Appendix D1

Integrated Transport Assessment

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Integrated Transport Assessment

Prepared for

ROLLESTON INDUSTRIAL DEVELOPMENTS LTD

1491 Springs Road
Lincoln

October 2020

Integrated Transport Assessment
Prepared for

Rolleston Industrial Developments Ltd

1491 Springs Road
Lincoln

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Introduction

1. Rolleston Industrial Developments Ltd has commissioned Novo Group to prepare an Integrated Transport Assessment (ITA) for a Plan Change at 1491 Springs Road, south of Lincoln.

2. This report provides an assessment of the transport aspects of the proposed Plan Change. It also describes the transport environment in the vicinity of the site, describes the transport related components of the proposal. It has been prepared broadly in accordance with the Integrated Transportation Assessment Guidelines specified in New Zealand Transport Agency Research report 422, November 2010.

3. It is proposed to develop the site primarily for residential use, plus a small commercial zone is also proposed. It is anticipated that the site will accommodate up to 2,000 residential Lots. Primary vehicle access will be taken from Springs Road and it is proposed this will link through to Moirs Land and then Ellesmere Road. Secondary accesses will be provided to Collins Road, Liffey Springs Drive and potentially the internal road networks of the Te Whāriki and Verdeco Park subdivisions.

4. The site location (to the south of Lincoln) is illustrated in **Figure 1** and a copy of the proposed Outline Development Plan (ODP) is included in **Appendix 1**.

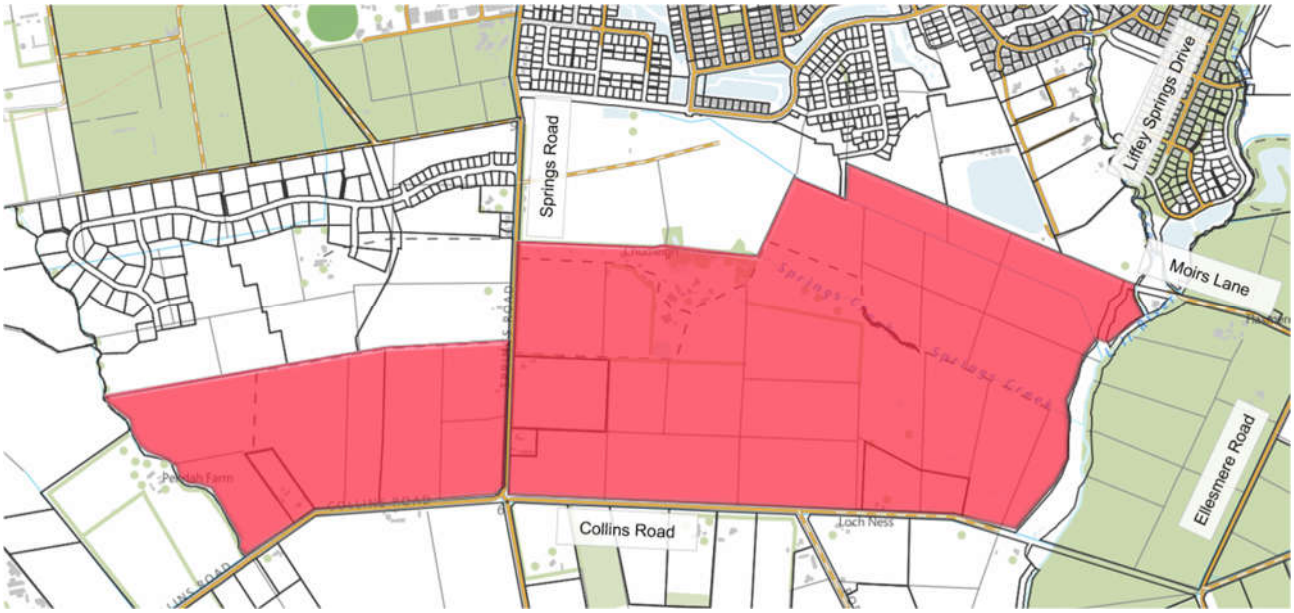


Figure 1: Site Location

Transport Environment

Road Links

Springs Road

5. **Table 1** sets out the transport details of Springs Road in the vicinity of the application site.

Table 1: Springs Road Details

Key Feature or Characteristic	Comment
Road Classification	Collector Road from Gerald Street to 800m north of Collins Road. Local Road south of this.
Cross-Section Description	6.2m sealed carriageway for the section outside the application site. The segments outside Verdeco Park and Te Whāriki are being upgraded to provide a 12.8m carriageway with footpaths on both sides. See **Figure 2** and **Figure 3** for images.
Traffic Volumes	1,531 vehicles per day[1].
Speed	60km/hr from south of the Verdeco Park access heading north. 100km/hr to the south of this.
Cycling Infrastructure	It is understood that the eastern footpath on Springs Road will be a shared path.
Pedestrian Infrastructure	Footpaths on both sides of the road where the carriageway has been upgraded. No footpaths in the rural sections of Springs Road.
Public Transport	None
Road Safety	One non-injury crash at the Springs Road / Anaru Road intersection where a driver u-turning on Springs Road hit a vehicle as they failed to check the road was clear.

Figure 2: Springs Road (Urbanised Area)

Figure 3: Springs Road (Rural Area)

[1] From the Mobile Road website.

Collins Road

6. **Table 2** sets out the transport details of Collins Road in the vicinity of the application site.

Table 2: Collins Road Details

Key Feature or Characteristic	Comment
Road Classification	Local Road.
Cross-Section Description	The section west of Springs Road has a 6m sealed carriageway. The section east of Springs Road has a 6.2m wide sealed carriageway for approximately 935m and then is a 4.2m wide metalled road for a further 540m before terminating.
Traffic Volumes	740 vehicles per day[2] west of Springs Road and 85 vehicles per day east of Springs Road.
Speed	100km/hr.
Cycling, Pedestrian and Public Transport Infrastructure	None
Road Safety	One non-injury crash at the intersection with Springs Road, where a drive lost control after negotiating the bend.

Figure 4: Collins Road West of Springs Road

Figure 5: Collins Road East of Springs Road

[2] From the Mobile Road website.

Ellesmere Road

7. **Table 3** sets out the transport details of Ellesmere Road in the vicinity of the application site.

Table 3: Ellesmere Road Details

Key Feature or Characteristic	Comment
Road Classification	Local Road south of Edward Street and Arterial Road north of Edward Street.
Cross-Section Description	The section south of Edward Street has a 6m sealed carriageway and grass berms beyond this.
Traffic Volumes	1,968 vehicles per day[3] south of Edward Street and 81 to 110 vehicles per hour in the peak hours.
Speed	80km/hr.
Cycling, Pedestrian and Public Transport Infrastructure	None
Road Safety	No crashes have been reported in the most recent five-year period available.

Moirs Lane

8. **Table 4** sets out the transport details of Moirs Lane in the vicinity of the application site.

Table 4: Moirs Lane Details

Key Feature or Characteristic	Comment
Road Classification	Local Road.
Cross-Section Description	This road is sealed for a length of approximately 50m from the stop-controlled intersection with Ellesmere Road. The carriageway is approximately 6.4m wide. This is then a 3.7m wide metalled track to the west of this.
Traffic Volumes	Estimated a 40 vehicles per day and four vehicles per hour based on this road currently serving four residential properties.
Speed	100km/hr.
Cycling, Pedestrian and Public Transport Infrastructure	Provides a cycle connection to the Little River Cycle Route, which crosses Ellesmere Road at the intersection with Moirs Lane.
Road Safety	No crashes have been reported in the most recent five-year period available.

[3] From the Mobile Road website.

Key Intersections

Springs Road / Ellesmere Junction Road / Gerald Street Roundabout

9. This intersection is a four-arm roundabout, as illustrated in **Figure 6**. Traffic counts were undertaken at this intersection from 07:00 to 09:00 and 16:00 to 18:00 on Thursday 15th October 2020. The peak hour traffic volumes are contained on the traffic diagrams in **Appendix 2**.

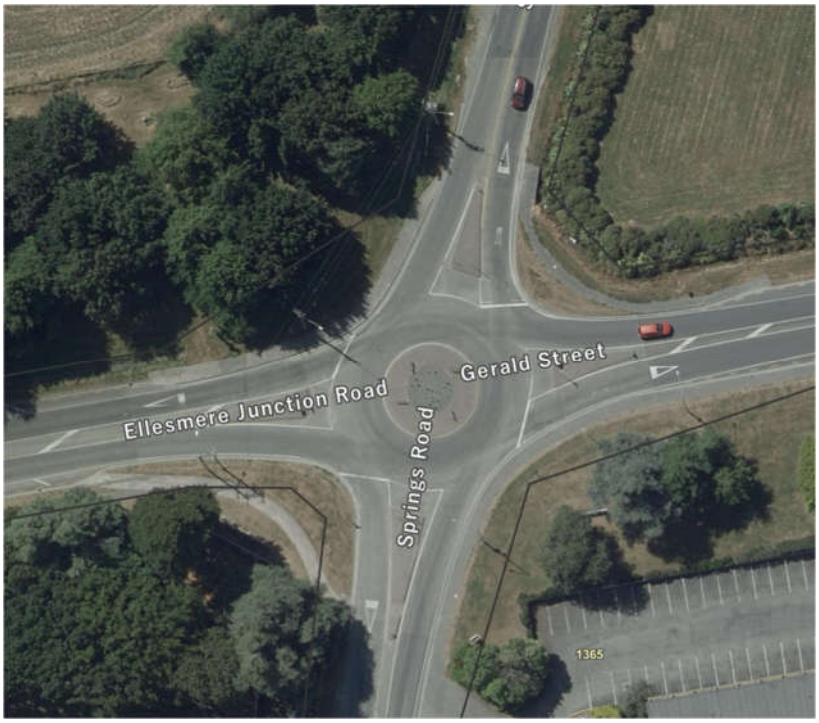


Figure 6: Springs Road / Ellesmere Junction Road / Gerald Street Roundabout

10. A SIDRA model has been created of this intersection to identify the existing traffic capacity. The results of this intersection model are included in **Appendix 3**. As a broad summary, the model results indicate that:

    i. The intersection operates satisfactorily in the AM peak hour, with an overall Level of Service of B[4]. Similarly, the worst Level of Service for any turning movement is C. The degrees of saturation are also considered to be within acceptable limits[5]; and

    ii. The intersection operates satisfactorily in the PM peak hour, again with an overall Level of Service of B. Similarly, the worst Level of Service for any turning movement is C. The degrees of saturation are also considered to be within acceptable limits.

11. The Selwyn District Council Long Term Plan commits funding to the upgrading of this intersection to traffic signals between 2018 to 2028. However, we understand that funding is being reviewed by the Council and this signalisation project may be pushed further into the future.

[4] Where Level of Service A is considered excellent, E is considered to be at capacity and F is over-capacity.
[5] A practical limit for degree of saturation on non-signalised intersections is considered to 0.85, as large queues and delays can occur above this value.

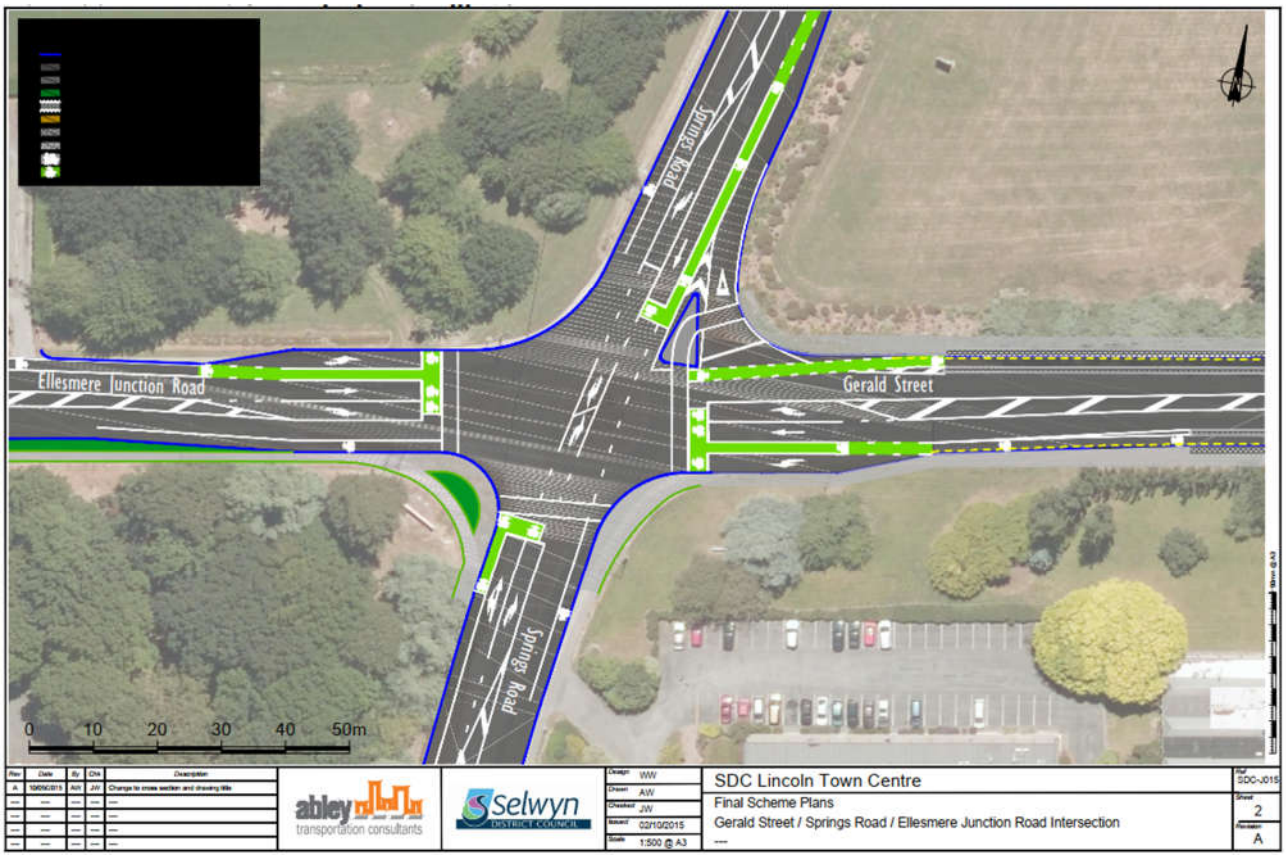


Figure 7: Springs Road / Ellesmere Junction Road / Gerald Street Intersection – Council Upgrade

12. The NZ Transport Agency Crash Analysis System (CAS) has been reviewed to identify crashes that have been reported within 100m of the Springs Road / Ellesmere Junction Road / Gerald Street roundabout in the most recent five-year period available. **Figure 8** is the collision diagram at this intersection.

