SELLICKS BEACH STRUCTURE PLAN
MOVEMENT ANALYSIS

CITY OF ONKAPARINGA

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1. EXECUTIVE SUMMARY

CIRQA has been engaged by the City of Onkaparinga to undertake a 'movement analysis' within Sellicks Beach. The intention of the study is to inform Council of future infrastructure requirements arising from the rezoning and development of both greenfield and infill areas within the study area.

It is anticipated that future development yields within the study area would result in the provision of approximately 935 to 1,560 residential allotments (varying in size from 450 m² to 750 m²), a 6 ha primary school, a 4 ha neighbourhood centre, 15.25 ha of public open spaces and 36.6 ha of road reserve once development of the study area is complete.

As a result of the anticipated urban development, increase demands will be created for movement to, from and within the study area through the use of various modes of transport (private vehicle, public transport and active transport).

Upon full completion and occupation, development of the study area is forecast to generate in the order of 15,350 additional daily vehicle movements on the internal and external road network (relative to the study area). Movements will be distributed to employment, education and lifestyle areas within the study area, locally (Aldinga and surrounds) and beyond (metropolitan and CBD Adelaide etc.).

Analyses of the existing road network identified that the existing hierarchy and designated function is generally appropriate with regard to existing traffic volumes. However, future development of the study area in line with anticipated yields will result in numerous changes to existing road functions, with upgrades required in order to accommodate forecast traffic volumes.

Similarly, analyses of key intersections within and adjacent to the study area have been undertaken. The following intersections have been identified to have a poor Level of Service upon the future development being realised:

- Main South Road/Norman Road/Rogers Road;
- Main South Road/Sellicks Beach Road/Old Sellicks Hill Road; and
- Sellicks Beach Road/Justs Road/Country Road.

It is likely that upgrade of these intersections will be required, however will be somewhat dependant on the ultimate development yields and access arrangements realised. Upgrade to the Main South Road, Norman Road and Rogers Road intersection is also recommended to accommodate future development-related traffic volumes.

Investigation of crash data has also identified existing crash issues at several key intersections adjacent the study area (of note, all intersections are associated with Main South Road). Upgrades to such intersections are recommended in order to ameliorate crash risks evident with existing traffic volumes as well as potential risks associated with increased development volumes.

In addition, development of the study area will also increase demands for a higher level of public transport services operating at a higher frequency and servicing a larger catchment. Investigations into the better utilisation of existing services as well as the potential for new and increased services have subsequently been explored and have identified significant areas for improvement.

Investigations into existing active transport networks have identified that, while small pockets of infrastructure are provided throughout the study area, provisions within the study area are generally poor with minimal connectivity between any existing provisions. In particular, connectivity to the area beyond Sellicks Beach restricts its effective use by the larger community Sellicks Beach and Aldinga Beach communities. Numerous opportunities have been identified to improve pedestrian and cyclist connectivity in order to service a high proportion of the study area (including adjacent residential areas) and provide a connected network.

2. STUDY AREA

The 325 ha (approximate) study area is located on the western side of Main South Road (approximately 50 km south of Adelaide's Central Business District) within the suburb of Sellicks Beach. The study area is bound by vacant land to the north and south, Main South Road to the east and the Gulf of St Vincent to the west.

Figure 1 illustrates the location of the study area in regard to the broader area.

Figure 1 – Location of the study area

The study area comprises land within four zones as identified by the City of Onkaparinga's Development Plan, including:

- Residential Zone (Sellicks Beach Policy Area 45) – approximately 192.5 ha;
- Local Centre Zone – approximately 0.5 ha;
- Deferred Urban Zone – approximately 85 ha; and
- Primary Production Zone – approximately 47 ha.

The study area is bound by a Primary Production Zone (Open Space Policy Area 33) to the north, Primary Production Zones to the east and south, and a Coastal Conservation to the west.

Figure 2 illustrates the various zones within the study area.

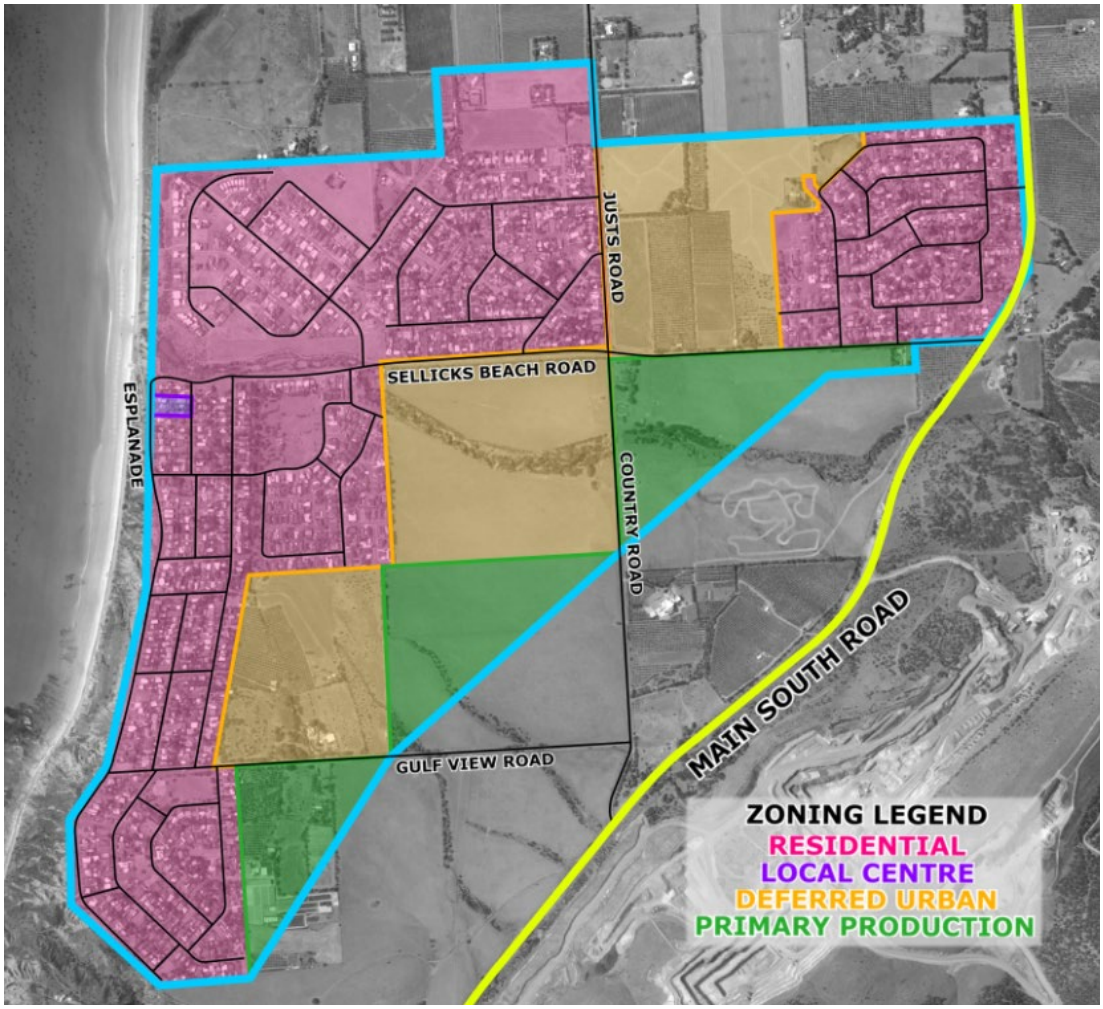

Figure 2 – Development plan zoning within the study area

3. BACKGROUND

The City of Onkaparinga are considering the potential to rezone the study area to provide and maintain an adequate supply of residential land within the outer south region of Adelaide. This aligns with "*The 30 Year Plan for Greater Adelaide*", within which the study area is defined as 'Planned Urban Lands'.

As part of the Council's preliminary investigations, Council has sought to prepare a 'Structure Plan' (as outlined in Council's Strategic Directions Report endorsed by the Stage Government in 2015) to inform of potential infrastructure, community and social services required to support development of the study area.

The rezoning of the study area is envisaged to facilitate additional residential development, a small neighbourhood centre and public open space areas. Historically, consideration of the establishment of a new primary school in Sellicks Beach was also cited catering for the anticipated growth of the area. However, recently with the construction of the new Birth to 12 Aldinga school, the Department for Education has not confirmed that a new school will be proposed in the Sellicks Beach area. Notwithstanding this, we have considered this possibility for the purposes of traffic modelling noting that no confirmation has been provided.

For the purposes of this report, the following additional development yields are envisaged within Sellicks Beach study area:

- 935 to 1,560 greenfield residential allotments (ranging in size from 450 to 750 m²);
- 570 infill residential allotments (current vacant allotments within the study area);
- a primary school allotment (in the order of 60,000 m² of site area); and
- a neighbourhood centre (in the order of 40,000 m² of site area).

The anticipated development of the land will be supported by additional public open space (152,500 m²) and road reserve (366,000 m²). Additional infrastructure (potable water, stormwater etc.) will also be constructed as land development occurs.

The 'Structure Plan' also seeks to ensure that such development does not create undue impacts for residents of the estimated 1,320 residential allotments currently located within the study.

4. VEHICLE NETWORK

4.1 EXISTING ROAD NETWORK

The existing road network within the study area comprises arterial, distributor, collector and local roadways. The roadways vary with regard to road authority, function, geometry and posted speed limit along with a range of other construction characteristics (i.e. seal type, drainage, roadside vegetation and environment etc.).

Figure 3 illustrates the locality of the key road networks within and immediately adjacent to the study area.

Figure 3 – Key road networks and their proximity within the study area

The function of a roadway is generally defined by its geometric design, posted speed limit and daily traffic volume. Consideration is also given to the number and type of allotments serviced directly from a roadway. Combined, such characteristics help to ensure that a desired level of amenity is achieved and maintained relative to the roadway's surroundings.

Roads are typically classified in a hierarchy based upon their respective traffic volumes. The City of Onkaparinga's Road Network Plan 2016-2021 identified the following road hierarchy and respective daily traffic volume capacities:

- **arterial road** – greater than 20,000 vehicles per day (vpd);
- **sub-arterial road** – 5,000 to 20,000 vpd;
- **distributor road** – 2,000 to 20,000 vpd for an urban environment (2,000 to 4,000 vpd in a rural environment);
- **collector road** – 800 to 3,000 vpd; and
- **local road** – less than 1,000 vpd.

Roadways within the study area have been classified in the above hierarchy by both Council's Development Plan and Road Network Plan (2016–2021). The classifications of such roads are considered to be representative of Council's intended amenity for the surrounding area. Figure 4 illustrates the road hierarchy within the Sellicks Beach study area.

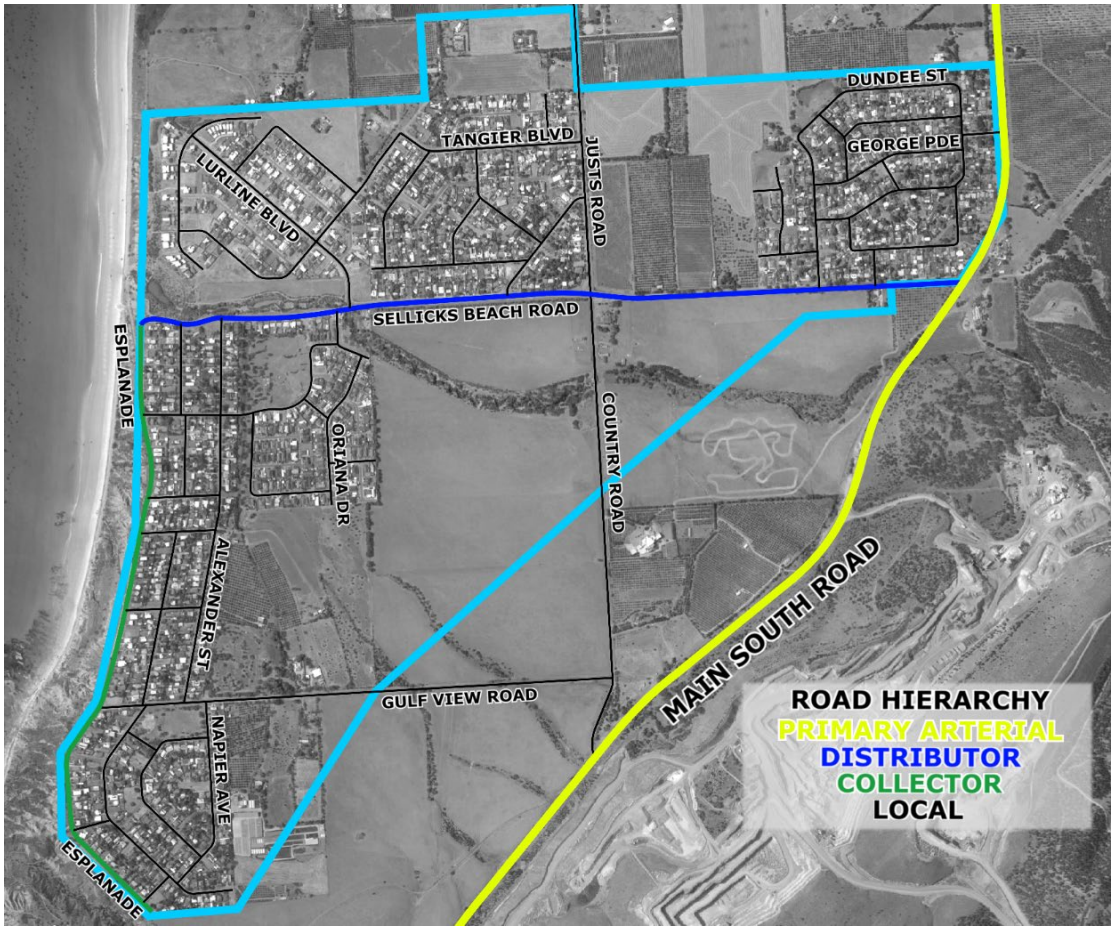

Figure 4 – Existing road hierarchy within the Sellicks Beach study area

As would be expected, roads with a higher-order function (such as arterial roads) generally have wider geometry and higher speed limits in order to attract higher traffic volumes. Conversely, roads with a lower-order function (i.e. local roads) typically deter non-local (cut-through) traffic volumes through lower speed environments and less direct routes. A brief description of key roads within the study area is as follows:

- Main South Road is identified as a primary arterial road within the City of Onkaparinga's Development Plan. Under the care and control of the Department for Infrastructure (DIT), Main South Road (adjacent the site) comprises a single traffic lane in each direction, with adjacent shoulders on each side (comprising sealed and unsealed surfaces). A 90 km/h speed limit applies on Main South Road adjacent the study area.
- Sellicks Beach Road is identified as a distributor road within the City of Onkaparinga's Development Plan. Under the care and control of Council, Sellicks Beach Road comprises a 6.6 m wide sealed carriageway (approximate), with unsealed shoulders on both sides. Two-way traffic movements are accommodated on Sellicks Beach Road with traffic lanes defined by central linemarking. On-street parking is generally permitted on the northern side of Sellicks Beach Road within the adjacent road verge, while a swale drain is located along the southern side (separated from the carriageway by a reflective delineator posts). An 80 km/h speed limit applies on the eastern portion of Sellicks Beach Road (between Main South Road and Justs Road), while the default urban speed limit of 50 km/h applies on the western portion.
- Esplanade is a collector road as identified by Council's Development Plan. The Esplanade's carriageway is generally in the order of 7.0 m wide (albeit varies marginally in width), accommodating two-way traffic movements along its length. Traffic lanes are defined by centre linemarking on the northern portion of Esplanade only. On-street parking is generally permitted along its length in the form of parallel parking, however a small section of angled parking is provided within close proximity to the Local Centre Zone and beach access. The roadway is defined by upright kerbs on the northern portion only. A default urban speed limit of 50 km/h applies on Esplanade.
- Justs Road is a local road under the care and control of the City of Onkaparinga. Along its length, Justs Road comprises a single traffic lane in each direction with shoulders (a combination of sealed and unsealed) on both sides. The southern portion of Justs Road has recently been upgraded with new footpaths, on-road bicycle lanes, indented parking and bus stops. An 80 km/h speed limit applies on the north portion of Justs Road (between Norman Road and Monaco Boulevard, while a default urban speed limit of 50 km/h is applicable to the southern section.

