

Other intersections within the LSP area will be relatively straightforward to determine at subdivision stage when the local road network is identified. Roundabouts or priority-controlled intersections will be appropriate within this area. Anticipated locations of some of the 4-way intersections that would be constructed as roundabouts are also illustrated in Figure 12.

There are also five key intersection locations numbered 1 to 5 around the Kingsford Town Centre on Figure 12. These five intersections are analysed in section 6.5 below.

6.5 Intersection Analysis

Intersection capacity analysis of the key intersections on Great Northern Highway and Chittering Road is documented in the LSP TIA report and is not repeated in this Addendum report. Traffic volumes have decreased slightly in this Addendum report, so the previous analysis still provides a robust analysis of those intersection requirements.

The five key intersections around the Kingsford Town Centre (numbered 1 to 5 on Figure 11) have been analysed for the school day 3-4PM peak hour flows (i.e. end of school pick-up period) that correspond to the modelled 2031 daily traffic flows in Figure 11. This period would be the critical peak hour of total traffic flows in this local area.

Capacity analysis of these intersections has been undertaken using the SIDRA computer software package. SIDRA is an intersection modelling tool commonly used by traffic engineers for all types of intersections. SIDRA outputs are presented in the form of Degree of Saturation, Level of Service, Average Delay and 95% Queue. These characteristics are defined as follows:

- ✚ Degree of Saturation is the ratio of the arrival traffic flow to the capacity of the approach during the same period. The Degree of Saturation ranges from close to zero for infrequent traffic flow up to one for saturated flow or capacity.
- ✚ Level of Service is the qualitative measure describing operational conditions within a traffic stream and the perception by motorists and/or passengers. In general, there are 6 levels of service, designated from A to F, with Level of Service A representing the best operating condition (i.e. free flow) and Level of Service F the worst (i.e. forced or breakdown flow).
- ✚ Average Delay is the average of all travel time delays for vehicles through the intersection.
- ✚ 95% Queue is the queue length below which 95% of all observed queue lengths fall.

The results of the SIDRA analysis are summarised in Appendix C and satisfactory intersection performance is shown for each of the intersections shown in Appendix C.

6.6 Access to Frontage Properties

The WAPC *Liveable Neighbourhoods* policy requires that “Development along integrator B and neighbourhood connector streets with ultimate vehicle volumes over 5,000 vehicles per day should be designed either so vehicles entering the street can do so travelling forward, or are provided with alternative forms of vehicle access.”

This aspect is fully covered in the LSP TIA report and there are no changes to report on this aspect in this Addendum.

7.0 Conclusions

This Transport Impact Assessment Addendum relates to the proposed Kingsford Town Centre Precinct Plan (PP) within the approved Kingsford Local Structure Plan (LSP) area at Bullsbrook in the City of Swan.

The LSP area will accommodate approximately 2,500 dwellings, a primary school site and the future district activity centre of up to 20,000m² net lettable area that will serve as the expanded town centre for the planned future growth of Bullsbrook townsite. That town centre, primary school and medium density residential development of approximately 385 dwellings is encompassed within the Kingsford Town Centre PP.

Traffic modelling of the LSP area and the surrounding Bullsbrook Townsite District Structure Plan (BTDSP) area has been updated for this TIA Addendum report.

The key intersections around the proposed Kingsford Town Centre have been assessed and intersection capacity analysis confirms that priority-controlled T-intersections (i.e. Give Way or Stop sign control) would be able to accommodate the projected 2031 traffic flows when this area is fully developed.

Appendix A

Precinct Plans



TOTAL NLA
~20,000m²

TOTAL PARKING
~1,050 Bays

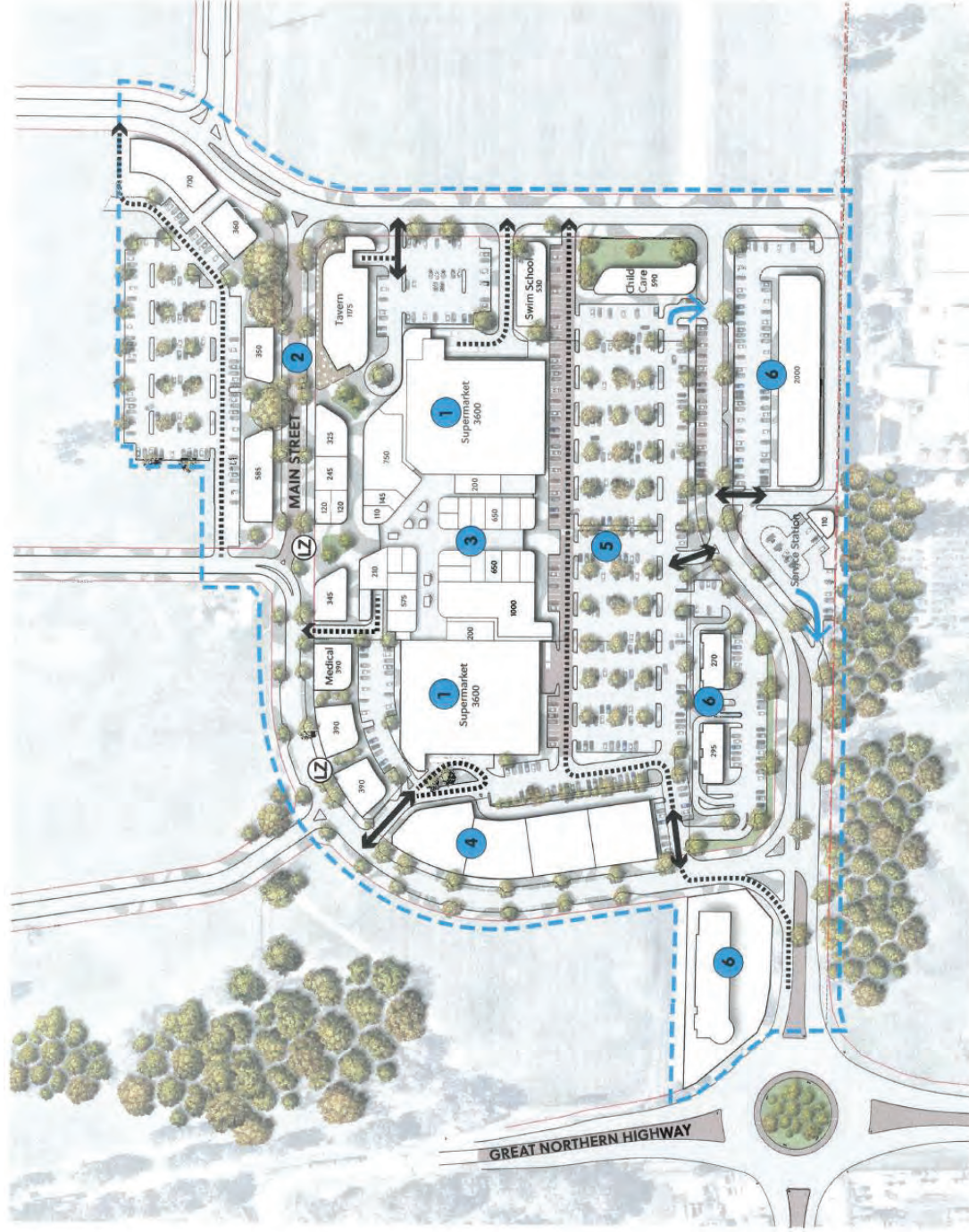
- 1** Shopping centre; supermarkets, specialty shops and open air tenancies
- 2** Main Street tenancies to be a diverse mix of retail / commercial and small public spaces
- 3** Key north / south pedestrian linkage to focus pedestrian movement on the retail outlets and Main Street
- 4** Retail/ Service Commercial with long term potential for Residential
- 5** Activity Centre shared car parking to be screened from Main Street and entry road and highly accessible
- 6** Car based retail sites

↔ Full movement access

⋯→ Truck access route

↗ One way access

Ⓛ Loading zone



Kingsford Town Centre

Conceptual Masterplan (Built Form and Access)

1:2000 @ A3



HATCH | RobertsDay

TAYLOR
ROBINSON
CHANEY
BRODERICK

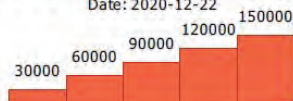
Appendix B

2031 Traffic Volumes



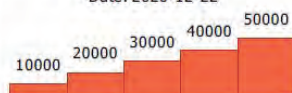


Scenario 37: 2031 Bullsbrook Town Centre ACP2
Date: 2020-12-22





Scenario 37: 2031 Bullsbrook Town Centre ACP2
Traffic to/from selected links
Date: 2020-12-22



Traffic flows with trip
origin and/or destination
within the LSP area.

