Harvest Home Road and Epping Road.	Basketball / netball courts	5	3	The basketball / netball courts will be provided in conjunction with the DET schools. Facilities co-located with DET schools will be subject to a joint use agreement to ensure community access.
Sporting pavilions	6	6	One sporting pavilion is proposed to be provided at each of the south west football / cricket facility and the south east tennis facility. Two pavilions are associated with the oval and the tennis courts facility between the DET primary / secondary school and the independent primary school. One pavilion is provided at each of the north west soccer facility and the Scanlon Drive soccer facility.	Tennis courts	8	8	The tennis courts will be provided in one group of four courts within active public open space adjacent to Section A of Aurora. An additional four courts facility is provided in the active public open space between the DET primary / secondary school and the independent primary school.
Soccer pitches	5	4	One two-pitch facility is on the west side of Scanlon Drive. The other two-pitch facility is in the north west portion of the subject land, adjacent to the Craigieburn Bypass.	Bocce links	2	4	Two, two-pitch bocce facilities will be incorporated in public open spaces within Aurora. Exact locations will be agreed with Whittlesea officers at a more detailed planning stage.
Lawn bowls facility	1	0	The ASR report nominates the Epping RSL Club on Harvest Home Road as the preferred location for the lawn bowls facility.				

An example of this interface treatment is illustrated below.



<p>5.5.3 Public Open Space - Passive / Unstructured Recreation</p> <ul style="list-style-type: none"> A number of passive / unstructured recreation spaces (total of approximately 31 hectares unencumbered) are proposed at Aurora. This is the dominant type of public open space and can accommodate a variety of spontaneous individual or group activities such as children's play, walking, picnics, barbecues and bird watching. Passive / unstructured public open space will be distributed throughout Aurora in a hierarchy of sizes, combined with a variety of facilities and recreation opportunities. The hierarchy and distribution is as follows. <ul style="list-style-type: none"> District parks (1 to 5 hectares) are primarily along Edgars Creek. In some locations, these parks overlap or combine with active / structured public open space. The passive / unstructured component of the district parks will service the residents within 800 to 1000 metres. These parks will provide a higher level of facilities, accommodating use by larger groups. The typical range of facilities to be provided in the district parks could include: <ul style="list-style-type: none"> multiple seating areas; multiple barbecue facilities; pergolas / shelters, some suitable for use by larger groups; larger playground areas for children up to the ages of 10 to 12; paved areas suitable for basketball / netball rings and / or rebound walls; informal ball play areas with a minimum dimension of between 60 and 80 metres; sub-spaces of various sizes that control and separate the play areas from the areas for more contemplative recreation; car parking at the edge or perimeter of the park. Local parks (500 to 2000 square metres) are distributed throughout Aurora and will be used as a focus for medium to higher density dwellings. These parks will service the residents within approximately 200 to 400 metres and are likely to be used for short duration recreation activities. The local parks will be designed to accommodate seating, play areas suitable for small children and informal gathering spaces. <ul style="list-style-type: none"> Neighbourhood parks (2000 to 5000 square metres) are the most dominant type of passive / unstructured recreation public open space at Aurora. These parks will be within approximately 400 to 500 metres of the majority of dwellings. The neighbourhood parks will facilitate a broader range of recreation opportunities for a wider range of potential users. The typical range of facilities to be provided in these parks could include: <ul style="list-style-type: none"> seating; barbecue facilities; pergolas / shelters; play equipment for children up to the ages of 8 to 10; paved areas suitable for basketball / netball rings and / or rebound walls; informal ball play areas with a minimum dimension of 50 metres; sub-spaces of various sizes that control and 	<p>/ manage the land as a public asset. Public access, once in public ownership, to some conservation areas will be restricted to protect significant habitat or other features. These areas could be designed to allow access at the perimeter, in selected portions or on contained paths, which combined with an interpretive program, provide recreational benefit.</p> <p>The conservation areas are located on and around naturally occurring features. Fortunately, these features and thus the areas are well distributed generally throughout Aurora.</p> <p>The landscape, ecological and cultural heritage assessments of Aurora identified the key sites of landscape, visual, environmental and cultural significance, which often coincided. The following sites are of greatest value and will be protected within conservation areas.</p> <ul style="list-style-type: none"> The large stand of River Red Gums in the north west of Aurora - which will be incorporated in an area that will be used to preserve and enhance the trees. Subject to future more detailed assessment, design and management works, access trails could be provided around the perimeter and through this area with an interpretive program. A significant complex of stony rises in the north east of the subject land adjacent to Edgars Creek and between Craigieburn Road East and Harvest Home Road. A small stony rise including remnant vegetation between the Craigieburn Bypass and Scanlon Drive. A large north-south complex of stony rises west of Edgars Creek between Harvest Home Road and O'Hens Road. This area could be crossed by an elevated timber boardwalk and gravel path. A small stony rise east of Edgars Road and south of the northern primary activity centre. <p>It is noted that the easterly extent of the north-west conservation area is pending a detailed flora and fauna assessment.</p> <p>As a matter of principle all conservation areas will have a road frontage, however, where Council agrees otherwise a 4 metre paper road is required, which includes a 1.5 to 2.5 metre path and landscaping.</p>
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Open Space



5.5.5 Public Open Space Links

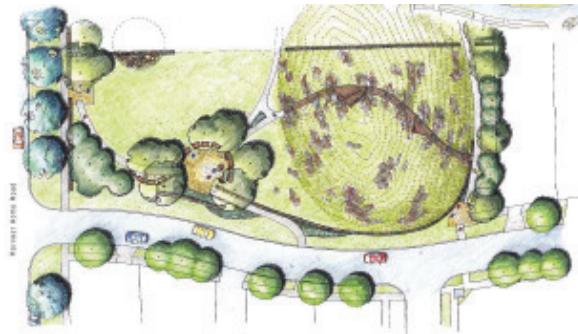
Aurora contains the following main public open space links, which are in accordance generally with the EIS/SP.

- Edgars Creek, which will be developed as a major linear public open space 'spine' through Aurora, connecting Craigieburn Road East in the north with O'Herns Road and potentially the Cooper Street Employment Area in the south.
- A north-south link from the River Red-gum conservation area in the north west to the western end of the power easement in the south. This link comprises a series of parks and wide vegetated paths.
- An east-west link across the northern portion of the subject land, connecting the Craigieburn Bypass, River Red-gum conservation area, Edgars Creek and the east boundary of Aurora. This link comprises a series of parks and wide vegetated paths, including paths along the edges of the north west soccer fields and DET primary school, the northern local activity centre and tennis courts and the DET primary / secondary school.
- An east-west link along the edge of the power easement in the south of Aurora.

5.5.6 Public Open Space Design and Planting

The detailed design of the public open spaces will be resolved as the exact size and levels of the spaces are determined through the subdivision and engineering design process. The landscape design intention for Aurora is to create public open spaces that

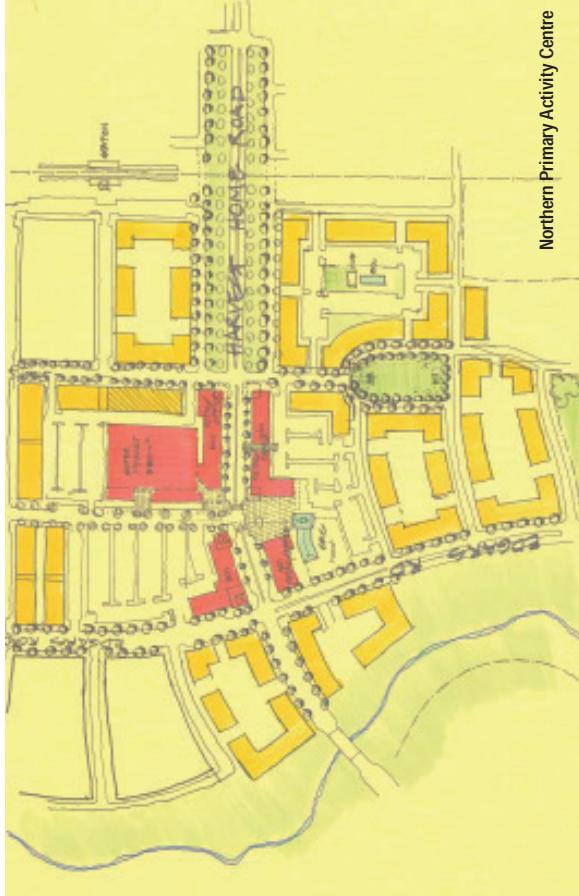
- feature predominantly native (including indigenous) species, particularly in the upper canopy;
- use exotic trees to reflect the cultural heritage of a particular space, create visual highlights or fulfil specific solar access requirements;
- include materials that reflect the cultural heritage of the subject land, including stone walls and large timbers;
- provide an environmental conservation and cultural heritage interpretive program, where appropriate;
- incorporate WSUD treatments for stormwater quality improvement;
- embrace the use of low embodied energy, low toxicity, recycled or renewable materials and resources for their construction.



The selection of particular trees for public open spaces will be refined and reviewed over time. An indicative list of species (excluding the conservation areas) is opposite.

INDICATIVE PLANT SPECIES	EVERGREEN (E) / DECIDUOUS (D)	TYPICAL HEIGHT AT MATURITY (metres)
Weeping Myall (<i>Acacia pendula</i>)	E	5-10
Black She-Oak (<i>Allocasuarina littoralis</i>)	E	6-10
Rose She-Oak (<i>Allocasuarina torulosa</i>)	E	10-15
Bottlebrush (<i>Callistemon 'Harkness'</i>)	E	3-6
Bottlebrush (<i>Callistemon salignus</i>)	E	4-6
Lemon-scented Gum (<i>Corymbia citriodora</i>)	E	15+
Spotted Gum (<i>Corymbia maculata</i>)	E	15+
Yellow-top Mallee Ash (<i>Eucalyptus luehmanniana</i>)	E	5-6
Whistick Mallee Ash (<i>Eucalyptus multicaulis</i>)	E	6-10
Brittle Gum (<i>Eucalyptus mannifera</i> ssp <i>preecox</i>)	E	10-15
Narrow-leaved Sally (<i>Eucalyptus moorei</i>)	E	3-6
Snow Gum (<i>Eucalyptus pauciflora</i>)	E	10-15
Red Box (<i>Eucalyptus polyanthemos</i>)	E	10-15
Red Ironbark (<i>Eucalyptus sideroxylon</i>)	E	15+
Pin Cushion Hakea (<i>Hakea laurina</i>)	E	4-6
Lilly Pilli (<i>Syzygium paniculatum</i>)	E	10-15

5.7 RETAIL AND COMMERCIAL	<p>5.7.2 Retail and Commercial Facilities</p> <p>As noted earlier, a variety of retail and commercial facilities will be required to serve the residents of Aurora. Urbis JHD Pty Ltd anticipates that the full development of Aurora will support the following hierarchy of retail and commercial facilities.</p> <p>The retail and commercial objectives of Aurora are to:</p> <ul style="list-style-type: none"> • provide primary activity centres that are destination places with their own distinct identity; • provide a mix of retail and commercial opportunities for residents; • provide community functions and residential development within the primary activity centres that are complementary to the retail and commercial uses; • design retail and commercial buildings to encourage active street frontages and pedestrian activity; • provide a staged delivery of retail and commercial uses with emphasis on the earliest possible provision; • create an energy within the primary activity centres that supports the viability of retail and commercial uses. 	<p>incorporates community facilities and residential development;</p> <ul style="list-style-type: none"> • integrates into surrounding residential and non-residential development, as appropriate; • is pedestrian-oriented by encouraging adjacent higher density residential development and carefully the subdivision layout, including roads; • provides an active centre or focal point, such as a plaza or public building; • creates active street frontages; • provides a high level of amenity. <p>Higher density residential development will be constructed in and around the primary activity centres. The density of this development will transition from higher density at the core to a lesser density at the edge. The built form of development is intended to comprise a mix of low-rise apartments and shop-top (where appropriate), attached, semi-detached, and detached dwellings. Heights and setbacks of buildings will be consistent with the intention of achieving higher density development and are likely to require alternative design parameters.</p>	<p>spaces adjacent to the public transport corridor equally spread either side of the station;</p> <p>southern primary activity centre - approximately 500 spaces in the power easement spread equally on either side of the public transport corridor.</p> <p>The car parking associated with the public transport stations will be designed and landscaped appropriately to minimise potential adverse amenity effects on the development surrounding the stations through vehicle movements, noise and light spillage.</p>
5.7.1 Objectives	<p>The retail and commercial objectives of Aurora are to:</p> <ul style="list-style-type: none"> • provide primary activity centres that are destination places with their own distinct identity; • provide a mix of retail and commercial opportunities for residents; • provide community functions and residential development within the primary activity centres that are complementary to the retail and commercial uses; • design retail and commercial buildings to encourage active street frontages and pedestrian activity; • provide a staged delivery of retail and commercial uses with emphasis on the earliest possible provision; • create an energy within the primary activity centres that supports the viability of retail and commercial uses. 	<p>(a) General Primary Activity Centres Response</p> <p>In accordance with the provisions of Melbourne 2030, it is proposed to develop primary activity centres that:</p> <ul style="list-style-type: none"> • are a focus for high quality development, activity and living for the whole community; • broaden the base of activity in centres to include a wider range of services over longer hours and restrict out-of-centre development; • locate a substantial proportion of new dwellings close to the activity centres, which offer good access to services and public transport. <p>A 'main street' model for primary activity centre development is proposed therefore, which:</p> <ul style="list-style-type: none"> • is located central to the catchment area that it serves; • is convenient to public transport and other infrastructure; 	<p>spaces adjacent to the public transport corridor equally spread either side of the station;</p> <p>southern primary activity centre - approximately 500 spaces in the power easement spread equally on either side of the public transport corridor.</p> <p>The car parking associated with the public transport stations will be designed and landscaped appropriately to minimise potential adverse amenity effects on the development surrounding the stations through vehicle movements, noise and light spillage.</p>



(b) Northern Primary Activity Centre

Urbis JHD Pty Ltd considers that the northern primary activity centre is located appropriately at the intersection of Harvest Home Road and Edgars Road. This location will provide exposure to north-south vehicle traffic along Edgars Road, which will be largely Aurora residents, as well as east-west vehicle traffic along Harvest Home Road, which will include residents of future developments to the east.