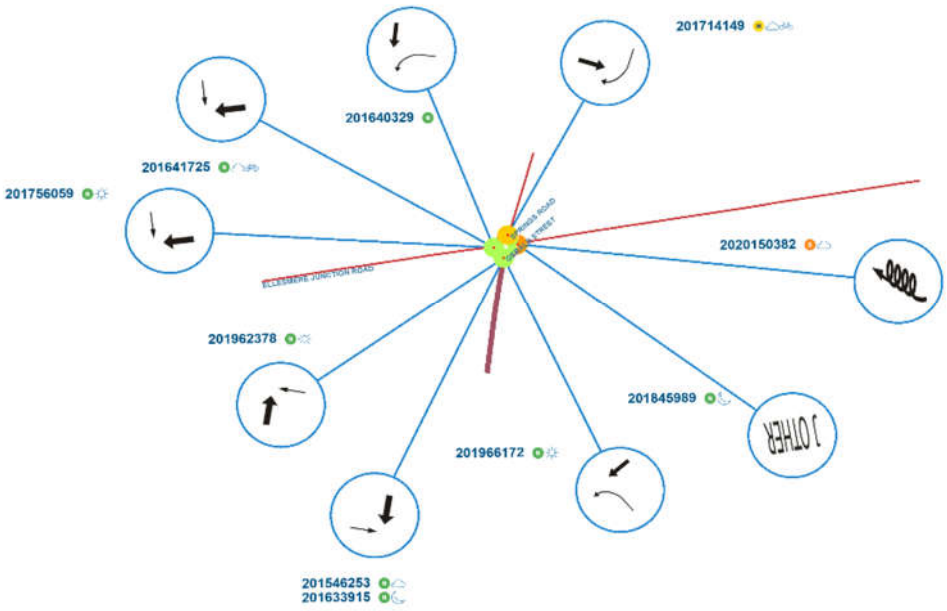


Figure 8: Springs Road / Ellesmere Junction Road / Gerald Street Roundabout Collision Diagram

13. Ten crashes were reported at this intersection, including one severe injury crash, one minor injury crash and eight non-injury crashes. These crashes are summarised as follows:

    i. A serious injury crash where a driver evading police lost control and hit a power pole;

    ii. A minor injury crash and non-injury crash where a southbound driver on Springs Road entered the roundabout and hit a cyclist that was circulating;

    iii. Three non-injury crashes where a southbound vehicle (on Springs Road) failed to give-way to circulating traffic (alcohol was a contributing factor in one of these crashes);

    iv. A non-injury crash where a westbound vehicle (on Gerald Street) failed to give-way to circulating traffic and crashed; and

    v. Three non-injury crashes where a northbound vehicle (on Springs Road) failed to give-way to circulating traffic.

Edward Street / Ellesmere Road / Lincoln Tai Tapu Road Intersection

14. This is a four arm priority controlled intersection, with the northern and southern arms both being stop-controlled (both Ellesmere Road approaches), as illustrated in **Figure 9**.

Figure 9: Edward Street / Ellesmere Road / Lincoln Tai Tapu Road Intersection

15. Traffic counts were undertaken at this intersection from 07:00 to 09:00 and 16:00 to 18:00 on Tuesday 20th October 2020. The peak hour traffic volumes are contained on the traffic diagrams in **Appendix 4**. It is noted that the dominant traffic flows at the intersection are the left turn from Edward Street to Ellesmere Road north and vice versa. This indicates that Ellesmere Road is being used as a route to / from Christchurch by residents of Lincoln.

16. A SIDRA model has been created of this intersection to identify the existing traffic capacity. The results of this intersection model are included in **Appendix 5**. As a broad summary, the model results indicate that:

    i. The intersection operates satisfactorily in the AM peak hour. The worst Level of Service for any turning movement is B. The degrees of saturation are also considered to be within acceptable limits; and

    ii. The intersection operates satisfactorily in the PM peak hour. Again, the worst Level of Service for any turning movement is B. The degrees of saturation are also considered to be within acceptable limits.

17. The Selwyn District Council Long Term Plan includes upgrading this intersection to a roundabout between 2018 to 2028.

18. The NZTA CAS database has been reviewed to identify crashes that have been reported within 100m of the Edward Street / Ellesmere Road / Lincoln Tai Tapu Road intersection within the most recent five-year period available. This indicated two non-injury crashes, as per the following collision diagram.

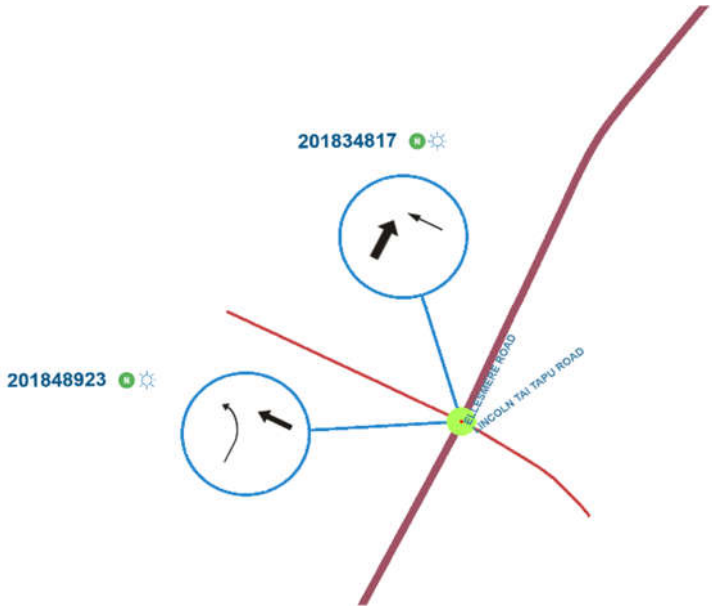


Figure 10: Edward Street / Ellesmere Road / Lincoln Tai Tapu Road Collision Diagram

19. The above crashes both occurred when northbound vehicles on Ellesmere Road failed to give-way to westbound traffic on Lincoln Tai Tapu Road.

Adjacent Subdivisions

Verdeco Park

20. The Verdeco Park subdivision is located on the western side of Springs Road to the north of the application site, as illustrated in **Figure 11**.

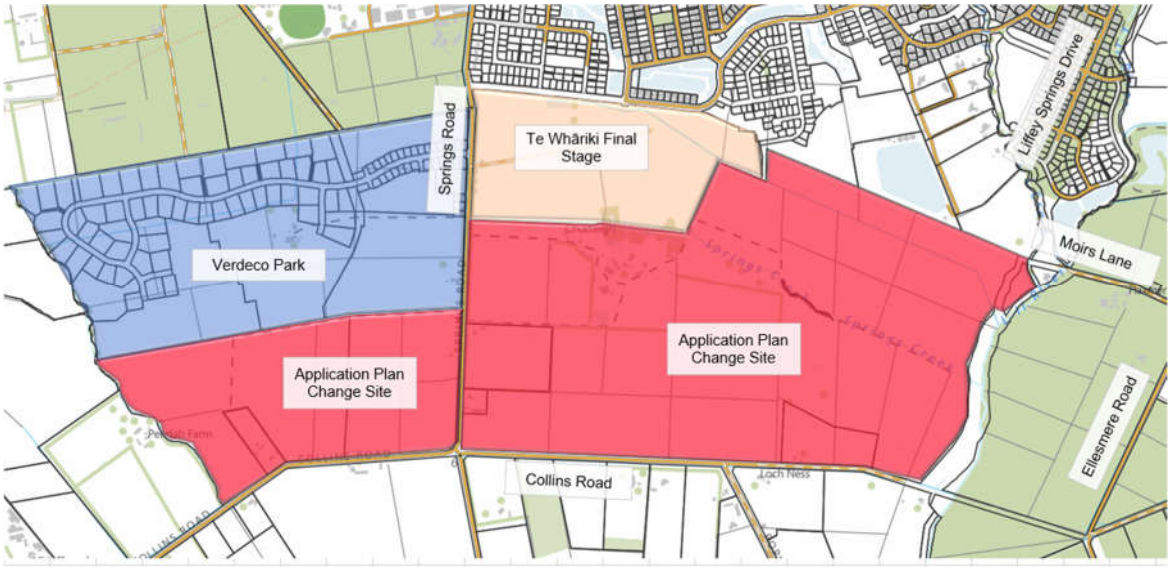


Figure 11: Adjacent Subdivisions

21. This subdivision is understood to comprise 225 sections, of which approximately 22 appeared to be constructed and occupied at the time of writing this report. The ODP for this site includes links for a potential bypass that connects to Ellesmere Junction Road via Weedons Road. The potential bypass route is consistent with that sought in the Lincoln Structure Plan[6] (see **Figure 12**) and is highlighted in **Figure 13**[7].

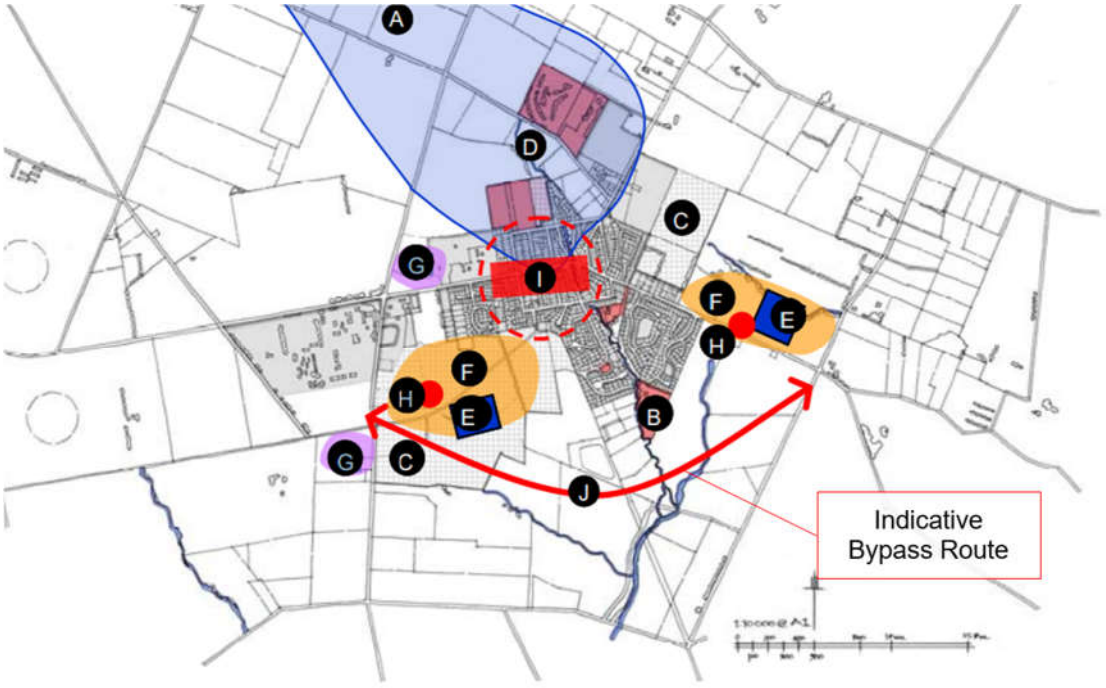


Figure 12: Extract of Lincoln Structure Plan

[6] *Lincoln Structure Plan* by Selwyn District Council dated May 2008.
[7] Extract from Outline Development Plan Area 5 in Township Appendix E37 of the Operative Selwyn District Plan.

Figure 13: Verdeco Park ODP & Bypass Route

Te Whāriki

22. It is understood that the Te Whāriki subdivision will be in the order of 1,200 residential Lots when complete, although it is currently approximately 80% complete. This subdivision has access to Springs Road and Gerald Street via Vernon Drive and West Belt. Southfield Drive also links to Edward Street opposite Eastfield Drive.

23. The ODP for this site also includes a potential bypass route that would continue the segment from Verdeco Park. This is illustrated in **Figure 14**[8]. However, that route stops at the eastern boundary of the subdivision and is unable to complete the bypass route.

[8] Extract from Outline Development Plan Area 1 in Township Appendix E37 of the Operative Selwyn District Plan.