Appendix C

SIDRA Intersection Analysis

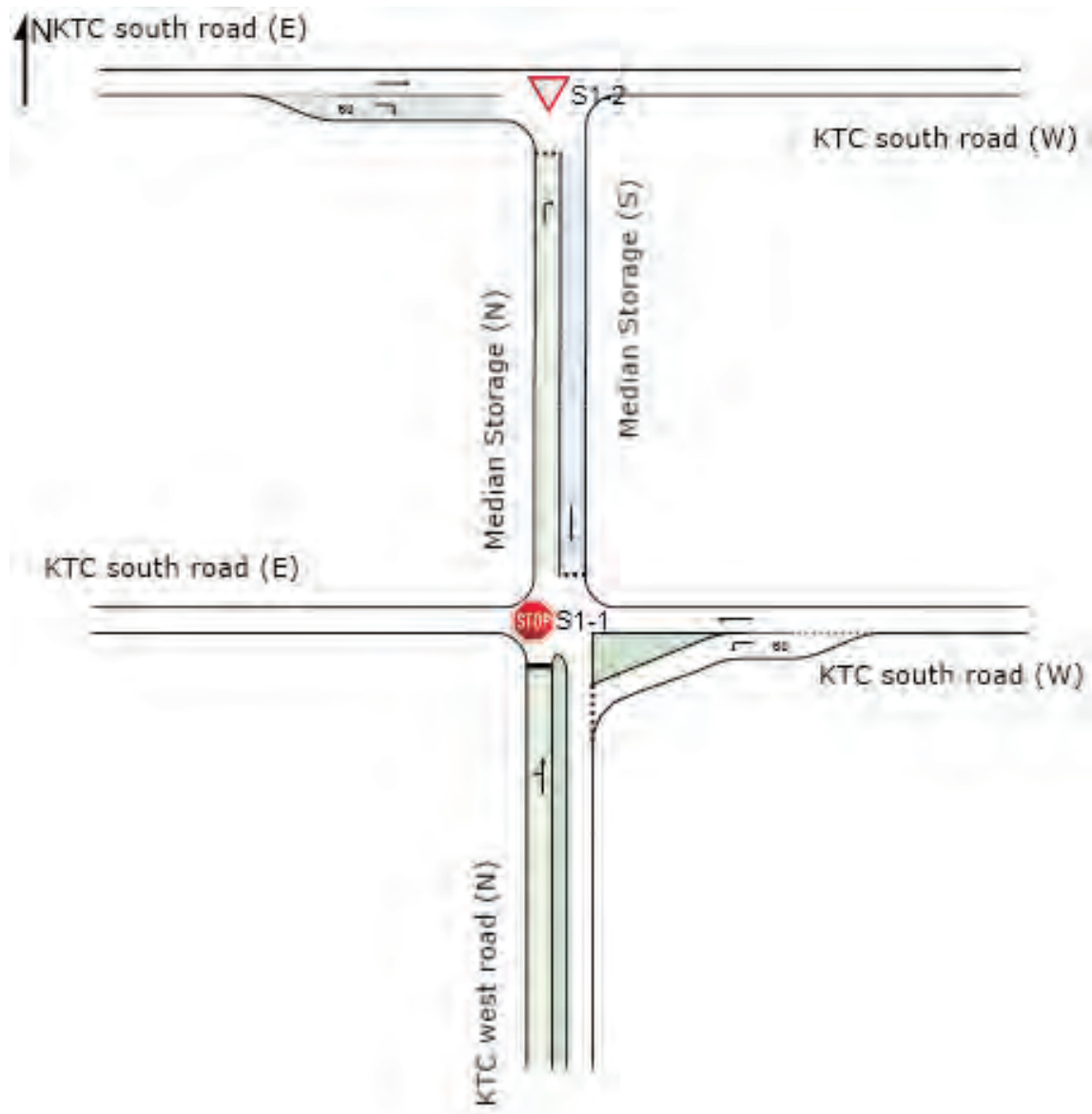


Figure C1. Kingsford Town Centre south road and west road T-intersection layout analysed in SIDRA

Note: This layout should be rotated 180 degrees to correctly represent the actual intersection orientation. (Currently not able to rotate this network template in SIDRA Intersection 9.0.)

The intersection is modelled in SIDRA Network analysis as two linked intersections to model the two stage right turn from the side road (first to the median and then turning right to the major road). The diagram is indicative only and not to scale. The modelled median width is 6 metres.

Table C1. SIDRA results – Kingsford Town Centre south road and west road T-intersection – 2031 weekday 3-4PM after-school peak with full development

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV %	[Total veh/h	HV %	v/c	sec		[Veh. veh	Dist] m				km/h
South: KTC west road (N)														
1	L2	7	3.0	7	3.0	0.374	10.5	LOS B	2.2	17.4	0.60	1.06	0.73	35.7
2	T1	241	3.0	241	3.0	0.374	12.2	LOS B	2.2	17.4	0.60	1.06	0.73	31.6
Approach		248	3.0	248	3.0	0.374	12.1	LOS B	2.2	17.4	0.60	1.06	0.73	31.7
East: KTC south road (W)														
3	L2	329	3.0	329	3.0	0.235	4.6	LOS A	1.1	9.2	0.06	0.47	0.06	41.4
4	T1	351	3.3	351	3.3	0.184	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	49.9
Approach		680	3.2	680	3.2	0.235	2.2	LOS A	1.1	9.2	0.03	0.23	0.03	44.7
North: Median Storage (S)														
5	T1	11	3.0	11	3.0	0.010	1.2	LOS A	0.0	0.3	0.37	0.22	0.37	40.7
Approach		11	3.0	11	3.0	0.010	1.2	LOS A	0.0	0.3	0.37	0.22	0.37	40.7
All Vehicles		939	3.1	939	3.1	0.374	4.8	NA	2.2	17.4	0.19	0.45	0.22	40.7
Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV %	[Total veh/h	HV %	v/c	sec		[Veh. veh	Dist] m				km/h
South: Median Storage (N)														
1	R2	241	3.0	241	3.0	0.203	1.6	LOS A	0.5	4.3	0.32	0.42	0.32	28.7
Approach		241	3.0	241	3.0	0.203	1.6	LOS A	0.5	4.3	0.32	0.42	0.32	28.7
West: KTC south road (E)														
2	T1	239	3.3	239	3.3	0.126	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	50.0
3	R2	241	3.0	241	3.0	0.133	4.9	LOS A	0.0	0.0	0.00	0.59	0.00	35.2
Approach		480	3.1	480	3.1	0.133	2.4	NA	0.0	0.0	0.00	0.30	0.00	42.8
All Vehicles		721	3.1	721	3.1	0.203	2.2	NA	0.5	4.3	0.11	0.34	0.11	39.1

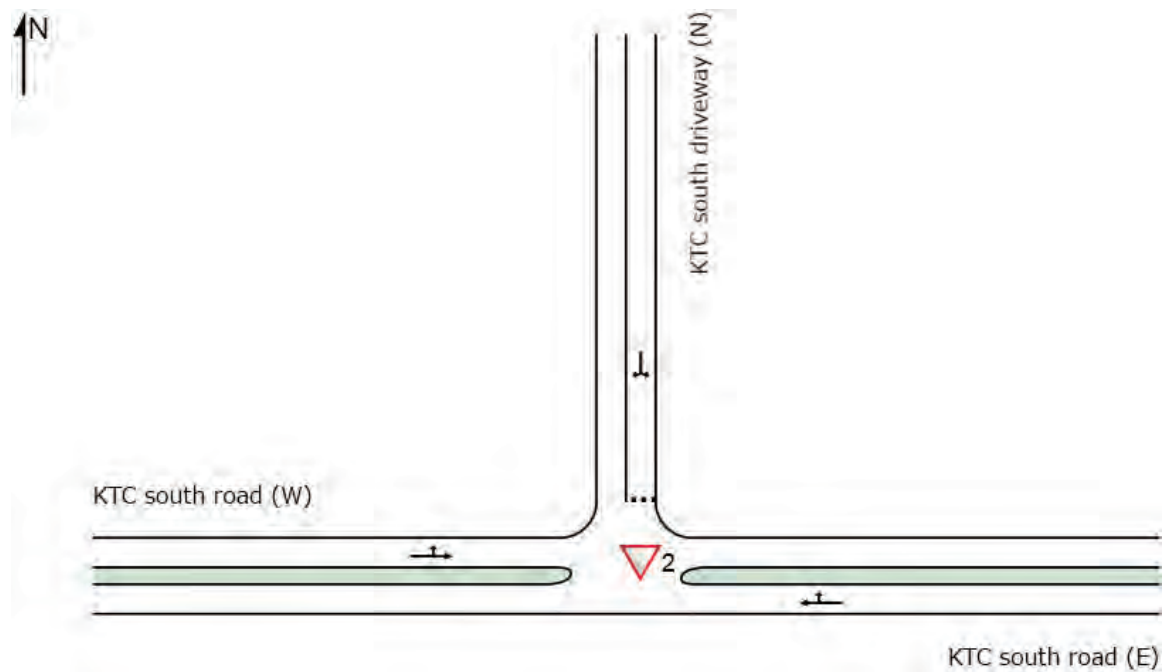


Figure C2. Kingsford Town Centre south road and Town Centre southern driveway T-intersection layout analysed in SIDRA

Table C2. SIDRA results – Kingsford Town Centre south road and southern driveway T-intersection – 2031 weekday 3-4PM after-school peak with full development

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
East: KTC south road (E)														
5	T1	100	3.3	105	3.3	0.127	0.6	LOS A	0.6	4.7	0.29	0.29	0.29	43.3
6	R2	100	0.0	105	0.0	0.127	5.3	LOS A	0.6	4.7	0.29	0.29	0.29	37.4
Approach		200	1.7	211	1.7	0.127	2.9	NA	0.6	4.7	0.29	0.29	0.29	40.6
North: KTC south driveway (N)														
1	L2	100	0.0	105	0.0	0.185	4.9	LOS A	0.7	5.7	0.25	0.57	0.25	36.3
2	R2	100	0.0	105	0.0	0.185	6.3	LOS A	0.7	5.7	0.25	0.57	0.25	35.4
Approach		200	0.0	211	0.0	0.185	5.6	LOS A	0.7	5.7	0.25	0.57	0.25	35.8
West: KTC south road (W)														
3	L2	100	0.0	105	0.0	0.111	4.6	LOS A	0.0	0.0	0.00	0.27	0.00	26.4
4	T1	100	3.3	105	3.3	0.111	0.0	LOS A	0.0	0.0	0.00	0.27	0.00	45.3
Approach		200	1.7	211	1.7	0.111	2.3	NA	0.0	0.0	0.00	0.27	0.00	34.7
All Vehicles		600	1.1	632	1.1	0.185	3.6	NA	0.7	5.7	0.18	0.37	0.18	36.9