- Urbis JHD Pty Ltd anticipates a combined floor space of 20,000 square metres in the two primary activity centres. The northern primary activity centre is expected to comprise a total of approximately 6000 square metres of retail and non-retail floorspace, including a supermarket and additional speciality shops, although the centre may organically develop to a different size.
- The south west corner of the northern primary activity centre incorporates a CAC and connects to public open space, Edgars Creek and a DET primary school. The walking / cycling paths that lead to the primary school and extend along Edgars Creek will provide access to the centre. A public transport station / interchange adjoins the northern primary activity centre to the east. The sketch opposite shows a potential layout for the northern primary activity centre.



(c) Southern Primary Activity Centre

Urbis JHD Pty Ltd considers that the southern primary activity centre is located appropriately for the following reasons.

- It is on Edgars Road, which is the main north-south vehicle route through Aurora and provides convenient access to all Aurora residents.
- It is immediately north of OHens Road, which will be the main east-west link through Whittlesea. The passing vehicle traffic will comprise Aurora residents, Cooper Street Employment Area workers and commuter residents from future developments to the east of Aurora using the interchange with the Craigieburn Bypass. The centre will have exposure therefore to a broad population base.
- It is served by a public transport station / interchange, which provides an additional reason for people to visit the centre and increases its potential as a community hub.
- It is close to the secondary activity centre on the north side of OHens Road, which provides the opportunity for users of this to also use the southern primary activity centre in the same trip.

Urbis JHD Pty Ltd expects that the southern primary activity centre will comprise approximately 14,000 square metres of the anticipated combined 20,000 square metres of retail and non-retail floorspace in the two primary activity centres, although the centre may organically develop to a different size. The southern primary activity centre will include two supermarkets, a discount department store and additional speciality shops.

The form of the southern primary activity centre will develop over time and in response to market demands however, it is intended that residential development will eventually occur above the retail and non-retail floorspace. A walking / cycling path extends along the north boundary of the centre in the power easement and a CAC adjoins to the south. The sketch opposite shows a potential layout for the southern primary activity centre.

<p>(d) Secondary Activity Centre</p>	<p>Urbis JHD Pty Ltd considers that the secondary activity centre is located appropriately for the following reasons.</p> <ul style="list-style-type: none"> • OHens Road will be the main east-west link through Whittlesea. The passing vehicle traffic, including that associated with the Cooper Street Employment Area on the south side of OHens Road, will provide the centre with exposure to a broad population base. • The interchange with the Craigieburn Bypass, which forms part the major road link between Sydney, Canberra and Melbourne, provides good access and exposure to the centre. • The proximity to the southern primary activity centre, including the public transport station / interchange, provides the opportunity for users of this centre to also use the secondary activity centre in the same trip. <p>While it is difficult to estimate the amount of commercial floorspace that the location and surrounding population will support, a review of developments of this scale and type, indicate that the size of the commercial floorspace component can vary significantly from 1500 to over 5000 square metres.</p>	<p>uses that will assist the integration of the secondary activity centre, the southern primary activity centre and the Cooper Street Employment Area.</p> <p>West of Edgars Creek, the uses are expected to be influenced by the proximity to the interchange with the Craigieburn Bypass. A service station, motor sales and repairs, take away food premises, offices and restricted retail premises are all likely uses.</p> <p>The desired built form for the secondary activity is for multi storey office-style development that creates a continuous 'street wall' as much as possible. VicUrban will prepare and distribute design controls for all lots in the secondary activity centre to guide buildings and landscape towards a dense, urban outcome. The design controls will provide detail on the approach to and implementation of building siting and design, building materials, vehicle access, car parking and landscape design.</p> <p>Vehicle access to the secondary activity centre will be provided generally by service roads adjacent to OHens Road and the north-south streets of Scanlon Drive, Cottens Road and Edgars Road. Access to the mid-block portions of the centre will be provided by the lower order, east-west streets that will separate the secondary activity centre from the tertiary activity centre and the residential development to the north.</p> <p>The land use in the secondary activity centre is intended to reflect the 'Business / Employment uses identified in the Cooper Street Employment Area to the south. This approach will reinforce the 'gateway' role of OHens Road, an important regional street, by flanking both sides with similar land uses. The land uses identified in the Cooper Street Development Plan (Part 1) include "corporation headquarters, offices and commercial buildings; high technology research and development, car showrooms, service uses and low density light industrial with quality facade treatments".</p> <p>Urbis JHD Pty Ltd anticipates that the uses in the secondary activity centre will differ east and west of Edgars Creek.</p> <p>East of Edgars Creek, the uses are expected to be influenced by the proximity to the southern primary activity centre. A mix of offices, restricted retail premises and indoor recreation facilities are possible</p> <ul style="list-style-type: none"> • New businesses will have the opportunity to build facilities to cater for specific requirements. • The Craigieburn Bypass interchange at OHens Road and easy access to the Western Ring Road provides businesses with good access to airports, ports, distribution centres and the required workforce. The visibility of the precinct from the Craigieburn Bypass may be also important for some businesses. • The future residents of Aurora and other developments to the east are expected to provide businesses with access to an appropriately skilled workforce. The centre is also close to complementary uses in the secondary activity centre and the Cooper Street Employment Area. • The size of the centre may be sufficient to attract like industries (possibly technology-related), which may create advantages in terms of efficiency of scale, business incubation and the transfer of new ideas or technologies. <p>Urbis JHD Pty Ltd considers that the local activity centres are distributed appropriately to ensure that all residents have access to convenience retailing, particularly those further from the primary activity centres. The local activity centres are also located generally on main streets or adjacent to other community uses such as schools and public open space.</p> <p>It is not intended that the local activity centres cater for the weekly shopping requirements of residents, just the everyday convenience needs such as newspapers, bread and milk. Urbis JHD Pty Ltd considers that the centres should not be large in scale and should avoid a major anchor tenant such as a supermarket. Recommended retailers include a newsagent, small grocery store and take away food premises.</p> <p>Urbis JHD Pty Ltd considers that the tertiary activity centre is located appropriately for the following reasons.</p> <ul style="list-style-type: none"> • There is minimal existing similar office development in the area to compete with office space at Aurora.
		<p>(e) Tertiary Activity Centre</p> <p>Urbis JHD Pty Ltd considers that the tertiary activity centre is located appropriately for the following reasons.</p> <ul style="list-style-type: none"> • There is minimal existing similar office development in the area to compete with office space at Aurora.

TRANSPORTATION SYSTEM

- Spreading traffic to a range of streets to provide drivers with a multiple choice of routes for the same trip and to create an environment where it is appropriate for cyclists and vehicular traffic to share the street carriageway.

The transportation objectives for Allura are as follows

- Early delivery of transport services and infrastructure.
 - Extend the public transport corridor from Lalor station to provide a public transport linkage between Aurora and the Melbourne central activities district, passing close to Epping Plaza and the Northern Hospital.
 - Provide a streetbased transport interchange in the eastern part of the southern primary activity centre.
 - Construct a highly interconnected street network with strong accessibility to the northern and southern primary activity centres and public transport stations/interchanges, including many direct neighbourhood connector streets that can be used efficiently as bus routes.
 - Develop a broad mix of land uses that locates dwellings, retail, educational, employment and community facilities close together for a high proportion of future residents of Aurora, enabling many people to choose to walk or cycle

- Concentrate housing within walking distance of the public transport stations / interchanges and the non-residential activities that are accessed conveniently by non-motorised transport.

- Limit larger, land extensive educational and recreational facilities within the walkable catchments of the public transport network / independent of residential density.

- Incorporate pedestrian-friendly traffic management
- Public transport
- Commercial use and thus the potential support for public transport
- Intercargos to maximise resource use

Create safe and comfortable recreational use of streets for all potential users.

Spread traffic to a range of streets to provide drivers with

- Spread traffic to a range of streets to provide drivers with a multiple choice of routes for the same trip and to create an environment where it is appropriate for cyclists and vehicular traffic to share the street carriageway.
 - Encourage multi-purpose trips.
 - Promote the health and environmental benefits of non-motorised transport.

The transportation objectives for Allura are as follows

- Early delivery of transport services and infrastructure.
 - Extend the public transport corridor from Lalor station to provide a public transport linkage between Aurora and the Melbourne central activities district, passing close to Epping Plaza and the Northern Hospital.
 - Provide a street-based transport interchange in the eastern part of the southern primary activity centre.
 - Construct a highly inter-connected street network with strong accessibility to the northern and southern primary activity centres and public transport stations/interchanges, including many direct neighbourhood connector streets that can be used efficiently on bus routes.

- Develop a broad mix of land uses that locates dwellings, retail, educational, employment and community facilities close together for a high proportion of future residents of Aurora, enabling many people to choose to walk or cycle where can be done without loss of open space.

- Concentrate housing within walking distance of the public transport stations / interchanges and the non-residential activities that are accessed conveniently by non-motorised transport.

- Limit larger, land extensive educational and recreational facilities within the walkable catchments of the public transport network / independent of residential density

- Incorporate pedestrian-friendly traffic management
- Public transport
- Commercial use and thus the potential support for public transport
- Intercargos to maximise resource use

Create safe and comfortable recreational use of streets for all potential users.

5.8.2 Future Vehicle Traffic Volumes

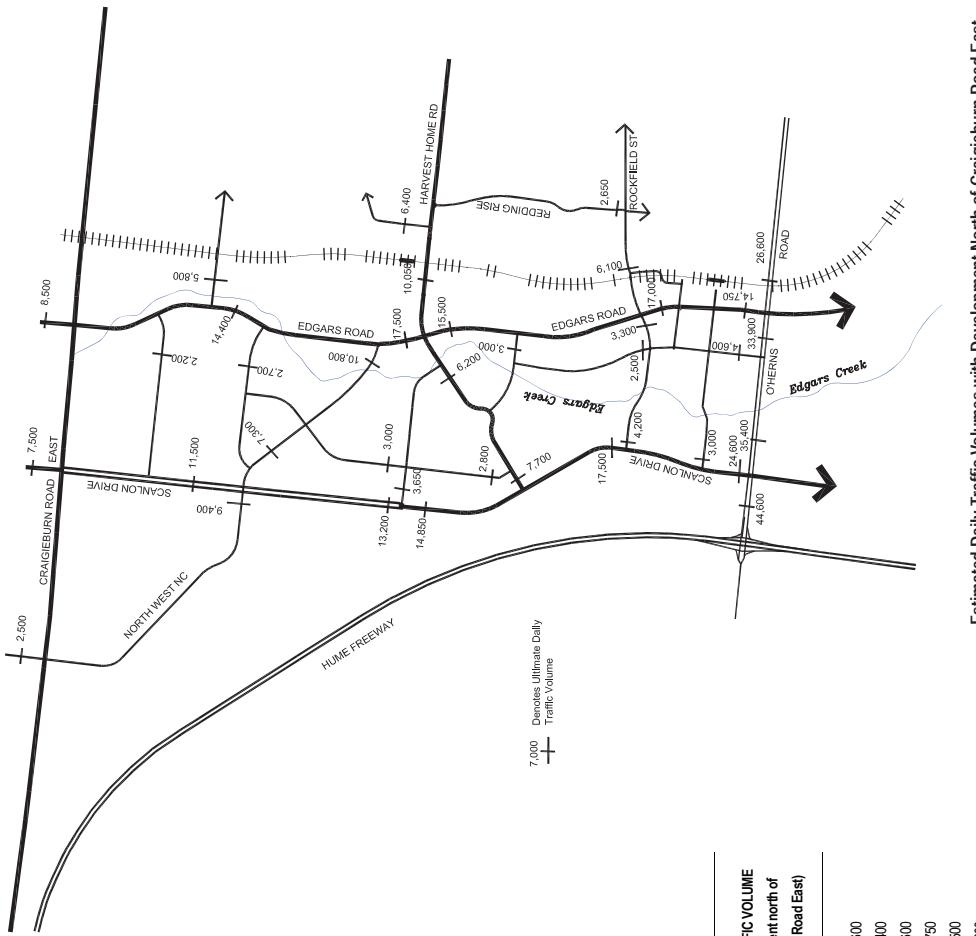
The diagram opposite shows the estimated daily traffic volumes with development north of Craigieburn Road East.

The table below sets out the estimated daily traffic volumes (with development north of Craigieburn Road East) for key streets in the street network of Aurora. Other streets within Aurora are not listed because the daily traffic volume is estimated to be less than 3000 vehicle movements. These estimates are based on each dwelling

generating ten vehicle movements per day.