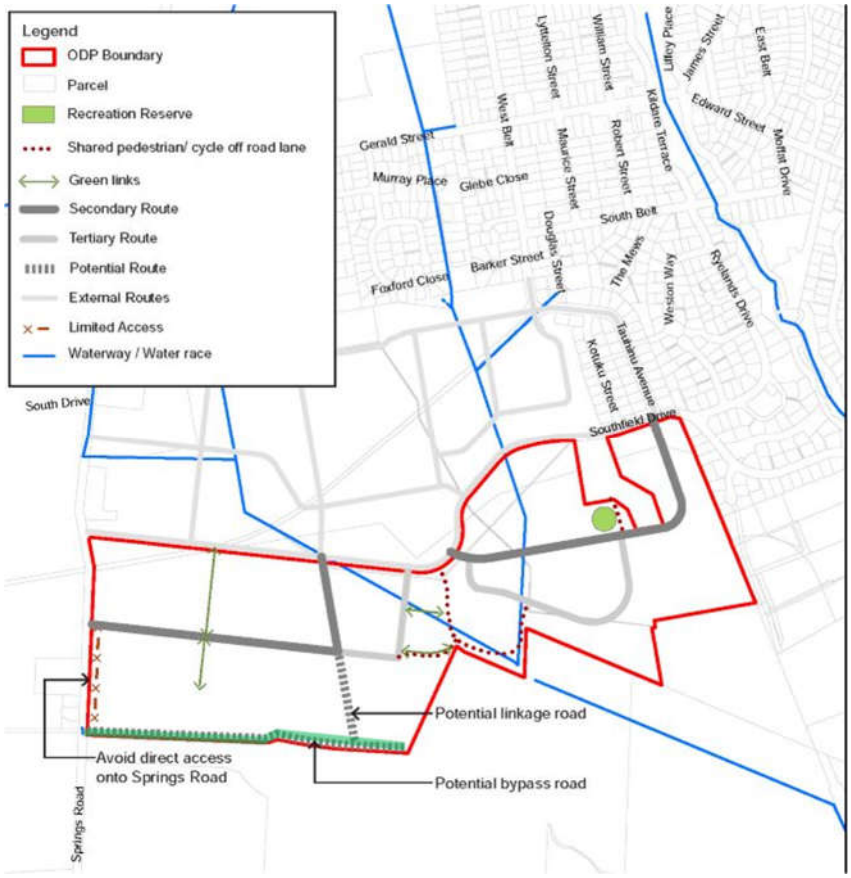


Figure 14: Te Whāriki ODP & Bypass Route

The Proposal

24. The proposed Plan Change would enable up to 2,000 residential lots and a small commercial zone to be established at the application site. A copy of the ODP is included in **Figure 15** and included in more detail in **Appendix 1**.

25. The following sets out the transport details of the proposed Plan Change.

26. Unless otherwise stated, it is proposed to adopt the transport provisions of the Operative District Plan or Proposed District Plan, whichever is relevant at the time.

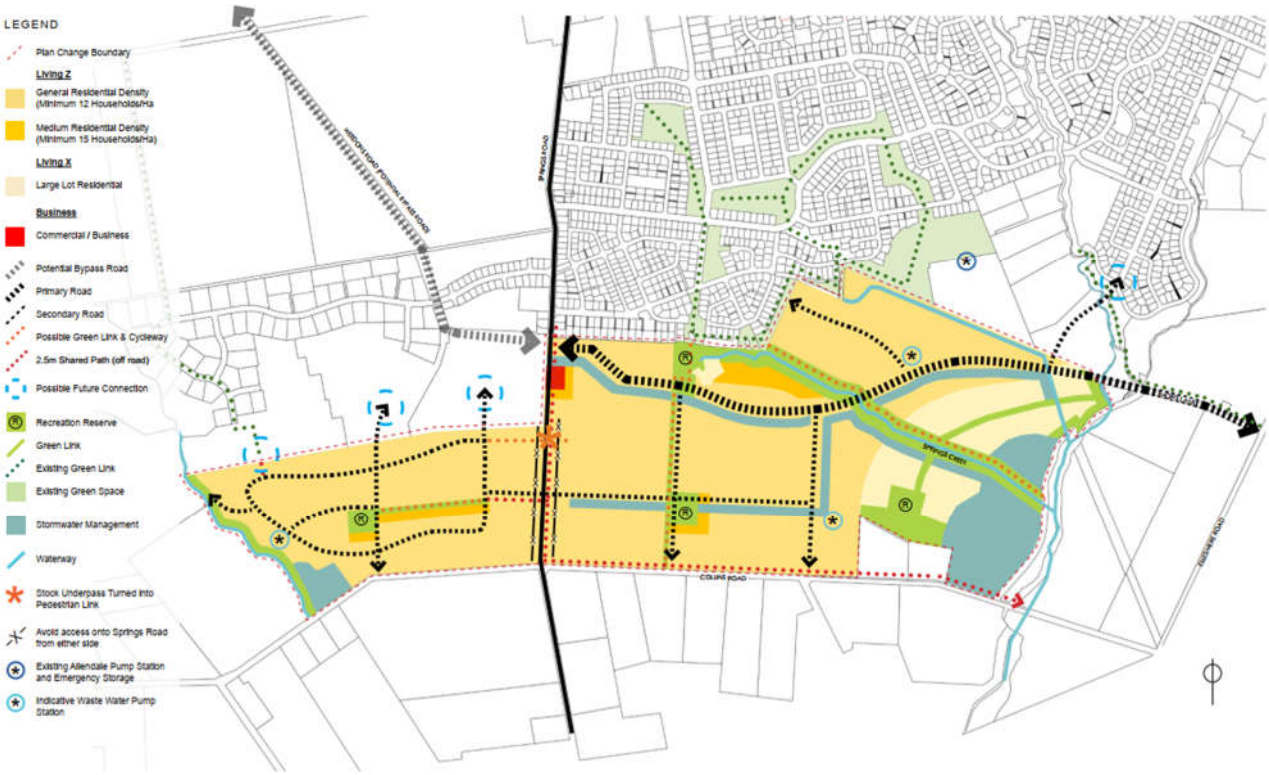


Figure 15: Proposed ODP Layout

Site Layout

Access Intersections

27. The proposed ODP enables the connection of the proposed Lincoln bypass through the site, linking to Ellesmere Road. It is noted that the subdivision layout anticipated for the Te Whāriki subdivision does not include this link, so the Plan Change would contribute to the provision of the bypass in a manner that might not otherwise be achieved.

28. The two Plan Change intersections with Springs Road are anticipated to be roundabouts. These will be designed at a later stage when it is understood whether the potential bypass would be completed and when the traffic volumes associated with this are known. This potential bypass intersection is closer than 151m from proposed Te Whāriki Stage 4 intersection, with approximately 100m spacing from centre to centre in a 60km/hr zone.

29. The Moirs Lane / Ellesmere Road intersection will also require upgrading. These roads are proposed to be upgraded and the intersection will need to tie in with the new cross-sections, with Ellesmere Road continuing to have the priority in the short-term. However, the predominant traffic volumes will be to / from Moirs Lane, so there would be value in realigning the priorities as part of completing the bypass route.

30. The three intersections with Collins Road are proposed to be priority-controlled T-intersections. The need for a right turn bay or other intersection treatments will be determined at subdivision stage, although there is sufficient space to accommodate upgrades in these locations.

31. The sight distances at the intersections will be confirmed at subdivision stage, although these are anticipated to comply as the road alignments are straight and flat, or on the outside of bend (in the case of the western Collins Road intersection).

32. No direct access is proposed to Springs Road, as is consistent with the other subdivisions in this area. Direct access is proposed to Collins Road to assist with the subdivision integrating with the existing area.

Potential Access Links

33. Potential traffic access links are indicated to Verdeco Park, Te Whāriki and Liffey Springs Road on the ODP. These links are intended to assist with permeability and connectivity fo the subdivision. That said, provision of these links is outside of the control of the Plan Change as they all rely on third party land.

Road Standards

34. The road cross-sections and intersection spacings within the Plan Change area are proposed to comply with the requirements of the District Plan. It is proposed that the bypass route would be constructed as a Collector Road, with the remainder of roads identified on the ODP being constructed as either Local Major or Local Intermediate roads.

Pedestrian & Cycle Links

35. The existing 2.5m shared path on the eastern side of Springs Road will be continued to Collins Road. This will then extend east along Collins Road to the boundary of the subdivision.

36. Greenlink connections are provided within Outline Development Plan area. These also include links to the Greenlinks in Verdeco Park and Te Whāriki to provide a connected and continuous facility.

Off-Site Transport Improvements

Springs Road / Ellesmere Junction Road / Gerald Street Intersection

37. As will be described later in this report, it is proposed to provide a further of the planned and funded improvements to the Springs Road / Ellesmere Junction Road / Gerald Street Intersection to better accommodate the predicted traffic generated this Plan Change, as well as the existing volumes on the network. The form of upgrade is anticipated to be dependent on whether the bypass route is constructed. The form of upgrade will be discussed in greater detail at paragraph 70.

Edward Street / Ellesmere Road / Lincoln Tai Tapu Road Intersection

38. The Edward Street / Ellesmere Road / Lincoln Tai Tapu Road intersection is not anticipated to require upgrading as a result of this Plan Change. However, there would be benefits in undertaking this upgrade and development contributions would be able to bring forward the Council's roundabout proposal.

Springs Road

39. It is proposed to upgrade Springs Road along the Plan Change boundary to provide a 60km/hr Collector Road consistent with that being provided by the existing subdivisions.

Collins Road

40. It is proposed to upgrade Collins Road along the Plan Change boundary to the District Plan standard for a 60km/hr Local Road.

Moirs Lane

41. Moirs Lane will be upgraded to a 50km/hr Collector Road consistent with the requirements of the requirements of the District Plan where sufficient width is available. It is noted that the road corridor of Moirs Lane varies between approximately 18m (toward the western end) and 13.5m (at the intersection with Ellesmere Road. This means compromises in cross-section will be required.

42. Given the above, the minimum proposed will be a 7.0m carriageway with minimum 1.5m sealed shoulders on both sides. The northern side of the road will need to incorporate the Little River Rail Trail as an off-road facility.

Ellesmere Road

43. Ellesmere Road is proposed to remain an 80km/hr rural road with shoulders. No footpath or cycle facilities are proposed as these users are anticipated to use alternate routes. The exception to this is the provision of a safe crossing facility for the existing Little River Rail Trail.

44. The proposed cross-section for this road is discussed further at paragraph 81.

Traffic Generation & Distribution

Traffic Generation

45. The traffic generation of residential activities is typically based on an 85th percentile rate of 0.9 vehicles per dwelling in the peak hours and 8.2 vehicles per dwelling per day[9]. However, it is considered that the location of the Plan Change site may lead to spreading of traffic generation, with some vehicles leaving early to commute to Rolleston and Christchurch, whilst other leave later having dropped children at school in Lincoln.

46. The TRICS database has been reviewed to identify the traffic generation of villages in the UK. This is considered to be a reasonable proxy for Lincoln given there are local facilities provided, but the majority of employment will be further afield. The TRICS data is contained in **Appendix 6**. This indicates traffic generation rates of between 0.53 and 0.55 vehicles per dwelling per hour in the peaks and 4.88 vehicles per dwelling per day.

47. **Table 5** sets out the assumed traffic generation rates of residential activity in Lincoln, which is considered to be a balance between the two data sources. This assumes a rate of 0.7 vehicles per dwelling per hour, to acknowledge that the traffic generation may not be as low as the UK sourced data.

[9] Based on Outer Suburban dwellings in the NZTA Research Report 453 – *Trips and Parking Related to Land Use*.

Table 5: Assumed Residential Traffic Generation Rates

Time Period	Arrivals	Departures	Total
AM Peak Hour	0.175	0.525	0.7
PM Peak Hour	0.441	0.259	0.7
Daily	3.5	3.5	7.0

48. Furthermore, it has been assumed that traffic associated with the commercial area would not generate noticeable volumes to the external transport network. The intention of these areas is that they would be internal only, attracting pass-by traffic on the way to / from work. These facilities are also intended to reduce the distance to small scale shopping opportunities (such as to a dairy) to encourage walking and cycling, rather than driving further for the same facilities.

49. The following tables set out the predicted traffic generation associated with the Plan Change site, as well as Verdeco Park and the remainder of Te Whāriki. This uses the traffic generation rates set out in **Table 5**.

Table 6: Plan Change Traffic Generation – 2,000 Lots

Time Period	Arrivals	Departures	Total
AM Peak Hour	350	1,050	1,400
PM Peak Hour	882	518	1,400
Daily	7,000	7,000	14,000

Table 7: Verdeco Park Traffic Generation – 203 Lots

Time Period	Arrivals	Departures	Total
AM Peak Hour	36	107	142
PM Peak Hour	90	53	142
Daily	711	711	1,421

Table 8: Te Whāriki Traffic Generation – 240 Lots

Time Period	Arrivals	Departures	Total
AM Peak Hour	42	126	168
PM Peak Hour	106	62	168
Daily	840	840	1,680

Distribution

50. The Distribution of traffic to the wider transport network has been based on Census data for Journey to Work of people living in Lincoln. This also assumes that vehicles would use predominantly Shands Road to access the Christchurch Southern Motorway, as this route avoids Prebbleton and has good access to the State highway interchange.

51. **Table 9** sets out the distribution of traffic on the wider road network (on the basis that it all leaves Lincoln). This is based on assumptions regarding the quickest route to get to the various locations based on the surrounding road network

Table 9: Wider Area Distribution

Location	Percentage
Shands Road (to / from north)	43%
Springs Road (to / from north)	19%
Ellesmere Junction Road (to / from west)	11%
Ellesmere Road (to / from north and east)	26%
Collins Road (to / from south and west)	1%
Total	***100%***

52. The traffic from Verdeco Park and Te Whāriki has been added to the key intersections as included in **Appendix 2** (Springs Road / Ellesmere Junction Road / Gerald Street Roundabout) and **Appendix 4** (Ellesmere Road / Edward Street / Lincoln Tai Tapu Road). This has then been added to the existing traffic volumes to create future baseline traffic volumes. These are the volumes that will be used to determine the baseline operation of these intersections (prior to accounting for the proposed Plan Change) in the following sections.

53. The traffic generation from the proposed Plan Change has also been added to the key intersections, as included in **Appendix 2** and **Appendix 4**. These are the volumes that will be used to determine the intersection operation with the proposed Plan Change in place in the following sections.

Assessment of Effects

54. Key matters for the assessment of transport effects associated with the proposed Plan Change are considered to be:

    i. **Parking & Loading:** Whether the District Plan rules adequately provide for the layout and provision of car parking and loading at the application site;

    ii. **Access Arrangements:** Where the accesses are anticipated to operate safely and efficiently and whether the District Plan rules adequately provide for access. Also, the internal roading pattern proposed in the ODP and the associated rules and formation standards; and

iii. **Wider Network Effects:** Whether the effects of the proposed activity can be satisfactorily accommodated by the surrounding road network. Whether the proposed Plan Change will be accessible by a range of transport modes.