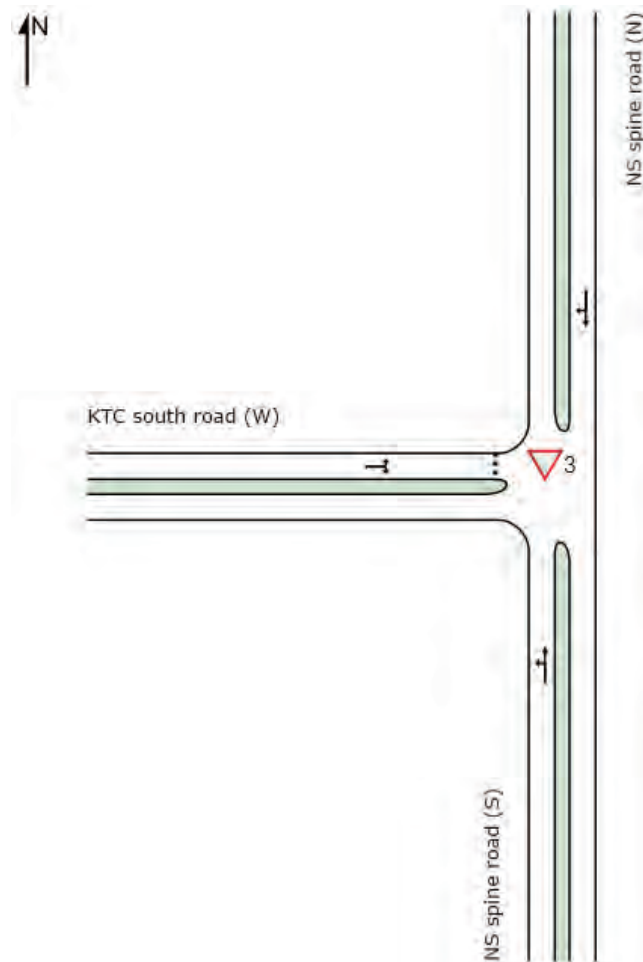


Figure C3. Kingsford Town Centre south road and north-south spine road T-intersection layout analysed in SIDRA

Table C3. SIDRA results – Kingsford Town Centre south road and north-south spine road T-intersection – 2031 weekday 3-4PM after-school peak with full development

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %	v/c	sec		[Veh. veh	Dist] m				km/h
South: NS spine road (S)														
3	L2	117	3.3	123	3.3	0.176	4.6	LOS A	0.0	0.0	0.00	0.20	0.00	44.4
4	T1	195	3.3	205	3.3	0.176	0.0	LOS A	0.0	0.0	0.00	0.20	0.00	47.2
Approach		312	3.3	328	3.3	0.176	1.7	NA	0.0	0.0	0.00	0.20	0.00	46.3
North: NS spine road (N)														
5	T1	121	3.3	127	3.3	0.100	0.5	LOS A	0.3	2.6	0.23	0.14	0.23	46.7
6	R2	39	3.3	41	3.3	0.100	5.9	LOS A	0.3	2.6	0.23	0.14	0.23	44.3
Approach		160	3.3	168	3.3	0.100	1.8	NA	0.3	2.6	0.23	0.14	0.23	46.1
West: KTC south road (W)														
1	L2	58	3.3	61	3.3	0.240	5.4	LOS A	0.9	7.4	0.41	0.67	0.41	40.1
2	R2	154	3.3	162	3.3	0.240	6.9	LOS A	0.9	7.4	0.41	0.67	0.41	36.7
Approach		212	3.3	223	3.3	0.240	6.5	LOS A	0.9	7.4	0.41	0.67	0.41	37.7
All Vehicles		684	3.3	720	3.3	0.240	3.2	NA	0.9	7.4	0.18	0.33	0.18	43.5

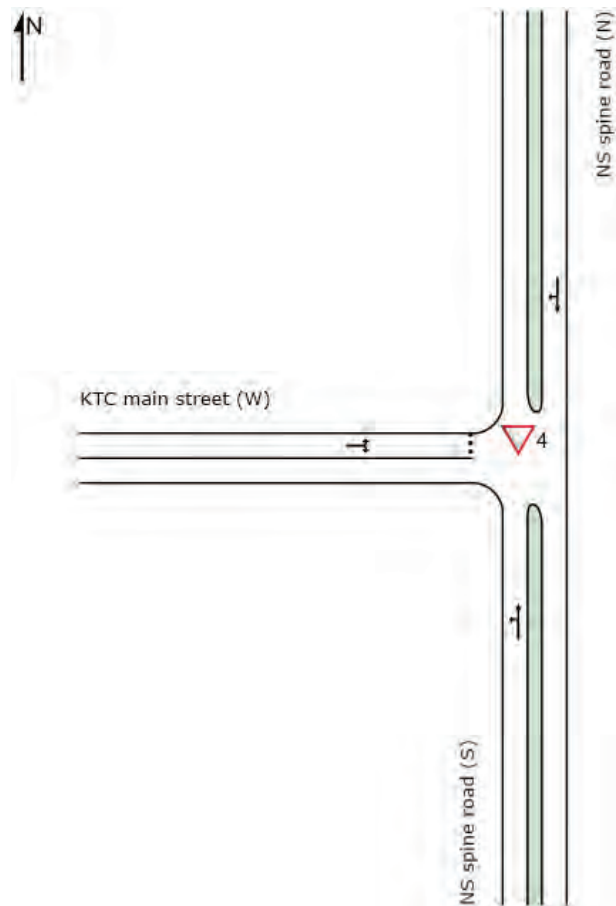


Figure C4. Kingsford Town Centre main street and north-south spine road T-intersection layout analysed in SIDRA

Table C4. SIDRA results – Kingsford Town Centre main street and north-south spine road T-intersection – 2031 weekday 3-4PM after-school peak with full development

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %	v/c	sec		[Veh. veh	Dist] m				km/h
South: NS spine road (S)														
3	L2	41	3.0	43	3.0	0.212	4.6	LOS A	0.0	0.0	0.00	0.06	0.00	47.5
4	T1	341	3.3	359	3.3	0.212	0.0	LOS A	0.0	0.0	0.00	0.06	0.00	48.9
Approach		382	3.3	402	3.3	0.212	0.5	NA	0.0	0.0	0.00	0.06	0.00	48.7
North: NS spine road (N)														
5	T1	274	3.3	288	3.3	0.174	0.2	LOS A	0.3	2.1	0.10	0.05	0.10	48.4
6	R2	24	3.0	25	3.0	0.174	6.2	LOS A	0.3	2.1	0.10	0.05	0.10	43.5
Approach		298	3.3	314	3.3	0.174	0.7	NA	0.3	2.1	0.10	0.05	0.10	48.1
West: KTC main street (W)														
1	L2	22	3.0	23	3.0	0.075	5.9	LOS A	0.3	2.0	0.47	0.69	0.47	31.6
2	R2	32	3.0	34	3.0	0.075	8.3	LOS A	0.3	2.0	0.47	0.69	0.47	38.8
Approach		54	3.0	57	3.0	0.075	7.3	LOS A	0.3	2.0	0.47	0.69	0.47	36.5
All Vehicles		734	3.3	773	3.3	0.212	1.1	NA	0.3	2.1	0.08	0.10	0.08	47.2

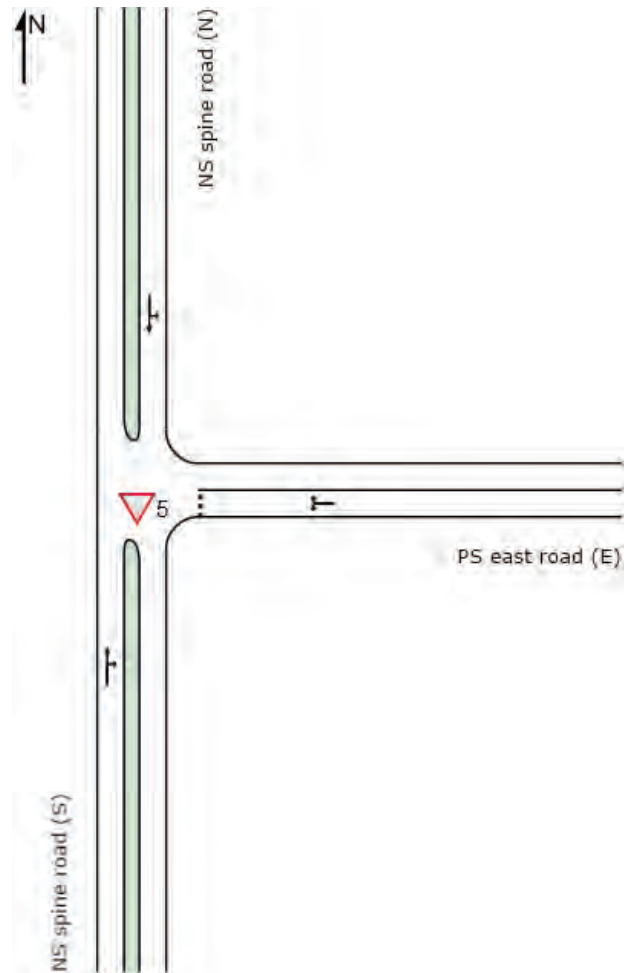


Figure C5. North-south spine road and primary school east road T-intersection layout analysed in SIDRA