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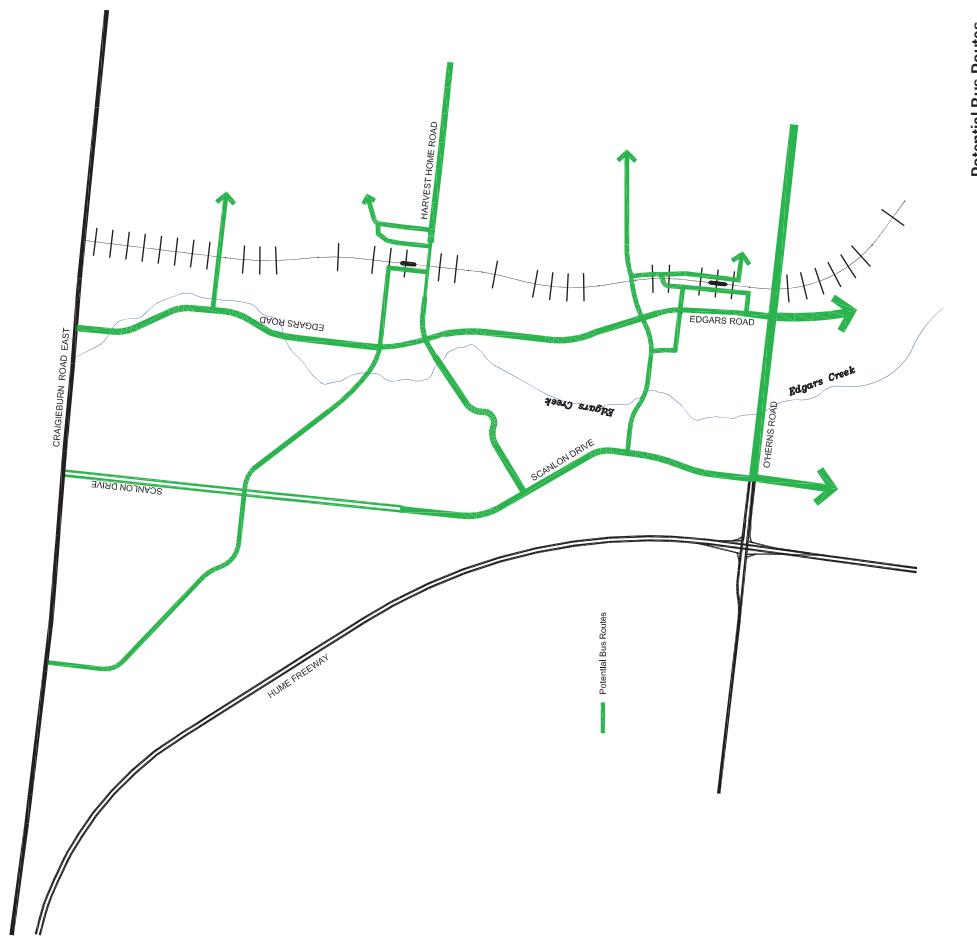
STREET	LOCATION	DAILY TRAFFIC VOLUME (Development north of Craigeburn Road East)
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Estimated Daily Traffic Volumes with Development North of Craigieburn Road East

STREET	LOCATION	DAILY TRAFFIC VOLUME (Development north of Craigieburn Road East)
O'Hens Road	At Craigieburn Bypass ramps	44,600
O'Hens Road	Scanlon Drive to Edgars Road	35,400
O'Hens Road	East of Edgars Road	26,600
Edgars Road	North of O'Hens Road	14,750
Edgars Road	North of Harvest Home Road	17,300
Scanlon Drive	North of O'Hens Road	24,600
Scanlon Drive	South of Harvest Home Road	17,500
	West of Edgars Road	6,200
	East of Edgars Road	10,150
Harvest Home Road		
Harvest Home Road		

<p>5.8.3 Public Transport</p> <p>(a) Rail</p> <p>The DOI has prepared a preliminary concept plan and longitudinal section of the grades for the extension of heavy rail from Lalor railway station to Aurora and possibly to Donnybrook and beyond. VicUrban has worked and will continue to liaise with the DOI in relation to the general alignment of the public transport corridor, station locations, car parking provisions, street crossing locations and grades to accommodate the drainage requirements of Aurora.</p> <p>The preliminary concept plan and longitudinal section create the following outcomes in general.</p> <ul style="list-style-type: none"> • The rail level close to the existing surface level at OHems Road, which will allow the railway line to pass over OHems Road and create an appropriate interface with the southern primary activity centre. • The rail level slightly below the existing surface level at the stations, which are to the north of OHems Road and Harvest Home Road. This will allow reasonably convenient pedestrian access across the railway line. • The rail level slightly below the existing surface level through the remainder of Aurora. This will allow the best acoustic outcomes as the major noise source is at the rail track. <p>(b) Bus</p> <p>The principles behind this network include the following:</p> <ul style="list-style-type: none"> • all activity centres, education centres, CAC and active public open spaces within Aurora and the ENSP area are linked with bus routes; • bus routes within Aurora have a strong connection to the public transport corridor and stations, interchanges; the majority of dwellings within Aurora are within about five minutes walking time of a bus route. <p>Any underground structures which affect proposed public transport will be designed to the satisfaction of the Department of Infrastructure.</p>	<p>proposed public transport corridor will be designed to accommodate grade separation unless otherwise agreed by the Minister for Public Transport.</p> <p>A potential bus network plan for Aurora has been developed in consultation with the DOI, Whittlesea and bus service operators and is shown opposite.</p> <p>The cross sections of the streets that are potential bus routes will be designed to the minimum standards agreed with the DOI and Whittlesea.</p> <p>The first stage of the bus network plan is already in place with Bus Route 575 operating between Section A of Aurora and Thomastown railway station, via the Northern Hospital, Epping Plaza and Epping railway station.</p> <p>All crossings including road, pedestrian and cycle paths of the</p>
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Potential Bus Routes

5.8.4 Arterial Street Design

(b) Harvest Home Road

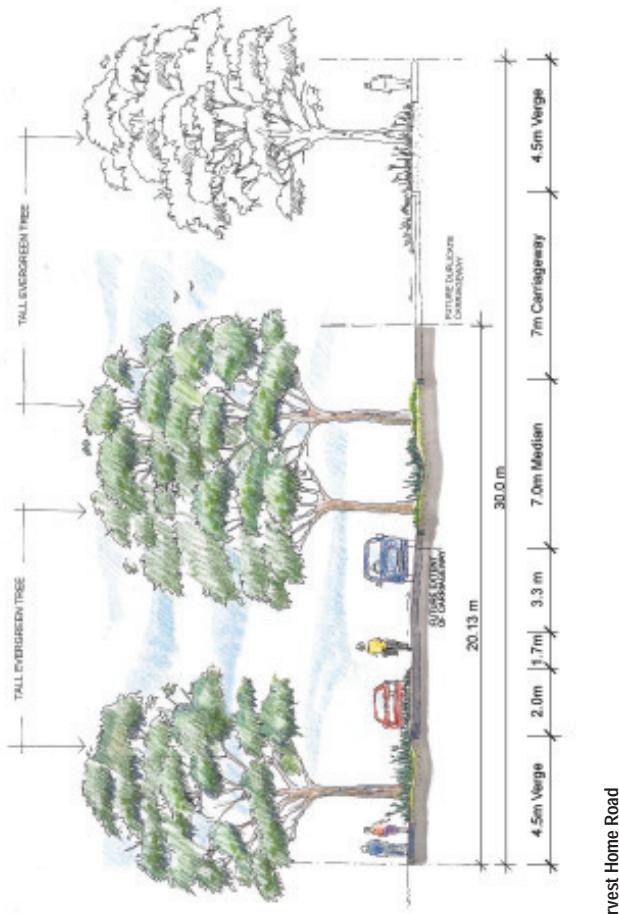
There are five arterial roads or streets within or adjacent to Aurora - Craigieburn Road East, Harvest Home Road, O'Hens Road, Edgars Road and Scanlon Drive. Each of these has differing requirements for streetscape, traffic volume and composition, interface with abutting land uses, vehicle speed environment and access and vehicle parking. A specific design approach has been used for each in consideration of these requirements, rather than applying a generic cross section design.

The arterial network at Aurora has been designed to provide sufficient land for any widening required to accommodate the traffic volume generated by development north of Craigieburn Road East. Developers within Aurora will only construct streets to accommodate the traffic generated by development in the ADP2 area.

(a) Craigieburn Road East

Craigieburn Road East is a primary arterial main road and will be managed by VicRoads. Any widening required will be on the north side of the reservation. Aurora will provide an appropriate level of access management using service roads (12 metres wide reservation) or internal streets to provide access to the properties abutting Craigieburn Road East. Intersections will be kept to a reasonable minimum.

Harvest Home Road is an important internal east-west route in Epping North. The forecast traffic volume for Harvest Home Road from Scanlon Drive to Epping Road is between 5,000 and 10,000 vehicles per day, depending on location. The appropriate street type includes a clear travel lane in each direction, a wide central median, on-street parking and cycling lanes adjacent to the parking lanes. A transition will be necessary from the cross section of Harvest Home Road abutting Section A of Aurora.



Harvest Home Road

(c) O'Herns Road

O'Herns Road is the major east-west arterial and provides an important connection to the Craigieburn Bypass. Traffic volumes are expected ultimately to reach levels in excess of 40,000 vehicles per day at the interchange and possibly more than 25,000 vehicles per day east of Edgars Road.

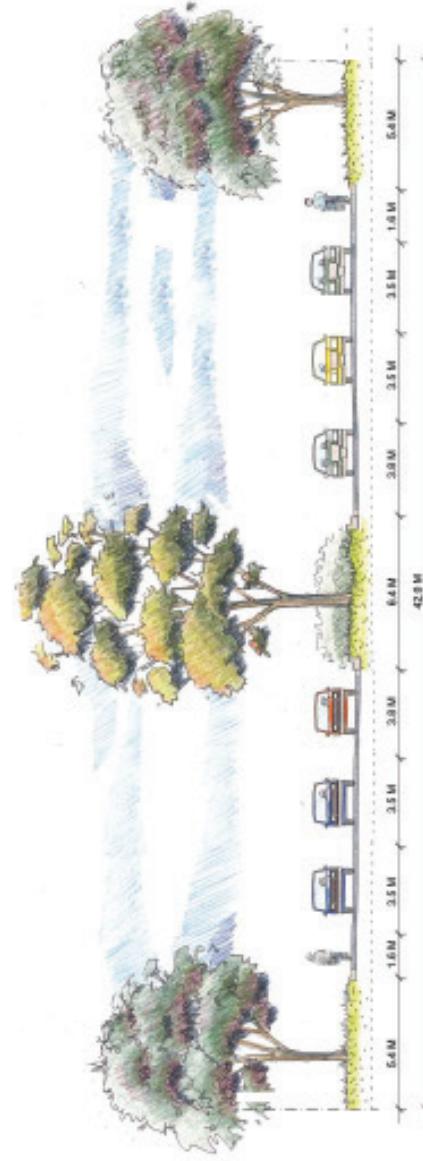
As land uses, traffic volumes and the desirable speed environment change along O'Herns Road, it will need to be modified so that it is not a divisive element in the community. It must still accommodate the expected traffic volume at an appropriate level of service. The various cross sections for O'Herns Road are described below.

- **Craigieburn Bypass to Scanlon Drive**

A sixlane cross section is proposed for the segment of O'Herns Road between the Craigieburn Bypass and Scanlon Drive. The median will vary in width between the interchange (to be designed by VicRoads) and the Scanlon Drive intersection (14 metres less turning lanes).

- **Scanlon Drive to east boundary of Aurora**

O'Herns Road from Scanlon Drive to the east boundary of Aurora is within the walkable catchment of the southern primary activity centre and public transport station / interchange. A significant part of the Cooper Street Employment Area is also within the walkable catchment of these facilities provided that the crossing of O'Herns Road is encouraged by a pedestrian compatible environment. A 60 kilometres per hour speed limit between Scanlon Drive and approximately 600 metres east of Edgars Road is required therefore to provide such an environment. The section across shows a mid-block design for O'Herns Road within the walkable catchment of the southern primary activity centre. The section makes for provision for the continuation of six lanes through this segment of O'Herns Road however, it will be constructed with four travel lanes and a median 14 metres wide.



O'Herns Road - Scanlon Drive to East Boundary of Aurora

(d) Edgars Road

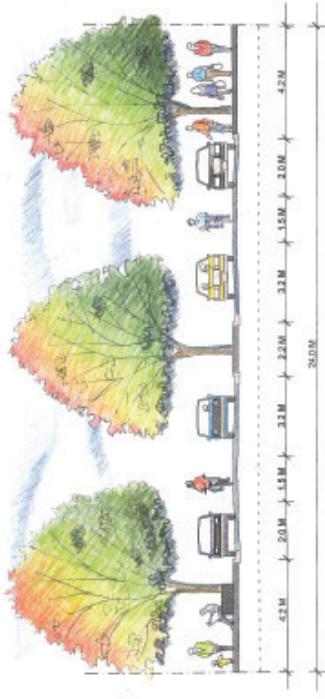
Edgars Road is an important north-south arterial through Aurora, although it will be supported strongly by Scanlon Drive and other parallel routes, particularly near the southern primary activity centre. The traffic modelling indicates an ultimate daily flow of about 17,000 vehicle movements within the southern and northern primary activity centres. This is a deliberate design outcome so that a two-lane main street can be used within the primary activity centres, enabled through the supporting, virtually parallel routes that also provide connections to O'Herns Road.