55. The above matters are assessed in turn in the following sections.

Parking & Loading

56. The District Plan rules regarding parking and loading will be adopted for this Plan Change. This is considered to be sufficient to confirm that parking and loading will be satisfactorily provided for in a functional and practical manner.

Access Arrangements

Site Accesses

57. The engineering details of the proposed access arrangements are yet to be determined, although it is considered there will be sufficient space to accommodate satisfactory intersections. The intersections will be designed to comply with relevant design standards, including sight line requirements. These will also be subject to road safety audit requirements to confirm they are anticipated to operate safely.

58. The passing volumes on Springs Road and Collins Road are considered to be sufficiently low that the access intersections can be designed that will accommodate the predicted traffic volumes.

59. The only anticipated non-compliance for the access arrangements is with regard to the proposed northern Springs Road access, which will be approximately 100m from the proposed southern intersection to Te Whāriki. That southern Te Whāriki intersection will primarily accommodate traffic coming to / from the north of the proposed subdivision, so these volumes are unlikely to interact with the proposed Plan Change intersection.

60. Overall, it is considered that satisfactory intersections to accommodate access can be designed and constructed.

Internal Access Roads

61. The internal access roads and intersections are proposed to comply with the District Plan requirements and will again be subject to road safety audits. This is considered to be sufficient to confirm the internal network will operate safely and efficiently.

62. Access to individual properties is also proposed to comply with the District Plan requirements. Any non-compliances will either be sought at subdivision stage or addressed on an individual basis and the effects of this on safety and efficiency considered at that stage.

63. The above is considered to be sufficient to confirm that the internal transport network will be safe and efficient.

Wider Effects

Springs Road / Ellesmere Junction Road / Gerald Street Roundabout

Existing Intersection Arrangement

64. The base traffic model of the Springs Road / Ellesmere Junction Road / Gerald Street roundabout has been updated with the Baseline traffic volumes, which account for the yet to be completed Verdeco Park and Te Whāriki subdivisions. The results of this model are included in **Appendix 7** and these indicate that:

    i. The intersection operates satisfactorily in the AM peak hour, with an overall Level of Service of B. The worst Level of Service for any turning movement is C. However, the degree of saturation for the Springs Road northern approach is at 0.86, which is over the practical capacity threshold of 0.85 and indicates that this approach is likely to incur significant delays and queuing with small changes to the traffic volumes; and

    ii. The intersection operates satisfactorily in the PM peak hour, with an overall Level of Service of B. The worst Level of Service for any turning movement is D, which occurs on the Springs Road northern approach. However, the degree of saturation for the Springs Road northern approach is at 0.879, which is again over the practical capacity threshold of 0.85.

65. The above indicates that the existing intersection is effectively at capacity (or slightly over-capacity) with the completion of the existing subdivisions on Springs Road.

66. The Plan Change traffic has been added to the roundabout model and these results are included in **Appendix 8**. These results indicate that:

    i. The intersection is over-capacity in the AM peak hour, with an overall Level of Service of F. The worst Levels of Service are on the Springs Road north and south approaches. The degree of saturation for the Springs Road north and south approaches at 1.296 and 1.393 respectively, meaning these approaches are unable to accommodate the predicted traffic volumes and extensive queueing and delays are predicted; and

    ii. The intersection is over-capacity in the PM peak hour, with an overall Level of Service of F. The worst Levels of Service are on the Springs Road north and south approaches, as well as Ellesmere Junction Road. The degree of saturation for these approaches is between 1.131 and 1.522, meaning these approaches are again unable to accommodate the predicted traffic volumes and extensive queueing and delays are predicted.

67. Given the above, it is apparent that the existing roundabout cannot accommodate the predicted traffic volumes and an intersection upgrade will be required.

Council Intersection Arrangement

68. The Council's proposed signalised intersection arrangement has been modelled, using the traffic volumes that include the proposed Plan Change traffic. This is to determine whether the currently planned and funded intersection could accommodate the Plan Change traffic. The results of this model are included in **Appendix 9**, which indicate:

    i. The intersection is over-capacity in the AM peak hour, with an overall Level of Service of F. The worst Levels of Service are on the Springs Road north, Gerald Street and Ellesmere Junction Road

approaches. The degree of saturation for the for all approaches is between 1.194 and 1.590, meaning these approaches are unable to accommodate the predicted traffic volumes and extensive queueing and delays are predicted; and

ii. The intersection is over-capacity in the PM peak hour, with an overall Level of Service of F. The worst Levels of Service are on the Springs Road north, Gerald Street and Ellesmere Junction Road approaches. The degree of saturation for the for these approaches is between 1.460 and 1.502, meaning these approaches are unable to accommodate the predicted traffic volumes and extensive queueing and delays are predicted.

69. Given the above results, it is apparent that further improvements to this proposed intersection upgrade would be required. That said, the final form of that upgrade is likely to be dependent on whether the Lincoln bypass is constructed, as this will reduce the traffic through the Springs Road / Ellesmere Junction Road / Gerald Street intersection. It is noted that the proposed Plan Change would contribute a significant element to that bypass in so far as to provides the connection from Springs Road through to Ellesmere Road.

Potential Intersection Arrangement

70. **Figure 16** is a concept arrangement to understand whether an intersection upgrade could be constructed that would lead to the Springs Road / Ellesmere Junction Road / Gerald Street intersection operating satisfactorily.

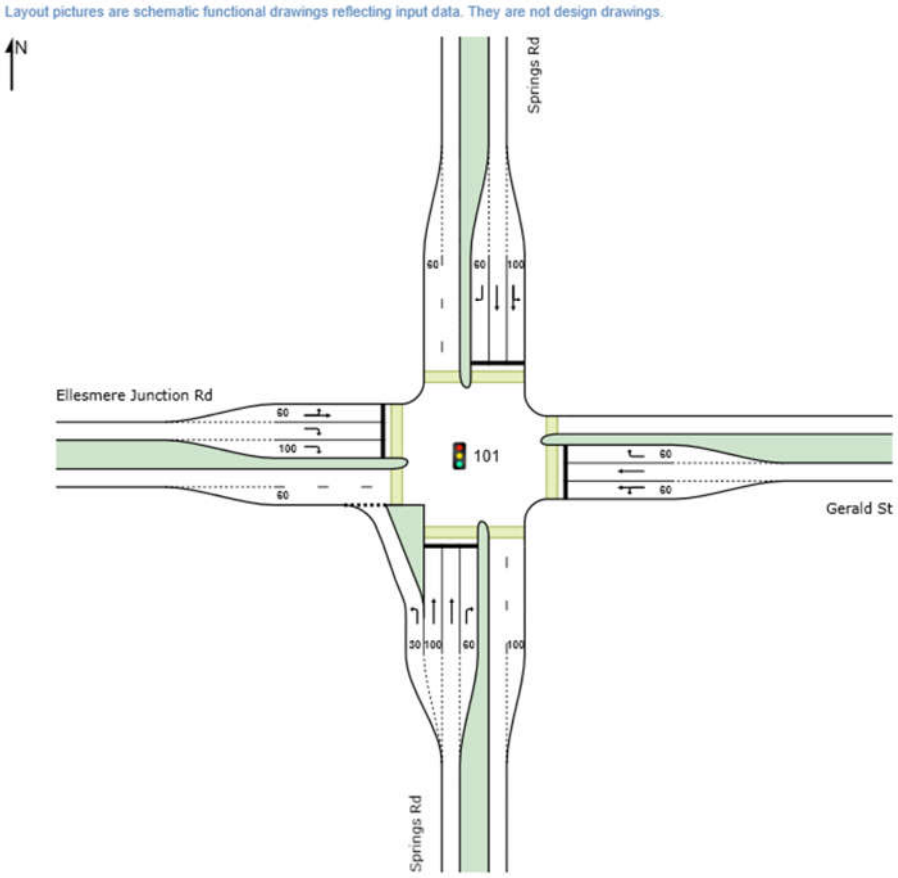


Figure 16: Springs Rd / Ellesmere Junction Rd / Gerald St – Concept Traffic Signals

71. It should be noted that the above intersection arrangement is conceptual only and the proposed arrangement would extend beyond the existing road reserve, as does the currently planned intersection upgrade for this intersection. However, this has been used as the basis of intersection modelling to understand whether a solution to the traffic capacity constraint at this location could be developed.

72. Traffic modelling results of the above intersection arrangement with the Plan Change traffic added to the network are included in **Appendix 10**. These indicate:

    i. The intersection operates satisfactorily in the AM peak hour, with an overall Level of Service of D. The worst Level of Service for any turning movement is E, which occurs on the right turns from Springs Road and Gerald Street. The degrees of saturation are less than 0.9, which is considered to be practical limit for traffic signal intersections; and

    ii. The intersection operates satisfactorily in the PM peak hour, with an overall Level of Service of D. The worst Level of Service for any turning movement is E, which occurs on the right turns from Springs Road and Gerald Street. The degrees of saturation are again less than 0.9.

73. The above confirms that a traffic signal intersection could be constructed at this location that would have sufficient capacity to accommodate the predicted traffic volumes from this intersection. The form, timing and contribution to the construction of the upgrade will need to be agreed with the Council, in conjunction with other stakeholders. It is anticipated that this upgrade would be required from early occupation of this Plan Change given the roundabout is predicted to be slightly over-capacity upon completion of the existing subdivisions.

74. There remains the possibility that a lesser intersection upgrade is required should the bypass route be completed. Again, this is a matter for further discussion with Council regarding timeframes. However, Plan Changes to date have contemplated and provided for a bypass (particularly the Verdeco Park Plan Change). This proposed Plan Change would construct the link between Springs Road and Ellesmere Road, which would contribute a significant portion of the bypass route.

Edward Street / Ellesmere Road / Lincoln Tai Tapu Road Intersection

75. The base traffic model of the Edward Street / Ellesmere Road / Lincoln Tai Tapu Road intersection has been updated with the Baseline traffic volumes, which account for the yet to be completed Verdeco Park and Te Whāriki subdivisions. The results of this model are included in **Appendix 11** and these indicate that:

    i. The intersection operates satisfactorily in the AM peak hour. The worst Level of Service for any turning movement is B. The degrees of saturation for all approaches is less than 0.85 and therefore there are no capacity concerns regarding this intersection in this time period; and

    ii. The intersection operates satisfactorily in the PM peak hour. The worst Level of Service for any turning movement is B. The degrees of saturation for all approaches is less than 0.85 and therefore there are no capacity concerns regarding this intersection in this time period.

76. The above indicates that the existing intersection is predicted to operate satisfactorily with the completion of the existing subdivisions on Springs Road.

77. The Plan Change traffic has been added to the roundabout model and these results are included in **Appendix 12**. These results indicate that:

i. The intersection operates satisfactorily in the AM peak hour. The worst Level of Service for any turning movement is C. The degrees of saturation for all approaches is less than 0.85 and therefore there are no capacity concerns regarding this intersection in this time period; and

ii. The intersection operates satisfactorily in the PM peak hour. The worst Level of Service for any turning movement is D. The degrees of saturation for all approaches is less than 0.85 and therefore there are no capacity concerns regarding this intersection in this time period. That said, the Ellesmere Road north approach is predicted to be at a degree of saturation of 0.843, which suggests the Plan Change would effectively take this intersection to its limit of capacity.

Potential Intersection Arrangement

78. Given the above results, it is apparent that an intersection upgrade is not required at this location as a result of this Plan Change. That said, it is understood that Council has a plan to install a roundabout at this location. This roundabout would benefit the capacity of the intersection with the Plan Change in place (noting the above results) as well as provide a safer intersection. The primary movement from the Plan Change would be through movements on the minor arms, which are typically the least safe movements at cross-roads.

79. We do not have a design for the proposed roundabout, although the following has been assumed for the purposes of confirming that a roundabout could be constructed in this location.

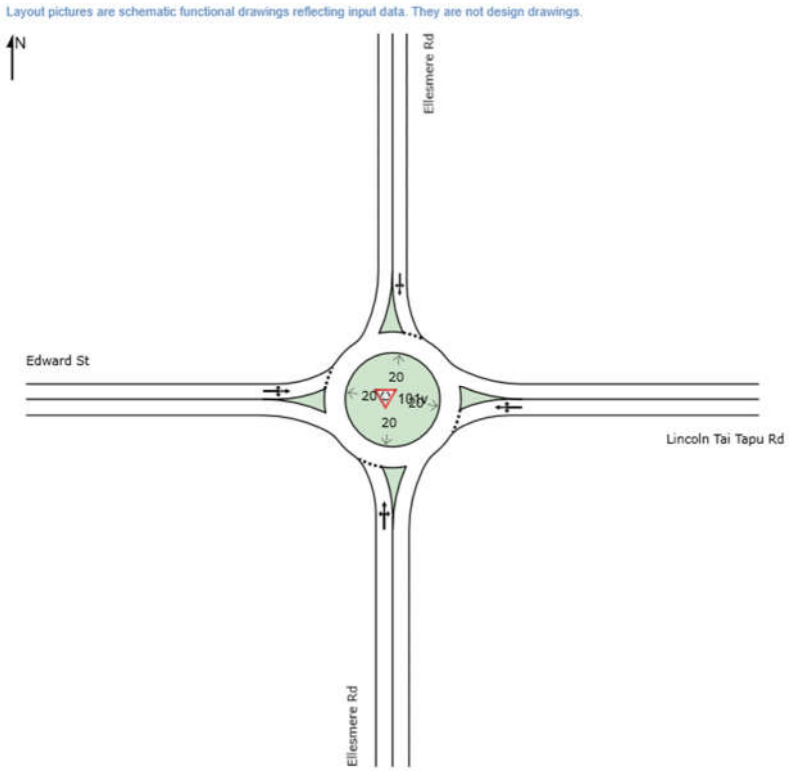


Figure 17: Edward St / Ellesmere Rd / Lincoln Tai Tapu Rd – Roundabout Concept

80. Traffic capacity results for the above roundabout with the Plan Change traffic added to the road network are included in **Appendix 13**. These indicate that the proposed roundabout could comfortably accommodate the predicted traffic volumes.