Table C5. SIDRA results – North-south spine road and primary school east road T-intersection – 2031 weekday 3-4PM after-school peak with full development

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: NS spine road (S)														
5	T1	276	3.3	291	3.3	0.227	0.6	LOS A	0.8	6.6	0.26	0.15	0.26	47.1
6	R2	88	3.0	93	3.0	0.227	5.8	LOS A	0.8	6.6	0.26	0.15	0.26	40.4
Approach		364	3.2	383	3.2	0.227	1.9	NA	0.8	6.6	0.26	0.15	0.26	46.1
East: PS east road (E)														
1	L2	81	3.0	85	3.0	0.224	5.5	LOS A	0.8	6.7	0.42	0.67	0.42	32.0
2	R2	97	3.0	102	3.0	0.224	8.6	LOS A	0.8	6.7	0.42	0.67	0.42	41.2
Approach		178	3.0	187	3.0	0.224	7.2	LOS A	0.8	6.7	0.42	0.67	0.42	38.5
North: NS spine road (N)														
3	L2	99	3.0	104	3.0	0.177	4.6	LOS A	0.0	0.0	0.00	0.17	0.00	47.1
4	T1	216	3.3	227	3.3	0.177	0.0	LOS A	0.0	0.0	0.00	0.17	0.00	47.9
Approach		315	3.2	332	3.2	0.177	1.5	NA	0.0	0.0	0.00	0.17	0.00	47.6
All Vehicles		857	3.2	902	3.2	0.227	2.8	NA	0.8	6.7	0.20	0.26	0.20	45.0

APPENDIX C

CPTED

Assessment Table

KINGSFORD TOWN CENTRE PRECINCT - CPTED ASSESSMENT TABLE

The following table is an assessment of the Kingsford Town Centre Precinct using the CPTED principles and performance criteria listed in the *Western Australian Planning Commissions Design Out Crime Planning Guidelines* (2006). This Assessment has been prepared to support the Kingsford Town Centre Precinct Plan in accordance with *State Planning Policy 7.2 Precinct Design Guidelines* (Draft August 2019).

Project developer, Okeland Communities, will work to ensure that they deliver on all the actions in its control and monitors and promotes the delivery of the actions outside its control.

STAGE

The following are the various stages of development for the project:

- Design – Local Structure Plan, subdivision, civil design and landscape drawings;
- Construction – Civil construction and landscaping undertaken by Okeland Communities;
- Development – Dwelling, commercial, retail, community and education building design and construction; and
- Post-Development – Development completed.

LOCATION

The following are the specific locations within the Kingsford Town Centre Precinct:

- Town Centre (Activity Centre);
- Residential Village;
- Educational and Community Facilities;
- Streets; and
- Public Open Space.

RESPONSIBILITY

The following are the stakeholders responsible for implementing the principles and performance criteria:

- Okeland Communities;
- Landscape Architect;
- Civil Engineer;
- Traffic Engineer;
- Urban Designer;
- City of Swan;
- State Government agency (e.g. Department of Education);
- Private developer (includes their architect); and
- Resident.

PERFORMANCE CRITERIA	STAGE	LOCATION	RESPONSIBILITY	KINGSFORD TOWN CENTRE PRECINCT ASSESSMENT
NATURAL SURVEILLANCE				
Blind corners and problem areas • Avoid blind corners in pathways, stairways, corridors, hallways, near toilets and car parks	Design	All	Landscape Architect Civil Engineer Urban Designer	The path network follows regular geometry and will be designed to ensure no blind corners.
	Development	All	Private developer State Government agency	

• Avoid sudden changes of grade on pathways • Ensure through visibility in tunnels and underpasses • Avoid or minimise the effect of barriers on pathways	Design	Streets Public Open Space	Landscape Architect Civil Engineer Urban Designer Landscape Architect Civil Engineer Urban Designer Landscape Architect Civil Engineer Urban Designer	The pathways will be designed to meet City of Swan standards. Not applicable The use of barriers on pathways (e.g. bollards) will be in accordance with City of Swan standards and will primarily be utilised to prevent or limit vehicle access.
Communal or public areas				
• Provide natural surveillance from activity land uses and activity rooms for communal and public areas	Design Development	All All	Landscape Architect Urban Designer City of Swan State Government agency Private developer	Each street and public open space reserve will have either commercial/retail uses or dwellings fronting them and is serviced by footpaths. These will provide of activity and natural surveillance. External malls and public circulation areas in the Town Centre will have passive surveillance provided by active trading edges and the street via access ways and breaks in built form.
• Establish community focal points at locations where surveillance is essential	Design Development	All All	Landscape Architect Urban Designer City of Swan State Government agency Private developer	Community focal points will be located along the Ki-iti Brook open space to provide amenity for residents and visitors and to provide for passive surveillance. Regular seating and lingering spaces will be provided on the streets around the Town Centre.
• Ensure public shelters do not impede surveillance	Development	All	Landscape Architect City of Swan State Government agency	Not applicable at this stage
• Co-locate movement systems to encourage surveillance in public areas	Design Development	All All	Landscape Architect Civil Engineer Traffic Engineer Urban Designer City of Swan State Government agency Private developer	The Hike and Bike Network correlates with the road and public open space layout. This allows drivers, pedestrians and cyclists to provide surveillance in these areas.
• Encourage mixed uses to extend hours of surveillance, ensuring compatible uses and avoiding conflicting uses	Design Development	Town Centre (Activity Centre)	Urban Designer City of Swan Private developer	The Town Centre will include a range of land uses that will open at varied times, including: • Supermarkets and retail; • Child care centre;

Entrances					- Bulk goods retail; - Medical; - Service station; - Fast food outlets; and - Food and beverage.
	Provide entries which are clearly visible.	Development	Town Centre (Activity Centre) Residential Village Educational and Community Facilities	City of Swan State Government agency Private developer	Not applicable. These will be determined at the Development Application stage. Refer to Part One Section 3.5 Development Standards of the Kingsford Precinct Plan
Fencing	Fence design should maximise natural surveillance from the street to the building, building to the street and minimise opportunities for intruders to hide.	Design Development Post-Development	All All Town Centre (Activity Centre) Residential Village	Landscape Architect Urban Designer City of Swan State Government agency Private developer Private developer Resident	No front fencing is permitted. Fencing abutting public open space will be permeable.
	Avoid landscaping which obstructs surveillance, serves as a barrier to unimpeded views and allows intruders to hide.	Design Development	All All	Landscape Architect City of Swan State Government agency Private developer	Maintaining adequate surveillance is a pre-requisite for all landscaping designs.
URBAN STRUCTURE					
Local context	Scale, siting, orientation and connections should take into account the local context of local topography, other land uses, actual and perceived crime risk and specific project requirements	Design	All	Urban Designer	The design is based on a walkable neighbourhood structure with a permeable street network and opportunities to capture Darling Scarp and K1-1 Brook open space views. All lots are located at or above the road pavement. Dwellings and retail /commercial uses front the public open space.
	Consider crime reduction measures in the early stages of design	Design	All	Urban Designer Civil Engineer Traffic Engineer	The design has taken crime reduction measures into consideration via the provision of a legible street and open

- Define ownership and use of space - Avoid ambiguous space and connections - Promote legibility and orientation - Buildings should be oriented towards the main street frontage and other areas of public realm - Street furniture should facilitate surveillance and discourage inappropriate use - Cul-de-sacs should be short and straight, allow visibility from one end to the other and not be joined by networks of footpaths that are irregularly used and likely to foster criminal activity - Avoid the establishment of small, unusable pockets of land and open space as they are difficult to maintain and do not facilitate recreation	Design Design Design Design Development Design Design Design	All All All Town Centre (Activity Centre) Town Centre (Activity Centre) Streets Streets Residential Village	Urban Designer Urban Designer Civil Engineer Traffic Engineer Urban Designer Civil Engineer Traffic Engineer Architect Private developer Landscape Architect Urban Designer Traffic Engineer Urban Designer	space network. The design clearly demarcates the private and public realm. Each of the proposed connections serves a purpose and has a clear function. The design is based on a walkable neighbourhood structure with a permeable and legible street network. The roads generally follow the cardinal. The concept plan for the Town Centre indicates tenancies fronting the main street and other publicly accessible areas. Refer to Part One Section 3.5 Development Standards of the Kingsford Precinct Plan Not applicable. This will be addressed at the detailed design phase Not applicable as there are no cul-de-sacs proposed. Each public open space reserve serves a function, including active and passive recreation, conservation or drainage.
Movement network - Maximise surveillance of entry and exit points - Based upon primary routes and shared spaces	Design Development Design	Town Centre (Activity Centre) Streets Streets Streets	Urban Designer Civil Engineer Traffic Engineer City of Swan Private Developer Urban Designer Civil Engineer Traffic Engineer	The entry and access points to the Town Centre are legible from the streets. The design is based on a walkable neighbourhood structure with a permeable street network. The roads generally follow the cardinal. The movement network has a clear hierarchy, ranging from integrator roads to a main street to laneways. The major roads include provision for cyclists and pedestrians, including shared paths and on-street cycle lanes.