- **Through southern and northern primary activity centres**

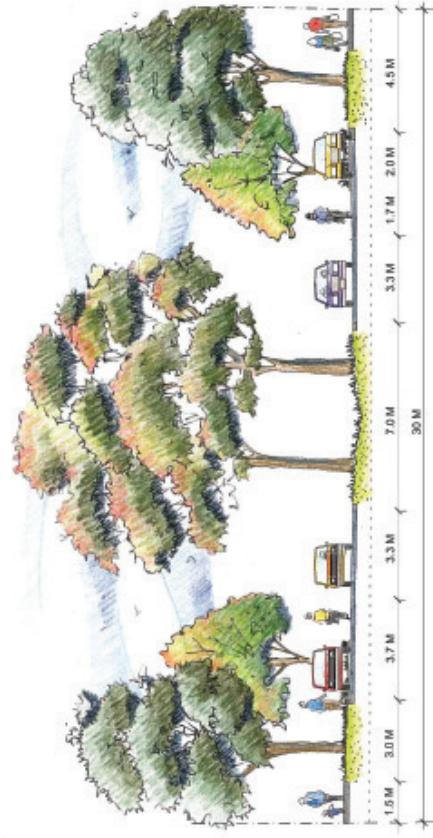
The main street sections of Edgars Road will have a median 2.2 metres wide, manoeuvre lanes adjacent to the parking lanes and a reservation width of 24 metres. This form of street design is proposed so that pedestrians can cross virtually anywhere and so that ambient traffic speeds are kept low through disruptions to the flow. The travel lane width has been kept narrow deliberately to discourage high vehicle speeds. One objective is to enable people on the footpath to see what is on offer in the shop windows on the other side of the street.

- **Outside southern and northern primary activity centres**

Outside the southern and northern primary activity centres, a two-lane divided cross section is proposed for Edgars Road, with a central median 7 metres wide and a lane configuration to suit a 60 kilometres per hour environment. A travel lane 3.3 metres wide marked adjacent to the median will allow a wide kerbside lane that can accommodate a parking lane (if required) and cycle lane.



Edgars Road - Through Southern and Northern Primary Activity Centres



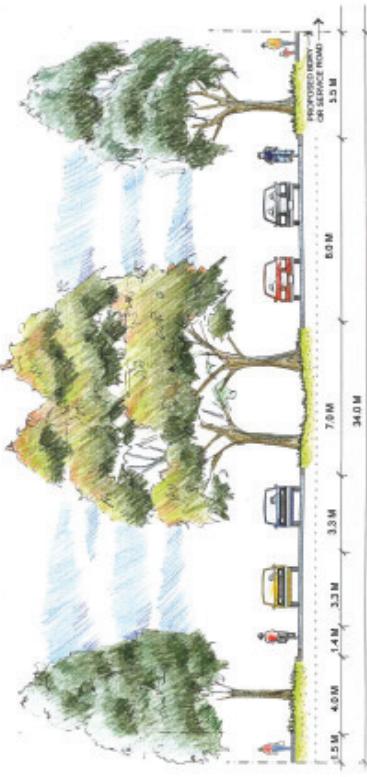
Edgars Road - Outside Southern and Northern Primary Activity Centres

Scanlon Drive

The current development potential of the land north of Craigiburn Road East, which is outside the urban growth boundary, does not necessitate Scanlon Drive being a four-lane arterial street north of the neighbourhood connector street type 2 that connects Scanlon Drive to the southern primary activity centre south of the power easement. It has been agreed with Whittlesea however, that Aurora will make provision for a four-lane divided cross section for Scanlon Drive between OHens Road and Craigiburn Road East.

Unlike Edgars Road, Scanlon Drive is not within the walkable catchment of the primary activity centres or the public transport stations/interchanges and consequently it is likely that larger lot sizes will be introduced generally abutting Scanlon Drive. Service roads will provide appropriate vehicle access, if required. Two 8 metres wide carriageways will allow for 3.3 metres wide travellanes and 1.4 metres wide cycle lanes.

North of Harvest Home Road, Scantlon Drive mostly aligns with the gas easement. This easement is approximately 35 metres wide. Allowance for two lanes on either side of the easement will be made and consequently the typical mid-block design is as shown in the above section however, with a wider median to accommodate the easement. Actual dimensions will be negotiated at the appropriate time.



Scanlon Drive - North of O'Herns Road

5.8.5 Other Street Design

(a) Principles of Street Design

Important ingredients in neighbourhood design and character are streetscape, street design and street diversity with legibility. Street design must evolve from the integration of elements including traffic function, future traffic volumes, access to abutting land uses, legibility and permeability, context and attractive setting, car parking provision, vegetation, visibility and safety.

The combination and weight given to these elements will vary in different situations (for example, in a 'main street' compared with an arterial street or in a street abutting a park compared with a rear access lane). Street design will occur in more detailed subdivision planning permit application stages including the consideration and balancing of the multitude of design elements as appropriate to the particular street context.

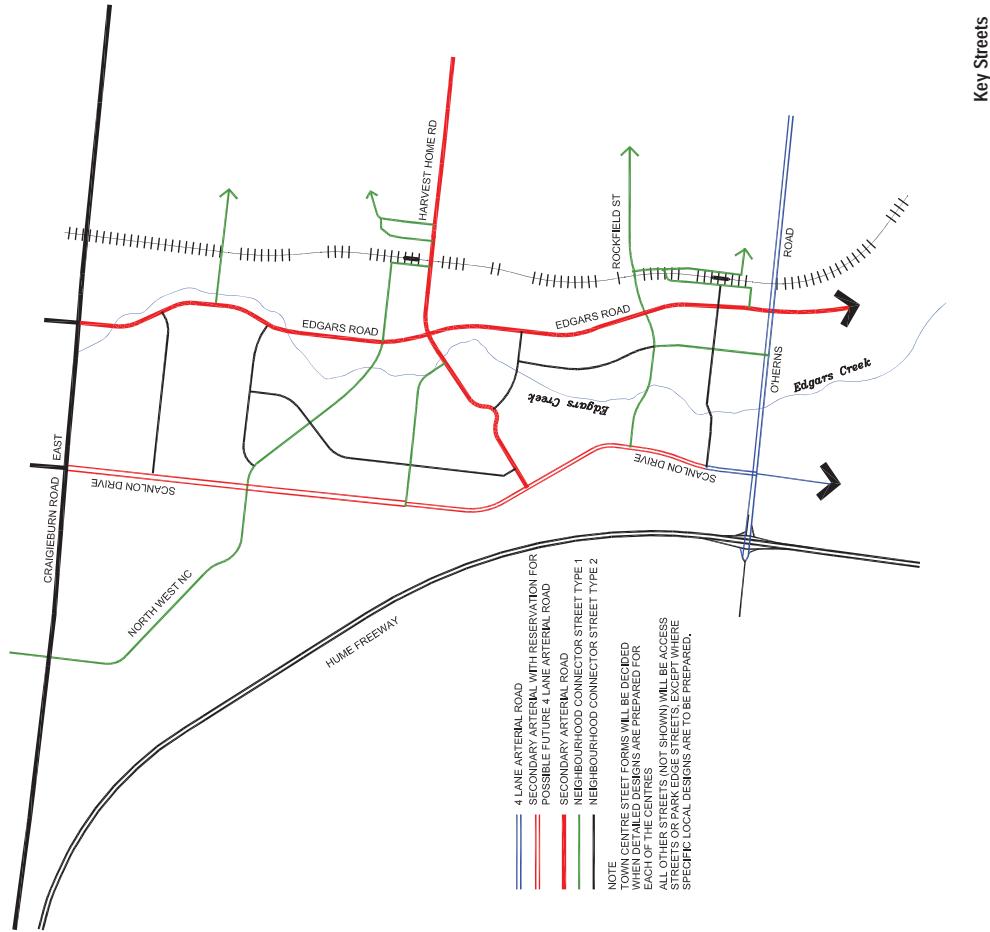
Generally however, the network of streets at Aurora will distribute traffic so that volumes on most sections of streets will be under 2000 vehicle movements per day. The street network design is based upon a clear objective to maintain high levels of traffic-related safety and amenity for all street users, not just vehicle drivers, so that non-motorised travel and the use of the street for social purposes are encouraged.

As a general guide, a street carriageway width of 7.3 metres can accommodate adequately up to 3000 vehicles per day in conjunction with moderate on-street parking demands. A cross section with two lanes clear for travel is preferred when volumes are greater than around 2000 vehicles per day. Where parking may be more intensive, a wider street cross section is proposed so that parking and travel is made easier and streetscape opportunities are enhanced.

Where streets are predicted to carry more than 3000 vehicles per day, on-street cycle lanes are proposed including appropriate treatments at intersections. No carriageway widening for on-street cycle lanes is proposed in streets having less than 3000 vehicles per day. This approach is in accordance with AustRoads Guide to Traffic Management Practice Part 14.

The diagram over provides the proposed 'in principle' street types for the key streets at Aurora. As noted above however, these in principle street types may be added to, as Aurora develops, in order to best meet particular development context requirements and urban design intentions.

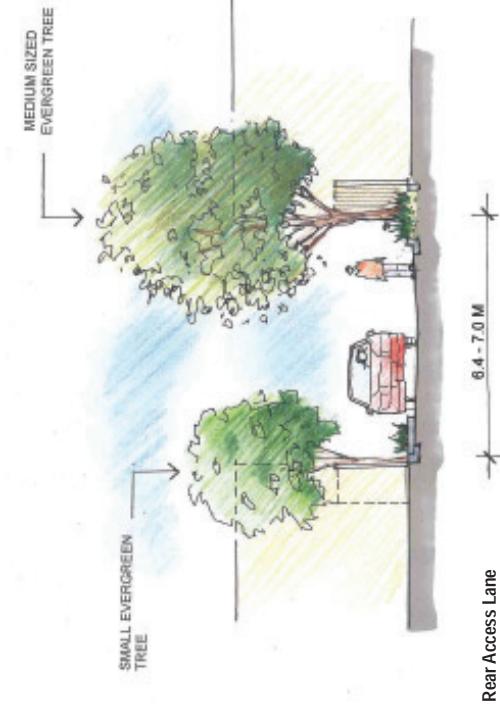
In respect of WSUD, VicUrban will continue to investigate and refine WSUD initiatives and design solutions. In consultation with and the agreement of Whittlesea, WSUD solutions in streets (and beyond) may be varied by VicUrban over time from those noted in the typical street cross sections and descriptions following.



Key Streets

(b) Rear Access Lanes

The typical 'rear access lane' will be 6.4 metres wide although there will be occasional local variations. This allows for garages with 4.8 metres wide doors and an internal depth of 6 metres to be constructed on the property boundary with the lane.



(c) Park Edge Streets

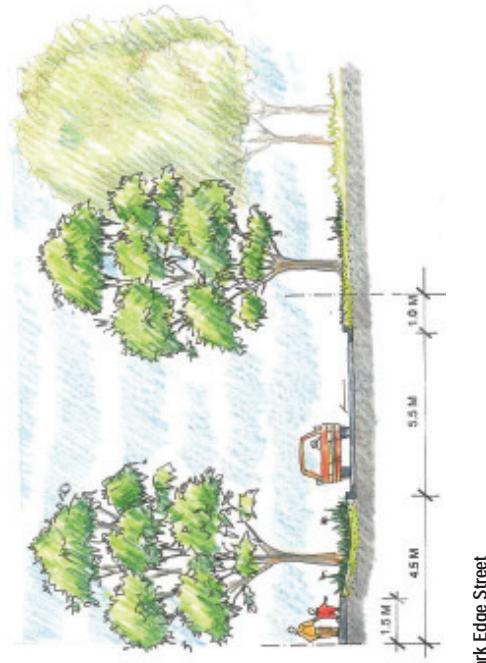
The 'park edge street' will carry generally less than 1000 vehicle movements per day, have a 5.5 metres wide carriageway between kerbs in reservation 11 metres wide and have housing on only one side of the carriageway. The verge abutting lots will be typically 4.5 metres wide while the verge abutting the public open space will be typically 1 metre wide. The verge widths may vary depending on WSUD requirements. There will be a minimum of 1 metre clear behind the kerb face to any trees and poles for emergency vehicle access.

Parked cars will generate a traffic management benefit, with passing vehicles potentially needing to pause for on-coming vehicles and also to move laterally when cars are parked on opposite sides of the street. Parking can occur on either side of the street without the need for controlling signs.

Depending on the size and purpose of the abutting public open space, the cross section may need to vary to accommodate parking on both sides of the street.