Ellesmere Road

81. Ellesmere Road currently accommodates a traffic volume of approximately 2,000 vehicles per day. This road has a sealed carriageway of approximately 6m plus grass berms at present.

82. The provision of a connection through the Plan Change site from Springs Road to Ellesmere Road will increase the traffic volumes on this route. The traffic distribution assumed that 26% of traffic from Verdeco Park would use Ellesmere Road, as would 26% of traffic from the Plan Change site. These two subdivisions would therefore increase traffic volumes on Ellesmere Road by approximately 370 vehicles per day and 3,600 vehicles per day respectively. These volumes would be further increased with the completion of the potential bypass route. This leads to a potential traffic volume of in the order of 6,000 vehicles per day.

83. The cross-section of this road will need to be upgraded to accommodate this increase in traffic. That said, the road will still be largely rural in nature and it is not proposed to provide dedicated pedestrian or cycle facilities. Austroads *Guide to Road Design Part 3 – Geometric Design* recommends the following cross-section for rural roads that accommodate greater than 3,000 vehicles per day:

    i. Traffic lanes: 7.0m (i.e. two 3.5m traffic lanes); and

    ii. Total Shoulder of 2.5m on both sides, including 1.5m minimum sealed shoulders.

84. It is envisaged that Ellesmere Road would be upgraded to meet this standard between Edward Street and Moirs Lane.

Accessibility

85. The proposed site will include pedestrian and cycle links within the Plan Change area and linkages to off-site facilities. This includes links to the Te Whāriki subdivision, which means the existing commercial centre on Vernon Drive will be approximately 1.6km from the centre of the Plan Change site. This equates to a walk of approximately 20 minutes or a six-minute bike ride. These are considered to be comfortable distances to walk / cycle.

86. The Plan Change will also provide a small local commercial area that is intended to provide for everyday shopping and further reduce the need to travel by car for local trips.

87. The above is considered to be sufficient to confirm that the site has access to a range of everyday facilities without the need to drive.

Summary & Conclusion

Summary

88. The Plan Change proposed would enable the development of up to 2,000 residential Lots plus a small commercial zone to be established at the application site. These activities are predicted to generate in the order of 1,400 vehicle movements per hour in the peak hours and 14,000 vehicle movements per day.

89. Primary access to the Plan Change site would be via two roundabouts on Springs Road. The northern roundabout has the potential to form part of a Lincoln bypass route, with the Plan Change road layout providing a connection from Springs Road to Ellesmere Road (via Moirs Lane). The remainder of the

bypass route has been accounted for in the Verdeco Park subdivision. The site would also have accesses to Collins Road.

90. Road cross-section upgrades are proposed as described in detail earlier in this report so as to accommodate the predicted traffic volumes from the Plan Change site.

91. The Ellesmere Junction Road / Springs Road / Gerald Street roundabout has been identified as being at capacity with the completion of the current subdivisions in Lincoln. The inclusion of traffic associated with this Plan Change would lead that intersection to being over-capacity and an upgrade will be required. Council has already planned and funded a traffic signal-controlled intersection at this location and a potential revised layout has been identified that would accommodate the Plan Change traffic. There is potential that a lesser upgrade would be required if the Lincoln bypass were to be completed, with the proposed Plan Change including internal roading that is intended to facilitate this bypass. As such, the final form of the intersection arrangement needs to be agreed with Council.

92. The traffic capacity of the Edward Street / Ellesmere Road / Lincoln Tai Tapu Road intersection has been assessed. This intersection can operate satisfactorily with the proposed Plan Change traffic added to the network. That said, the Council has a proposal to upgrade this intersection to a roundabout and this would reduce the traffic safety effects of the proposed Plan Change at this location.

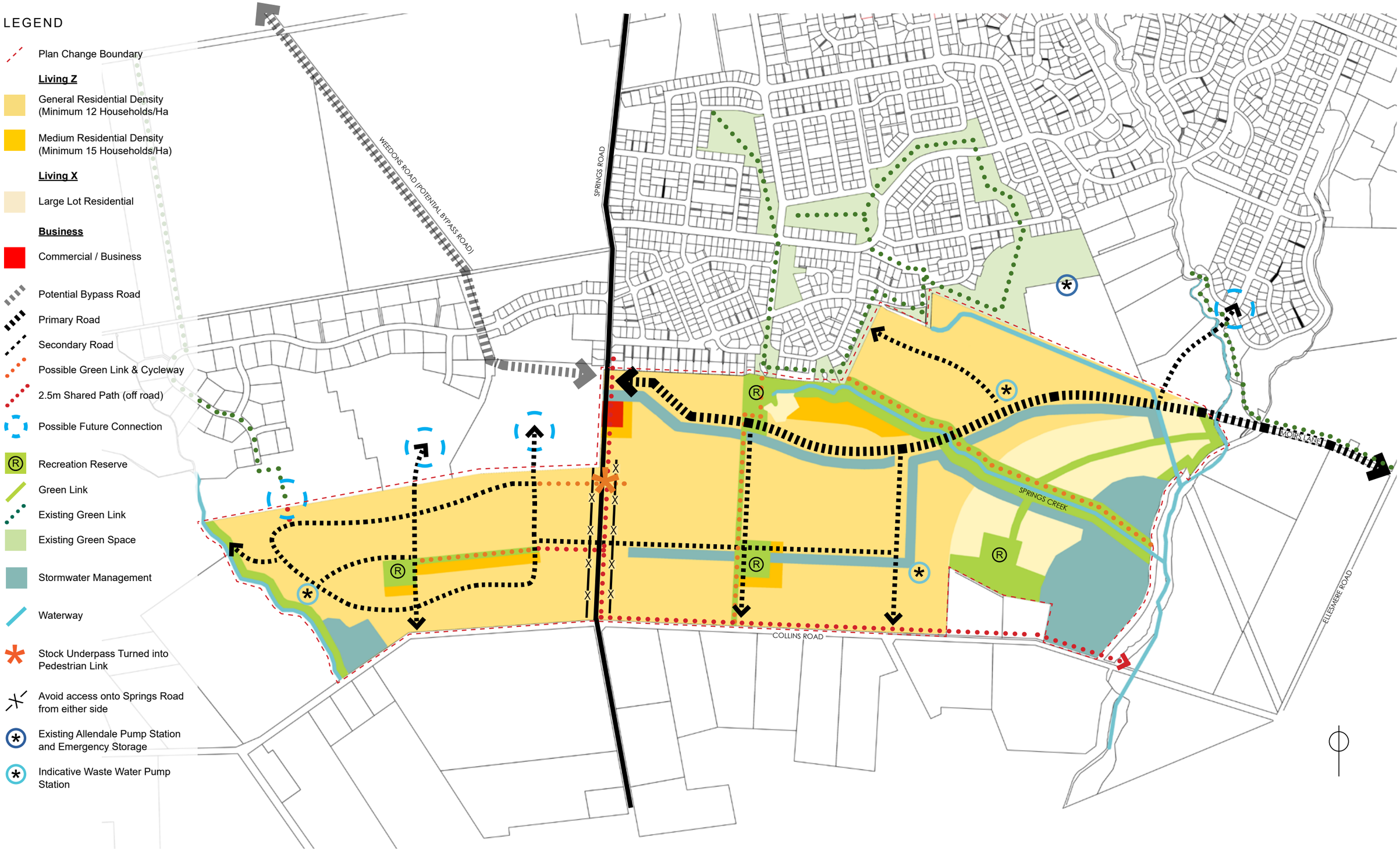
Conclusion

93. Overall, it is considered that the transport effects of the proposed Plan Change will be acceptable on the surrounding transport network subject to undertaking the off-site improvements outlined in this report.

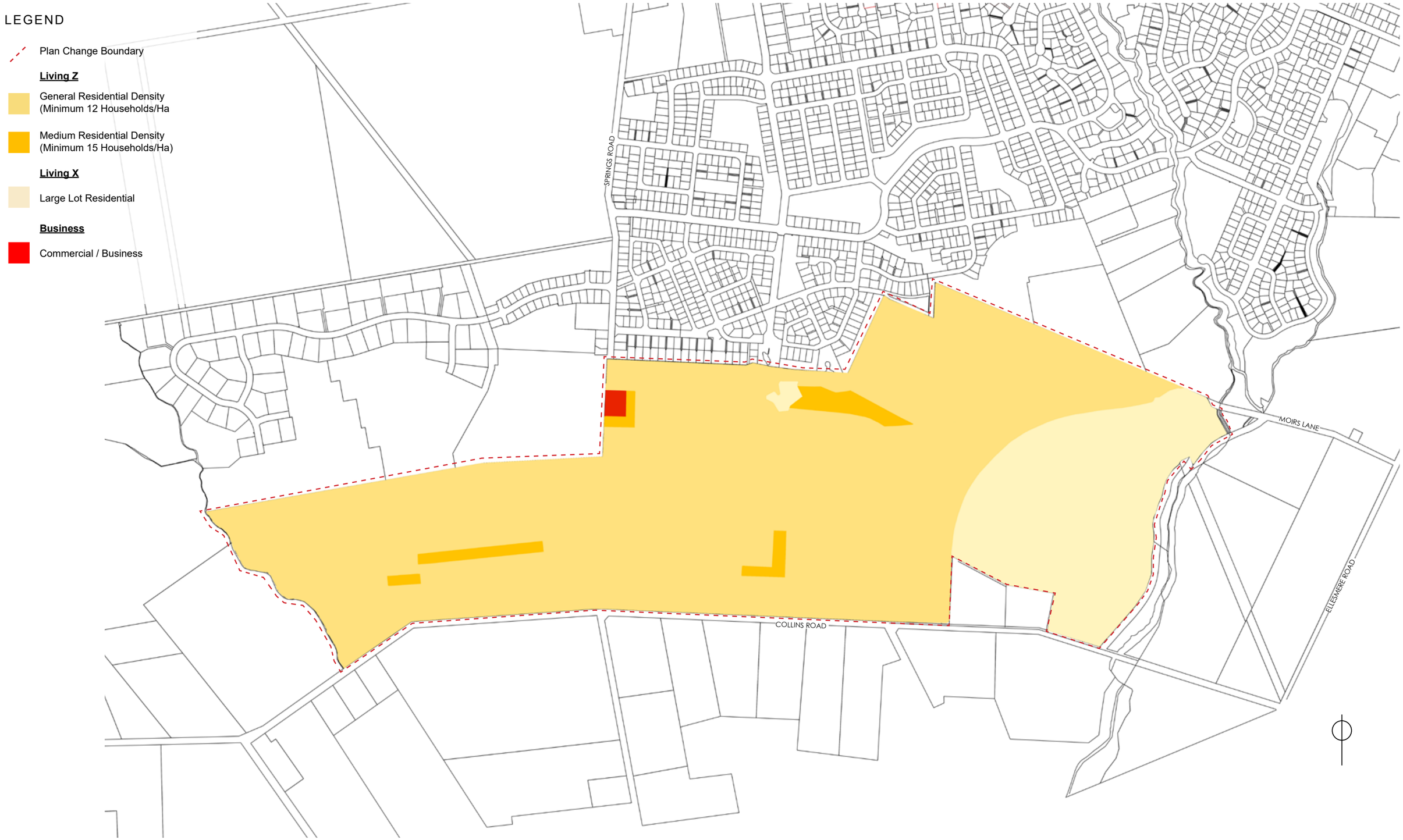
Appendix 1

Outline Development Plan

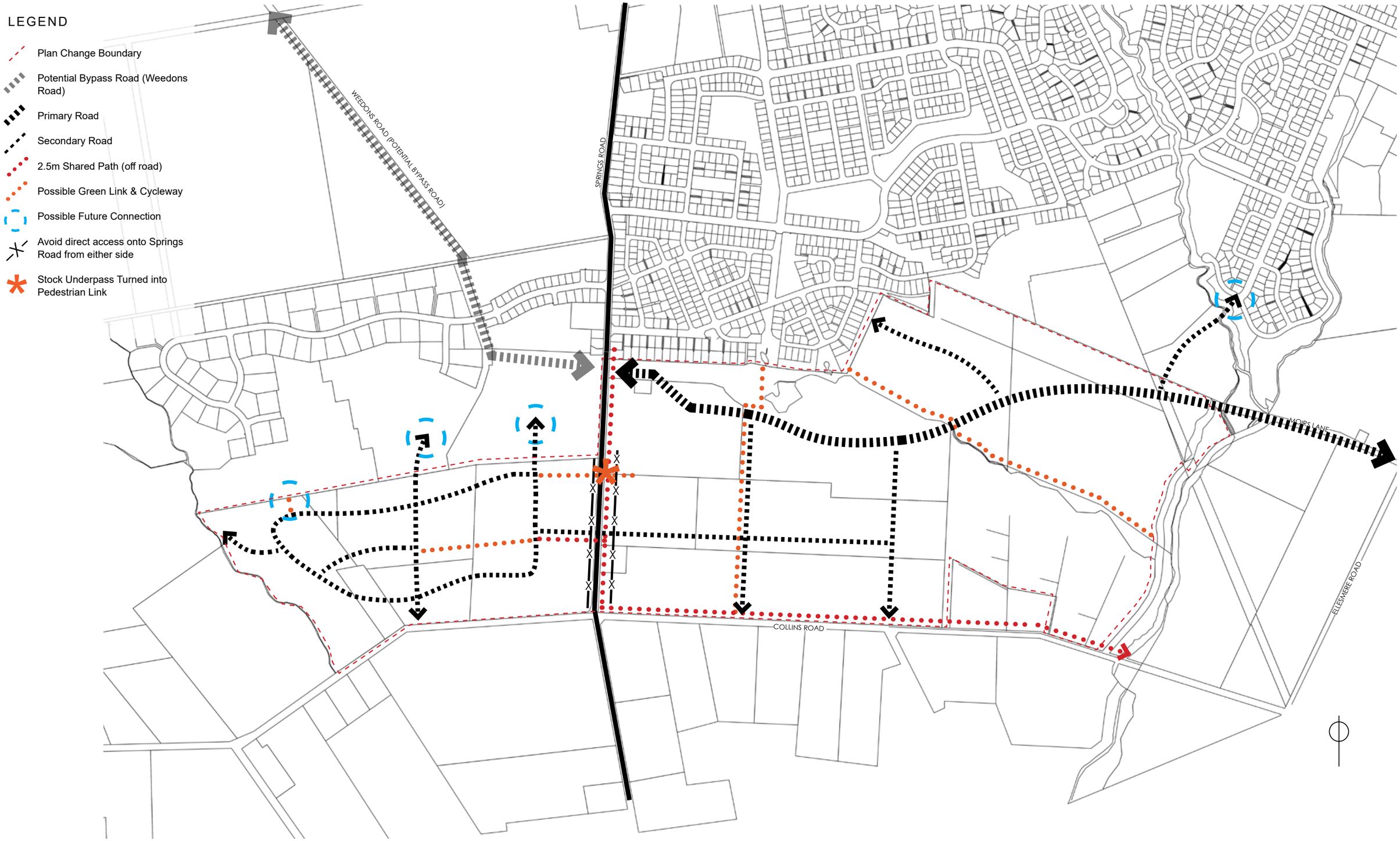
OUTLINE DEVELOPMENT PLAN (ODP)