- Minimise confusion about priorities of use on shared paths and access ways - Minimise underused and unnecessarily segregated streets and footpaths - Avoid routes which can become entrapment spots - Provide direct and clearly signed pedestrian, cycle and vehicular links to nearby destinations - Pathways and cycleways to facilitate surveillance - Maximise legibility, sightlines and comfort to encourage use	Design	Streets Public Open Space	Urban Designer Civil Engineer Traffic Engineer Landscape Architect	Shared paths and access ways will be appropriately designed and signposted to reduce the potential for confusion.
	Design	Streets Public Open Space	Urban Designer Civil Engineer Traffic Engineer Landscape Architect	Each street and footpath has been designed to serve a function.
	Design	Streets Public Open Space	Urban Designer Civil Engineer Traffic Engineer Landscape Architect	The street and path network is permeable with multiple routes of access and egress.
	Design	Streets Public Open Space	Urban Designer Civil Engineer Traffic Engineer Landscape Architect City of Swan	The hike and bike network will be appropriately signposted with destinations.
	Design	Streets Public Open Space	Urban Designer Civil Engineer Traffic Engineer Landscape Architect	Each road and public open space reserve will have pathways or shared path
	Design	Streets Public Open Space	Urban Designer Civil Engineer Traffic Engineer Landscape Architect	The design is based on a walkable neighbourhood structure with a permeable street network. The roads generally follow the cardinal.
Location of land uses				
- Minimise opportunities for conflict, especially in mixed use development - Provide active frontages of overlooked streets - Minimise blank walls and sides of buildings onto public open space and public realm	Design Development	All All	Urban Designer City of Swan Private Developer State Government Agency	The main street, including food and beverage uses, fast foods outlets and service station are located away from residential areas to reduce the potential for land use conflict.
	Design Development	All	Urban Designer City of Swan Private Developer State Government Agency	Each street has commercial/retail land uses or dwellings fronting them to allow for passive surveillance
	Design Development	All	Urban Designer City of Swan Private Developer State Government Agency	Each street and public open space reserve has dwellings fronting them and is serviced by footpaths. These will provide of activity and natural surveillance.
				The Town Centre buildings will be designed to minimise blank walls and sides of buildings onto public open space and public realm. Refer to Part One Section 3.5 Development Standards of the Kingsford Precinct Plan
Regeneration and remodeling				

- Minimise dereliction, under utilised and under maintained spaces and places. - All open space should be well defined and purposeful - Vulnerable public spaces should become more liveable or be removed from public ownership	Post-Development Design Post-Development	All Public Open Space All	City of Swan Urban Designer Landscape Architect City of Swan	Not applicable The open space areas will be designed as a hierarchy with specific purposes and uses (e.g. conservation, passive or active recreation). Not applicable
LAND USE MIX				
Land use layout				
Encourage mixes that promote activity, surveillance and legitimate contact between people	Design	Town Centre (Activity Centre) Residential Village Educational and Community Facilities	Urban Designer Private Developer Department of Education	The Town Centre will include a range of land uses that will open at varied times, including: - Supermarkets and retail; - Child care centre; - Bulk goods retailers; - Medical; - Service station; - Fast food outlets; - Food and beverage; - Recreation (swim school); - Childcare; and - Education.
- Avoid strict separation of compatible land uses that may result in isolation of buildings or spaces - Encourage land use mixes which are compatible in scale and neighbouring uses, particularly in isolated areas	Development and Design Development and Design	Town Centre (Activity Centre) Educational and Community Facilities All	Urban Designer Private Developer Urban Designer Private Developer	The buildings in the Town Centre will be integrated in a coordinated manner to ensure that they are not isolated. The buildings in the Town Centre will be of a similar scale.
Access				
Encourage pedestrian passage through or activity at ground level to promote surveillance	Design Development	All All	Urban Designer Landscape Architect City of Swan Private Developer	Footpaths are provided on every street and public open space reserve
ACTIVITY GENERATORS				
Land use layout				
Locate around active edges or fringes of space to create surveillance opportunities	Design	Town Centre (Activity Centre) Educational and Community Facilities	Urban Designer	The Town Centre and school will be designed with buildings on the street edge to ensure activation and associated surveillance.

Access	Design	All	Urban Designer Civil Engineer Traffic Engineer Landscape Architect	The hike and bike network will be integrated with the streets.
Activity mix	Development	Town Centre (Activity Centre)	City of Swan Private Developer	The food and beverage uses will be located on the main street and will be of a scale to cater for local residents.
BUILDING DESIGN, INCLUDING BOUNDARY DEFINITION				
Building entrances	Development	All	Private Developer City of Swan State Government Agency	Refer to Part One Section 3.5 Development Standards of the Kingsford Precinct Plan
- Ensure entrances are oriented to face open or active spaces - Ensure entrances are clearly defined, distinguishable from public walkways, secure and well lit - Design lobbies to be visible from the exterior so that entry and exits spaces can be seen - Avoid creating entrapment spots or places where intruders may loiter or be concealed - Avoid locating ramped and elevator entrances and lifts in isolated locations - Secure non pedestrian entrances from illegal entry - Ensure staff entrances are well lit and allow maximum surveillance and sightlines				
Building design	Design	All	Urban Designer	Each street and public open space reserve has either commercial/retail uses or dwellings fronting them and is serviced by footpaths. These will provide of activity and natural surveillance
- Consider crime reduction measures in the early stages of design - Minimise blank walls overlooking parks, car parks and other public areas - Minimise features or structures that can be used as natural ladders to gain access to higher levels, windows or doors - Optimise the variety of building design to create interesting built environments - Provide windows to overlook public areas	Development	All	Private Developer City of Swan State Government Agency	
Materials and fixtures				

• Avoid materials and exterior fixtures which might encourage crime • Use transparent and materials in doors and walls at major entry points	Development	All	Private Developer City of Swan State Government Agency	Will be addressed at development application stage
Storage areas • Ensure surveillance and illumination of loading and storage areas • Locate delivery hatches, bins and other service facilities in a manner which does not create natural ladders or entrapment spaces	Development	All	Private Developer City of Swan State Government Agency	Will be addressed at development application stage. Refer to Part One Section 3.5 Development Standards of the Kingsford Precinct Plan
Retail commercial frontages • Promote after hours uses in frontage locations where public buildings front public spaces	Development	All	Private Developer City of Swan	The Town Centre will include a range of land uses that will open at varied times, including: • Supermarkets and retail; • Child care centre; • Bulk goods retailers; • Medical; • Service station; • Fast food outlets; and • Food and beverage.
Sightlines • Provide clear sightlines	Development	All	Private Developer City of Swan State Government Agency	Will be addressed at development application stage
Lighting • Illuminate entries so that access and egress visibility is maximised • Facilitate good interior to exterior surveillance through illumination	Development	All	Private Developer City of Swan State Government Agency	Will be addressed at development application stage
Employee carparking • Ensure safe and secure parking for employees near the building entry • Provide surveillance of car parking	Development	All	Private Developer City of Swan State Government Agency	Will be addressed at development application stage
Landscaping • Ensure landscape design will not provide concealment or entrapment areas	Development	All	Private Developer City of Swan State Government Agency	Will be addressed at development application stage

Optimise the variety of landscape to create interesting built environments				
Building security	Development	All		Private Developer City of Swan State Government Agency
Secure all windows, particularly at street level but ensure that security devices do not create a "fortress like" appearance				Will be addressed at development application stage
LIGHTING				
Situational lighting	Design	All		Urban Designer Civil Engineer Landscape Architect
- Ensure lighting is an early consideration in site planning and design - Select lighting appropriate to local context - Ensure inset spaces, access, egress and signage are well lit - Provide adequate lighting for directional signage	Development	All		Private Developer City of Swan State Government Agency
Consistency of lighting	Design	All		Urban Designer Civil Engineer Landscape Architect
- Maximise opportunities for natural light penetration - Provide consistent levels of lighting to reduce contrast and shadow - Ensure lighting supports visibility - Consider energy use	Development	All		Private Developer City of Swan State Government Agency
Placement of lighting	Design	All		Urban Designer Civil Engineer Landscape Architect
- Select and light safe routes and spaces - Avoid placement in areas shielded by vegetation, awnings and other physical barriers - Avoid unshielded lighting at eye level - Consider light pollution - Ensure lighting falls upon the subject matter - Avoid lighting areas not intended for night time use - Consider lighting in terms of vulnerable groups, with elderly, people with disabilities, children, women,	Development	All		Private Developer City of Swan State Government Agency
				Streets and public open reserves will be appropriately lit.
				Streets and public open reserves will be appropriately lit.
				Refer to Part One Section 3.5 Development Standards of the Kingsford Precinct Plan
				Streets and public open reserves will be appropriately lit.