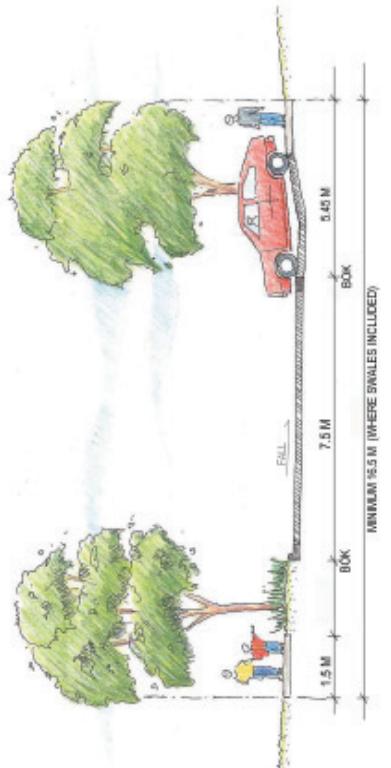
(d) Service Roads and Wide Median Streets

Service roads and wide median streets are designed generally for each carriageway to operate one-way. A 10 metres wide reservation is appropriate for a service road. The wide median street reservation width will be a function of the width of the median. WSUD requirements may lead to variations in verge dimensions.



(e) Access Street Type 1

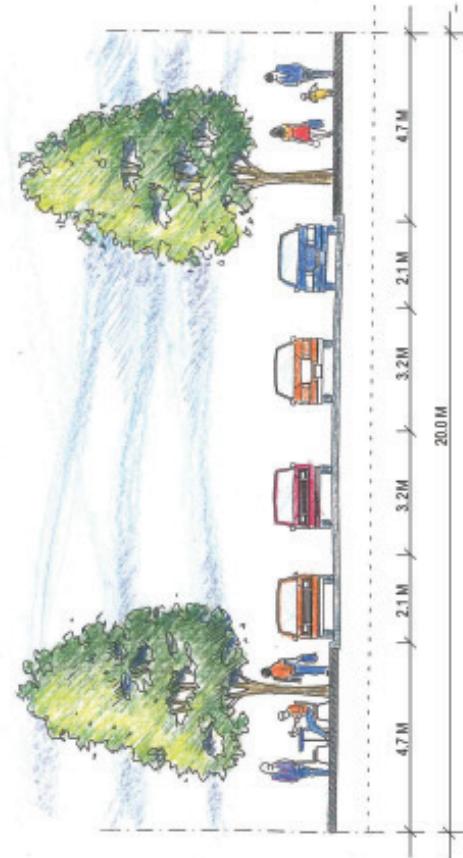
An 'access street type 1' will have a 7.3 metres wide carriageway between kerbs in a reservation of a minimum of 16.5 metres width, dependent upon requirements for bioretention swales, streetscape designs and reticulated services needs. This allows for parallel parking on both sides of the street plus clear passage for a single lane of traffic in one direction at a time or for opposing traffic to pass a single parked car. This minimum 16.5 metre reserve width will be subject to ongoing review and may change. WSUD requirements may lead to variations in verge dimensions. This street type is the most common throughout Aurora, providing a good balance between the needs of kerbside parking and moving traffic.



This street type is appropriate typically in areas of traffic volume up to 2000 to 3000 vehicles per day and the moderate kerbside parking demands usually associated with the densities proposed at Aurora. There is no situation however, on the subject land where this street type is proposed when the traffic volume will exceed 1300 vehicles per day.

(f) Secondary Town Centre Streets

A 'secondary town centre street' will have a 10.6 metres wide carriageway between kerbs in a reservation 20 metres wide and is proposed in the northern and southern primary activity centres where parking needs are expected to be quite high and where commercial vehicle access is anticipated for loading and service. WSUD requirements may lead to variations in verge dimensions.



Secondary Town Centre Street

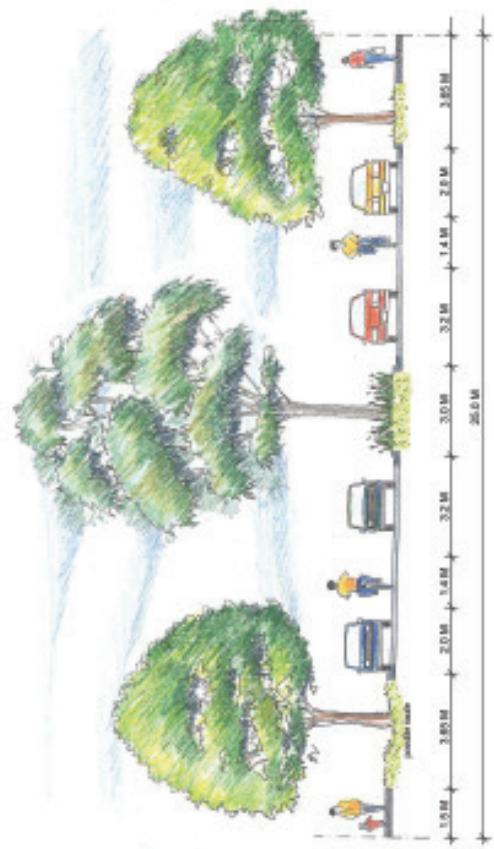
(g) Neighbourhood Connector Street Type 1

The 'neighbourhood connector street type 1' will be used where relatively high traffic volumes warrant the use of two clear travel lanes and where AustRoads Guide to Traffic Engineering Practice suggests that on-street cycle lanes are necessary. A reservation width of 25 metres will allow for two divided 6.6 metres wide carriageways with a 3.2 metres wide travel lane, parallel parking and an on-street cycle lane. WSUD requirements and specific design intentions may lead to variations in reservation width.

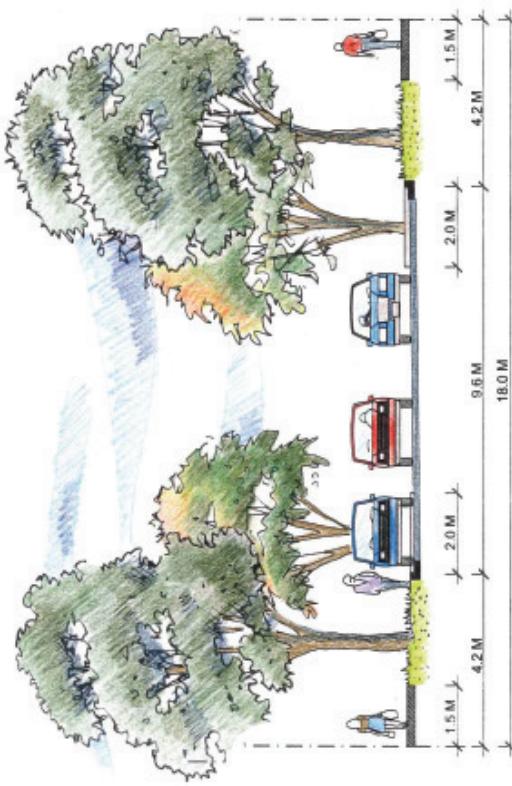
(h) Neighbourhood Connector Street Type 2

The 'neighbourhood connector street type 2' is the 'lower order' neighbourhood connector street. It will provide a higher level of service than the 'access street type 1' to assist those travelling longer distances but not using arterial streets. A reservation width of 18 metres will allow for generous verges, travel lanes and parallel parking on both sides of the street between trees set into the parking lane. The parking lane will be marked at 2.1 metres from the kerb face, leaving 5.4 metres of clear trafficable pavement. This reasonably tight configuration is aimed at keeping vehicle speeds appropriately low.

This street type is suitable where traffic volumes of up to 3000 vehicles per day are anticipated, with or without direct vehicle access to lots. WSUD requirements may lead to variations in verge dimensions.



Neighbourhood Connector Street Type 1



Neighbourhood Connector Street Type 2

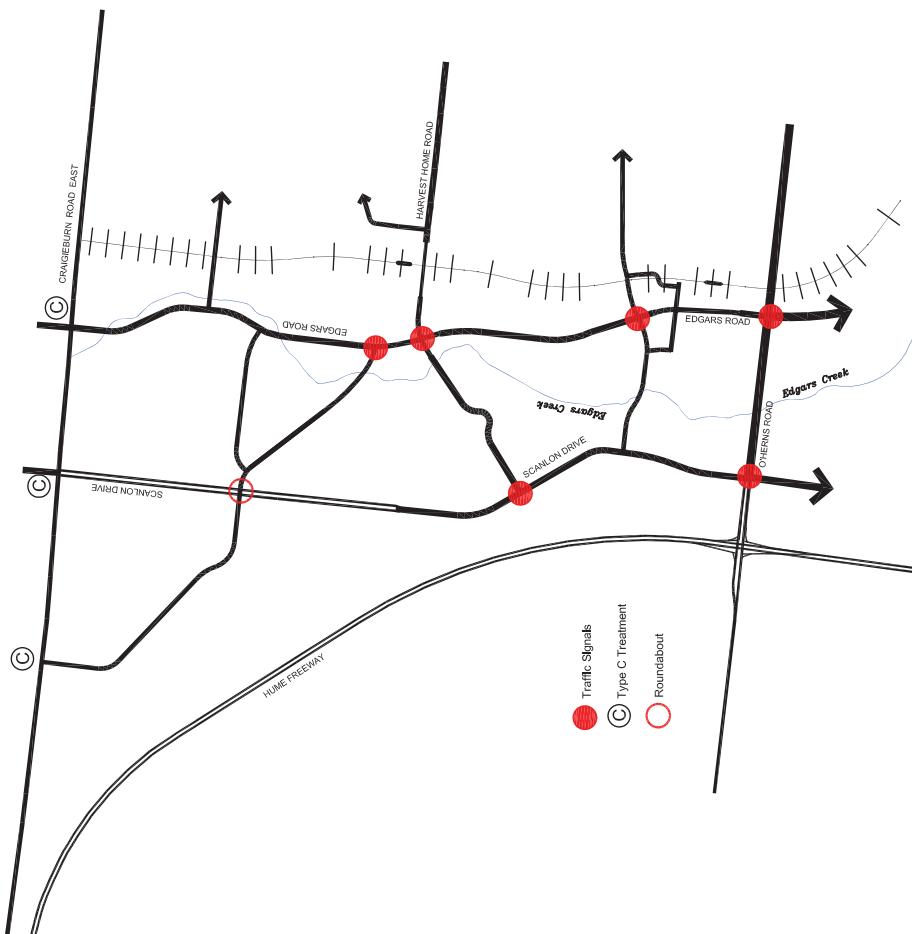
5.8.6 Arterial Street Intersection Management

(a) Design Principles

When Epping North, including Aurora, is close to fully built out, it is envisaged that there will be traffic signal-controlled intersections at suitable spacing along all of the arterial streets within or adjacent to Aurora. Roundabouts will be avoided generally within the walkable catchment of the primary activity centres and public transport stations / interchanges of Aurora.

In the vicinity of the primary activity centres it is important that signal control is used at a number of intersections to maximise pedestrian safety and amenity and to afford the highest levels of accessibility. Bus movements to and from the public transport interchanges will be assisted also by the proposed traffic signal strategy.

The diagram opposite shows the general strategy for the management of the arterial street intersections.



Arterial Street Intersection Management Strategy

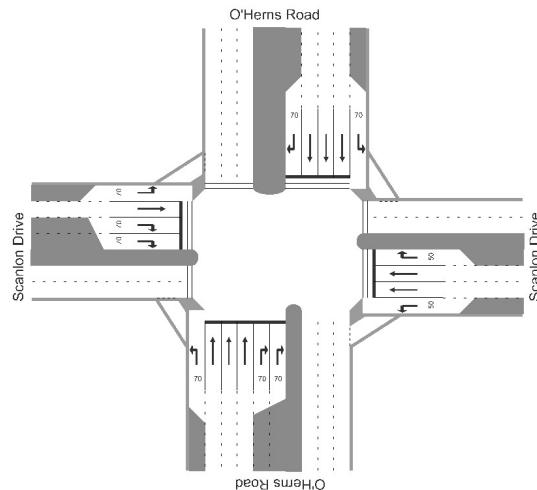
(b) Craigieburn Road East

Traffic modelling (with no development north of Craigieburn Road East) by TTM indicates a two-way daily traffic volume of 7000 vehicle movements on Craigieburn Road East near Scanlon Drive and Edgars Road. The modelling also indicates that for right turns onto Craigieburn Road East, the intersection with Edgars Road has the highest vehicle movements - approximately 70 movements per hour. Gap analysis indicates a practical absorption capacity in excess of 300 vehicles per hour to turn through 700 vehicles per hour with a critical acceptance gap of 6 seconds. A Type C intersection is proposed therefore at the three intersections of Aurora arterial and neighbourhood connector streets with Craigieburn Road East.

At Scanlon Drive

A large signal-controlled intersection is the most appropriate treatment for the intersection of O'Herns Road and Scanlon Drive. An indicative design for the intersection is shown in the diagram below.

The intersection of O'Herns Road and the Craigieburn Bypass is likely to require signal control, which will be designed by VicRoads.



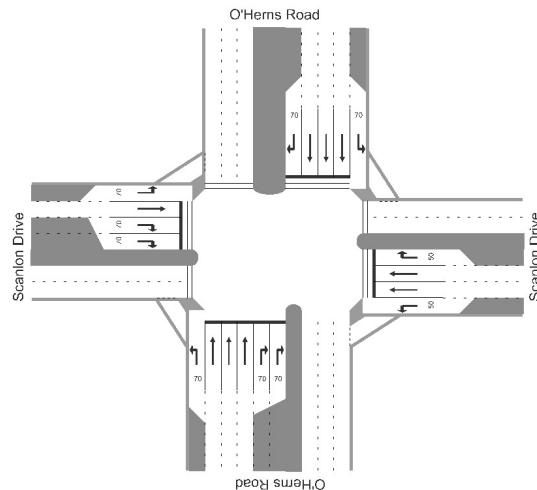
(c) O'Herns Road

At the Craigieburn Bypass

The intersection of O'Herns Road and the Craigieburn Bypass is likely to require signal control, which will be designed by VicRoads.