- Country Road is a local road under the care and control of the City of Onkaparinga. Country Road comprises a 6.8 m wide sealed carriageway (approximate) accommodating a single traffic lane in each direction. Unsealed shoulders are provided on both sides of Country Road. A 50 km/h speed limit applies within the vicinity of its intersection with Sellicks Beach Road, with an 80 km/h speed limit applying to the remaining portion.
- Gulf View Road is a local road under the care and control of the City of Onkaparinga. Gulf View Road comprises a 7.2 m wide carriageway with a single traffic lane in each direction. Unsealed shoulders are provided on both sides of Gulf View Road. A 50 km/h speed limit applies along Gulf View Road within the built-up area of Sellicks Beach, while an 80 km/h applies on the remaining portion.
- Alexander Street is a local street under the care and control of the City of Onkaparinga. Along its length, Alexander Street generally comprises a 6.0 m wide carriageway accommodating two-way vehicle movements. Unsealed shoulders are generally provided along its length, accommodating intermittent on-street parking within the road verge (no kerbs have been installed). A default urban speed limit of 50 km/h applies on Alexander Street.

Similarly to the above, intersection design is typically reflective of the function of the intersecting roads (considering factors including, but limited to, speed, volumes and environment) and can also be used to deter (or even prevent) non-local (cut-through) traffic. A brief description of key intersections within (and adjacent to) the study area is as follows:

- Main South Road, Norman Road and Rogers Road form a priority controlled (Stop) four-way intersection. At the intersection, Main South Road comprises a single through lane in each direction and a dedicated right-turn lane accommodating right-turn movements in to Norman Road only. Opposing directions of traffic are separated with a painted median. It is noted that Rogers Road is only sealed for the first 20 m (approximate) adjacent the intersection. No separated turning treatments are currently provided on Norman Road, Rogers Road or the southern Main South Road approach.
- Norman Road and Justs Road forms a priority controlled (Stop) T-intersection. An unsealed road reserve is located to the north of the intersection (continuation of Justs Road) providing secondary access to two properties as well as emergency vehicle access to the north. The informal access creates a four-way intersection with Norman Road and Justs Road. No separated turning treatments are currently provided.
- Sellicks Beach Road, Justs Road and Country Road form a priority controlled (Give Way) staggered off-set four-way intersection (approx. 30 m) in a left-right configuration. The minor approaches of Justs Road and Country Road

comprise a single lane in each direction. Right-turn movements from Sellicks Beach Road are provided with 25 m (approximate) long dedicated right-turn lanes. Sellicks Beach Road slopes down from west to east at the intersection with the gradients of Justs Road and Country Road gently declining away from the intersection. No separated turning treatments are currently provided on either Justs Road or Country Road.

- Main South Road, Sellicks Beach Road and Old Sellicks Hill Road form a priority controlled (Give Way) four-way intersection. The minor approaches of Sellicks Beach Road and Old Sellicks Hill Road intersect Main South Road at near 45-degree (acute) angles restricting sightlines to the south. The minor approaches are also slightly offset creating a minor stagger. It should also be noted that a second access to Old Sellicks Hill Road is located approximately 150 m south of the intersection. Main South Road has a steady incline though the intersection (inclining to the south) with Old Sellicks Hill Road forming a steep descent toward the intersection. Sellicks Beach Road slopes away from the intersection (to the west). No separated turning treatments are currently provided.
- Gulf View Road and Country Road intersect at a priority controlled (Give Way) T-intersection. Country Road comprises a moderate incline up to the south with Gulf View Road declining to the west, away from the intersection. No separated turning treatments are currently provided.
- Main South Road and Country Road intersect at a priority controlled (Give Way) T-intersection. The intersection is located in 'dip' on Main South Road, with Country Road also declining away from the intersection. No separated turning treatments are currently provided.

4.1.1 MAIN SOUTH ROAD

4.1.1.1 ROAD MANAGEMENT PLAN

The Department for Infrastructure and Transport's (DIT's) 2015 Road Management Plan (RMP) has been obtained for Main South Road between Maslin Beach Road/Tatachilla Road and Sellicks Beach Road/Old Sellicks Hill Road. The RMP has taking into consideration a number of factors including (but not limited to):

- existing traffic volumes (AADT data is reflective of 2015 volumes);
- reported crash data (2009 to 2013 inclusive);
- roadway function and condition (including pavement);
- roadside environment; and
- operating speed.

Relevant to this study, the RMP has reviewed the existing configuration of Main South Road between (and including) its intersections with Norman Road/Rogers Road, Perth Street and Sellicks Beach Road/Old Sellicks Hill Road (inclusive of midblock locations). Key findings and recommendations identified by the RMP (relating to the study area) include:

- decrease the speed limit of Main South Road (adjacent the study area) from 100 km/h to 90 km/h in order to improve road safety (this was implemented circa mid 2017). Further speed limit decreases were not considered necessary given "*... that the frequency of locations where drivers on Main South Road may encounter conflicting vehicle movements is* [not] *at a level to warrant a lower speed limit of 80 km/h*";
- reconfiguration of the Main South Road/Sellicks Beach Road/Old Sellicks Hill Road intersection in order to:
  - square the Sellicks Beach Road and Old Sellicks Hill Road approaches to Main South Road such that they are perpendicular;
  - restrict the northern Victory Hotel access to left-in/left-out only and formalise the southern access (Old Sellicks Hill Road) to create staggered right-left T-Intersections;
  - install separated right turn lanes to accommodate movements from Main South Road into Sellicks Beach Road and Old Sellicks Hill Road;
  - install a separated left-turn acceleration lane to accommodate left turn movements from Sellicks Beach Road onto Main South Road (allowing a driver to increase their vehicle's speed before merging into the northbound traffic stream);
  - install a short left-turn deceleration lane to accommodate left-turn movements from Main South Road into Old Sellicks Hill Road;
- closure of Rogers Road such that Norman Road creates a T-Intersection with Main South Road. Alternatively, should Rogers Road remain a connection to Main South Road, the RMP recommends sealing and formalising an apron in order to provide improved visibility (for vehicles travelling on Main South Road) and delineation (primarily for vehicles approaching on Rogers Road); and
- no recommendations with regard to roadside hazards were identified in midblock locations adjacent the study area, despite noting the proximity of Stobie Poles to the existing carriageway. However, the RMP does note that "*The provision of some hazard protection at these locations will be considered*".

No recommendations were made with regard to the Main South Road and Perth Street intersection primarily due to no crashes having been reported within the five-year period of crash data obtained.

4.1.1.2 GOVERNMENT UPGRADE FUNDING

The Department for Infrastructure and Transport (DIT) has commenced planning studies for the duplication and upgrade of Main South Road between Griffith Drive and Sellicks Beach Road. The upgrade is understood to comprise the duplication of a 10 km section (approx.) of Main South Road (Stage 1), with localised upgrades and safety improvements for the remaining 6 km (approx.) section to Sellicks Beach.

The State Government has announced that it will provide $305 million in funding for the Stage 1 duplication works, with Stage 2 recently receiving $136 million in funding from the Federal Government (with $34 million yet to be funded). The recent announcement was presented in a media release by The Hon Michael McCormack MP (dated 05 October 2020) in conjunction with the Morrison Government.

4.1.1.3 MARWP REQUIREMENTS

Metropolitan Adelaide Road Widening Plan (MARWP) requirements apply to properties adjacent Main South Road within the vicinity of the study area. Specifically, between Rogers Road and Sellicks Beach Road on the eastern side of Main South Road, a 30 m 'strip requirement' applies to all properties plus an additional 6 m 'consent area'. On the western side of Main South Road between Norman Road and Renfrew Road, a 30 m 'strip requirement' plus an additional 6 m 'consent area'.

It should be noted that a MARWP 'requirement' prohibits development within designated strip (unless written consent is provided by the Commissioner of Highways (CoH)), while development within a 'consent' area may be plausible albeit still requires consent from the CoH.

4.2 CRASH DATA (2015 TO 2019)

Crash data has been requested and obtained from DIT for the five-year period from 2015 to 2019 (inclusive). The data indicates that a total of 49 crashes have been reported, 7 of which resulted in 'serious injury', 15 in 'injury' and 27 in 'property damage only'. Importantly, no 'fatalities' were identified within the crash data provided. Figure 5 illustrates the various reported crash locations, along with the number of incidents which have occurred at each location and the worst reported severity at that location.

Of the 49 reported crashes, the predominant crash type was identified as 'right angle' with 9 crashes reported. A breakdown of the reported crash types is as follows:

- Right angle – 9 reported crashes (1 of which resulted in serious injury);

- Hit fixed object – 8 reported crashes (1 of which resulted in serious injury);
- Rear end - 7 reported crashes;
- Hit parked vehicle - 6 reported crashes;
- Hit animal – 5 reported crashes (1 of which resulted in serious injury);
- Side swipe – 4 reported crashes (1 of which resulted in serious injury);
- Right turn – 3 reported crashes;
- Roll over – 2 reported crashes (both of which resulted in serious injury);
- Hit pedestrian – 2 reported crashes (1 of which resulted in serious injury);
- Head on – 2 reported crashes; and
- Other – 1 reported crash.

In addition to the above, the predominant 'error' type was identified as 'inattention', with 22 crashes reported to have occurred for this reason. A further 11 crashes were reported to have arisen from failing to give way/stop, 4 from 'D.U.I.' and the remaining from operating a vehicle without 'due care' or a reason not provided.

With regard to location, in the order of half of the reported crashes (24) occurred on Main South Road within the immediate vicinity of the study area. The worst crash location was identified as the intersection of Main South Road, Sellicks Beach Road and Old Sellicks Hill Road, with seven crashes reported (three right-angle, one right-turn and three rear end).

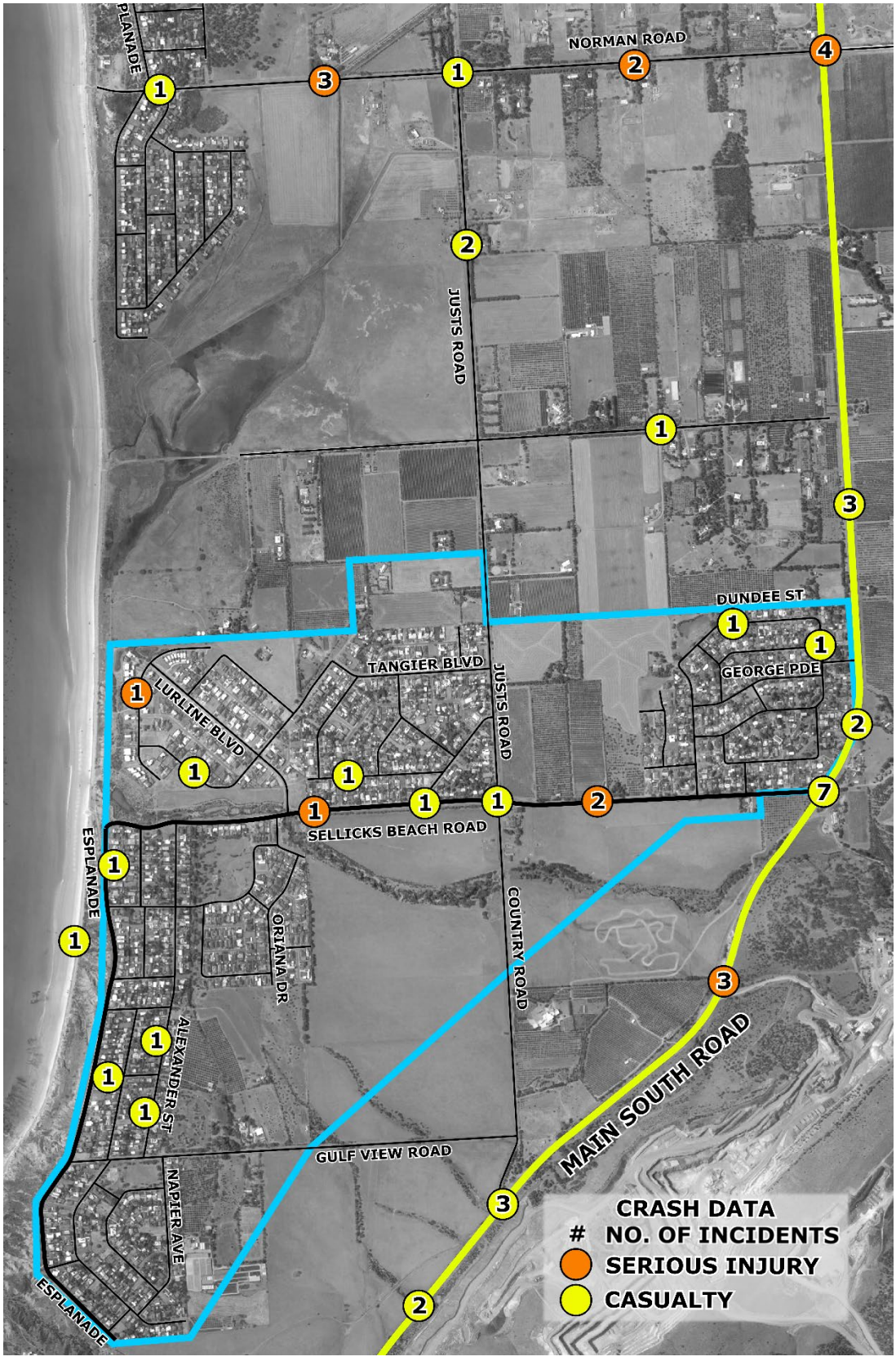

Figure 5 – Reported crash data locations throughout the study area.

4.3 EXISTING TRAFFIC

Existing traffic data has been obtained from the City of Onkaparinga and DIT for various roadways throughout the study area. The data obtained varies with regard to the type and format of data collected (i.e. 'tube counter' vs 'turning movement' data) as well as the month (season), year and sample size of the data collection.

Figure 6 illustrates the location and type of data recorded throughout and adjacent the study area.