- night staff - Avoid creating natural ladders with lighting fixtures					
Types of lighting	Design	All		Urban Designer Civil Engineer Landscape Architect	Will be addressed at development application stage
- Install vandal resistant lighting - Avoid dependence on bollard lighting as the only light source - Combine lighting along footpaths with entrance lighting wherever possible	Development	All		Private Developer City of Swan State Government Agency	
Maintenance	Post-Development	All		Private Developer City of Swan State Government Agency	Not applicable
- Ensure light fixtures are routinely and rapidly maintained - Consider public notices regarding maintenance contact details					
LANDSCAPE					
Footpath planting	Design	All		Urban Designer Civil Engineer Landscape Architect	Landscaping will be in accordance with City of Swan requirements and will be cognisant of CPTED requirements.
- Should improve amenity - Ensure shrubbery and planting is low to medium level and does not impede sightlines, surveillance, security and way finding - Non concealing trees for selected locations should not encourage climbing and should be placed to avoid clumping - Avoid planting screening signage and lighting					
Wall planting	Design	All		Urban Designer Civil Engineer Landscape Architect	Will be addressed at development application stage
Grade planting with taller plants next to walls	Development	All		Private Developer City of Swan State Government Agency Resident	
Entrance planting	Design	All		Urban Designer Civil Engineer Landscape Architect	Will be addressed at development application stage
Avoid planting screening doorways, entrances and windows	Development	All		Private Developer City of Swan State Government Agency	

Maintenance	Design			Resident	
- Carefully locate climbing plants to deter graffiti and vandalism - Specify high quality plants for long, low maintenance life	Design	All		Urban Designer Civil Engineer Landscape Architect	Will be addressed at development application stage
	Development	All		Private Developer City of Swan State Government Agency Resident	
Hard landscaping	Design	All		Urban Designer Civil Engineer Landscape Architect	Will be addressed at development application stage
- Select low maintenance, long life materials appropriate to the local context, level and type of use - Use details to identify public and private space and access ways for pedestrian, cycle and vehicular movement	Development	All		Private Developer City of Swan State Government Agency Resident	
MANAGEMENT & MAINTENANCE					
Maintenance	Post-Development	All		Okelard Communities Private Developer City of Swan State Government Agency	Not applicable at this stage
- Identify emergency contacts for maintenance in public locations - Promptly repair damage - Consider preventative maintenance					
Materials	Design	All		Urban Designer Civil Engineer Landscape Architect	Will be addressed at development application stage
- Use secure and enclosed service points - Specify materials that can withstand normal hard use and easily replaced - Provide protective heavy duty coatings in public areas and vulnerable hot spots - Avoid the use of highly vulnerable and flimsy materials and fittings which can be easily vandalised or removed in open locations - Avoid extensive and prolonged use of problem materials such as duty mesh, cyclone fencing and grilles which may encourage wilful damage - Avoid long expanses of non-permeable walls unless there is	Development	All		Private Developer City of Swan State Government Agency	

extensive public surveillance				
SIGHTLINES & WAY FINDING				
Sightlines	Design	All	Urban Designer Civil Engineer Landscape Architect	Each street and public open space reserve has commercial/retails uses or dwellings fronting them and is serviced by footpaths. The streets are designed to allow for sightlines.
Avoid the use of gradients or changes in direction which impede sightlines, especially on pathways, stairs or enclosed spaces	Development	All	Private Developer City of Swan State Government Agency	These will provide of activity and natural surveillance.
Avoid landscape materials acting as a screen or barrier to unimpeded views of pathways				
Ensure that pedestrians have a clear view ahead				
Improve the sightlines in established areas through a reconsideration of routes, times of access and additional hardware such as appropriate security mirrors				
Way finding	Design	All	Urban Designer Civil Engineer Landscape Architect	The hike and bike network will be appropriately signposted with destinations
Signage should identify where assistance and key areas can be located such as taxi ranks, toilets, public transport and telephones	Development	All	Private Developer City of Swan State Government Agency	
Signage should be visible, concise and easily maintained				
Use environmental cues such as changes in footpath materials, levels of lighting and appropriate changes in grade or elevation				
Use appropriate physical barriers (permeable fences) and symbolic barriers (low vegetation) to define use and ownership				
SIGNAGE				
Provision of signage	Design	All	Urban Designer Civil Engineer Landscape Architect	The hike and bike network will be appropriately signposted with destinations
Prepare a signage plan focussing on safe routes, destinations, facilities and amenities en route	Development	All	Private Developer City of Swan State Government Agency	
Ensure signage is easily legible at all hours				
Locate signage strategically, at crossing points, junctions, activity places and other common areas				

- Indicate where to go for assistance - Provide maps in large public open spaces and orientate maps to be consistent with the viewers direction					
Maintenance	Design	All	Urban Designer Civil Engineer Landscape Architect	Not applicable	
- Ensure key public signage is not obscured by mature landscape, awnings, poor lighting, too many commercial signs and vandalism - Consider reporting contacts and the process for emergency maintenance	Development	All	Private Developer City of Swan State Government Agency		
PREDICTABLE ROUTES & SPACES SAFE FROM ENTRAPMENT					
Entrapment spots adjacent to pedestrian and cycle routes	Design	All	Urban Designer Civil Engineer Landscape Architect	No dead ends or cul-de-sacs are proposed.	
- Avoid creating entrapment spots adjacent to a main pedestrian and or cycle route, a predictable unchangeable path or a private dead end alleyway - In established areas consider additional facilities such as lighting, improved maintenance or uses such as a kiosk or vendors to make spaces safer - Consider appropriate target hardening of storage areas, loading docks or other potential entrapment spots after hours in order to limit access - Arrange for regular security or police patrols	Development	All	Lease/LandCorp Private Developer City of Swan State Government Agency	Refer to Part One Section 3.5 Development Standards of the Kingsford Precinct Plan	
Location of facilities	Development	Town Centre (Activity Centre)	Private Developer City of Swan State Government Agency	Will be addressed at development application stage	
- Locate entrances to automatic teller machines and other facilities within direct view of pedestrian paths - Locate car parking away from potential entrapment spaces - Ensure signs do not create entrapment spots					

APPENDIX D

POS

HEALTHY ACTIVE DESIGN ASSESSMENT



PUBLIC OPEN SPACE KINGSFORD ACP

Objective:

PROVIDE A RANGE OF PUBLIC OPEN SPACES THAT CONTRIBUTE TO THE RECREATIONAL, PHYSICAL AND SOCIAL NEEDS OF ALL MEMBERS OF THE COMMUNITY.

Principle	Considerations	Strength of evidence	Yes	No	N/A
Access: Public use of open spaces can be improved by ensuring that they are easily accessible to, and by, all members of the community	Do all community members have at least one open space within a 400m - 800m walk?	Refer to Healthy Active By Design Plan	X		
	Are there clear pedestrian and cycle routes, designated crossings, and suitable ramps to, and within, the open space?	Refer to Healthy Active By Design Plan	X		
	Are the public open spaces accessible to people of all ages, genders and cultures, including those with disabilities and limited mobility?	Refer to POS Concept Plans	X		
Function: Open spaces assist in meeting the physical, recreational and social needs of a community.	Have the open spaces been designed to meet the diverse needs of the community? How were those needs identified?	Refer to POS Concept Plans	X		
	Are there a range of uses that promote physical activity and community interactions? How do these uses generate activity throughout the week and day and night?	Refer to POS Concept Plans	X		
	How are the open spaces and supporting infrastructure managed and maintained?	Developer maintained for 2 years and then maintained by City	X		
	Does the open space reflect the cultural heritage and identity of the site, and the character of the surrounding community?	Refer to POS Concept Plans	X		
Design: Open space designs that respond to their surrounds can enable a strong connection to the community and the environment.	How well do the surrounds contribute to safety? Do nearby buildings and streets overlook the space? Is there adequate lighting within the space?	Refer to POS Concept Plans	X		
	How does the open space respond to existing environmental conditions such as drainage, slopes and retaining trees?	Refer to CPTED table	X		

Process considerations:

Establish linear connections and access along the coast, public foreshores, wetlands and waterbodies to enhance opportunities for physical activity.
Undertake a community needs assessment to identify open space needs. Consider roles and functions within public open spaces holistically to resolve needs across the open space network.

APPENDIX E

Acoustic Report

HERRING STORER



**LOT 1354
GREAT NORTHERN HIGHWAY
BULLSBROOK**

STATE PLANNING POLICY 5.4 ACOUSTIC ASSESSMENT

JUNE 2021

OUR REFERENCE: 27868-1-16264-04



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SPP 5.4 NMP
KINGSFORD TOWN CENTRE; BULLSBROOK

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CONTENTS

1.	INTRODUCTION	1
2.	SUMMARY	1
3.	CRITERIA	2
4.	NOISE MONITORING	5
5.	MODELLING	6
6.	DISCUSSION / RECOMMENDATIONS	7

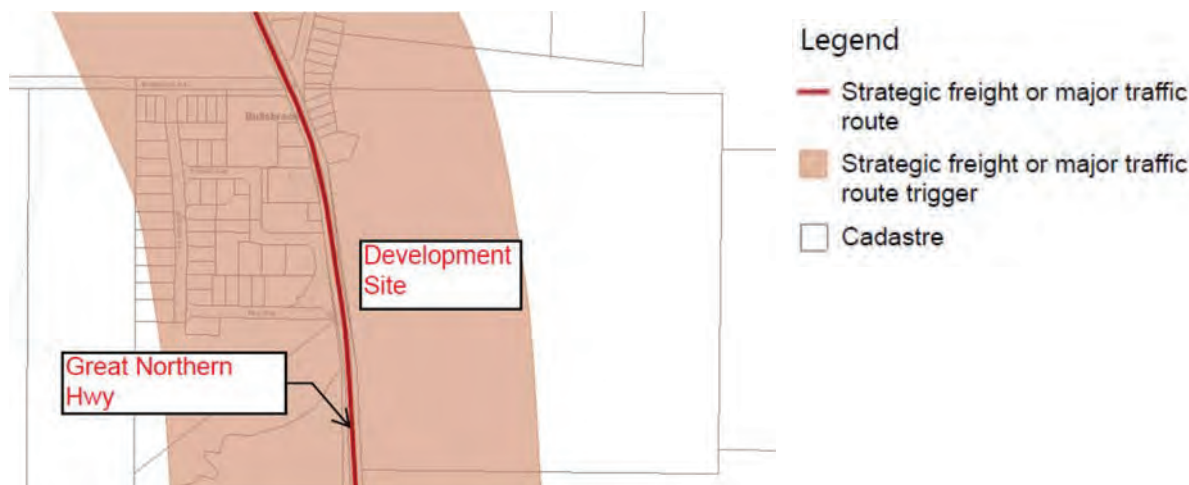
APPENDICIES

A	Structure Plan, Chittering Road Realignment Plan and Monitoring Locations
B	Noise Monitoring Results
C	$L_{Aeq(16hr)}$ Day Period Noise Contours
D	MRWA Traffic Data

1. INTRODUCTION

Herring Storer Acoustics was commissioned to update the noise assessment undertaken for the proposed Activity Centre to be located at Lot 1354 Great Northern Highway, Bullsbrook from vehicles travelling along both the Great Northern Highway. This update has been undertaken to take into account the revised LSP and updates to State Planning Policy 5.4.