At Edgars Road

The indicative design concept for the intersection of O'Herns Road and Edgars Road is similar geometrically to that proposed for the O'Herns Road-Scanlon Drive intersection, as shown in the diagram below.



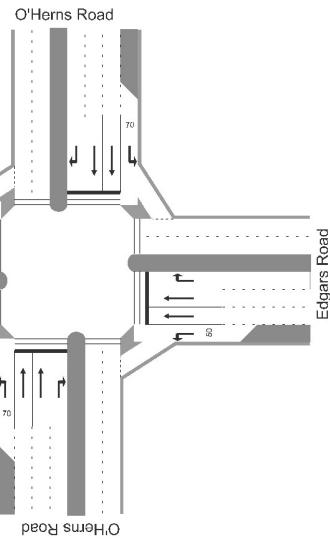
(d) Edgars Road

Other intersections

Other intersections along O'Herns Road are proposed to be controlled by a give-way sign either with or without median openings.

Depending on the development of the Cooper Street Employment Area, a signal-controlled cross junction may be required at the intersection of O'Herns Road and Cotters Road.

Signal-controlled intersections on Edgars Road are likely to be required at the centre of the southern primary activity centre, at Harvest Home Road and to the north of the northern primary activity centre. These intersections have not been designed as they are internal to Aurora.



Intersection - O'Herns Road / Edgars Road

The performance (with development north of Craigieburn Road East) of this intersection was assessed using SIDRA for the morning and afternoon peak hours. It was concluded that the peak degree of saturation would be 0.900 in the morning peak hour, indicating satisfactory operation of the intersection.

Intersection - O'Herns Road / Scanlon Drive

The performance (with development north of Craigieburn Road East) of this intersection was assessed using SIDRA for the morning and afternoon peak hours. It was concluded that the peak degree of saturation would be 0.899 in the morning peak hour, which indicates satisfactory operation of the intersection.

5.8.7 Other Street Intersection Management

metres of intersecting kerb alignments and across driveways and intersections. This assumption establishes the kerb return radius at each intersection.

- (a) **Design Principles**
- The design of intersections in Aurora is based generally upon the following three fundamental objectives:
- safe entry and exit to / from the major street from / to the minor street;
 - the capacity to accommodate expected vehicles - in this case the design vehicle is an 11 metres long rigid truck throughout the subject land and a 17 metres long semi-trailer in the streets surrounding the primary activity centres, along the main access streets and on potential bus routes;
 - the intersection treatment is used as a traffic management device to achieve an appropriate traffic speed environment where practicable.
- Kerb radii are kept to a minimum in consideration of these objectives and to shorten walk distances for pedestrians crossing street intersections.
- (b) **Standard Designs**
- The majority of intersections in Aurora will be T-intersections between streets with 7.3 metres wide carriageways, mostly intersecting at an angle close to 90 degrees. Kerb radii at these intersections should not exceed 6 metres.

On Edgars Road, Scanlon Drive, Harvest Home Road and the 'neighbourhood connector street type 1' that are potential bus routes, a 17 metres long semi-trailer is accommodated so that easy bus access is obtained and building materials on the more heavily trafficked routes can be delivered by semi-trailers without the need to mount kerbs.

A general design objective is to avoid signage. It is assumed generally that parking can / will occur in all places except within 10

metres of intersecting kerb alignments and across driveways and intersections. This assumption establishes the kerb return radius at each intersection.

(c) **Traffic Speed Control**

Traffic speed control is proposed through a combination of slow points, which may be either at or between intersections, and the general design and use of each street type.

Parked cars will add to traffic management by providing a 'relatively tight street cross section that must be negotiated carefully and slowly. Having adequate but not excessive carriageway widths will add further to the level of control over traffic speeds where necessary.

Typically the aim of the proposed street network is to have a 'leg length' of no greater than 200 metres. Leg length is the distance between points where traffic will need to slow to approximately 15 kilometres per hour to negotiate a particular section of street.

Clause 56.03-4 of the Scheme sets out spacings or separations for speed control devices. Strict adherence to the Scheme would result in new residential developments being inundated with speed control devices that cannot all be located at intersections and therefore will reduce accessibility and streetscape values.

In response to Clause 56.03-4 and the design principles for traffic speed control, a suite of intersection treatments has been developed for Aurora that will operate effectively as slowing points.

5.8.8 Non-Motorised Transport

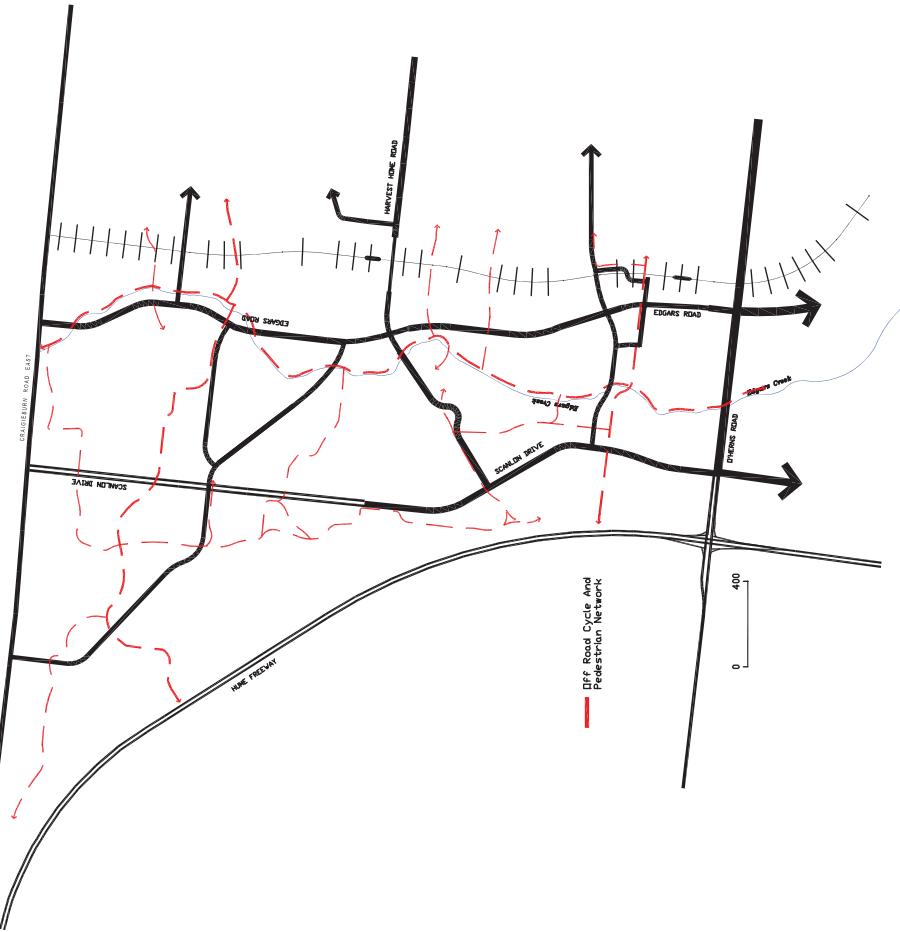
(a) Footpaths in Streets

All streets Aurora will have 1.5 metres wide footpaths along sides fronted by residential development. In the primary and local activity centres, near education centres and other areas where pedestrian

activity levels will be higher, footpaths will be wider generally.

(b) Off-Street Paths

A network of shared paths through open space and abutting major streets will link community facilities and provide for walking and cycling at Aurora. These paths will be typically 2.5 metres wide.



Off-Street Path Network

5.9 ENGINEERING INFRASTRUCTURE

5.9.1 Objectives

The engineering objectives of Aurora are to:

- provide high quality, low maintenance infrastructure to the community;
- develop infrastructure that is sustainable economically;
- provide infrastructure that minimises the impact on the environment using techniques such as:
 - lower embodied energy products and materials;
 - employing construction techniques that reduce earthworks;
 - reducing the volume of waste material;
 - recycling and reusing materials derived from Aurora;
 - using off-site recycled materials;
 - using WSUD to improve stormwater quality;
 - using local sewage treatment and recycled water reticulation to reduce demand on potable supplies.

sustainable approach to development mitigates these changes through appropriate management of water resources.

A number of alternative integrated water management systems have been investigated and assessed for their application to Aurora. Estate-wide approaches to wastewater management and demand management have the ability to reduce potable water demand, maintain water quality standards and be more economical in the long term.

- providing the community with a local intranet and real time metering of water and energy use to support conservation habits.
- The combined effect of these measures is to reduce potable water consumption by approximately 50 to 70 per cent when compared with conventional servicing arrangements.
- Other measures within the public realm include WSUD, the capture and treatment of stormwater and the retention of large areas of open space.

The sustainable practices being investigated in detail at Aurora include water conservation and demand management measures at the household level, harvesting of rainwater, WSUD, wastewater recycling, higher density housing to support public transport, energy efficient dwelling design incorporating solar energy for hot water and electrical energy and the encouragement of reduction in private vehicle use through efficient urban design.

The implementation of the water management initiatives will require the consent and cooperation of a number of government agencies. These agencies have been engaged closely and are participating in the development of innovative and more sustainable servicing options for the subject land.

VicUrban has initiated a significant research program to address all of the issues associated with adopting a sustainable development approach at Aurora. The investigations in relation to the water cycle have identified that the impact on the environment can be reduced significantly if a number of initiatives are introduced. The initiatives being investigated include the following:

- use of low-flow water fittings in showers and basins;
- use of water efficient appliances (five-star rated washing machines and dishwashers);
- use of rainwater tanks to capture roof water for hot water, bathroom and laundry use, subject to satisfactory field testing and the approval of relevant authorities, in the early stages of Aurora;
- treating sewage locally to tertiary standard and reticulating the recycled water back to lots for toilet flushing and private and public open space irrigation;

• providing the community with a local intranet and real time metering of water and energy use to support conservation habits.

The combined effect of these measures is to reduce potable water consumption by approximately 50 to 70 per cent when compared with conventional servicing arrangements.

Other measures within the public realm include WSUD, the capture and treatment of stormwater and the retention of large areas of open space.

Until such time as the new Quarry Hill high level tanks are installed, a water supply booster pump will be required which will be capable of servicing up to the 162 metres contour level. A YWW water supply pump station has been upgraded and will be used for this purpose.

These approaches to introducing integrated water management have been discussed and tested with Yarra Valley Water (YWW) and Melbourne Water Corporation (MWC) and will be incorporated into an Aurora Estate Agreement to provide a sewage and recycled water treatment facility and the reticulation of the recycled water throughout Aurora.

In addition, VicUrban, in concert with YWW and MWC, has appointed and is being advised by an independent expert panel to review the technical aspects of the water management systems proposed at Aurora. The panel has praised and supported the initiatives. As a result, the development of Aurora can be commenced immediately and serviced by the innovative and sustainable servicing arrangements described above.

5.9.3 Water Supply

In accordance with State government policy, VicUrban has adopted a sustainable development approach to the planning of Aurora. As a result, the remote location of services becomes less of a constraint and will result in innovative but sustainable approaches being adopted to service the new community. The innovative and sustainable approach of VicUrban to the provision of the necessary infrastructure can only be achieved with a significant development of the scale of Aurora.

The conversion of rural to urban uses results in a significant change to the landscape, adds to the consumption of potable water, generates surface water flows and increases the discharge of wastewater. A

agency responsible for the provision of water at Aurora is YWW. Water supply is provided from supply reservoirs on Quarry Hill, 5 Kilometres to the east of Aurora. The water supply catchments of MWC are located immediately to the north east of Aurora and there is sufficient capacity within these networks to meet the expected demand.