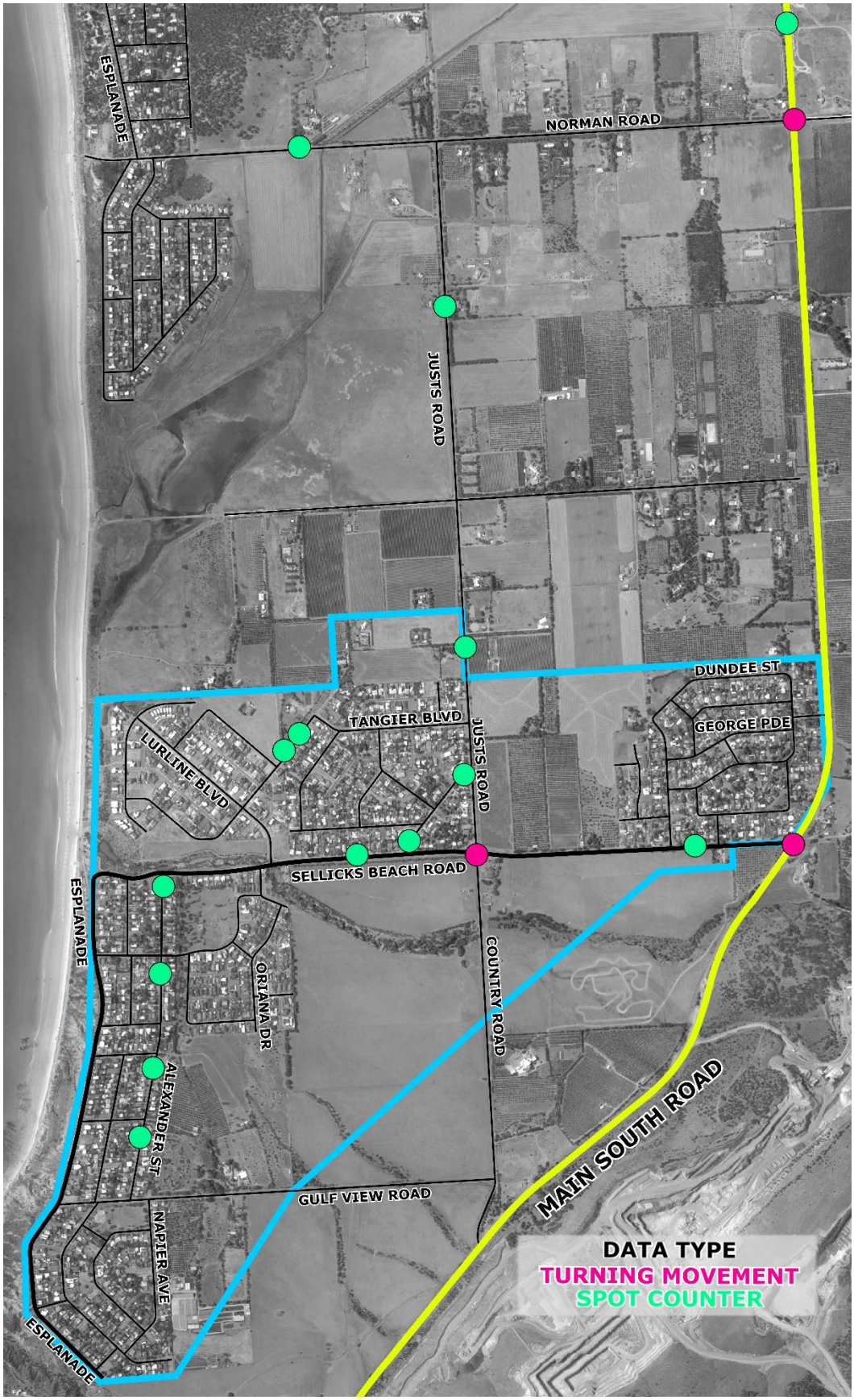

Figure 6 – Location and type of data recorded throughout and adjacent the study area

It should be noted that a roadway's traffic volume is typically based on Annual Average Daily Traffic (AADT) volumes, where data is collected continuously throughout the duration of a year. Where such data is unavailable, sample volumes (collected over a shorter period) may be used to estimate AADT assuming that minimal variation in traffic volumes occur throughout a year.

Relevant to the study area, no AADT data derived from a full year of traffic volume counts has been obtained. All data provided by Council and DIT has been based upon a sample size recorded over a week (tube counter data) or a day (turning movement data).

However, DIT have provided 'true' AADT from a permanent counter station located on Main South Road approximately 8 km from the study area. The data obtained from this location has been used to determined seasonal fluctuation (arising from recreation/tourism activities) in traffic volumes at key intersections with Main South Road as well as provide estimates of variations internally within the study area. The existing data has then been factored in order to create a 'base' dataset anticipated to be reflective of an AADT volume.

Consideration has also been given to the existing number of dwellings within the study area and the number of those which are permanently occupied (i.e. residential vs holiday rental properties). Specifically, data obtained from the Australian Bureau of Statistics' (ABS) 2016 Census indicates that of the dwellings within Sellicks Beach, 78.2% are permanently occupied. The remaining 21.8% have therefore been assumed to be (holiday) rental properties.

Using the above factors, a 'base case' traffic dataset has been determined (considered to be reflective of an AADT volume). The 'base case' dataset assumes that 86.6% of dwellings are occupied and is considered to represent average traffic volumes throughout the given year.

Based upon the above data, traffic volumes have been derived at the following locations for the 'base case' scenario:

- Midblock locations
  - Main South Road *(north of Sellicks Beach Road);*
  - Main South Road *(south of Sellicks Beach Road);*
  - Sellicks Beach Road *(between Main South Road and Justs Road/Country Road);*
  - Sellicks Beach Road *(between Justs Road/Country Road and Esplanade);*
  - Justs Road;
  - Country Road;
  - Esplanade;

  - Gulf View Road; and
  - Alexander Street.
- Intersection locations
  - Main South Road/Norman Road;
  - Main South Road/Sellicks Beach Road;
  - Main South Road/Country Road;
  - Norman Road/Justs Road;
  - Sellicks Beach Road/Justs Road/Country Road; and
  - Country Road/Gulf View Road.

Noting the above, consideration has also been given to the seasonal traffic peaks to ensure the continuous and safe operation of the road network throughout the duration of a given year. Analysis of traffic variations has been undertaken in a 'sensitivity analysis', with consideration to results given on a case by case basis relative to the type of traffic and associated location and environment.

4.3.1 MIDBLOCK ANALYSIS (BASE CASE)

Relevant to the study area, Table 1 illustrates the existing function of the key roads identified above, their respective theoretical capacity and existing 'base case' daily traffic volumes.

Table 1 – Designated function and capacity of key roads within the study area

Road Name	Designated Function	Theoretical Capacity	Existing Daily Traffic Volume
Main South Road *(north of Sellicks Beach)*	Primary arterial	20,000+	8,000
Main South Road *(south of Sellicks Beach)*	Primary arterial	20,000+	5,600
Sellicks Beach Road *(east of Justs/Country)*	Distributor	4,000 (rural) 20,000 (urban)	1,800
Sellicks Beach Road *(west of Justs/Country)*	Distributor	4,000 (rural) 20,000 (urban)	2,200
Esplanade	Collector	3,000	1,100
Justs Road	Local	1,000	850
Country Road	Local	1,000	800
Gulf View Road	Local	1,000	2,100
Alexander Street	Local	1,000	300

Existing daily 'base case' traffic volumes on the key roads identified in Table 1 are generally within those envisaged for the designated function of the respective roadway. This indicates that roadways are generally operating relative to the level of amenity intended by Council's Development Plan and Road Network Plan.

With regard to Gulf View Road, Table 1 identifies that existing 'base case' traffic volumes are marginally higher than those envisaged for a local road. However, while both Council's Development Plan and Road Network Plan identify Gulf View Road as a local road, Gulf View Road has an environment similar to that of a collector road in that limited allotments are accessed directly from the roadway and a higher speed limit applies on the large majority of Gulf View Road (80 km/h). On this basis, the existing 'base case' traffic volumes identified for Gulf View Road are considered to be representative of its physical characteristics.

While Table 1 indicates that key roads are generally operating within their respective capacities (relative to road function), Figure 5 identifies that a small number of midblock crashes have occurred throughout the study area.

Of particular note, 10 crashes were reported in midblock locations on Main South Road directly adjacent the study area. Four of the reported crashes were a result of 'inattention', two were 'fail to keep left' and the remainder 'insecure load', 'fail to give way', 'D.U.I.' or unreported. Interestingly, five of the crashes occurred prior to the speed limit decrease with the remaining five occurring after the decrease had been implemented.

Within the study area, three crashes were reported on Sellicks Beach Road (two midblock between Justs Road/Country Road and Norman Victory Parade and one midblock between Lurline Boulevard and Casablanca Place). Two of the three crashes were reported to have occurred due to 'inattention' resulting in 'serious injury' (one of which involved a cyclists), while the remaining crash was reported to have occurred due to 'fail to give way' (resulting in 'injury').

The number of crashes reported in any one location (either external or internal within the study area) are not considered significant (i.e. no sole roadside environment factor can be attributed to an abnormal number of crashes at any given location). It is therefore considered that the occurrence of midblock crashes is random and primarily a result of driver behaviour.

4.3.2 INTERSECTION ANALYSIS (BASE CASE)

As noted in Section 4.2, existing 'base case' traffic volumes have been determined at key intersections throughout and adjacent to the Sellicks Beach

study area. In order to determine their existing performance, SIDRA Intersection analyses have been undertaken.

SIDRA Intersection software is a computer modelling package used to determine the operational performance of various forms and configurations of road intersections. A wide variety of detailed performance characteristics are reported by SIDRA including (but not limited to) Level of Service (LoS).

LoS is an assessment characteristic commonly used to determine how an intersection, approach or turning movement operates at a high level. LoS is based upon a weighted average of the control delay anticipated to be experienced by drivers. Noting the high-level nature of LoS, such an output is considered to be an appropriate assessment tool to determine the operating performance of an intersection relative to this assessment. Table 2 illustrates the LoS relative to the average control delay experienced.

Table 2 – Level of Service relative to average control delay

Level of Service	Average Control Delay
A	0 – 10
B	11 – 15
C	16 – 25
D	26 – 35
E	35 – 50
F	+ 50

Relevant to this report, traffic volumes have been entered into SIDRA in order to determine the existing LoS for each approach at all intersections identified in Section 4.1. Table 3 to Table 7 illustrate the recommended minimum LoS, existing peak hour volumes and existing LoS for each of the subject intersections.

It should be noted that DIT's "*Traffic Modelling Guidelines – SIDRA Intersection 7*" identifies a minimum recommended LoS of 'D' for signalised and unsignalised intersections. This recommendation has been adopted as a coarse measure to indicate the performance of any given intersection approach within the study area.

4.3.2.1 MAIN SOUTH ROAD/NORMAN ROAD/ROGERS ROAD

Table 3 – 'Base case' am and (pm) peak hour volumes and LoS for the Main South Road/Norman Road/Rogers Road intersection

Approach	Recommended Minimum LoS	Existing Peak Hour Volumes	Existing LoS
Main South Rd (N)	D	240 (437)	A (A)
Rogers Rd (E)	D	4 (8)	C (C)
Main South Rd (S)	D	433 (367)	A (A)
Norman Rd (W)	D	184 (86)	B (B)

As illustrated in Table 3, all approaches are currently operating with a satisfactory LoS. It should be noted that Rogers Road has an existing LoS of 'C' during both the am and pm peak periods, however traffic volumes are very low in comparison to the number of vehicles utilising adjacent approaches. This is due to the large delays associated with the non-priority movements and the increased traffic volumes using Main South Road (i.e. is reflective of the delay associated with turning from Rogers Road).

With regard to crashes, four crashes were reported at the Main South Road/Norman Road/Rogers Road intersection over the five-year crash data period. One crash was attributed to 'D.U.I.' while the remaining three were a result of an inattentive driver or failure to obey traffic control signage. Three of the crashes were the fault of a driver approach Main South Road from the west (on Norman Road) while the remaining crash was reported as the fault of a southbound driver on Main South Road (failure to give way when turning right). It is therefore considered that the potential for the Norman Road roadside environment to be a factor attributing to crashes at this intersection.

4.3.2.2 NORMAN ROAD/JUSTS ROAD

Table 4 – 'Base case' am and (pm) peak hour volumes and LoS for the Norman Road/Justs Road intersection

Approach	Recommended Minimum LoS	Existing Peak Hour Volumes	Existing LoS
Norman Rd (E)	D	66 (101)	A (A)
Justs Rd (S)	D	151 (86)	A (A)
Norman Rd (W)	D	76 (91)	A (A)

Table 4 illustrates that all approaches of the Norman Road and Justs Road intersection are currently operating at a satisfactory level during the am and pm peak hours (LoS 'A').

Crash data obtained indicates a single reported crash at the Norman Road/Justs Road intersection throughout the 2015 to 2019 period. The crash was a result of the northbound driver failing to stop at the intersection. As only one crash has occurred, the roadside environment is not considered to be detrimental to the intersection's operation.

4.3.2.3 SELLICKS BEACH ROAD/JUSTS ROAD/COUNTRY ROAD

Table 5 – 'Base case' am and (pm) peak hour volumes and LoS for the Sellicks Beach Road/Justs Road/Country Road intersection

Approach	Recommended Minimum LoS	Existing Peak Hour Volumes	Existing LoS
Justs Rd (N)	D	28 (78)	A (A)
Sellicks Beach Rd (E)	D	45 (143)	A (A)
Country Rd (S)	D	22 (44)	A (A)
Sellicks Beach Rd (W)	D	169 (83)	A (A)

As illustrated in Table 5, the Sellicks Beach Road, Justs Road and Country Road intersection is operating with an acceptable LoS of 'A' on all approaches during both the am and pm peak hours.

A single crash was reported at the Sellicks Beach Road, Justs Road and Country Road intersection over the five-year data period. The crash was a result of a northbound driver on Country Road failing to give way to a westbound driver on Sellicks Beach Road. Noting the isolated crash, the intersection is not considered a significant issue with regard to current traffic volumes.

4.3.2.4 MAIN SOUTH ROAD/SELLICKS BEACH ROAD/OLD SELLICKS HILL ROAD

Table 6 – 'Base case' am and (pm) peak hour volumes and LoS for the Main South Road/Sellicks Beach Road/Old Sellicks Hill Road intersection

Approach	Recommended Minimum LoS	Existing Peak Hour Volumes	Existing LoS
Main South Rd (N)	D	196 (305)	A (A)
Old Sellicks Hill Rd (E)	D	3 (17)	A (A)
Main South Rd (S)	D	239 (264)	A (A)
Sellicks Beach Rd (W)	D	117 (56)	A (A)

The SIDRA output illustrated in Table 6 identifies that during both the am and pm peak hours, the Main South Road, Old Sellicks Hill Road and Sellicks Beach Road intersection is operating with an acceptable LoS 'A' on all approaches.

At the intersection of Main South Road, Sellicks Beach Road and Old Sellicks Hill Road, seven crashes were reported throughout the crash data period (three right-angle, one right-turn and three rear end). All seven crashes were reported to have occurred as a result of driver error, with three arising from a driver being stopped on Main South Road (waiting for an appropriate gap in traffic before turning from Main South Road) and three arising from disobeying traffic control signage (failing to give way prior to turning onto Main South Road).