LANDUSE AND DENSITY



MOVEMENT AND CONNECTIVITY

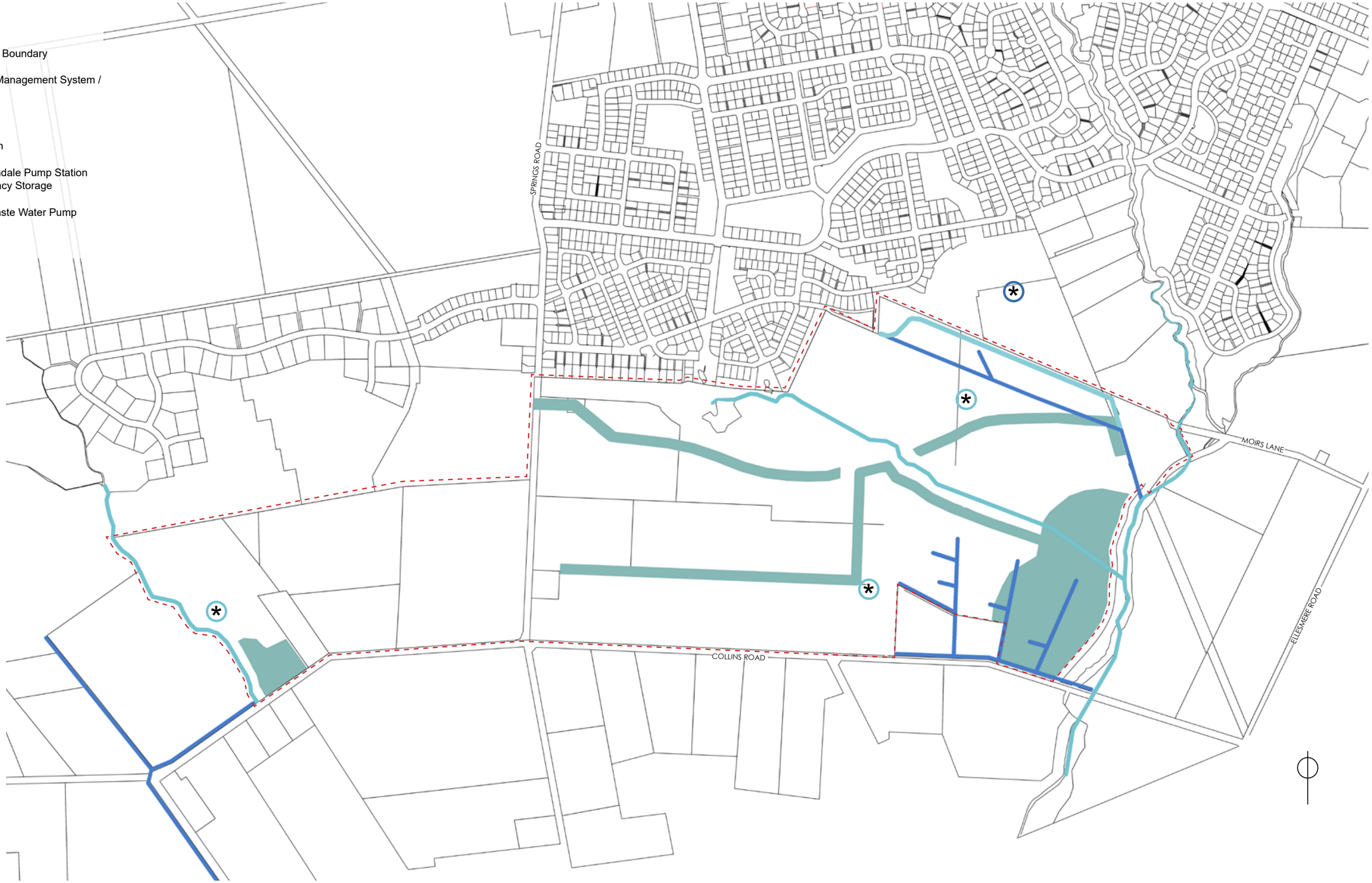


GREEN / OPEN SPACE NETWORK

BLUE NETWORK

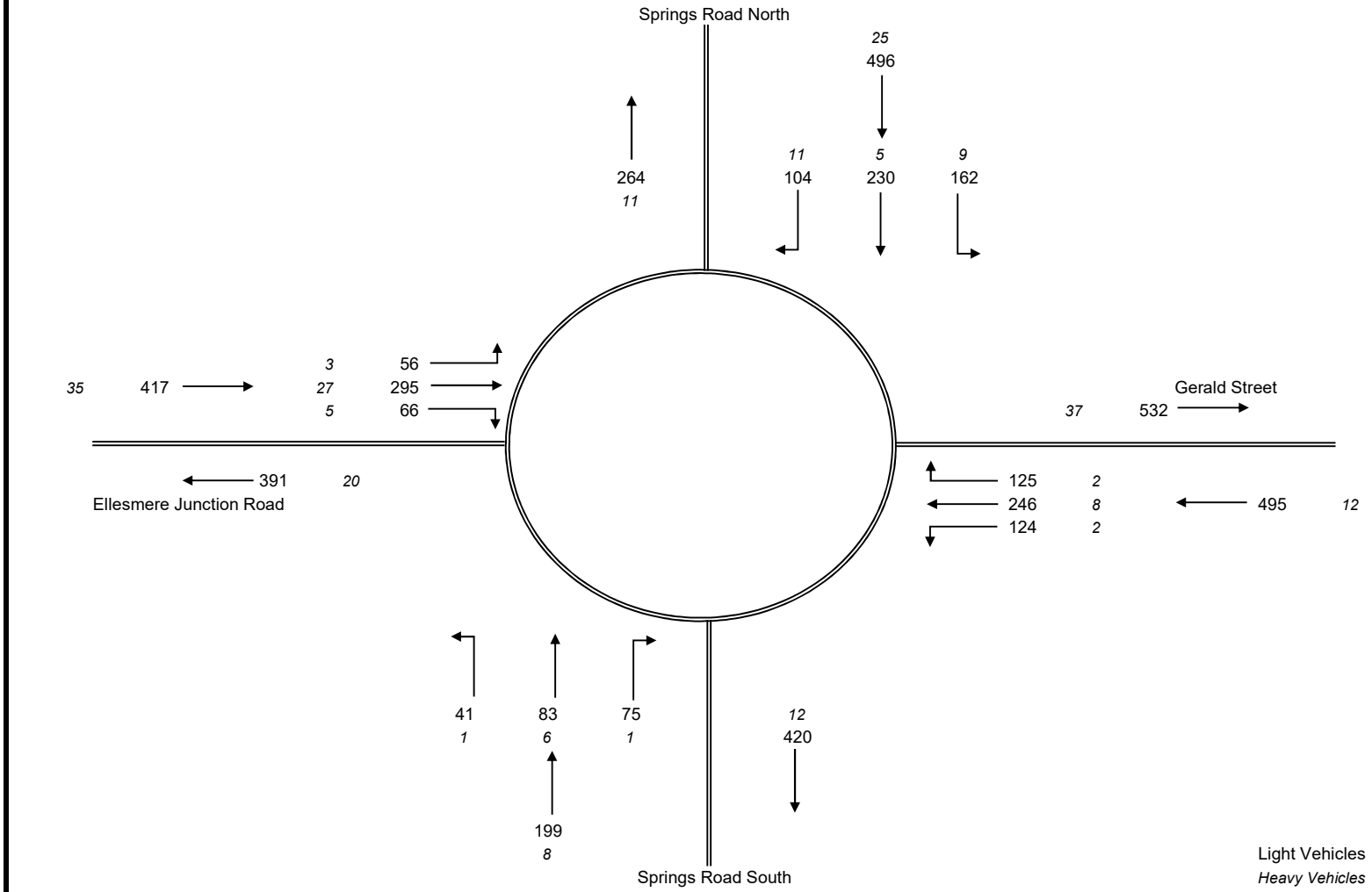
LEGEND

- Plan Change Boundary
- Stormwater Management System / Areas
- Waterway
- Existing Drain
- Existing Allendale Pump Station and Emergency Storage
- Indicative Waste Water Pump Station



Appendix 2

Springs Rd / Ellesmere Junction Rd / Gerald St Traffic Volumes



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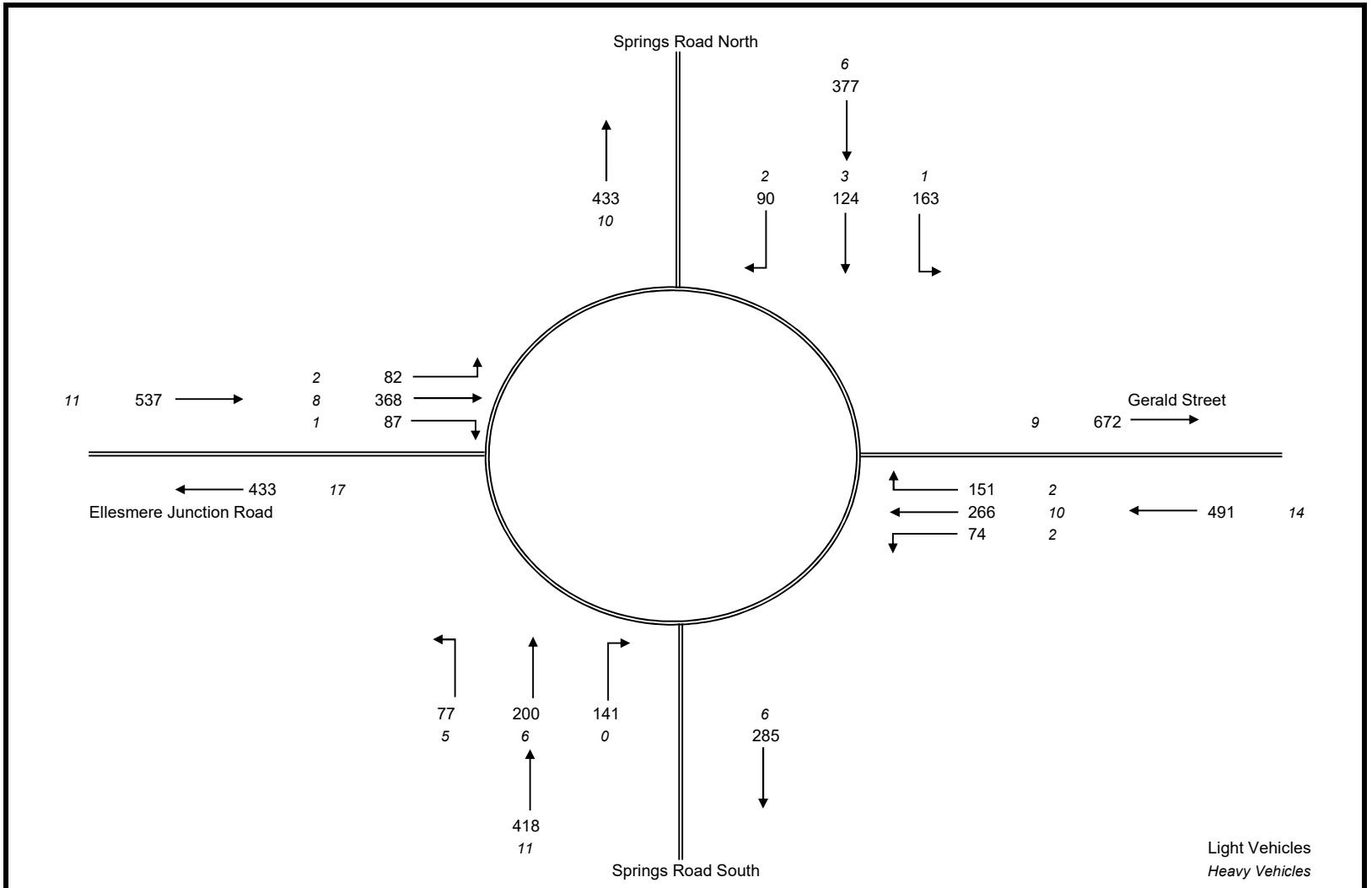
021-028: Lincoln South Plan Change
Ellesmere Junction Rd / Springs Rd / Gerald St
2020 Peak Hour Surveyed Traffic Volumes - AM Peak