As shown on Figure 1.1, the Activity Centre is located on the Great Northern Highway, which is within the assessment buffer zones for traffic noise associated with the Great Northern Highway.



As part of the assessment, the following was carried out:

- Determine by modelling, the noise that would be received at residences within the residential development from vehicles travelling along Great Northern Highway, based on previous noise monitoring.
- Assess the predicted noise levels for compliance with the appropriate criteria.
- If exceedances are predicted, comment on possible noise amelioration options for compliance with the appropriate criteria.

For information, a locality plan is attached in Appendix A. Also attached in appendix A is the proposed realignment of northern section of Chittering Road.

2. SUMMARY

Under the WAPC State Planning Policy 5.4, for this development, the appropriate “Noise Targets” to be achieved under SPP 5.4, external to a residence are:

External

Day	Maximum of 55 dB(A) L_{Aeq}
Night	Maximum of 50 dB(A) L_{Aeq}

The policy states that the “outdoor targets are to be met at all outdoor areas as far as reasonable and practical to do so using the various noise mitigation measures outlined in the guidelines”. The Policy also states, under Section 6 – Policy Measures that “a reasonable degree of acoustic amenity for living areas on each residential lot”. The policy recognises that “it may not be practicable to meet the outdoor noise targets”.

The Policy states the following acceptable internal noise levels:

Internal

Living and Work Areas	L _{Aeq} (Day) of 40 dB(A)
Bedrooms	L _{Aeq} (Night) of 35 dB(A)

For this development, compliance with the requirements of SPP 5.4, noise modelling and assessment are based on the day period for residence located adjacent to the Great Northern Highway.

Based on the noise modelling and assessment undertaken, noise received at residences within the Activity Centre would comply with the acoustic criteria as outlined in State Planning Policy 5.4. Thus, no further action is required.

3. CRITERIA

The Western Australian Planning Commission (WAPC) released on 6th September 2019 State Planning Policy 5.4 “Road and Rail Noise”. The requirements of State Planning Policy 5.4 are outlined below.

POLICY APPLICATION (Section 4)

When and where it applies (Section 4.1)

SPP 5.4 applies to the preparation and assessment of planning instruments, including region and local planning schemes; planning strategies, structure plans; subdivision and development proposals in Western Australia, where there is proposed:

- a) *noise-sensitive land-use within the policy’s trigger distance of a transport corridor as specified in **Table 1**;*
- b) *New or major upgrades of roads as specified in **Table 1** and maps (**Schedule 1,2 and 3**); or*
- c) *New railways or major upgrades of railways as specified in maps (**Schedule 1, 2 and 3**); or any other works that increase capacity for rail vehicle storage or movement and will result in an increased level of noise.*

Policy trigger distances (Section 4.1.2)

Table 1 identifies the State’s transport corridors and the trigger distances to which the policy applies.

*The designation of land within the trigger distances outlined in **Table 1** should not be interpreted to imply that land is affected by noise and/or that areas outside the trigger distances are unaffected by noise.*

*Where any part of the lot is within the specified trigger distance, an assessment against the policy is required to determine the likely level of transport noise and management/ mitigation required. An initial screening assessment (**guidelines: Table 2: noise exposure forecast**) will determine if the lot is affected and to what extent.”*

TABLE 1: TRANSPORT CORRIDOR CLASSIFICATION AND TRIGGER DISTANCES

Transport corridor classification	Trigger distance	Distance measured from
Roads		
Strategic freight and major traffic routes <i>Roads as defined by Perth and Peel Planning Frameworks and/or roads with either 500 or more Class 7 to 12 Austroads vehicles per day, and/or 50,000 per day traffic volume</i>	300 metres	Road carriageway edge
Other significant freight/traffic routes <i>These are generally any State administered road and/or local government road identified as being a future State administered road (red road) and other roads that meet the criteria of either $\geq 23,000$ daily traffic count (averaged equivalent to 25,000 vehicles passenger car units under region schemes)</i>	200 metres	Road carriageway edge
Passenger railways		
	100 metres	Centreline of the closest track
Freight railways		
	200 metres	Centreline of the closest track

Proponents are advised to consult with the decision making authority as site specific conditions (significant differences in ground levels, extreme noise levels) may influence the noise mitigation measures required, that may extend beyond the trigger distance.

POLICY MEASURES (Section 6)

The policy applies a performance-based approach to the management and mitigation of transport noise. The policy measures and resultant noise mitigation will be influenced by the function of the transport corridor and the type and intensity of the land-use proposed. Where there is risk of future land-use conflict in close proximity to strategic freight routes, a precautionary approach should be applied. Planning should also consider other broader planning policies. This is to ensure a balanced approach takes into consideration reasonable and practical considerations.

Noise Targets (Section 6.1)

Table 2 sets out noise targets that are to be achieved by proposals under which the policy applies. Where exceeded, an assessment is required to determine the likely level of transport noise and management/mitigation required.

In the application of the noise targets the objective is to achieve:

- indoor noise levels as specified in **Table 2** in noise sensitive areas (for example, bedrooms and living rooms of houses, and school classrooms); and
- a reasonable degree of acoustic amenity for outdoor living areas on each residential lot. For non-residential noise-sensitive developments, for example schools and child care centres the design of outdoor areas should take into consideration the noise target.

It is recognised that in some instances, it may not be reasonable and/or practicable to meet the outdoor noise targets. Where transport noise is above the noise targets, measures are expected to be implemented that balance reasonable and practicable considerations with the need to achieve acceptable noise protection outcomes.

TABLE 2: NOISE TARGETS

Proposals	New/Upgrade	Noise Targets		
		Outdoor		Indoor
		Day ($L_{Aeq}(\text{Day})$ dB) (6 am-10 pm)	Night ($L_{Aeq}(\text{Night})$ dB) (10 pm-6 am)	(L_{Aeq} dB)
Noise-sensitive land-use and/or development	New noise sensitive land use and/or development within the trigger distance of an existing/proposed transport corridor	55	50	L_{Aeq} (Day) 40(Living and work areas) L_{Aeq} (Night) 35 (bedrooms)
Roads	New	55	50	N/A
	Upgrade	60	55	N/A
Railways	New	55	50	N/A
	Upgrade	60	55	N/A

Notes:

- The noise target is to be measured at one metre from the most exposed, habitable façade of the proposed building, which has the greatest exposure to the noise-source. A habitable room has the same meaning as defined in State Planning Policy 3.1 Residential Design Codes.
- For all noise-sensitive land-use and/or development, indoor noise targets for other room usages may be reasonably drawn from Table 1 of Australian Standard/New Zealand Standard AS/NZS 2107:2016 Acoustics – Recommended design sound levels and reverberation times for building interiors (as amended) for each relevant time period.
- The 5dB difference in the criteria between new and upgrade infrastructure proposals acknowledges the challenges in achieving noise level reduction where existing infrastructure is surrounded by existing noise-sensitive development.
- Outdoor targets are to be met at all outdoor areas as far as is reasonable and practical to do so using the various noise mitigation measures outlined in the guidelines. For example, it is likely unreasonable for a transport infrastructure provider to achieve the outdoor targets at more than 1 or 2 floors of an adjacent development with direct line of sight to the traffic.

Noise Exposure Forecast (Section 6.2)

When it is determined that SPP 5.4 applies to a planning proposal as outlined in Section 4, proponents and/or decision makers are required to undertake a preliminary assessment using **Table 2**: noise exposure forecast in the guidelines. This will provide an estimate of the potential noise impacts on noise-sensitive land-use and/ or development within the trigger distance of a specified transport corridor. The outcomes of the initial assessment will determine whether:

- no further measures is required;
- noise-sensitive land-use and/or development is acceptable subject to deemed-to- comply mitigation measures; or
- noise-sensitive land-use and/or development is not recommended. Any noise-sensitive land-use and/ or development is subject to mitigation measures outlined in a noise management plan.”

4. NOISE MONITORING

Noise logging was undertaken on the site to determine the existing noise received from vehicles travelling on the Great Northern Highway. Monitoring was previously carried out for the Great Northern Highway between Friday 9th December 2016 and Thursday 15th December 2016.

We note that 2016 was the year that MRWA provided road traffic numbers for the existing traffic flows on Great Northern Highway. Thus, 2016 noise monitoring would be appropriate for the calibration of the noise model.

For information, the logger location is shown on the aerial photograph below, as Figure 4.1.



FIGURE 4.1 – NOISE MONITORING LOCATION

The results for the noise logging are summarised in Table 4.1.