In order to address the above, consideration should be given to the installation of separated right-turn lanes for drivers turning from Main South Road into both Sellicks Beach Road and Old Sellicks Hill Road, and a continuous left-turn lane (with associated acceleration provisions) for driver turning left from Sellicks Beach Road onto Main South Road. This will assist in reducing rear-end crashes at the intersection.

In addition, consideration should be given to the realignment of the Sellicks Beach Road approach such that it is perpendicular with Main South Road. This will assist in increase available sight distance to vehicles travelling on Main South Road (i.e. in order to select an appropriate gap to enter the Main South Road traffic stream) and decreasing vehicle speed on the Sellicks Beach Road approach to the intersection.

It should be noted that similar crash types were reported in the earlier crash data utilised for the Main South Road RMP. On this basis, the recommendations identified by the RMP in regard to the Main South Road, Sellicks Beach Road and Old Sellicks Hill Road intersection are still considered relevant.

4.3.2.5 COUNTRY ROAD/GULFVIEW ROAD

Table 7 – 'Base case' am and (pm) peak hour volumes and LoS for the Country Road/ Gulf View Road intersection

Approach	Recommended Minimum LoS	Existing Peak Hour Volumes	Existing LoS
Country Rd (N)	D	45 (40)	A (A)
Country Rd (S)	D	60 (160)	A (A)
Gulf View Rd (W)	D	145 (65)	A (A)

Table 7 identifies that the Country Road and Gulf View Road intersection is currently operating at an acceptable level, with all approaches having a LoS of 'A'.

No crashes were reported at this intersection throughout the crash data period.

4.3.2.6 MAIN SOUTH ROAD/COUNTRY ROAD

Table 8 – 'Base case' am and (pm) peak hour volumes and LoS for the Main South Road/Country Road intersection

Approach	Recommended Minimum LoS	Existing Peak Hour Volumes	Existing LoS
Main South Rd (N)	D	180 (250)	A (A)
Main South Rd (S)	D	125 (255)	A (A)
Country Rd (W)	D	165 (75)	A (A)

SIDRA output for the intersection of Main South Road and Country Road (illustrated in Table 8) indicates that all approaches are operating with an acceptable LoS of 'A' during both the am and pm peak hours.

The crash data obtained from DIT indicates that three crashes have been reported at the Main South Road and Country Road intersection. All three crashes were a reported as a result of inattention, with two being rear-end crashes. The rear-end crashes both occurred when a southbound vehicle stopped on Main South Road while waiting for a gap to enter Country Road. The construction of a separated right-turn lane to accommodate such movements is considered an appropriate solution to address this issue.

4.4 FUTURE TRAFFIC

4.4.1 TRAFFIC GENERATION

In order to determine potential infrastructure upgrade requirements arising from the potential rezoning, traffic forecasts in relation to the anticipated development yields have been prepared. As noted in Section 3, the forecast yields adopted in this assessment are as follows:

- 935 to 1,560 greenfield residential allotments (ranging in size from 450 to 750 m²);
- 570 infill residential allotments (current vacant allotments within the study area);
- a primary school allotment (in the order of 60,000 m² of site area); and
- a neighbourhood centre (in the order of 40,000 m² of site area).

Typical traffic generation rates have been applied to each of the respective land uses within the study area in order to forecast the potential additional volume of vehicle movements generated by the infill and greenfield development.

In order to provide a conservative assessment, greenfield residential allotment sizes of 450 m² have been adopted (equivalent to 1,560 greenfield allotments).

It should be noted that the additional traffic forecast to be generated by the above development yields is akin to 100% occupation of all future greenfield and infill development. As noted in Section 4.2, in the order of 21.2% of existing residential dwellings are considered to be (holiday) rental properties which are not occupied on a permanent basis. Accordingly, the traffic forecasts have been factored to reflect a 'future case' scenario (equivalent to 86.6% of dwellings being permanently occupied) for the purposes of comparison to the existing 'base case' scenario.

4.4.2 TRAFFIC DISTRBUTION

In order to determine the resultant 'future case' traffic volumes on any given midblock section of road or at an intersection, future traffic volumes have been distributed to the internal and external road networks. This has been undertaken by dividing the study into five infill and five greenfield development areas. Figure 7 illustrates the infill and greenfield areas adopted for the purposes of this assessment.

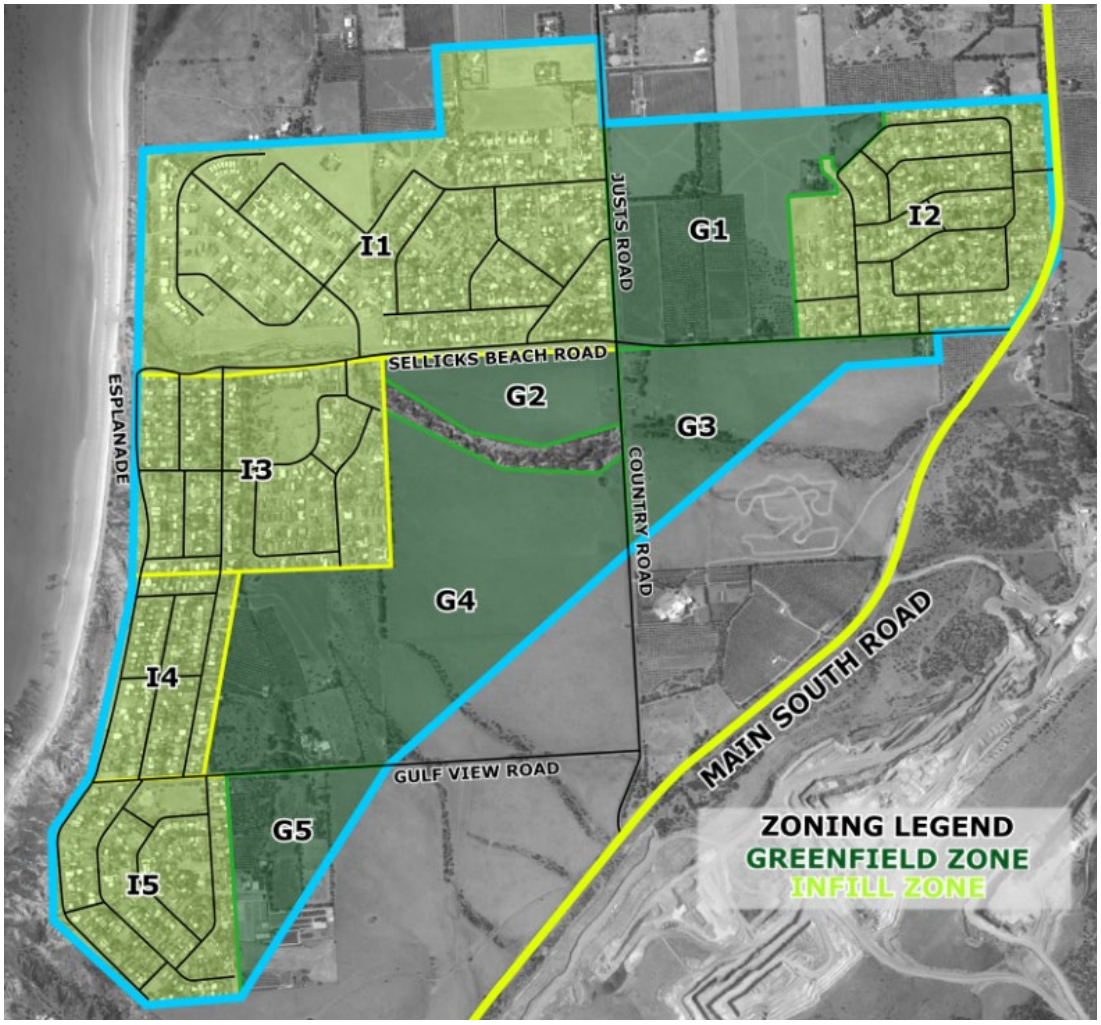

Figure 7 – Infill and greenfield areas adopted for the purposes of future traffic impact assessment

As identified above, in the order of 570 residential allotments are currently vacant within the study area. For the purposes of this assessment, it has been assumed that infill development will occur within the following areas:

- Area I1 – 55% of infill development;
- Area I2 – 10% of infill development;
- Area I3 – 10% of infill development;
- Area I4 – 10% of infill development; and
- Area I5 – 15% of infill development.

With regard to greenfield development, it has been assumed that the neighbourhood centre and primary school will be constructed within 'Area G2'. Accordingly, the number of residential allotments assumed to be located within this area is lower (comparatively) than other greenfield areas within the study

area. The resultant residential vehicle movements have been assumed to originate and finish within greenfield areas as follows:

- Area G1 – 25% of greenfield residential development;
- Area G2 – 2.5% of greenfield residential development;
- Area G3 – 15% of greenfield residential development;
- Area G4 – 47.5% of greenfield residential development; and
- Area G5 – 10% of greenfield residential development.

Taking into consideration data from the ABS's 2016 Census and the location of nearby employment and education centres (including the primary school and neighbourhood centre anticipated within Area G2), the following distribution of vehicle movements has been assumed for future development within the study area:

- 67.5% of vehicle movements will occur to/from the north (via Main South Road);
- 5% of vehicle movements will occur to/from the north-west (via Norman Road and Esplanade);
- 7.5% of vehicle movements will occur to/from the south (via Main South Road; and
- 20% of vehicle movements will occur internally within the study area (to/from the proposed school/neighbourhood centre within Area G2 and the existing 'local centre' zone).

4.4.3 MIDBLOCK ANALYSIS (FUTURE CASE)

Based upon the above infill and greenfield development areas and the resultant traffic distribution, traffic volumes have been forecast for key midblock sections of roadway within and adjacent to the study area. Table 9 illustrates the existing function and volume as well as the future function and volume on each key midblock section of roadway.

Table 9 – Designated function and capacity of key roads within the study area upon realisation of the 'future case' scenario

Road Name	Designated Function	Theoretical Capacity	Existing Daily Traffic Volume	Future Daily Traffic Volume	Future Function
Main South Road (north of Sellicks Beach)	Primary arterial	20,000+	8,000	16,950	Primary arterial

Road Name	Designated Function	Theoretical Capacity	Existing Daily Traffic Volume	Future Daily Traffic Volume	Future Function
Main South Road (south of Sellicks Beach)	Primary arterial	20,000+	5,600	8,450	Primary arterial
Sellicks Beach Road (east of Justs/Country)	Distributor	4,000 (rural) 20,000 (urban)	1,800	8,750	Distributor
Sellicks Beach Road (west of Justs/Country)	Distributor	4,000 (rural) 20,000 (urban)	2,200	6,950	Distributor
Esplanade	Collector	3,000	1,100	1,500	Collector
Justs Road	Local	1,000	850	4,500	Distributor
Country Road	Local	1,000	800	6,300	Distributor
Gulf View Road	Local	1,000	2,100	6,450	Distributor
Alexander Street	Local	1,000	300	500	Local

Table 9 illustrates that upon development of the 'future case' scenario, the existing designated function of Esplanade and Alexander Street will be retained. While traffic volumes on Sellicks Beach Road will also not change its existing designated function, it is considered that the road environment will change from a 'rural' to an 'urban' setting. This will result in the need for change to the formation of Sellicks Beach Road from its current arrangement.

It is noted that the increase in traffic volumes on Sellick Beach Road may also lead to a minor increase in crash risk at midblock locations along the length Sellick Beach Road. Changes to the road formation should therefore ensure suitable road geometry and traffic control (including both devices and signage).

With regard to Justs Road, Country Road and Gulf View Road, it is forecast that traffic volumes will increase to similar levels anticipated for distributor roads. Accordingly, it is considered highly likely that upgrades to their respective carriageways will be required in order to safely accommodate 'future case' traffic volumes. Figure 8 illustrates the suggested designated function of key roads within the study area upon realisation of the 'future case' scenario.

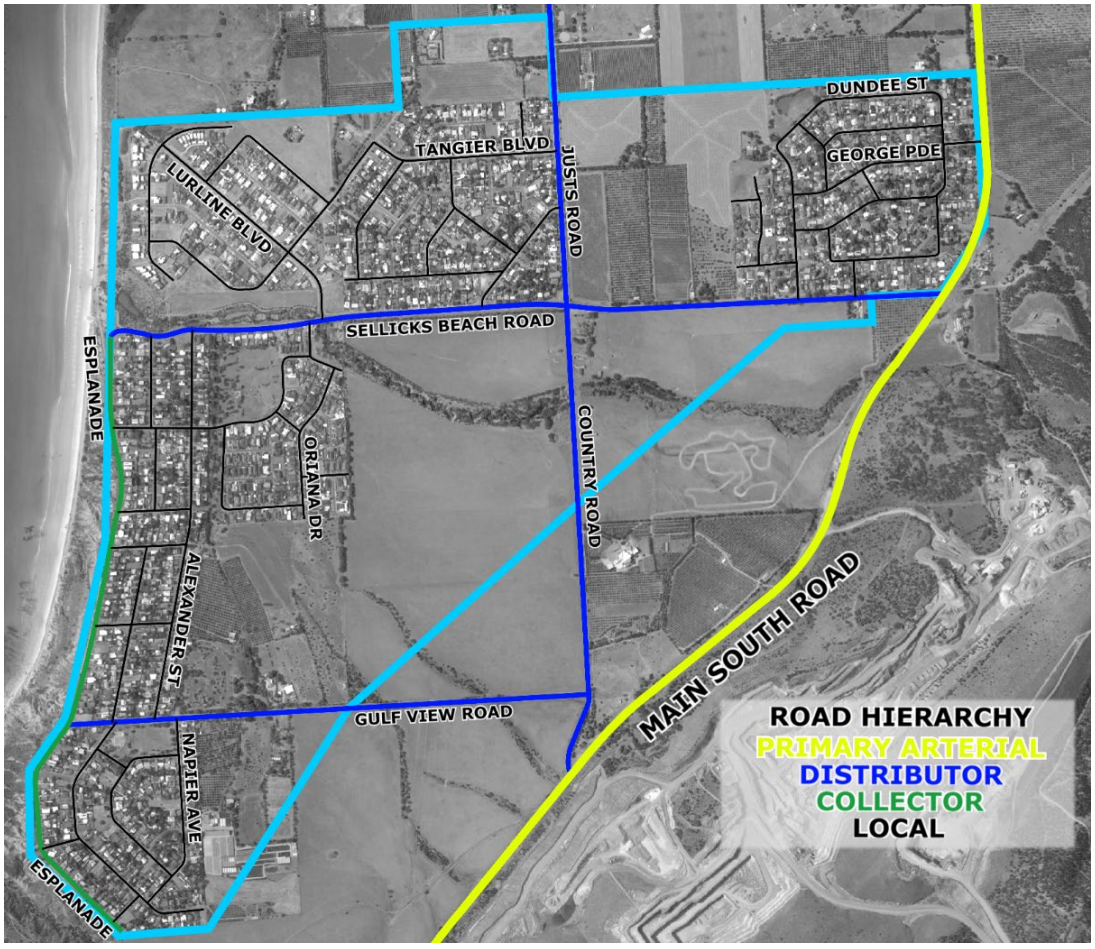

Figure 8 – Recommended future hierarchy of the road network within the study area

4.4.4 INTERSECTION ANALYSIS (FUTURE CASE)

Future traffic volumes have also been forecast for each of the six key intersections within and adjacent to the study area for the 'future case' scenario. SIDRA Intersection has again been used to determine a Level of Service (LoS) for each approach at each intersection for the purposes of comparison. Again, it should be reiterated that LoS is a coarse measure to indicate intersection performance.