The recently completed strategy for the water supply of Melbourne identifies that alternative sources are available to augment existing supplies, sufficient to meet expected demand until 2050. The strategy does promote the use of alternative water sources however, for uses

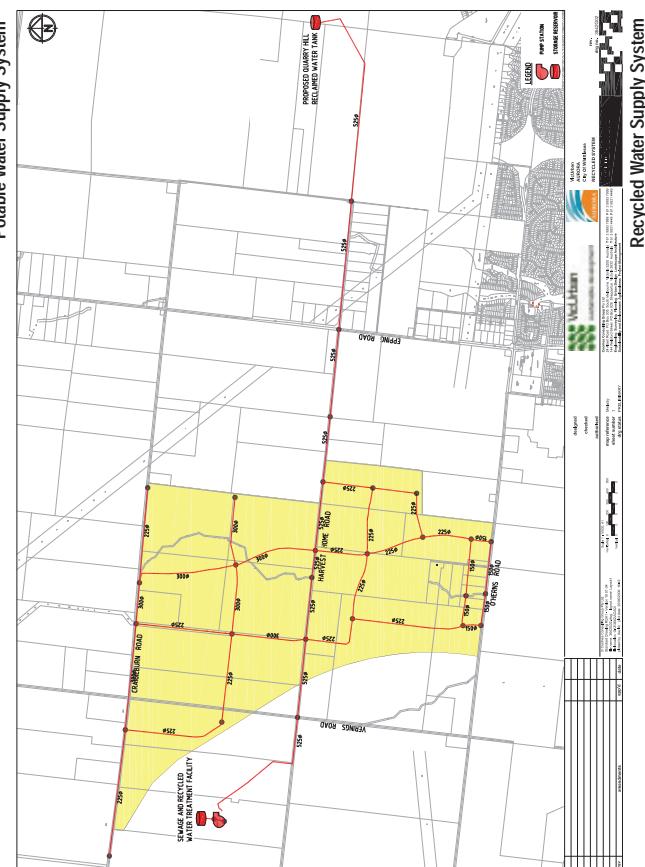
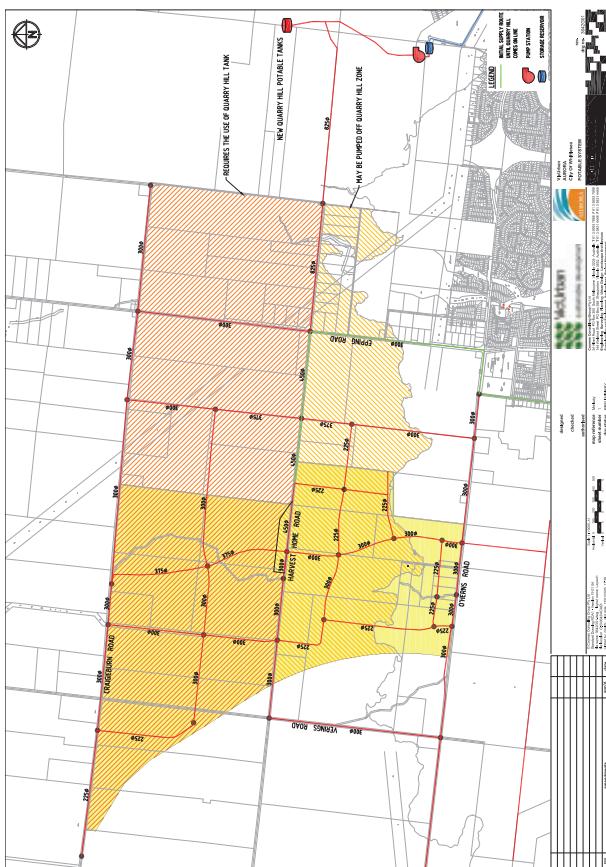
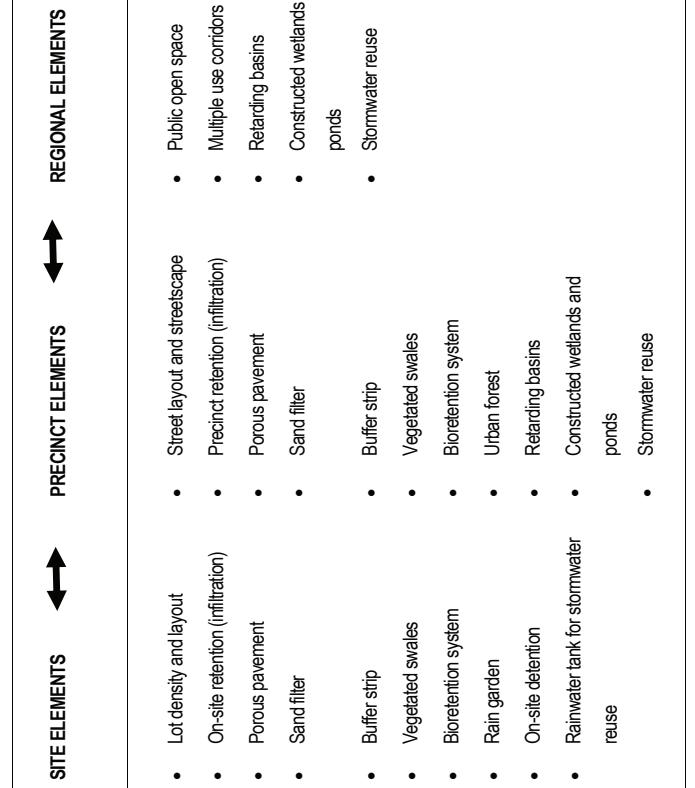
5.9.4 Drainage

The agency responsible for drainage facilities at Aurora is MWC, which has an approved drainage strategy for Edgars Creek. The Edgars Creek Drainage Strategy will form the basic framework for stormwater management at Aurora. In addition, WSUD principles will be incorporated as part of the development to manage and treat stormwater in a sustainable and innovative way.

Edgars Creek is an ephemeral stream that flows through Aurora. It is ill-defined in some sections and has been badly degraded. Water quality improvement will be completed throughout Aurora as part of the approach to WSUD.

WSUD provides an alternative to the traditional conveyance approach to water, stormwater and wastewater management. WSUD focuses on the integration of urban planning and development with the management, protection and conservation of the water cycle. The design philosophy recognises that it is impracticable to replicate the natural system however, it is possible to mitigate changes to the existing water balance.

The interrelationship between site, precinct and regional stormwater management measures is below.



A hierarchy of water sources has been developed for Aurora to avoid the possibility of having competing supply sources for the same end use. Based on this water hierarchy, stormwater has the potential to provide:

- supply to a rainwater tank for hot water use within the dwelling;
- irrigation at the streetscape level as a by-product of stormwater treatment with, for example, the use of bioretention systems;
- environmental flows to Edgars Creek.

VicUrban pioneered WSUD at Lyndbrook in the City of Casey. Many of the key components used at Lyndbrook will be enhanced and modified to suit the site specific conditions of Aurora. The exact treatments and standards to be used at Aurora are being determined in consultation with Whittlesea, YVW and MWC. Possible WSUD techniques will include:

(a) Streetscape Bioswale

Bioswales are bioretention systems that are located within the base of the swale. They provide treatment of stormwater through fine filtration, extended detention and some biological uptake as well as providing a conveyance function along the swale.

Runoff is filtered through a fine media layer as it percolates downward. It is then collected via perforated pipes and discharged to the downstream drainage system.

The bioswale forms part of the streetscape and landscape of the development. Road reservations incorporating swales will be determined at the planning permit stage. The surface of the bioswale will be predominantly grass. Front draining houses connect to a "bubble pit" within the swale. The one-way cross-fall road enters the bioswale via kerbside inlets.

(b) Nodal Streetscape Raingarden

Streetscape raingardens operate with the same treatment processes as bioretention swales except that they do not have a conveyance

function. Instead they act as an ephemeral basin. High flows are diverted away from the basin and into an overflow structure (eg side entry pit).

- These nodal streetscape treatment have some flexibility in terms of their size, shape and location to fit with the streetscape.
- The vegetation will be predominately plants. Front draining houses connect their stormwater drain to the kerb and channel. These flows and the road pavement enter the rain garden via kerbside inlets.
- Rainwater for Hotwater

Rainwater can be harvested to supplement existing mains potable supply. The system captures rainwater falling on roofs of individual houses; it is then stored in an above ground tank and pumped to either a gas hot water storage system or a continuous flow gas hot water system.

(d) Raingarden (allotment)

Raingardens are a form of bio-retention system that are specifically designed to integrate household gardens into the stormwater management system of the estate. Bio-retention systems treat stormwater by percolation through a vegetated media is collected via a sub-surface drainage system for discharge to the main stormwater drainage system. Bio retention systems are filtration, not infiltration systems. Treatment stormwater is not intended to enter groundwater. The raingarden has an overflow bypass system that ensures the allotment is adequately drained during high intensity rainfall events.

(e) Linear (Creek) Raingardens

Raingardens can also be located within public open space. A creek corridor provides a potential opportunity to incorporate linear raingardens parallel to the waterway.

The function and operation is essentially the same as the nodal raingardens except that the landscape response is generally different as the nodal system is integrated into an urban landscape whereas the linear system is integrated into a more natural environment.

Topography and open space reservation is a significant consideration with this option as sufficient grade is necessary to enable the bioretention system to drain to the existing waterway.

- (f) Wetlands
- Constructed wetlands systems are shallow, extensively vegetated water bodies that use enhanced sedimentation, fine filtration and pollutant uptake processes to remove pollutants from stormwater. Water levels rise and fall during rainfall events and outlets are configured to slowly release flows, typically over three days, back to the water levels of dry weather.

Any use of a treatment identified above will require Council approval.

5.9.5 Sewerage

Epping North, including Aurora, is located at the upstream end of the major trunk sewer infrastructure servicing the northern suburbs of Melbourne. YVW advises that the Edgars Creek Branch Sewer and Merri Creek Branch Sewer are at capacity during peak flows. Consequently, the increased flows that will be generated by the development of Epping North cannot be accommodated by the existing infrastructure.

YVW and MWC will be extending the North Western Trunk Sewer and Merri Creek Main Sewer to relieve the existing sewer system regardless of development at Epping North. This sewerage service will be available to Epping North in approximately 2011.

Investigations have indicated that in some years the volume of recycled water generated from sewage flows will be less than the demand for recycled water for example, during dry years. In other years for example, wet years, a surplus of recycled water will be generated. In dry years, the potable water supply system will be used to supplement the recycled water supply.

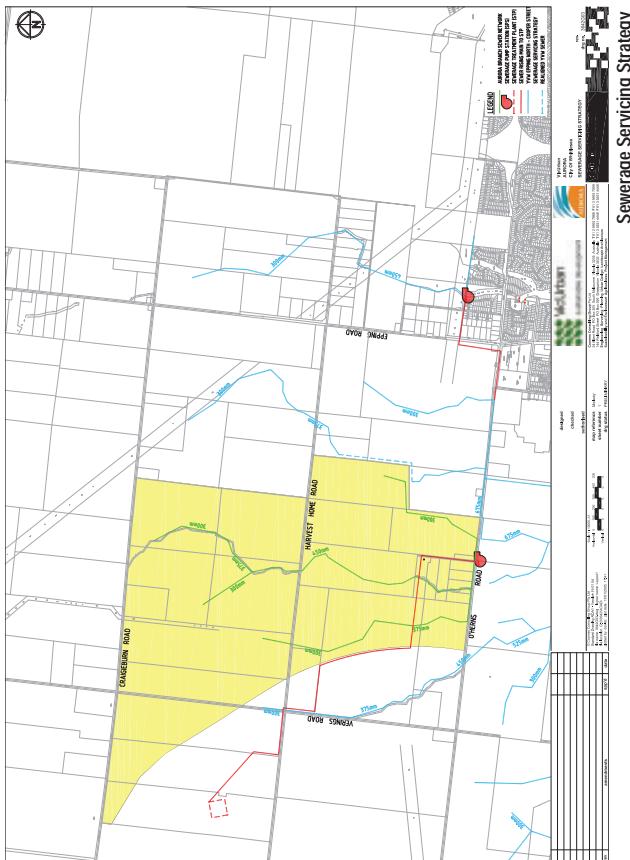
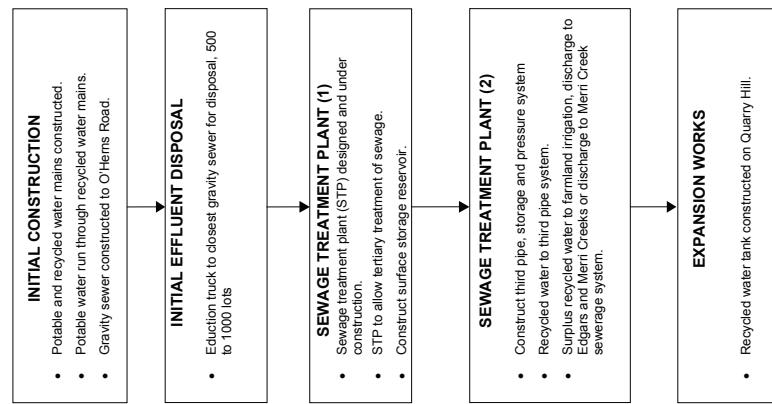
A Sewage and Recycled Water Treatment Facility (SRWTF) has been constructed to treat the sewage generated from Aurora to Class A standard (Environment Protection Authority - Guidelines for Environmental Management: Use of Reclaimed Water) for reutilisation throughout Aurora. The sewage treatment plant component of the SRWTF will also service land outside Aurora on an interim basis until the North West Trunk Sewer and associated works are complete. The sewage treatment plant will be commissioned once the supply infrastructure is in place, which is expected to occur in early 2007.

The recycled water will be managed by YVW in accordance with the Environment Protection Authority approvals for the SRWTF. The sewage treatment plant component of the SRWTF will produce at least Class B recycled water, which will be stored in the winter storage dams and also used for irrigation on the SRWTF site. The water treatment plant component of the SRWTF will draw from the storage dams and treat the water to Class A standard. This treated water will then be reutilised to households within Aurora for toilet flushing and garden watering and will also be used for public open space irrigation. All infrastructure required to support a recycled water system, including treatment, storage and reutilisation, will be installed to appropriate standards. All advice and information indicates that a recycled water system will be appropriate for Aurora and will be a significant step in demonstrating sustainable development principles.

The SRWTF is also likely to cater initially for the development of land in Epping North East. The SRWTF will service this and until the Merri Creek Main Sewer extension is complete in approximately 2011.

The flow chart below sets out the sequence and phasing of the sewerage infrastructure works from the initial construction and effluent disposal method through to construction of the full sewage treatment plant.