**TABLE 4.1 - SUMMARY OF LOGGED NOISE LEVELS
GREAT NORTHERN HIGHWAY**

Parameter	Measured Level dB(A)*	Difference between L _{10(18hour)} and L _{Aeq(parameter)} dB(A)
L _{A10} (18 hour)	67.6	N/A
L _{Aeq, day} (6am to 10pm)	64.7	= L _{A10} (18 hour) – 2.9
L _{Aeq, night} (10pm to 6am)	58.8	= L _{Aeq} (Day) – 5.9

* It is normal practice to quote decibels to the nearest whole number. Fractions are retained here to minimise any cumulative rounding error.

The above parameters are :

- L_{A10} The noise level exceeded for 10% of the time (in this instance, the noise level exceeded for 6 minutes in each 1-hour period).
- L_{Aeq} The energy equivalent noise level for the 1-hour period. A single number value that expresses the time-varying sound level for the 1 hour period as though it were a constant sound level with the same total sound energy as the time-varying level.

5. MODELLING

To determine the noise received within the Activity Centre from the Great Northern Highway, acoustic modelling was carried out using SoundPlan, using the Calculation of Road Traffic Noise (CoRTN) algorithms. Noise modelling was undertaken in accordance with the “Implementation Guidelines” for the State Planning Policy 5.4.

The input data for the model included:

- Traffic data as listed in Table 5.1; and
- A +2.5 dB adjustment to allow for façade reflection.

**TABLE 5.1 - NOISE MODELLING INPUT DATA
GREAT NORTHERN HIGHWAY**

Parameter	Value	
	Current	Future
Current Traffic Flow (vpd)	14800	15000
Speed (km/hr)	60	60
Heavy Vehicles (%)	28	14
Percentage traffic 0600 – 2400 hours	94	94
Other		
Receiver Level (m)	+1.5 above ground	+1.5 above ground
Façade Correction	+ 2.5 dB(A)	+ 2.5 dB(A)
Road Surface	Chip seal	Chip seal

Future traffic flows, being as provided by MRWA transport modelling section (Job No : 41902). For reference, the traffic flows are attached in Appendix D.

Other input data for the model included:

- Noise source heights for the three road source strings (Passenger Vehicles, Heavy Vehicles Engine and Heavy Vehicle Exhausts) are +0.5, +1.5 and +3.6m, with a noise correction of -0.8 and -8.0 applied to the heavy vehicle engines and exhaust noise sources.
- Traffic data from MRWA (<https://mrapps.mainroads.wa.gov.au/TrafficMap/>)
- Topographical data, with the ground level within the development based on natural ground levels as per Google Earth.
- Development receiver heights at 1.4m above ground level.
- Future buildings located on the Lots (assumed to be present for future road traffic volumes).

As shown in Table 4.1, the difference between the $L_{Aeq} (Day)$ and the $L_{Aeq} (Night)$ for the Great Northern Highway was 5.9 dB. Thus, noting that the under the Policy, the difference between the Day and night criteria are 5 dB, with the differences between the $L_{Aeq} (Day)$ and the $L_{Aeq} (Night)$ being greater than 5 dB(A), achieving compliance with the day period criteria would also achieve compliance with the night period criteria. Therefore, noise modelling was only undertaken for the day period and the results are shown on Figure C1 in Appendix C.

6. DISCUSSION / RECOMMENDATIONS

Under the WAPC State Planning Policy 5.4, for this development, the appropriate “Noise Targets” to be achieved under SPP 5.4, external to a residence are:

External

Day	Maximum of 55 dB(A) L_{Aeq}
Night	Maximum of 50 dB(A) L_{Aeq}

The policy states that the “outdoor targets are to be met at all outdoor areas as far as reasonable and practical to do so using the various noise mitigation measures outlined in the guidelines”. The Policy also states, under Section 6 – Policy Measures that “a reasonable degree of acoustic amenity for living areas on each residential lot”. The policy recognises that “it may not be practicable to meet the outdoor noise targets”.

The Policy states the following acceptable internal noise levels:

Internal

Living and Work Areas	$L_{Aeq(Day)}$ of 40 dB(A)
Bedrooms	$L_{Aeq(Night)}$ of 35 dB(A)

For this development, compliance with the requirements of SPP 5.4, noise modelling and assessment are based on the day period for residence located adjacent the Great Northern Highway.

Based on the noise modelling and assessment undertaken, noise received at residences within the Activity Centre would comply with the acoustic criteria as outlined in State Planning Policy 5.4. Thus, no further action is required.

APPENDIX A

STRUCTURE PLAN



LEGEND

ACTIVITY CENTRE BOUNDARY

ZONES

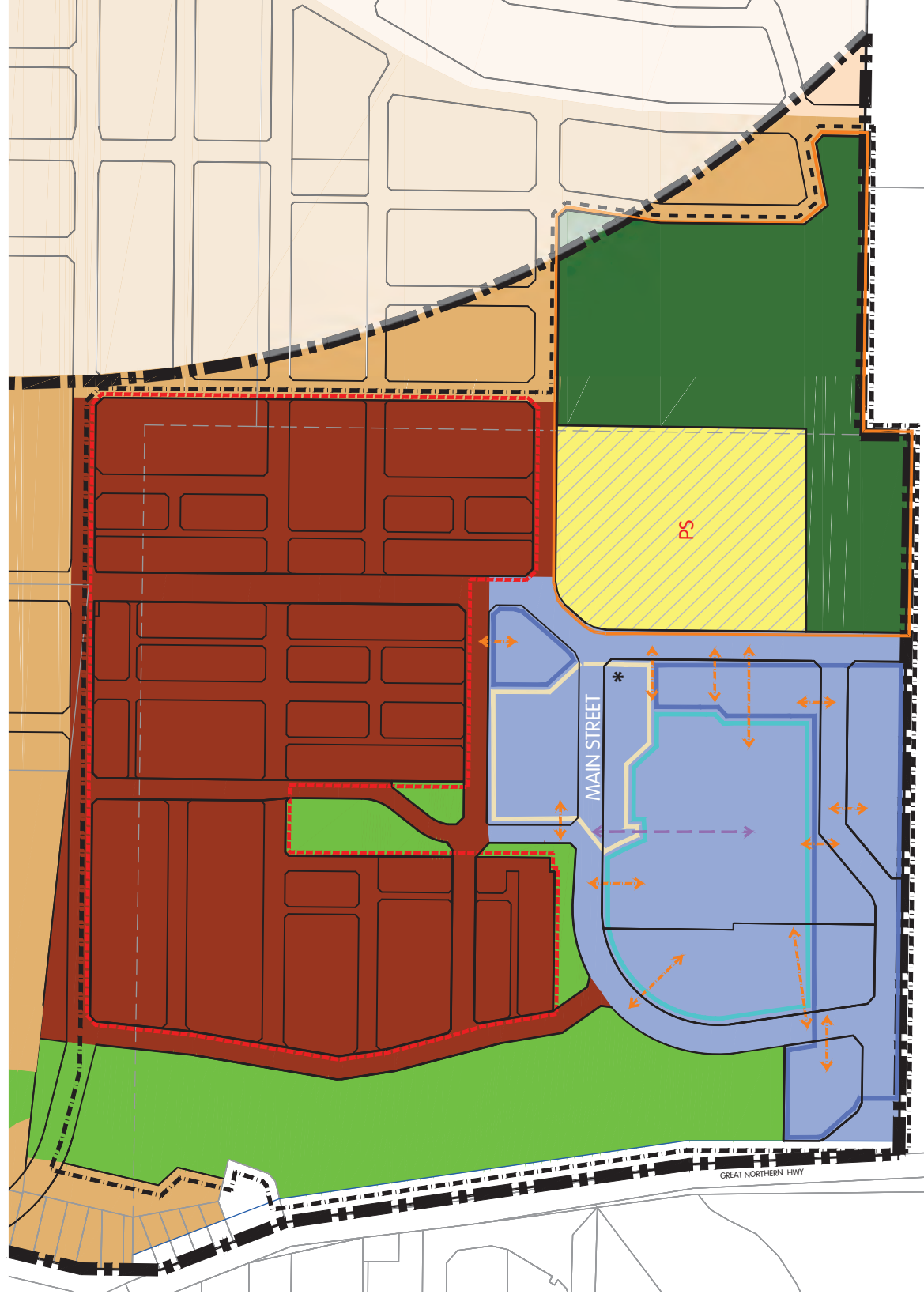
- GENERAL COMMERCIAL
- RESIDENTIAL R40-R60
- PUBLIC PURPOSE
- PRIMARY SCHOOL
- POS/ CONSERVATION
- DISTRICT OPEN SPACE

CHARACTER AREA

- RETAIL
- MAIN STREET
- SERVICE COMMERCIAL
- RESIDENTIAL
- EDUCATION/RECREATION

OTHER

- R-CODE R80
- PEDESTRIAN LINKAGES
- VEHICLE ACCESS
- LANDMARK BUILDING



CADASTRAL INFORMATION
SOURCE: ROBERTSDAY
YYMMDD: 200407
DWG REF: RD1301A
PROJECTION: PCG94

AERIAL PHOTOGRAPHY
SOURCE: NA
YYMMDD: NA



ACTIVITY CENTRE PLAN
Kingsford Town Centre - Bullsbrook
City of Swan

REF NO. DRAW NO. REV.
AMX BUL RD1 240 G

SIZE A4 1:5000
0 50 100 150 200 250
metres

DISCLAIMER: ISSUED FOR DESIGN INTENT ONLY. ALL AREAS AND DIMENSIONS ARE SUBJECT TO DETAIL DESIGN AND SURVEY