Noting that DIT recommend a minimum LoS 'D' be achieved, Table 10 to Table 15 illustrate the LoS achieved as a result of 'future case' peak hour.

4.4.4.1 MAIN SOUTH ROAD/NORMAN ROAD/ROGERS ROAD

Table 10 – 'Future case' am and (pm) peak hour volumes and LoS for the Main South Road/Norman Road/Rogers Road intersection

Approach	Existing Peak Hour Volumes	Existing LoS	Future Peak Hour Volumes	Future LoS
Main South Rd (N)	240 (437)	A (A)	549 (1155)	A (A)
Rogers Rd (E)	4 (8)	C (C)	4 (8)	F (F)
Main South Rd (S)	433 (367)	A (A)	1058 (647)	A (A)
Norman Rd (W)	184 (86)	B (B)	269 (126)	F (F)

As illustrated in Table 10, the LoS experienced for drivers approaching Main South Road on Norman Road and Rogers Road falls to a LoS 'F' in the 'future case' scenario. This is due to the large increase of traffic volumes travelling through the intersection on Main South Road (i.e. the priority movements) and the associated increased difficulty experienced by a driver to select an appropriate gap in order to enter the Main South Road traffic stream.

Noting the LoS 'F' identified by the SIDRA analyses and the intersection's existing crash history, additional modelling of potential upgrade scenarios has been undertaken. Further detail of possible upgrade scenarios and their resultant LoS performance is identified in Section 4.5.2.1.

4.4.4.2 NORMAN ROAD/JUSTS ROAD

Table 11 – 'Future case' am and (pm) peak hour volumes and LoS for the Norman Road/ Justs Road intersection

Approach	Existing Peak Hour Volumes	Existing LoS	Future Peak Hour Volumes	Future LoS
Norman Rd (E)	66 (101)	A (A)	105 (188)	A (A)
Justs Rd (S)	151 (86)	A (A)	290 (154)	A (A)
Norman Rd (W)	76 (91)	A (A)	102 (149)	A (A)

SIDRA analyses of the Norman Road and Justs Road intersection (Table 11) indicates that the intersection will continue to operate at a satisfactory level upon realisation of the 'future case' development scenario. While traffic volumes utilising the intersection are forecast to increase, the number of additional vehicles are not considered to detrimentally increase the intersection's safe operation.

4.4.4.3 SELLICKS BEACH ROAD/JUSTS ROAD/COUNTRY ROAD

Table 12 – 'Future case' am and (pm) peak hour volumes and LoS for the Sellicks Beach Road/Justs Road/Country Road intersection

Approach	Existing Peak Hour Volumes	Existing LoS	Future Peak Hour Volumes	Future LoS
Justs Rd (N)	28 (78)	A (A)	184 (231)	A (B)
Sellicks Beach Rd (E)	45 (143)	A (A)	237 (486)	A (A)
Country Rd (S)	22 (44)	A (A)	310 (232)	B (B)
Sellicks Beach Rd (W)	169 (83)	A (A)	386 (287)	A (A)

Table 12 identifies no change to the LoS of priority movements on Sellicks Beach Road. The reported LoS on Country Road decreases from 'A' to 'B' during both the am and pm peak periods as a result of the 'future case' development scenario, while Justs Road decreases to a LoS 'B' during the pm peak only.

The analyses also indicate that the increase in traffic volumes will increase delays at the intersection. While the forecast delays are not significant, additional delays could lead to drivers using the intersection taking increased risks. The somewhat unusual configuration of the intersection could also lead to driver misjudgement when selecting an appropriate gap to enter or leave the Sellick Beach Road carriageway.

Finally, noting the intersection's location adjacent the proposed neighbourhood centre (and potential primary school), it is expected that the intersection will accommodate a large number of short trips within the local area (i.e. internally within the Sellicks Beach study area). On the basis of the above, an alternate intersection design has been explored (see Section 4.5.2.2).

4.4.4.4 MAIN SOUTH ROAD/SELLICKS BEACH ROAD/OLD SELLICKS HILL ROAD

Table 13 – 'Future case' am and (pm) peak hour volumes and LoS for the Main South Road/Sellicks Beach Road/Old Sellicks Hill Road intersection

Approach	Existing Peak Hour Volumes	Existing LoS	Future Peak Hour Volumes	Future LoS
Main South Rd (N)	196 (305)	A (A)	468 (929)	A (A)
Old Sellicks Hill Rd (E)	3 (17)	A (A)	3 (17)	B (E)
Main South Rd (S)	239 (264)	A (A)	432 (354)	A (A)
Sellicks Beach Rd (W)	117 (56)	A (A)	550 (257)	B (A)

SIDRA analyses of the Main South Road, Old Sellicks Hill Road and Sellicks Beach Road intersection indicate that a satisfactory LoS will be achieved during the am peak period on all approaches.

In regard to the pm peak, the LoS experienced for users approaching the intersection on Old Sellicks Hill Road will decrease to 'E' as a result of additional left-turn movements from Sellicks Beach Road onto Main South Road (i.e. additional movements to which users exiting from Old Sellicks Hill Road must give way to).

However, the existing design of the intersection is not a typical 'four-way' intersection in that Old Sellicks Hill Road intersects with Main South Road twice within approximately 150 m. In reality, vehicles approaching Main South Road (on Old Sellicks Hill Road) will be distributed between the two locations with the resultant LoS at either location likely to be higher than identified above. On this basis, it is not considered that the intersection will perform detrimentally upon completion of the 'future case' scenario.

Notwithstanding the above, the Main South Road, Old Sellicks Hill Road and Sellicks Beach Road intersection recorded the highest crash rate of any location within the study area over the five-year data period. The increased traffic volumes entering and exiting the study area (particularly right-turn movements from Main South Road into Sellicks Beach Road) reinforce that consideration should be given to the installation of a separated right-turn lane on Main South Road (i.e. to decrease the risk of rear-end crashes).

The increased number of vehicles exiting the study area via Sellicks Beach Road also provides weight to the realignment of the intersection such that Sellicks Beach Road intersects perpendicular with Main South Road. Such an alignment is considered to improve visibility to vehicles approaching the intersection on Main South Road, thereby decreasing the risk of right-angle crashes. Further discussion relating to a potential intersection upgrade is detailed in Section 4.5.2.3.

4.4.4.5 COUNTRY ROAD/GULF VIEW ROAD

Table 14 – 'Future case' am and (pm) peak hour volumes and LoS for the Country Road/ Gulf View Road intersection

Approach	Existing Peak Hour Volumes	Existing LoS	Future Peak Hour Volumes	Future LoS
Country Rd (N)	45 (40)	A (A)	135 (161)	A (A)
Country Rd (S)	60 (160)	A (A)	178 (433)	A (A)
Gulf View Rd (W)	145 (65)	A (A)	448 (195)	A (A)

Table 14 illustrates that the Country Road and Gulf View Road intersection will continue to operate with a LoS 'A' upon completion of the 'future case' development scenario.

While no crashes were reported at the intersection within the five-year crash data period, it is noted that the Country Road/Gulf View Road intersection is relatively narrow. Combined with increase traffic volumes using the intersection, this could lead to an increased risk of a driver misjudging the alignment of the intersection. It therefore recommended that widening and sealing of shoulders be explored within its vicinity (additional description in Section 4.5.2.4).

4.4.4.6 MAIN SOUTH ROAD/COUNTRY ROAD

Table 15 – Peak hour volumes and LoS (Base Case Scenario) for the Main South Road/ Country Road intersection

Approach	Existing Peak Hour Volumes	Existing LoS	Future Peak Hour Volumes	Future LoS
Main South Rd (N)	180 (250)	A (A)	270 (444)	A (A)
Main South Rd (S)	125 (255)	A (A)	166 (347)	A (A)
Country Rd (W)	165 (75)	A (A)	431 (199)	A (A)

The SIDRA analyses identified that the Main South Road and Country Road intersection will operate with a high LoS ('A') upon completion of the 'future case' development scenario. However, noting the increase volumes forecast to access the study area via this intersection (right-turn from Main South Road and left-turn from Country Road) and the existing crash statistics at the intersection, it is recommended that consideration be given to the installation of a separated right-lane on Main South Road (to accommodate right-turn vehicle movements into Country Road). Further description of a potential intersection upgrade is detailed in 4.5.2.5.

4.4.5 INTERSECTION ANALYSIS (PEAK CASE)

In order to ensure a robust assessment, a sensitivity analysis (reflective of a 'future summer peak' scenario) has been undertaken. The sensitivity analysis assumes a 95% occupancy level of all residential allotments (existing, infill and greenfield) within the study area.

As identified in Section 4.2, roadways are typically classified based upon annual average traffic volumes rather than peak seasonal fluctuations. Accordingly, the sensitivity analysis has only taken into consideration seasonal volumes at key intersections to ensure their continued satisfactory operation.

Approach Level of Service (LoS) has again been determined by using SIDRA Intersection software. A comparison of LoS achieved at key intersections of the 'future case' and 'future summer' scenarios is illustrated in Table 16 to Table 21.

4.4.5.1 MAIN SOUTH ROAD/NORMAN ROAD/ROGERS ROAD

Table 16 – 'Future summer peak' am and (pm) peak hour volumes and LoS for the upgraded Main South Road/Norman Road/Rogers Road intersection

Approach	Future Peak Hour Volumes	Future LoS	Summer Peak Hour Volumes	Summer LoS
Main South Rd (N)	549 (1155)	A (A)	647 (1359)	A (A)
Rogers Rd (E)	4 (8)	F (F)	5 (9)	F (F)
Main South Rd (S)	1058 (647)	A (A)	1258 (770)	A (A)
Norman Rd (W)	269 (126)	B (F)	295 (139)	E (F)

Table 16 compares the reported LoS for the upgraded Main South Road, Norman Road and Rogers Road intersection for the 'future case' and 'future summer' scenarios. The impact of the seasonal traffic variation is considered low, with no changes to LoS for the Main South Road approaches.

The LoS reported for the Norman Road approach decreases from 'B' to 'E' during the am peak while remaining 'F' during the pm peak. As noted above in Section 4.4.4.1, this is due to large delays associated with through and right-turn movements from Norman Road and Rogers Road. Description of a concept upgrade treatment is detailed in Section 4.5.2.1.

4.4.5.2 NORMAN ROAD/JUSTS ROAD

Table 17 – 'Future summer peak' am and (pm) peak hour volumes and LoS for the upgraded Norman Road/Justs Road intersection

Approach	Future Peak Hour Volumes	Future LoS	Summer Peak Hour Volumes	Summer LoS
Norman Rd (E)	105 (188)	A (A)	115 (207)	A (A)
Justs Rd (S)	290 (154)	A (A)	318 (168)	A (A)
Norman Rd (W)	102 (149)	A (A)	111 (163)	A (A)

As identified in Table 17, the 'future summer' scenario identifies that Norman Road and Justs Road intersection will operate with satisfactory LoS during peak seasonal traffic fluctuations.

4.4.5.3 SELLICKS BEACH ROAD/JUSTS ROAD/COUNTRY ROAD

Table 18 – 'Future summer peak' am and (pm) peak hour volumes and LoS for the Sellicks Beach Road/Justs Road/Country Road intersection

Approach	Future Peak Hour Volumes	Future LoS	Summer Peak Hour Volumes	Summer LoS
Justs Rd (N)	184 (231)	A (B)	202 (254)	B (B)
Sellicks Beach Rd (E)	237 (486)	A (A)	260 (534)	A (A)
Country Rd (S)	310 (232)	B (B)	340 (255)	B (B)
Sellicks Beach Rd (W)	386 (287)	A (A)	424 (314)	A (A)

Table 18 illustrates minimal variation in LoS between the 'future case' and 'future summer' development scenarios. However, it is noted that, again, traffic volumes using the intersection are forecast to increase. This places further emphasis on an alternate intersection design in order to increase its safe operation, particularly for users who are not familiar with its somewhat unusual design (such as tourists in the Sellicks Beach area during the summer peak). An alternate intersection design has been explored in Section 4.5.2.2.

4.4.5.4 MAIN SOUTH ROAD/SELLICKS BEACH ROAD/OLD SELLICKS HILL ROAD

Table 19 – 'Future summer peak' am and (pm) peak hour volumes and LoS for the Main South Road/Sellicks Beach Road/Old Sellicks Hill Road intersection

Approach	Future Peak Hour Volumes	Future LoS	Summer Peak Hour Volumes	Summer LoS
Main South Rd (N)	468 (929)	A (A)	537 (1060)	A (B)
Old Sellicks Hill Rd (E)	3 (17)	B (E)	3 (17)	C (F)
Main South Rd (S)	432 (354)	A (A)	514 (420)	A (A)
Sellicks Beach Rd (W)	550 (257)	B (A)	604 (282)	C (B)

Table 19 identifies that during the 'future summer' development scenario, LoS is reported to decrease to 'C' for the Old Sellicks Hill Road and Sellicks Beach Road approaches during the am peak. Similarly, the same approaches will decrease to 'F' and 'C' respectively during the pm peak.

While the decreases in LoS are not considered to be detrimental to the intersection's operation (particularly for the Old Sellicks Hill Road approach, noting low traffic volumes and two intersecting locations), upgrades of the intersection are considered to be warranted with regard to safety. Further discussion relating to a potential intersection upgrade is detailed in Section 4.5.2.3.

4.4.5.5 COUNTRY ROAD/GULF VIEW ROAD

Table 20 – 'Future summer peak' am and (pm) peak hour volumes and LoS for the Country Road/ Gulf View Road intersection

Approach	Future Peak Hour Volumes	Future LoS	Summer Peak Hour Volumes	Summer LoS
Country Rd (N)	135 (161)	A (A)	148 (176)	A (A)
Country Rd (S)	178 (433)	A (A)	195 (474)	A (A)
Gulf View Rd (W)	448 (195)	A (A)	491 (214)	A (A)

SIDRA analyses (Table 20) identify that the intersection of Country Road and Gulf View Road will continue to operate with a satisfactory LoS during the 'future summer' scenario. However, as noted in Section 4.4.4.5, it is recommended that widening of the intersection and the sealing of shoulders be explored in order to maintain safety.

4.4.5.6 MAIN SOUTH ROAD/COUNTRY ROAD

Table 21 – 'Future summer peak' am and (pm) peak hour volumes and LoS for the Main South Road/Country Road intersection

Approach	Future Peak Hour Volumes	Future LoS	Summer Peak Hour Volumes	Summer LoS
Main South Rd (N)	270 (444)	A (A)	309 (499)	A (A)
Main South Rd (S)	166 (347)	A (A)	193 (401)	A (A)
Country Rd (W)	431 (199)	A (A)	473 (219)	A (A)

Table 21 illustrates that an adequate LoS will be achieved at the Main South Road and Country Road intersection during the 'future summer' scenario. However, noting further increases in traffic volumes, it is recommended that consideration be given to a separated right-turn lane treatment.