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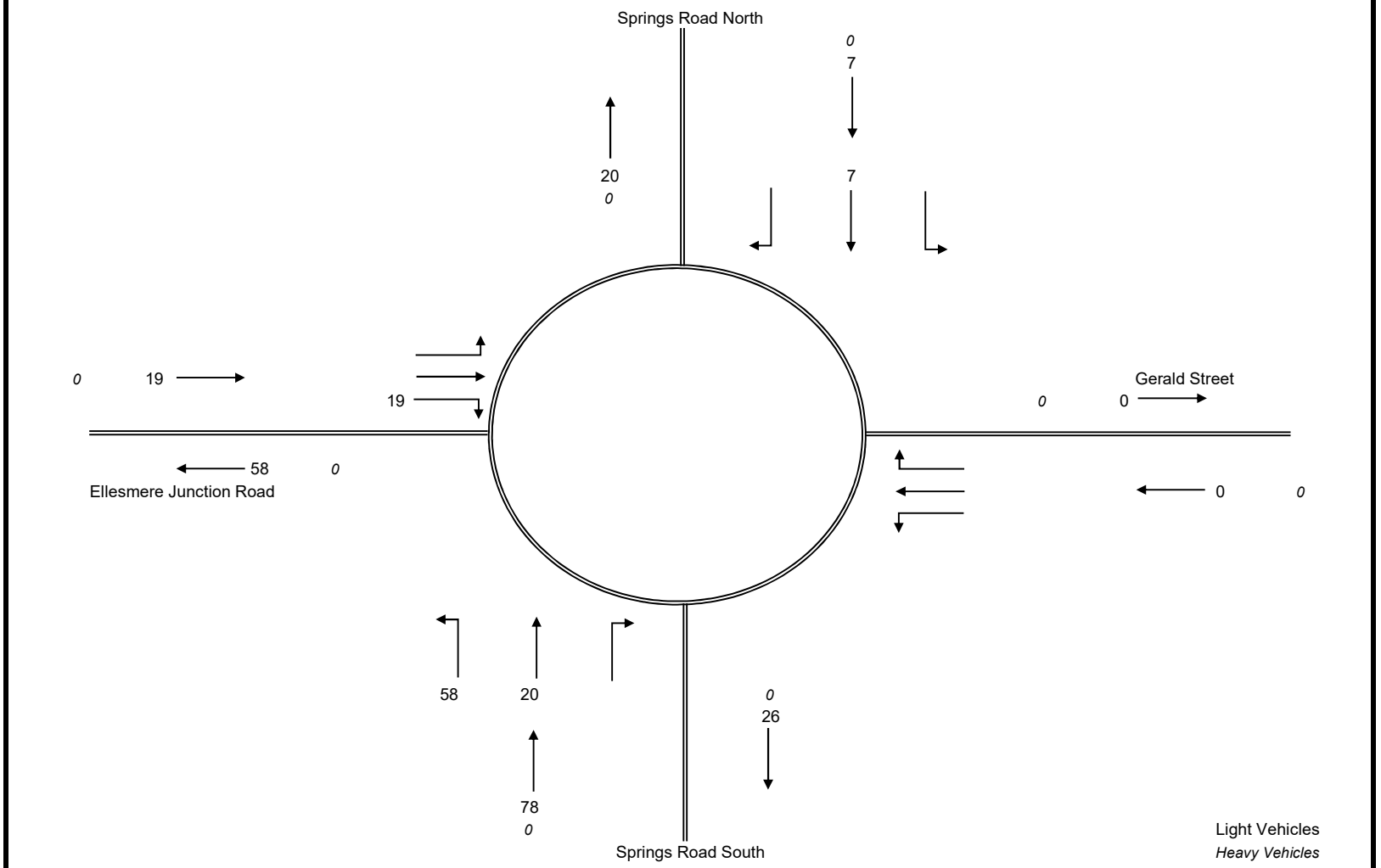
021-028: Lincoln South Plan Change
Ellesmere Junction Rd / Springs Rd / Gerald St
2020 Peak Hour Surveyed Traffic Volumes - PM Peak



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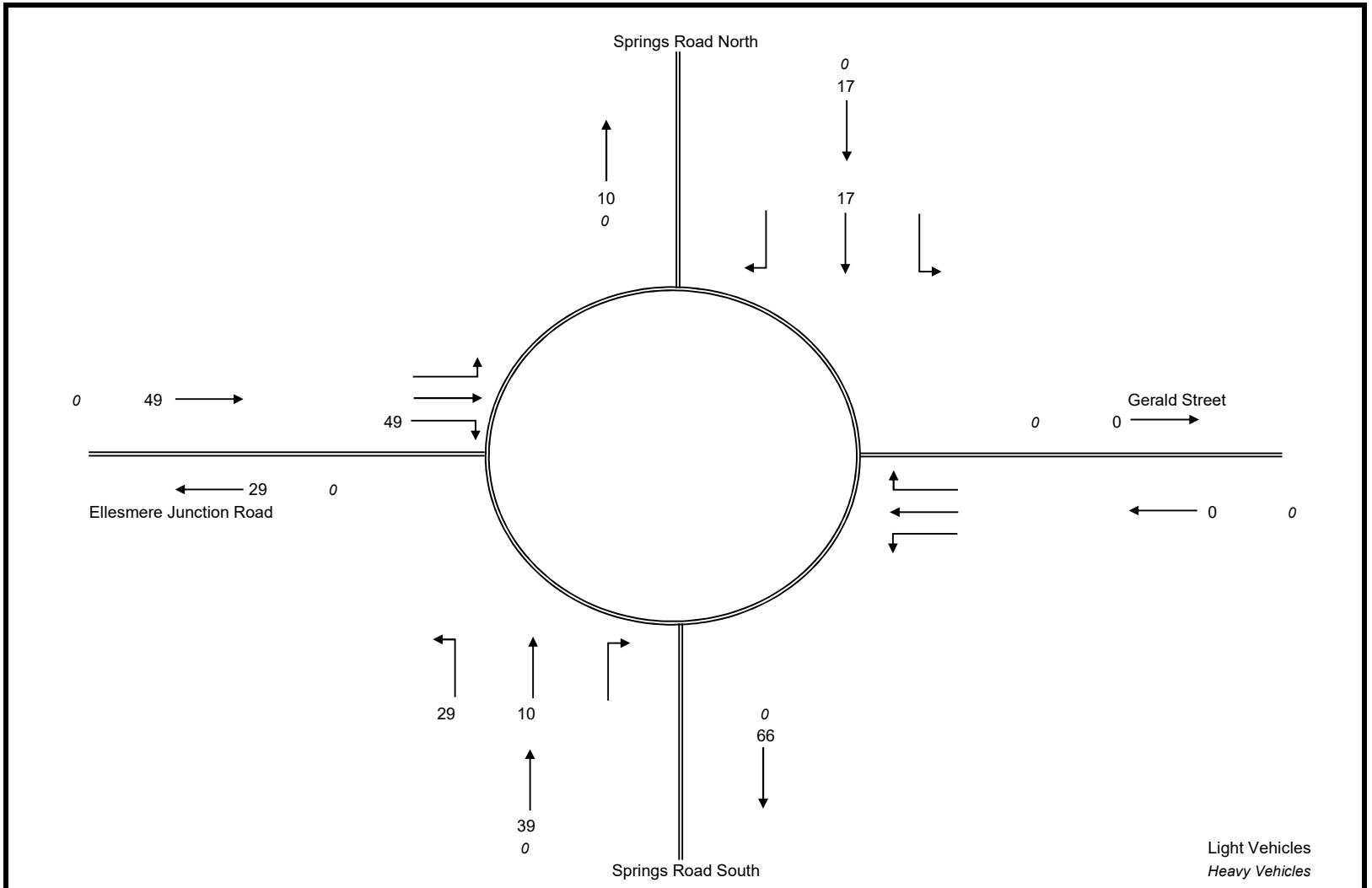
021-028: Lincoln South Plan Change
Ellesmere Junction Rd / Springs Rd / Gerald St
Verdeco Park Additional Traffic Volumes - AM Peak



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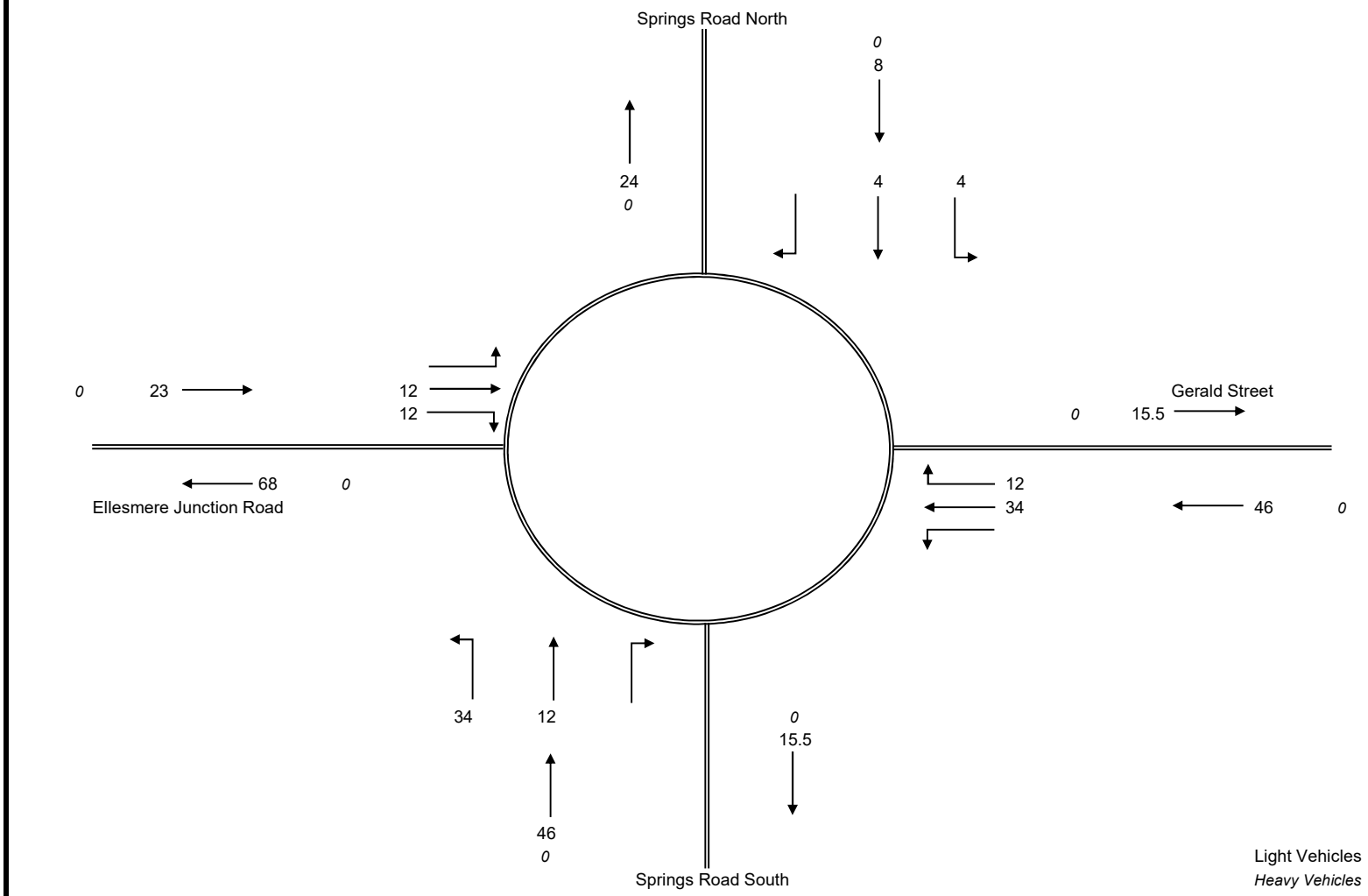
021-028: Lincoln South Plan Change
Ellesmere Junction Rd / Springs Rd / Gerald St
Verdeco Park Additional Traffic Volumes - PM Peak



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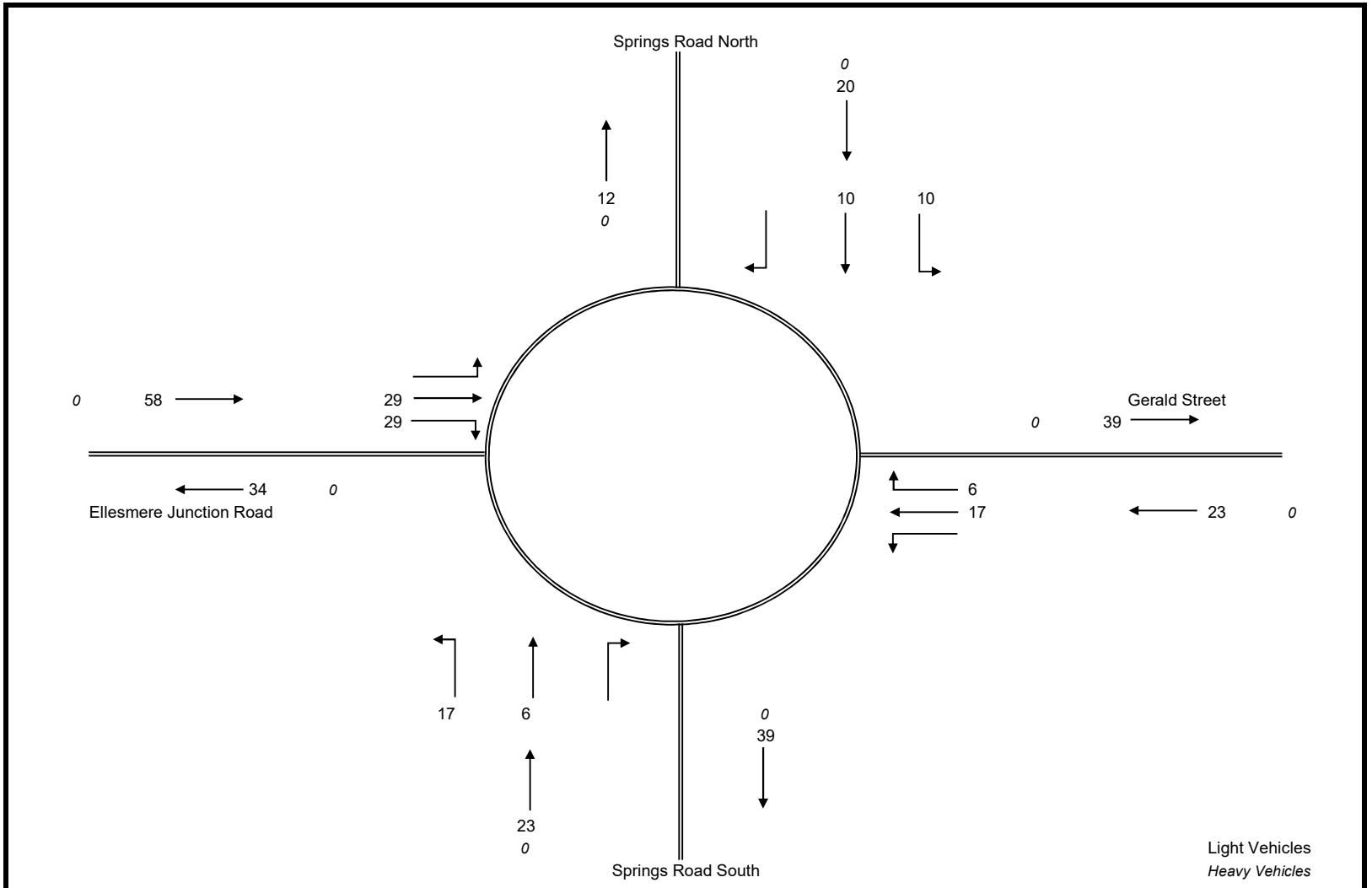
021-028: Lincoln South Plan Change
Ellesmere Junction Rd / Springs Rd / Gerald St
Te Whariki Additional Traffic Volumes - AM Peak