Sequencing and Phasing of Sewerage Infrastructure at Aurora



In wet years, the surplus recycled water will be used in one or more of the following ways:

- irrigation on the SRWTF site;
- discharge (subject to approvals from the relevant authorities) to Edgars Creek and Merri Creek;
- discharge (subject to approvals from the relevant authorities) to the Merri Creek sewer system.

YVW has advised that the SRWTF will be also capable of providing recycled Class A water to other nearby development areas using sewer mining from the outfall sewers. As a result, the amount of excess water will be reduced and a more deliberate strategy of managing the demand for recycled water and reducing unproductive discharge can be introduced. The application of recycled water will be managed therefore by providing water to:

- Aurora for residential use;
- other developments for residential use;
- irrigate Aurora public open spaces;
- irrigate other public open spaces;
- Edgars Creek for environmental flows;
- Merri Creek for environmental flows;
- other productive uses, such as industry.

The sewage from the expected residential development on land in Epping North East will be used as the source of sewage for the 'sewer mining' process and excess sewage will be diverted into the Merri Creek Main Sewer after 2011. The volume of effluent treated by the SRWTF will continue to increase with the occupation of lots at Aurora and other developments however, until the full capacity of the SRWTF is reached.

The sewerage strategy for Aurora and Epping North is shown opposite. It is consistent generally with the YVN strategy except that Aurora is isolated from the rest of the system. A normal gravity sewer system will be constructed within Aurora with all flows being concentrated at the junction of Edgars Creek and O'Hens Road. From this location, the sewage will be pumped via a rising main to the sewage treatment plant on land west of the Craigieburn Bypass between Harvest Home Road and Craigieburn Road East.

5.9.6 Other Services

All lots at Aurora will have available electricity, gas and fibre technology for telecommunications.

5.10 LINKAGES AND COMPATIBILITY WITH ADJOINING PROPERTIES

5.10.1 Objectives

The objectives for the treatment of Aurora in relation to adjoining properties are to:

- ensure compatibility and logical linkages between different land ownerships and developments;
- provide strong vehicle, walking and cycling connections;
- accommodate the integration of services and drainage.

5.10.2 Aurora Development Plan: Part 1

As noted earlier, the ADP1 is similar to ADP2 but deals with Section A of Aurora to the east of the subject land.

Harvest Home Road and the southern east-west neighbourhood connector street east of Edgars Road on the subject land provide direct links between the northern and southern primary activity centres and Section A of Aurora. These streets also connect Section A to the various facilities on the subject land including education centres, public open space and CAC. A series of access streets provide lower order connections. Two off-street walking and cycling paths extend through to Crimson Crescent and Gammage Boulevard in Section A of Aurora.

5.10.3 Other Adjoining Properties

Craigieburn Road East forms the north boundary of the subject land. Edgars Road, Scanlon Drive and the diagonal neighbourhood connector street in the north west of Aurora, provide opportunities for future connections from Aurora to the properties north of Craigieburn Road East. One off-street walking and cycling path along Edgars Creek also extends through Aurora to Craigieburn Road East.

Several east-west neighbourhood connector streets, in addition to the three east-west arterial streets, provide a connection between Aurora and the properties to the east. Several off-street shared paths, including one along the power easement, also extend through Aurora to the east (excluding Section A). The rear boundaries of lots and public open spaces on the subject land will abut generally the east boundary.

The south boundary of Aurora is formed by OHerns Road. Edgars Road and Scanlon Drive provide opportunities for future connections from Aurora to the properties south of OHerns Road. Several access streets and one off-street shared path along Edgars Creek extend through Aurora to OHerns Road. Lots at Aurora will front generally OHerns Road with vehicle access as described in Section 5.7.2.

The Craigieburn Bypass forms the west boundary of Aurora. The rear boundaries of predominantly larger lots on Aurora will abut this boundary as will streets and public open space in a number of locations. An interface treatment to satisfy the acoustic attenuation requirements of DDO2 and to create a visual appearance appropriate to the desires of VicUrban and Whittlesea will be designed.

6 DEVELOPMENT CONTRIBUTIONS

A comprehensive infrastructure needs assessment has been undertaken for the ADP area. This analysis identified the need for a broad range of infrastructure items to be funded on an equitable basis by all development at Aurora.

Given the nature and scale of Aurora, infrastructure obligations within the ADP area are set out in the form of an agreement in accordance with Section 173 of the Planning and Environment Act 1987. This agreement specifies the particular projects, costs and obligations for delivery and was signed by the relevant parties before the subject land was rezoned.

The diagram opposite identifies key community and recreation development contribution projects.



Community Infrastructure

7 IMPLEMENTATION

7.1 PROPOSED DEVELOPMENT STAGING

Aurora has commenced at the northern end of Section A (the ADP1 area), entering from Harvest Home Road. A second development front will be established to the west of Section A, on the south side of Harvest Home Road.

The two development fronts are expected to progress to the south and north, providing sufficient population to support the establishment of the northern primary activity centre. Additional development fronts may also be established over the life of Aurora for example, on Craigieburn Road East. In time, it is anticipated that infill development around the southern primary activity centre will occur at a higher dwelling density, particularly around the core of the centre.



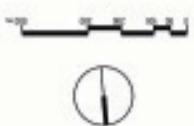
Proposed Development Staging

7.2 CLAUSES 54 AND 55 AND BUILDING REGULATIONS	7.3 DEVELOPMENT APPROVALS PROCESS	7.5 DWELLING DELIVERY METHODS
<p>In the review of design outcomes sought by VicUrban for Aurora, various standards in Clauses 54 and 55 of the Scheme and in Part 4 of the Building (Interim) Regulations 2005, have been reviewed. The review has resulted in some particular alternative design parameters to tailor outcomes specifically for Aurora.</p>	<p>Planning permit applications will be submitted to Whittlesea for subdivision and all other development and uses requiring a permit under CD74 and the relevant overlays including VPO2. Generally, subdivision and development will need to be in accordance with the approved ADP2, as required by DFO23.</p> <p>Following an extensive design process (refer Sections 7.4 and 7.5), applications for the construction of one dwelling on each lot less than 300 square metres and any applications for the construction of two or more dwellings on a lot will be submitted to Whittlesea.</p>	<p>VicUrban has worked intensively with architects and builders over the past three years to develop an integrated dwelling and land product delivery model. The integrated housing approach used in Section A of Aurora will continue on the subject land and involves the following steps.</p> <ul style="list-style-type: none"> • VicUrban allocates lots to builders. • VicUrban works with builders to prepare plans in response to the Scheme, the subdivision permits, the varied approaches to design and siting noted above and the design controls. • Potential purchasers are able to choose a dwelling from a builder in a display village however, the chosen dwelling can only be constructed on a lot that enables the achievement of a six-star energy rating and all other requirements.
<p>In accordance with the Scheme and Building Regulations, the varied approaches will be implemented via conditions on planning permits for subdivision and as restrictions on plans of subdivision certified under the Subdivision Act 1988.</p> <p>These varied approaches will promote a preferred neighbourhood character and are anticipated to include:</p> <ul style="list-style-type: none"> • reduced minimum front and side street setbacks of dwellings; • increased maximum building height of dwellings; • increased maximum site coverage of dwellings; • increased maximum length and height of new boundary walls; • reduced minimum amount of private open space for a single dwelling on a lot to equate with the minimum amount of private open space for two or more dwellings on a lot. 	<p>7.4 DESIGN CONTROLS</p> <p>VicUrban has prepared and will distribute design controls that will affect all lots in each stage of subdivision of Aurora. The design controls provide detail on the approach to and implementation of building siting and design, fencing, energy efficiency, building materials and landscape design, among other things. Compliance with the design controls will be required as a condition of the contract of sale for each lot. The design controls will not require any consent or control input from Whittlesea.</p>	<p>While complex to administer, the integrated housing approach is accepted widely as best practice for producing sustainable design outcomes. VicUrban will continue to progress the evolution of sustainable development and incorporate new sustainability features into the design controls.</p> <p>Considering the timeframe associated with constructing a development the size of Aurora, VicUrban may also consider other methods of dwelling delivery, including the direct sale of lots to the general public and the sale of packaged land precincts to other developers.</p> <p>These alternative delivery methods will respond to the design controls, including the integrated design principles and the incorporation of sustainability features. A greater degree of control of and certainty in the built form outcome is facilitated and maintained therefore at Aurora.</p>

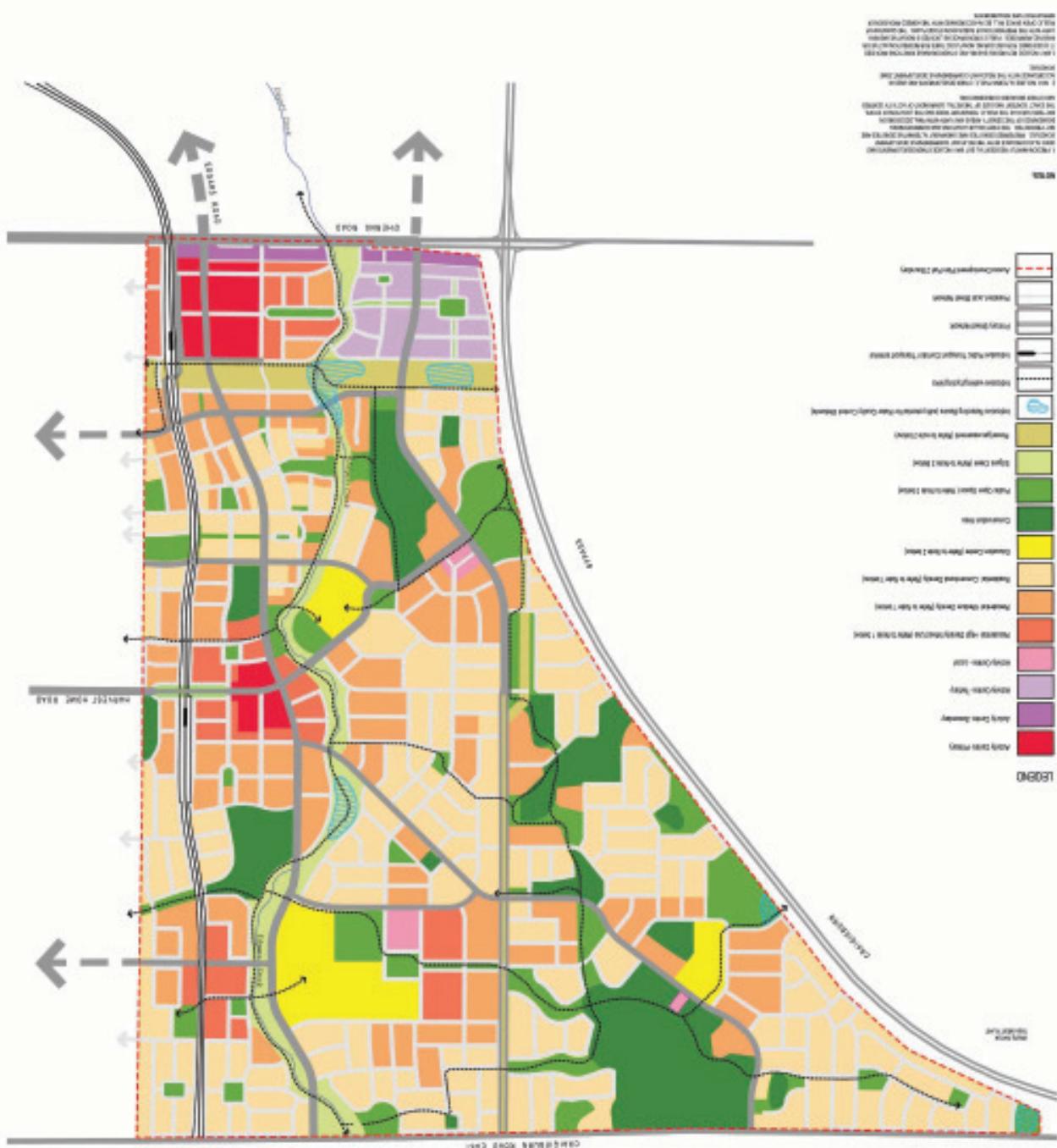
APPENDIX A

AURORA DEVELOPMENT PLAN: PART 2

AURORA
DEVELOPMENT PLAN PART 2



VicUrban
Victoria's Building



APPENDIX B

REFERENCES

The following were the results of studies leading to the preparation of ADP2. Not included in this list are reports referenced by the project team members in their own reports.

Department of Infrastructure (October 2002), *Melbourne 2030 - planning for sustainable growth*

MDG Landscape Architects (April 2006), *Urban Design and Landscape Approach for Aurora*

ASR Research Pty Ltd (July 2001), *Stage 1 Quantitative Assessment of Social, Leisure & Open Space Infrastructure Requirements within the Epping North Strategy Plan Area*

ASR Research Pty Ltd (March 2004), *Epping North Revised Community Infrastructure Requirements*

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Biosis Research Pty Ltd (May 2006), *Flora and Fauna of Aurora, Epping North, Victoria*

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Biosis Research Pty Ltd (January 2007), *Net Gain Assessment of the Aurora Development Plan Area, Epping, Victoria*

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The Hornsey Institute (April 2005) *Aurora Context Study*

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Urbis JHD Pty Ltd (April 2006), *Aurora Assessment of Retail and Commercial Uses*

VicUrban (February 2005), *Aurora Design Controls: Stage 1 - 3*

Whittlesea Planning Scheme

APPENDIX C

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APPENDIX D

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