4.5 FUTURE ROAD IMPROVEMENTS

4.5.1 MIDBLOCK UPGRADES

Midblock sections of key roads should be maintained to an acceptable standard which does not impair road user safety. Consideration should be given to ensuringthat traffic lane widths align with the recommendations set out by the relevant Austroads Guidelines ("*Guide to Road Design Part 3*"), with a typical traffic lane width of 3.5 m provided.

Provisions associated with parking, cycling and pedestrians should be provided in accordance with the City of Onkaparinga's Road Network Plan (RNP) relative to the hierarchy and classification of a given road.

Street should also be lit in accordance with the requirements set out by Australian Standard 1158 and the guidelines identified in Council's RNP. The RNP details where lighting is required on both urban roads and rural roads as well as their associated intersections.

Both existing roads (within and connecting to infill areas) as well as new roads (within greenfield area) should be maintained and constructed as per Council's RNP requirements. The RNP also details general road cross-sections for a variety of road types including laneways, local roads, collector roads and distributor roads.

4.5.2 INTERSECTION UPGRADES

4.5.2.1 MAIN SOUTH ROAD/NORMAN ROAD/ROGERS ROAD

Noting that the Main South Road, Norman Road and Rogers Road intersection is forecast to have a LoS 'F' on both the Norman Road and Rogers Road approaches during the am and pm peaks, investigations into intersection performance improvements have been undertaken.

Further analysis of the intersection analyses indicate that queues associated with through and right-turn movements from Norman Road restrict large numbers of left-turn movements (left from Norman Road onto Main South Road). The queues have been identified to occur as a result of infrequent gaps in the Main South Road traffic stream to allow such vehicles to exit from Norman Road.

In order to address this, an additional left-turn lane has been added to the approach of Norman Road. To allow vehicles to merge appropriately into the northbound Main South Road traffic stream, the left-turn lane has been designated as a continuous lane with an acceleration treatment. A similar arrangement currently exists at the Main South Road and Aldinga Beach Road intersection. Figure 9 illustrates a concept of the intersection treatment.

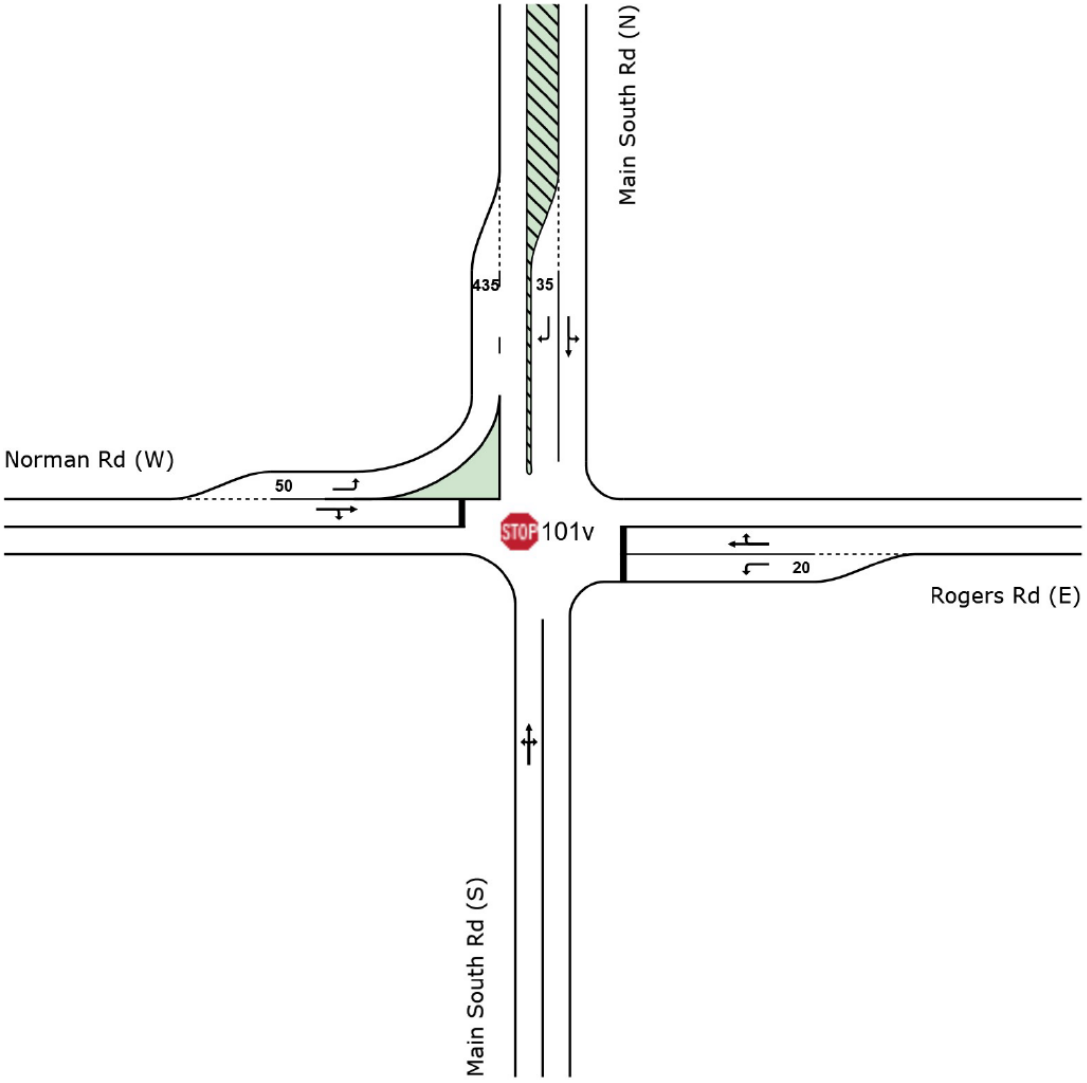

Figure 9 – A concept of the Main South Road, Norman Road and Rogers Road intersection upgrade

In order to ensure appropriate performance of the concept upgrade, additional SIDRA analyses have been undertaken. Table 22 illustrates the key SIDRA output of the concept upgrade configuration for the 'future case' scenario.

Table 22 – 'Future case' am and (pm) peak LoS for the existing and upgrade configurations Main South Road/Norman Road/Rogers Road intersection

Approach	Future Peak Hour Volumes	Existing Configuration LoS	Upgrade Configuration LoS
Main South Rd (N)	549 (1155)	A (A)	A (A)
Rogers Rd (E)	4 (8)	F (F)	F (F)
Main South Rd (S)	1058 (647)	A (A)	A (A)
Norman Rd (W)	269 (126)	F (F)	B (F)

The SIDRA output illustrated in Table 22 indicates that the continuous left-turn lane from Norman Road increases the Norman Road approach LoS from 'F' to 'B' during the am peak period.

However, the LoS remains 'F' during the pm peak due to the larger delays associated with through and right-turn movements from Norman Road (given the southbound traffic volume on Main South Road increases significantly during the pm peak). By analysing the SIDRA output further, the left-turn traffic movement from Norman Road improves substantially during the pm peak as a result of the upgraded intersection, with delays decreasing significantly.

It should be noted that an option achieving a LoS of 'D' or higher for all road users would likely result in a significant intersection upgrade and would be cost prohibitive considering the number of vehicles in which the LoS improvement is sought for. Noting that the number of through and right-turn vehicle movements from Norman Road and Rogers Road, the intersection upgrade illustrated in Figure 9 is considered to be satisfactory to service a large number of drivers despite the reported LoS 'F'.

In order to compliment the above the concept illustrated in Figure 9, appropriate linemarking and signage shall be installed in accordance with relevant Standards and Guidelines. It is also recommended that advanced warning signage (in addition to the typical statutory requirements) be installed on all approaches to ensure driver awareness of the intersection's proximity.

4.5.2.2 SELLICKS BEACH ROAD/JUSTS ROAD/COUNTRY ROAD

As identified in Section 4.4.4.3, traffic volumes are forecast to significantly increase at the Sellicks Beach Road, Justs Road and Country Road intersection. While SIDRA analyses identify that the intersection will perform adequately with forecast volumes, noting the somewhat unusual design and proximity to the neighbourhood centre (and potential primary school), it is recommended that consideration be given to a roundabout in place of the existing intersection.

The roundabout should be designed such that centre annulus is round (rather than elliptical) and that all approaches intersect at 90-degrees to one another (i.e. removal of the intersection's existing staggered arrangement). Figure 10 illustrates a concept of the Sellicks Beach Road, Justs Road and Country Road roundabout upgrade.

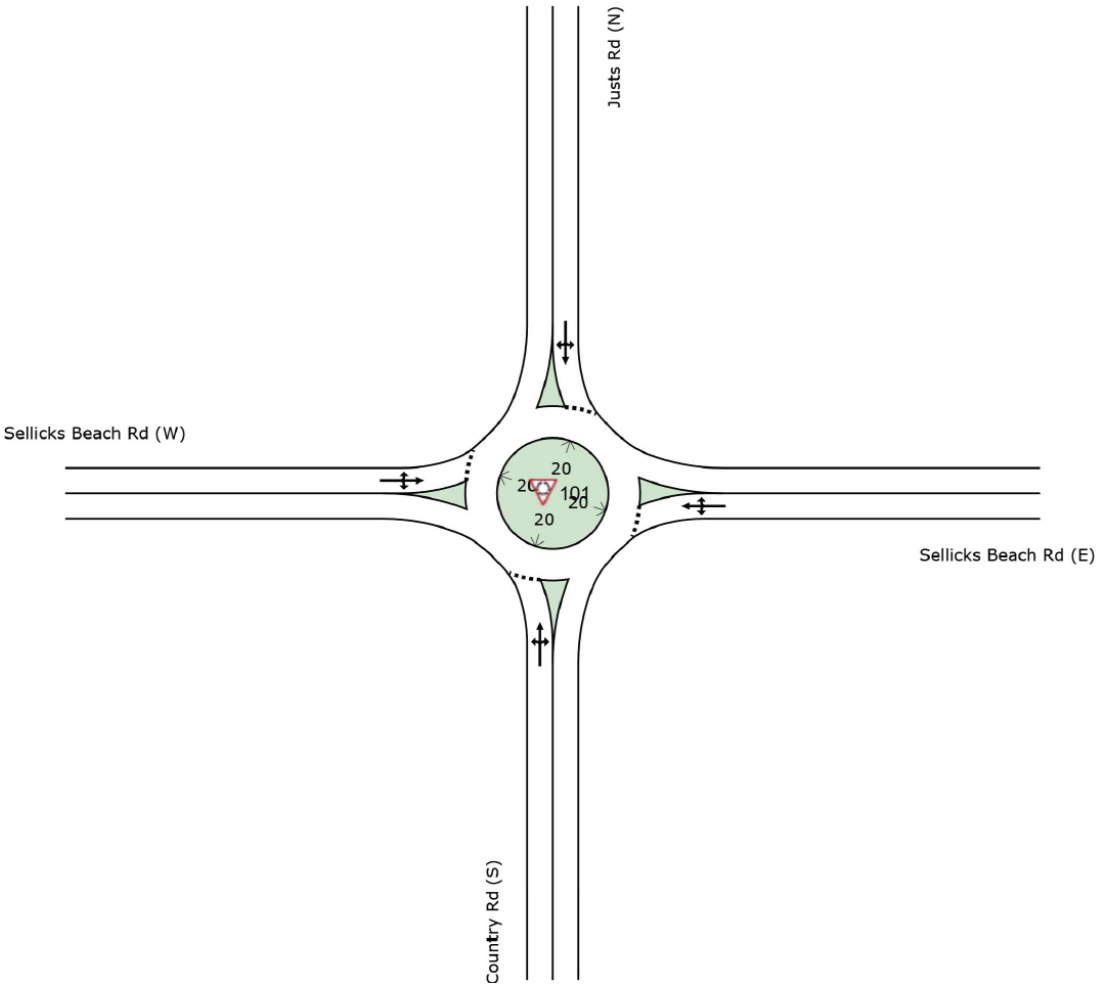

Figure 10 – A concept of the Sellicks Beach Road/Justs Road/Country Road intersection upgrade

SIDRA analyses have also been undertaken to ensure that LoS does not decrease at the subject intersection as a result of the concept design. Table 23 illustrates the key SIDRA output of the concept upgrade configuration for the 'future case' scenario.

Table 23 - 'Future case' am and (pm) peak LoS for the existing and upgrade configurations Sellicks Beach Road/Justs Road/Country Road intersection

Approach	Future Peak Hour Volumes	Existing Configuration LoS	Upgrade Configuration LoS
Justs Rd (N)	184 (231)	A (B)	A (A)
Sellicks Beach Rd (E)	237 (486)	A (A)	A (A)
Country Rd (S)	310 (232)	B (B)	A (B)
Sellicks Beach Rd (W)	386 (287)	A (A)	A (A)

As illustrated in Table 23, the a roundabout treatment at the intersection of Sellicks Beach Road, Justs Road and Country Road will further improve the LoS

on all approaches during both the am peak period. With regard to the pm peak, LoS will increase to 'A' on the Justs Road approach, while a LoS 'B' will be retained on the Country Road approach. The concept roundabout treatment is therefore considered an improvement with regard to LoS as well as general intersection safety.

4.5.2.3 MAIN SOUTH ROAD/SELLICKS BEACH ROAD/OLD SELLICKS HILL ROAD

Noting that the intersection of Main South Road, Sellicks Beach Road and Old Sellicks Hill Road recorded the highest crash rate of any location within the study area over the five-year data period, upgrades to the existing intersection configuration are considered warranted regardless of future development within the Sellicks Beach study area.

As identified in Section 4.3.2.4, consideration should be given to the installation of separated right-turn lanes on Main South Road (for right turn movements in to both Sellicks Beach Road and Old Sellicks Hill Road. Furthermore, it is recommended that consideration be given to a continuous left-turn lane with associated acceleration provisions. This is due to the significant increase in vehicle movements between Main South Road (northern approach) and Sellicks Beach Road as a result of the potential future development.

It is also recommended that the intersection be realigned such that the Sellicks Beach Road and Old Sellicks Hill Road approaches intersect perpendicular to Main South Road. The realignment will assist in increasing sight distance provisions for through-bound vehicles on Main South Road as well as vehicles turning to/from the minor road approaches.

A concept design of a potential intersection upgrade was prepared as part of DIT's Main South Road RMP. The design reflects the recommendations identified above and is considered to assist in accommodating additional traffic movements generated by potential development as well as improve user safety at the intersection. Figure 11 illustrates the concept design provided in DIT's 2015 Main South Road RMP.

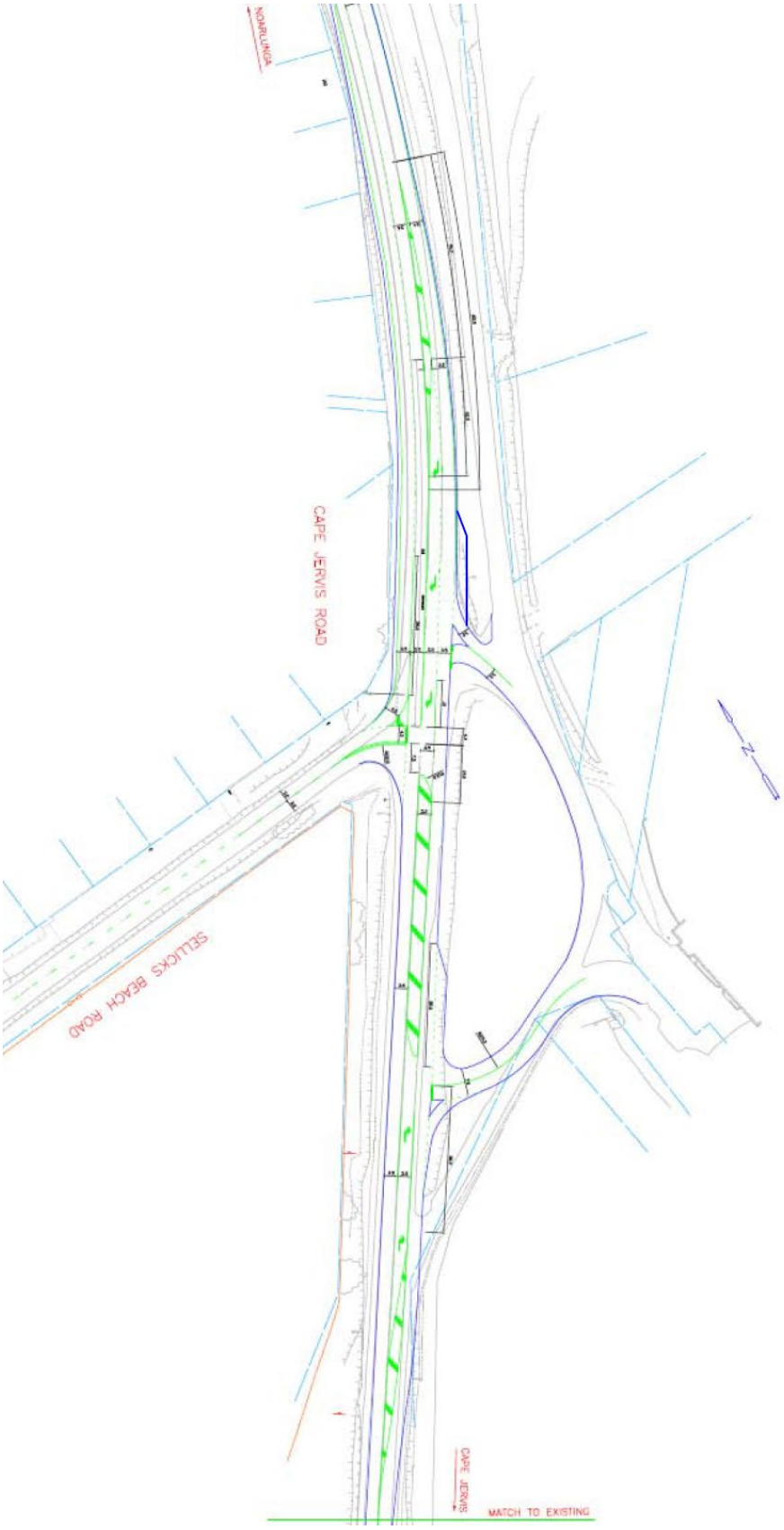

Figure 11 – The concept design of the Main South Road, Sellicks Beach Road and Old Sellicks Hill Road intersection as identified in DIT's 2015 RMP

SIDRA analyses adopting the concept design have also been undertaken, with key LoS output identified in Table 24.

Table 24 - 'Future case' am and (pm) peak LoS for the existing and upgrade configurations Main South Road/Sellicks Beach Road/Old Sellicks Hill Road intersection

Approach	Future Peak Hour Volumes	Existing Configuration LoS	Upgrade Configuration LoS
Main South Rd (N)	468 (929)	A (A)	A (A)
Old Sellicks Hill Rd (E)	3 (17)	B (E)	A (A)
Main South Rd (S)	432 (354)	A (A)	A (A)
Sellicks Beach Rd (W)	550 (257)	B (A)	A (A)

The SIDRA analyses indicate that the intersection's performance will significantly improve should the concept upgrade of the Main South Road, Sellicks Beach Road and Old Sellicks Hill Road intersection be constructed. Specifically, LoS on both the minor road approaches will increase to 'A' during the am peak period, while the LoS of the Old Sellicks Hill Road approach will also increase to 'A' during the pm peak period.

Given that the design will achieve a higher level of performance while addressing existing safety issues, the concept is considered to be an appropriate upgrade solution for the Main South Road, Sellicks Beach Road and Old Sellicks Hill Road intersection.

4.5.2.4 COUNTRY ROAD/GULF VIEW ROAD

Neither SIDRA analyses nor existing crash data identify existing or potential future issues associated with the Gulf View Road and Country Road intersection. However, it is noted that the intersection is narrow in width and has limited shoulders available on all sides. It is also noted that pavement at the intersection is in poor condition and, should traffic volumes grow, increases the risk of a crash occurring.

On the basis of the above, it is recommended that consideration be given to pavement works at the intersection including (but not limited to) resurfacing and widening of existing seal within the intersection.

4.5.2.5 MAIN SOUTH ROAD/COUNTRY ROAD

SIDRA analyses of the Main South Road and Country Road intersection (section 4.4.4.6 and 4.4.5.6) indicate that the intersection will continue to perform satisfactorily upon realisation of the potential development. However, the number of rear-end crashes reported at the intersection is considered 'above-average' in comparison to nearby intersections. Accordingly, it is recommended that a separated right-turn lane be provided to accommodate

right turn movements from Main South Road (northern approach) into Country Road. Figure 12 illustrates a concept of the recommended intersection configuration.

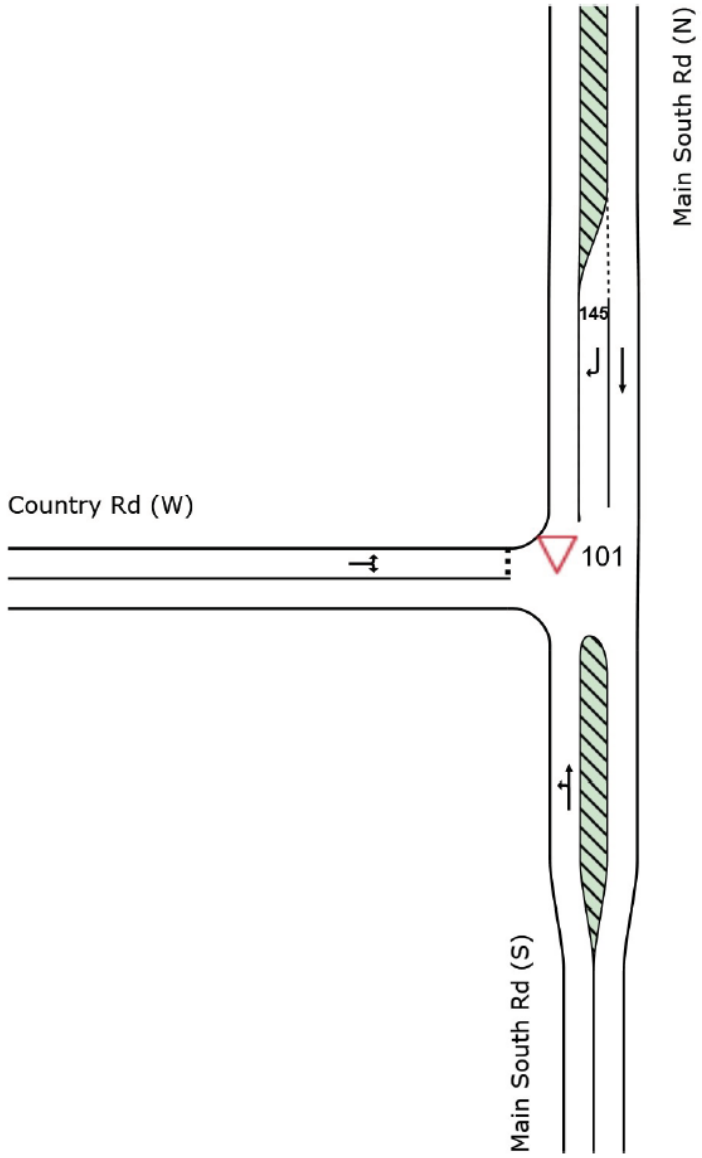

Figure 12 – A concept of the Main South Road/Country Road intersection upgrade

SIDRA analyses have also been undertaken to ensure that LoS does not decrease at the intersection as a result of the concept design. Table 25 illustrates the key SIDRA output of the concept upgrade configuration for the 'future case' scenario.

Table 25 - 'Future case' am and (pm) peak LoS for the existing and upgrade configurations Main South Road/Country Road intersection

Approach	Future Peak Hour Volumes	Existing Configuration LoS	Upgrade Configuration LoS
Main South Rd (N)	270 (444)	A (A)	A (A)
Main South Rd (S)	166 (347)	A (A)	A (A)
Country Rd (W)	431 (199)	A (A)	A (B)

SIDRA analyses of the Main South Road and Country Road intersection indicate that the installation of separated right-turn lane will not significantly impact upon intersection performance. Noting the safety improvements associated with such a treatment, it is recommended that consideration be given to such a treatment.

5. PUBLIC TRANSPORT

5.1 EXISTING SERVICES AND ROUTES

Few public transport services operate within and adjacent to the Sellicks Beach study area. Bus services operating within the study area include:

- Route 750 – Sellicks Beach to Colonnades Centre Interchange;
- Route 750A – Sellicks Beach to Noarlunga;
- Route 750R – Sellicks Beach to Seaford Interchange; and
- Route 750X – Sellicks Beach to Noarlunga Centre Interchange.

Buses routes operating within the study area provide connectivity to the Aldinga Shopping Centre, Seaford Shopping Centre, Seaford Interchange, Noarlunga Shopping Centre and Noarlunga Interchange. Interchanges provide opportunities for patrons to alight and board frequent rail services for connectivity to broader metropolitan Adelaide and the Central Business District.

However, it should be noted that all bus routes currently utilise the same route within the study area, with the majority of routes utilising a one-way loop through the study area. Key roadways used by buses within the study area include Justs Road (used for entry and exit to/from the study area), Sellicks Beach Road, George Parade, Norman Victory Parade, Alexander Street and Esplanade.

Figure 13 illustrates the existing bus route within the study area.

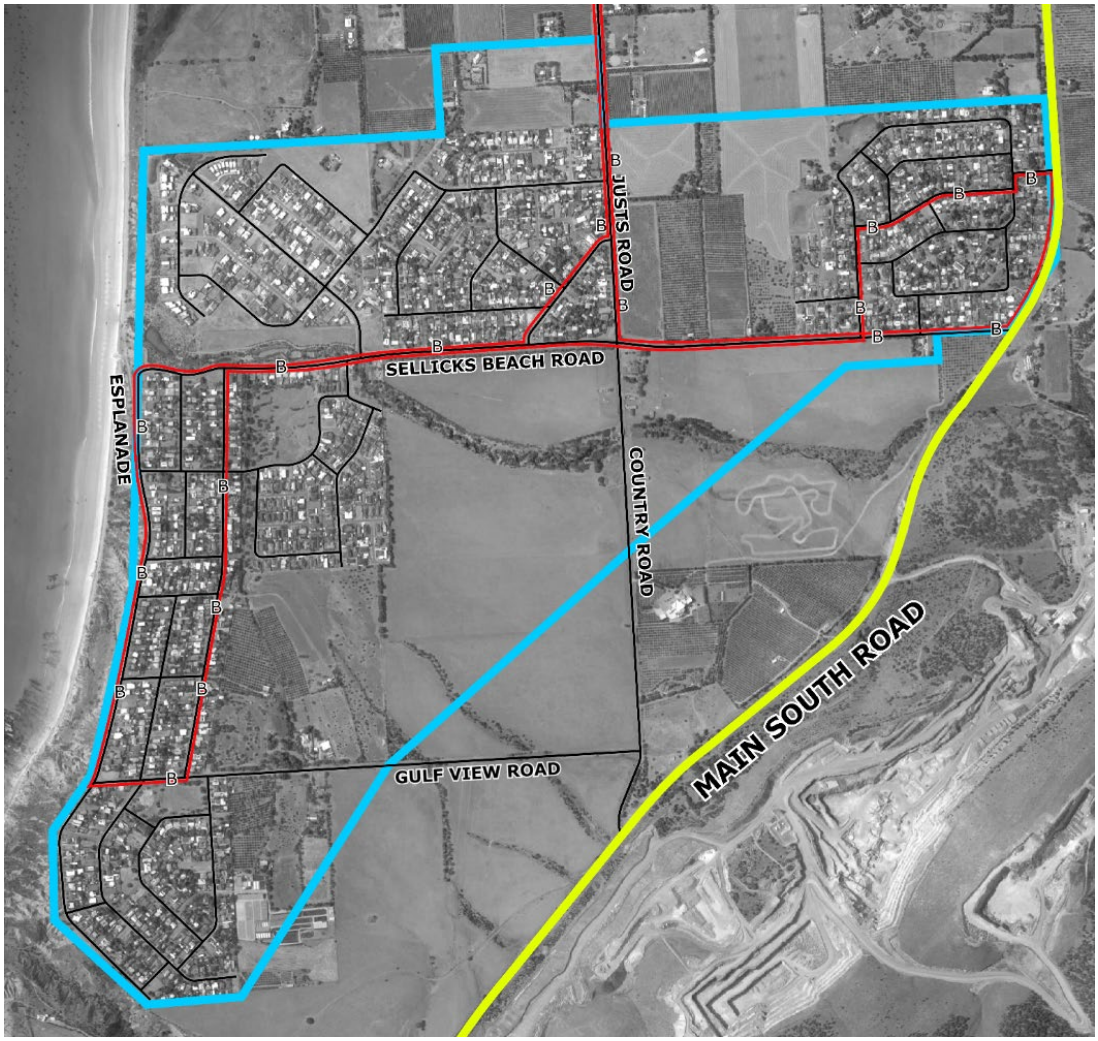

Figure 13 – Existing bus route within the study area

Bus stops within the study area are typically serviced on an hourly basis, with more frequent services only occurring during peak commuter periods on weekdays. Weekend services are less frequent with buses typically servicing a selection of stops every two hours.

Within the study area, bus stops are generally spaced at intervals in the order of 350 m. Good route planning is typically based upon a maximum walking distance in the order of 400 m (less than 5-minutes) in order to access a given bus stop. Accordingly, the spacing of existing bus stops is considered to be appropriate.

However, with regard to the existing catchment created by the location of existing bus stops, only a portion of the study area is adequately serviced. In particular, the older and more established areas (along Esplanade and adjacent Main South Road) have a high level-of-service while the newer development areas have a low level-of-service, with numerous allotments within the

north-western and southern corners being located outside of catchment areas altogether.

Figure 14 illustrates the indicative location and catchment of existing bus stops within the study area.

Figure 14 – Location and indicative catchment of existing bus stops within the study area

5.2 NETWORK IMPROVEMENTS

Public transport services within the study area will largely be dependent on the layout of the future road network. While the future road network configuration is currently unknown, bus routes should be designed to minimise the need for bus routes to overlap and 'double up' along any given section of roadway.

It is however acknowledged that mitigating bus route overlap is not always possible due to the road network's configuration and/or the staging of land divisions. Furthermore, in high-activity areas (such as within the vicinity of the neighbourhood centre) overlap may be desired to increase the frequency in which services operate.

Furthermore, consideration should be given to the various turns required to be undertaken by buses, with right turns onto higher order roads (from local roads) avoided where possible (due to increased gap acceptance requirements and the potential for increased delays).

Figure 15 illustrates an indicative bus route through the study area based upon full development of the study area and a concept road network alignment.

Figure 15 – Indicative bus route through the study area upon completion of the development

Planning of bus routes should also ensure that the catchments of individual bus stops are maximised, with minimal catchment overlap between stops. Catchment overlap should primarily be focused on higher density areas and activity centres where increased patronage is expected (or already occurs).

Within the vicinity of such areas, consideration should also be given to locating bus stops on the same side of the roadway as patron origin/destination. This is

particularly relevant to the study area given that the majority of the anticipated future bus route would be one-way in nature (i.e. a one-way loop through the study area). Such an arrangement is reflective of existing bus routes through the Sellicks Beach area and is common in extremity locations where patronage numbers are comparatively low.

Figure 16 illustrates indicative bus stop locations (based upon the route illustrated in Figure 15) and their respective catchment within the study area.

Figure 16 – Indicative bus stop locations and their respective catchment areas

6. ACTIVE TRANSPORT

6.1 EXISTING INFRASTRUCTURE

Walking and cycling infrastructure vary significantly throughout the Sellicks Beach study area. Specifically, within the older and more established areas of Sellicks Beach, minimal footpath infrastructure is provided throughout, with most streets having no pedestrian infrastructure at all.

Within the newer development areas, footpaths are generally provided on at least one side of any given roadway. Footpaths (where provided) connect within these areas (generally) via the use of DDA-compliant pedestrian ramps (i.e. with 'Warning Tactile Ground Surface Indicators').

Pedestrian connectivity between the older and newer development areas is limited, with path connections typically only provided adjacent higher order roads (i.e. Sellicks Beach Road and Esplanade). Elsewhere, paths appear to be worn into the ground as a result of pedestrians following desire lines due to a lack of (or missing) pedestrian infrastructure.

Adjacent to Sellicks Beach Road (northern side), a predominantly gravel path provides connectivity between Esplanade and Justs Road. Further to the east, no infrastructure is provided at all, resulting in a disconnection within the existing network.

It is noted that a sealed off-street shared path extends from the Sellicks Beach beach-access to the north, however the path does not provide the same level of continual service to networks beyond the study area. This is due to the shared path terminating adjacent the north-western corner of the study area and continuing north only as an informal track. No other connectivity is provided between the study area.

An unsealed (gravel) path is also provided adjacent Esplanade on its western side. The location of this path is considered to be consistent with paths typically found along the coastline within the City of Onkaparinga (albeit the majority of paths are sealed/paved).

With regard to cycling, dedicated bicycle provisions are scarce throughout the study area. Specifically, bicycle lanes are provided on both sides of Lurline Boulevard (within one of the newer development areas) and have recently been constructed on both sides of the southern portion of Justs Road (between approximately 150 m north of Tangier Boulevard and Sellicks Beach Road). No other on-street bicycle infrastructure is provided within the study area.

As noted above, an off-street shared path is provided adjacent the Sellicks Beach beach-access. The shared path accommodates for bicycle movements in its design (i.e. comprises of a wider width than a regular footpath), however it is noted that cyclists are able to ride on the adjacent footpath network.

6.2 EXISTING MOVEMENTS

Walking and cycling heatmap data have been obtained from Strava in order to determine if demands for such activities are present within the study area. It should be noted that Strava does not quantify the number of movements however instead compares the number of movements along a given route relative to movements on nearby routes.

Furthermore, the Strava heatmap data only captures users who have signed up to the Strava platform. As such, a number of recreational movements will not be captured by the heatmaps, with the data typically identifying more frequent users. Nonetheless, the heatmap data provides an insight into walking and cycling demands, and the routes in which respective users chose.

Figure 17 illustrates the walking, jogging and running movements recorded by Strava within the study area.

Figure 17 – Heatmap of existing walking/jogging/running movements within Sellicks Beach

As illustrated in Figure 17, walking, jogging and/or running movements are evident within the study area. Notably, the shared use path, Esplanade footpath and Sellicks Beach Road footpath are used comparatively more than any other area within the study area.

In conjunction with this, Strava identifies that the Sellicks Beach beachfront is heavily used for walking, jogging and running and, in particular, adjacent to where the shared path terminates in the north-western corner of the study area. This identifies that there is a strong existing demand for connectivity of the shared path further north to Aldinga Beach.

The heatmap data also indicates some level of activity occurring within the residential areas (i.e. local roads) and in particular, on roadways without footpath provisions. The existing heatmap data therefore indicates that despite limited dedicated pedestrian infrastructure being provided, there is a strong demand for such facilities to be provided within the study area.

Figure 18 illustrates cycling movements recorded by Strava within the study area.

Figure 18 – Heatmap of existing cycling movements within Sellicks Beach

Strava's cycling heatmap data identifies comparatively higher cycling movements along higher order roads than those recorded on lower order (local) roads within the Sellicks Beach study area. Specifically, a comparatively larger number of cycling movements were identified on Sellicks Beach Road, Justs Road, Country Road and Esplanade. Lower cycling movements were identified on the local roads within the residential areas.

However, as noted above, the cycling heatmap data is considered to be skewed in that only more-serious recreational cyclist movements are typically captured within the data. Interestingly, the heatmap data still indicates a demand for cycling movements to be accommodated off-street (separated from vehicles), with the small section of off-road shared path comparatively higher than nearby local streets. Based upon this, it is considered that a number of recreation/leisure movements would also occur however are simply unrecorded.

6.3 STUDY AREA INFRASTRUCTURE IMPROVEMENTS

As noted above, the heatmap data identifies that there is a strong existing demand for both pedestrian (walking, jogging and running) and cycling infrastructure within the study area. The creation of additional residential allotments is therefore only considered to emphasis and increase this demand.

As a minimum, it is considered that sealed footpaths should be provided on at least one side of existing residential streets (local roads), with associated DDA-compliant pedestrian ramps at local road intersections (where practicable). An example of a DDA-compliant pedestrian ramp within the study area is illustrated in Figure 19.

Figure 19 – A DDA-compliant pedestrian ramp within the Sellicks Beach study area

Where a roadway is of a higher order (collector), consideration should be given to the construction of an off-road shared path on one side or a footpath on one side with on-street bicycle lanes. For distributor roads (such as Sellicks Beach Road), consideration should be given to the installation of an off-road shared path on one side, a footpath on the other and on-road bicycle lanes as a preference.

While standard pedestrian ramps are generally considered sufficient for footpath crossings at local road intersections, consideration should be given to refuge treatments (capable of accommodating a bicycle) where a footpath crosses a collector or distributor road adjacent an intersection. An example of a pedestrian refuge at an intersection within the study area is illustrated in Figure 20.

Figure 20 – An example of a pedestrian refuge at an intersection within the Sellicks Beach study area

Refuges should be constructed to ensure continuity and facilitate safer crossing movements for shared path users. Such treatments will allow path users to stage their crossing movement (i.e. crossing a single traffic lane with each movement) rather than crossing two traffic lanes in a single movement.

Figure 21 illustrates an example of an off-road shared path crossing over a local roadway within metropolitan Adelaide.

Figure 21 – An example of a shared path crossing over a local road within metropolitan Adelaide

Shared paths should be provided such that they provide connectivity to one another rather than in isolation throughout the study area. Where a shared path or footpath crosses over a higher order road (collector or distributor) at a midblock location (i.e. not adjacent an intersection), it is recommended that a refuge be installed. An example of a midblock refuge for a footpath is illustrated in Figure 22.

Figure 22 – An example of a midblock pedestrian refuge within metropolitan Adelaide

In order to reinforce on-road bicycle lanes, it is recommended that bicycle lanes are delineated through intersections via the use of green pavement marking. Such pavement treatments not only assist to delineate bicycle lanes through an

intersection, but also help to define priority for motorists. Figure 23 illustrates an example of such a treatment within metropolitan Adelaide.

Figure 23 – An example of green pavement marking used to delineate and reinforce the continuity of a bicycle lane through an intersection (priority movement)

The above treatments will assist in adding to pedestrian and cyclist user amenity throughout the study area. Additional consideration should also be given to visual elements such as trees and landscaping to assist in the provision of an appropriate road environment as well as provide general environmental benefits (such as shade and permeable areas).

6.4 BROADER AREA INFRASTRUCTURE IMPROVEMENTS

As noted in Section 6.1, no walking or cycling infrastructure is provided to connect Sellicks Beach to the Aldinga Beach or surrounding areas, effectively isolating Sellicks Beach in regard to active transport. Future rezoning and development of the study area should also give consideration to the provision of dedicated off-road shared paths within the study area and should provide connectivity to a central path connecting to Aldinga Beach to the north.

Based upon a review of the study area and surrounds, it is considered that there are two primary routes available for a shared path to be provided. The suggested shared paths routes are as follows (in no particular order):

- Route 1
  - from the study area, travel to the north alongside Justs Road;

- provide a formalised shared path crossing adjacent the Norman Road/Justs Road intersection (inclusive of a central refuge);
- continue north through the unmade road (the effective continuation of Justs Road to the north) and across the emergency access bridge;
- continue north alongside Cox Road and follow around the 90-degree bend to the east;
- turn left into 'Gate 2' of 'Aldinga Scrub';
- follow the existing informal track to the north before connecting to Hart Road; and
- follow Hart Road to the west before connecting with the existing off-road shared path within the 'Hart Road Wetland'.

- Route 2
  - from the north-western corner of the study area (the end of the existing off-road shared path), travel north within the unmade road reserve (within the dune system adjacent Sellicks Beach) to Button Road;
  - continue north within the unmade road reserve (within the dune system adjacent Silver Sands) to Loongana Road;
  - continue north alongside the Esplanade to Norman Road;
  - provide a formalised shared path crossing adjacent the Norman Road/Esplanade intersection (inclusive of a central refuge); and
  - continue north alongside the Esplanade and Lower Esplanade before connecting into the existing shared path adjacent the intersection of Esplanade and Morgan Street.

Noting the significant lack of existing shared path infrastructure within Sellicks Beach and Aldinga Beach, Route 1 will require in the order of 4.7 km of shared path infrastructure to be constructed while Route 2 will require approximately 4.1 km.

However, noting the extent of infrastructure required and that the route traverse through the Aldinga Scrub and coastline dune system (for routes one and two respectively), the provision of an off-road shared path may not be feasible. While such infrastructure is certainly preferred, should it be deemed unfeasible, consideration should be given to provide pedestrian and cyclist connectivity in another form (for example, separated pedestrian paths and on-road bicycle lanes). Figure 24 illustrates the two potential shared paths routes considered appropriate to provide connectivity existing infrastructure within Aldinga Beach.

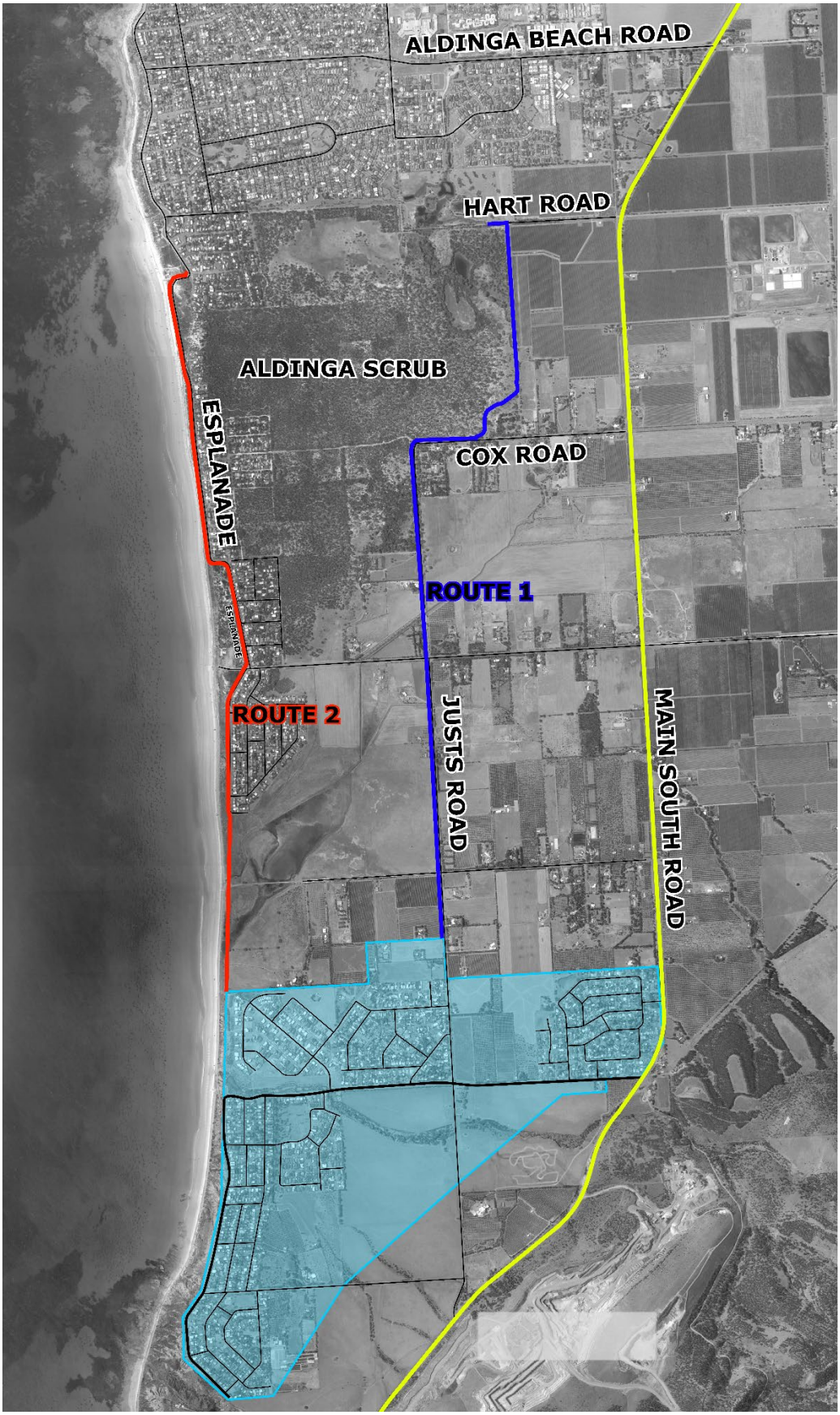

Figure 24 – Potential shared path routes to connect Sellicks Beach to Aldinga Beach