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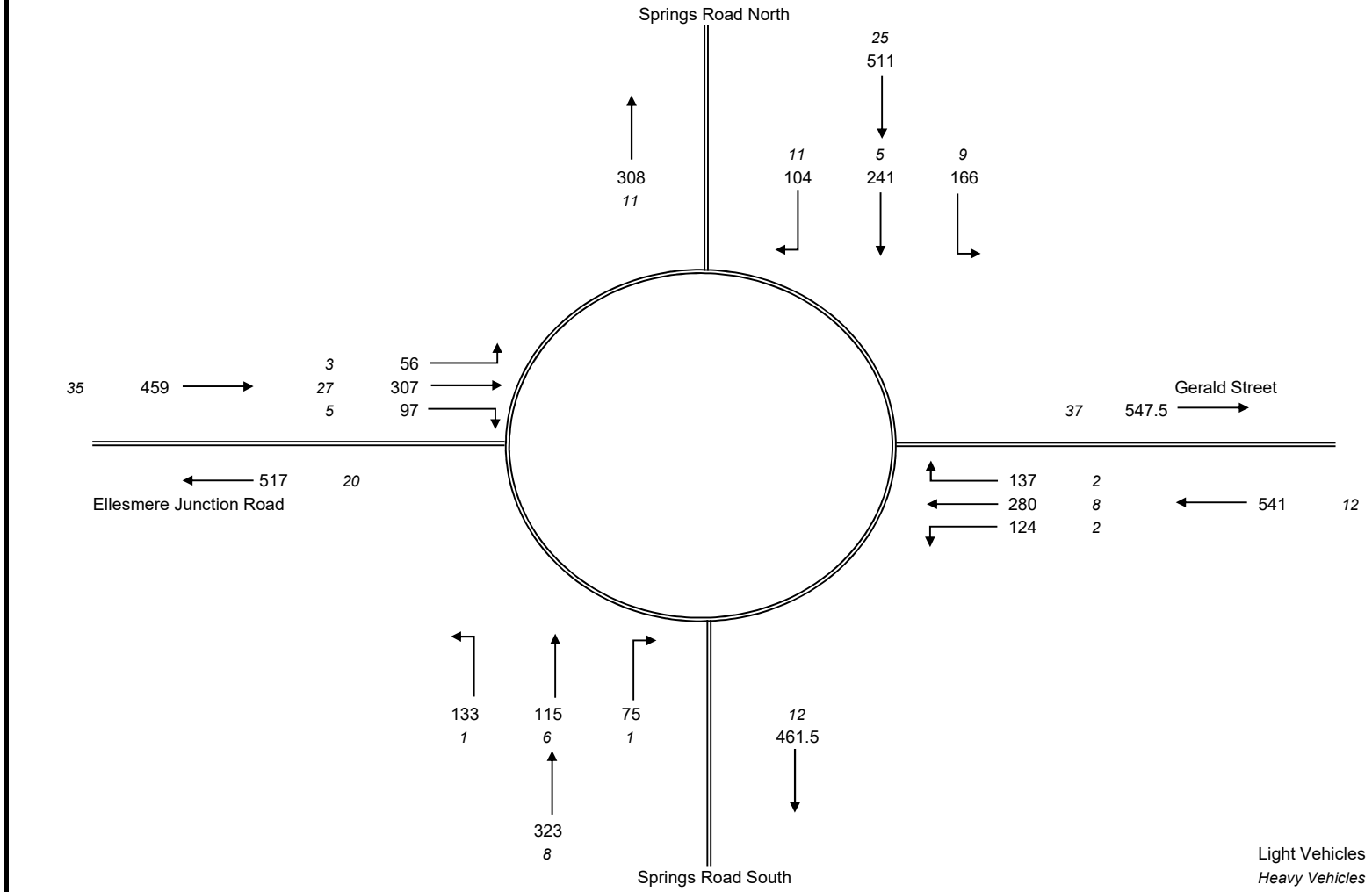
021-028: Lincoln South Plan Change
Ellesmere Junction Rd / Springs Rd / Gerald St
Te Whariki Additional Traffic Volumes - PM Peak



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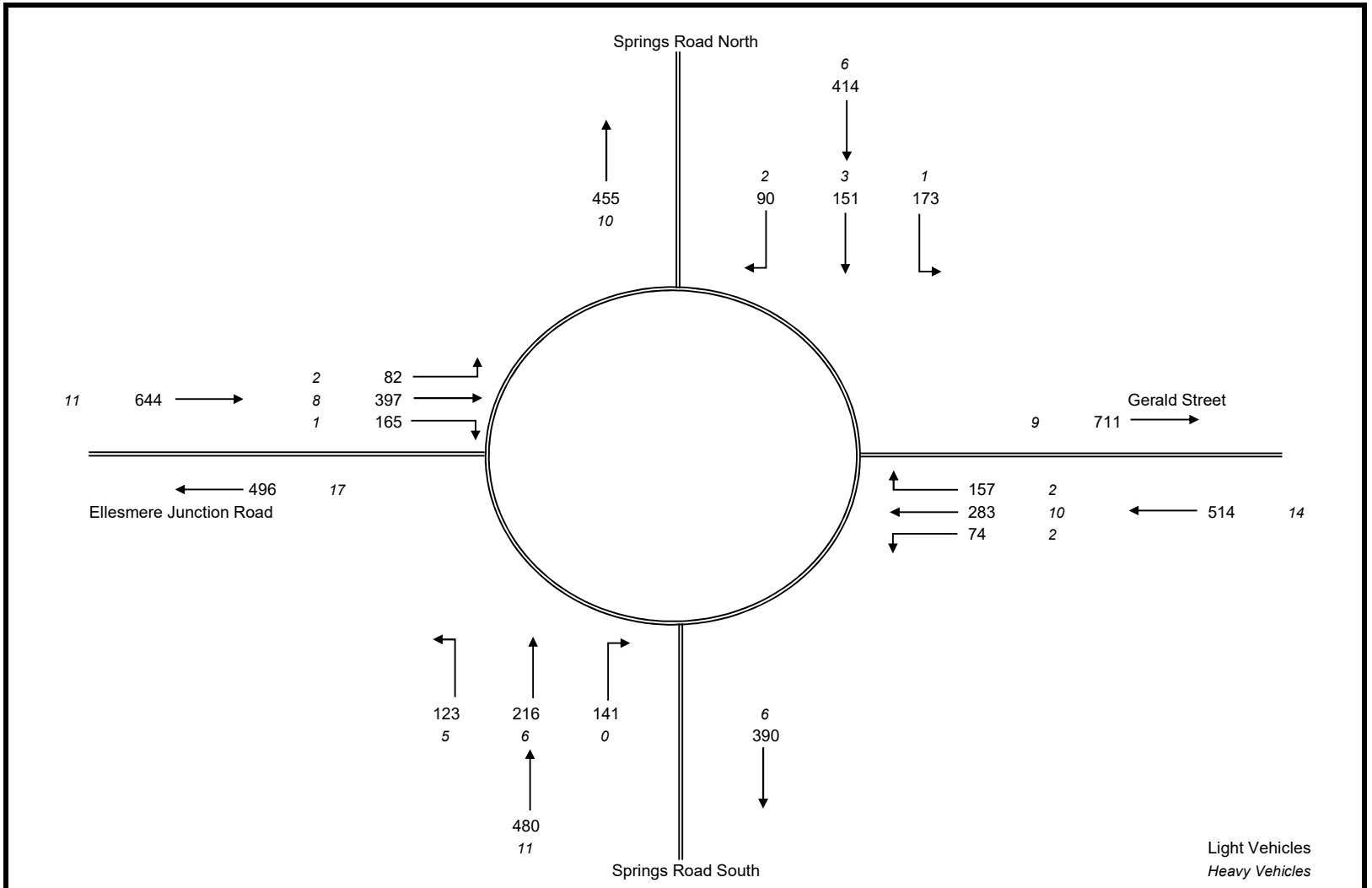
021-028: Lincoln South Plan Change
Ellesmere Junction Rd / Springs Rd / Gerald St
Base plus Additional Subdivision Traffic Volumes - AM Peak



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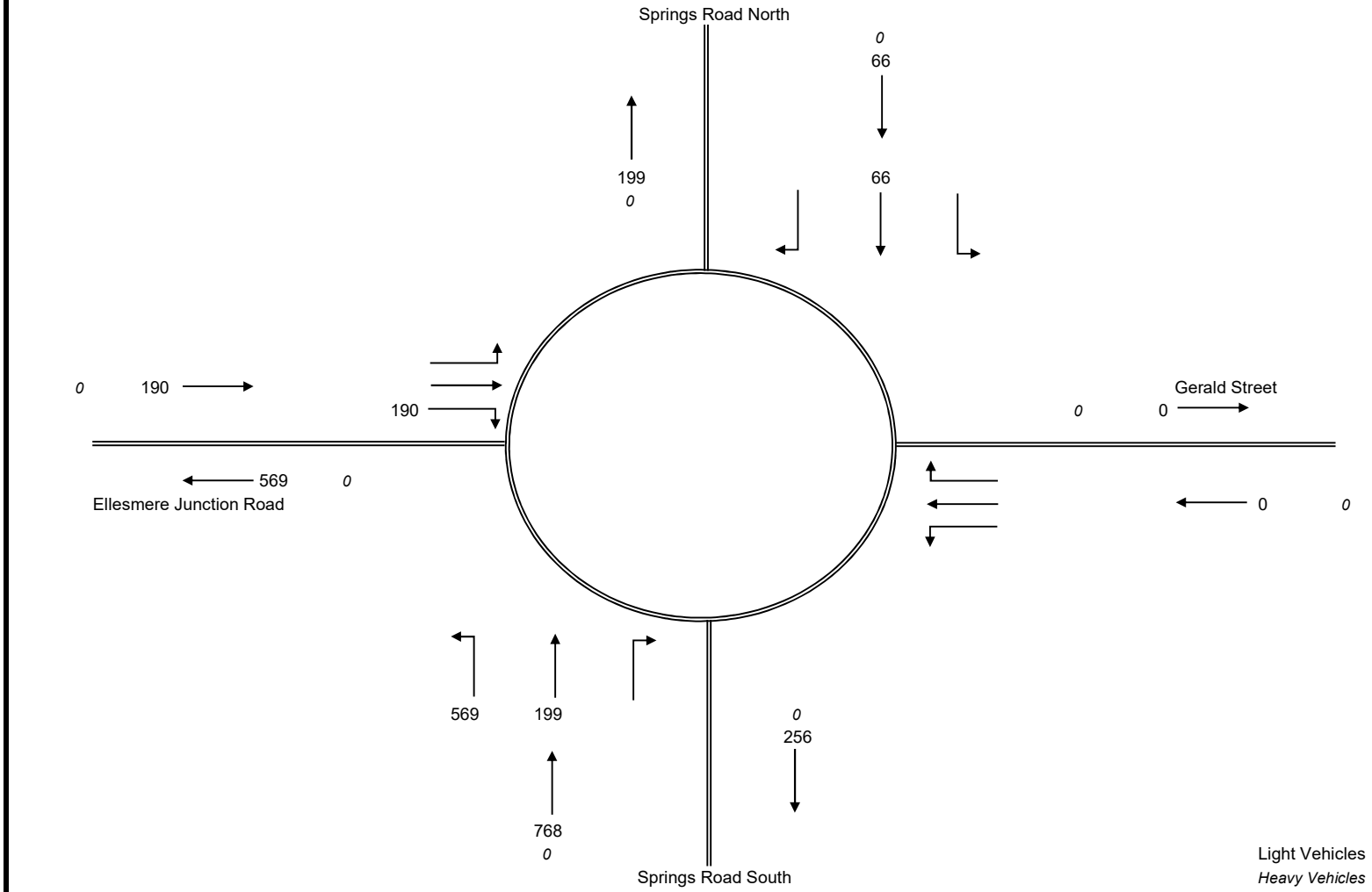
021-028: Lincoln South Plan Change
Ellesmere Junction Rd / Springs Rd / Gerald St
Base plus Additional Subdivision Traffic Volumes - PM Peak



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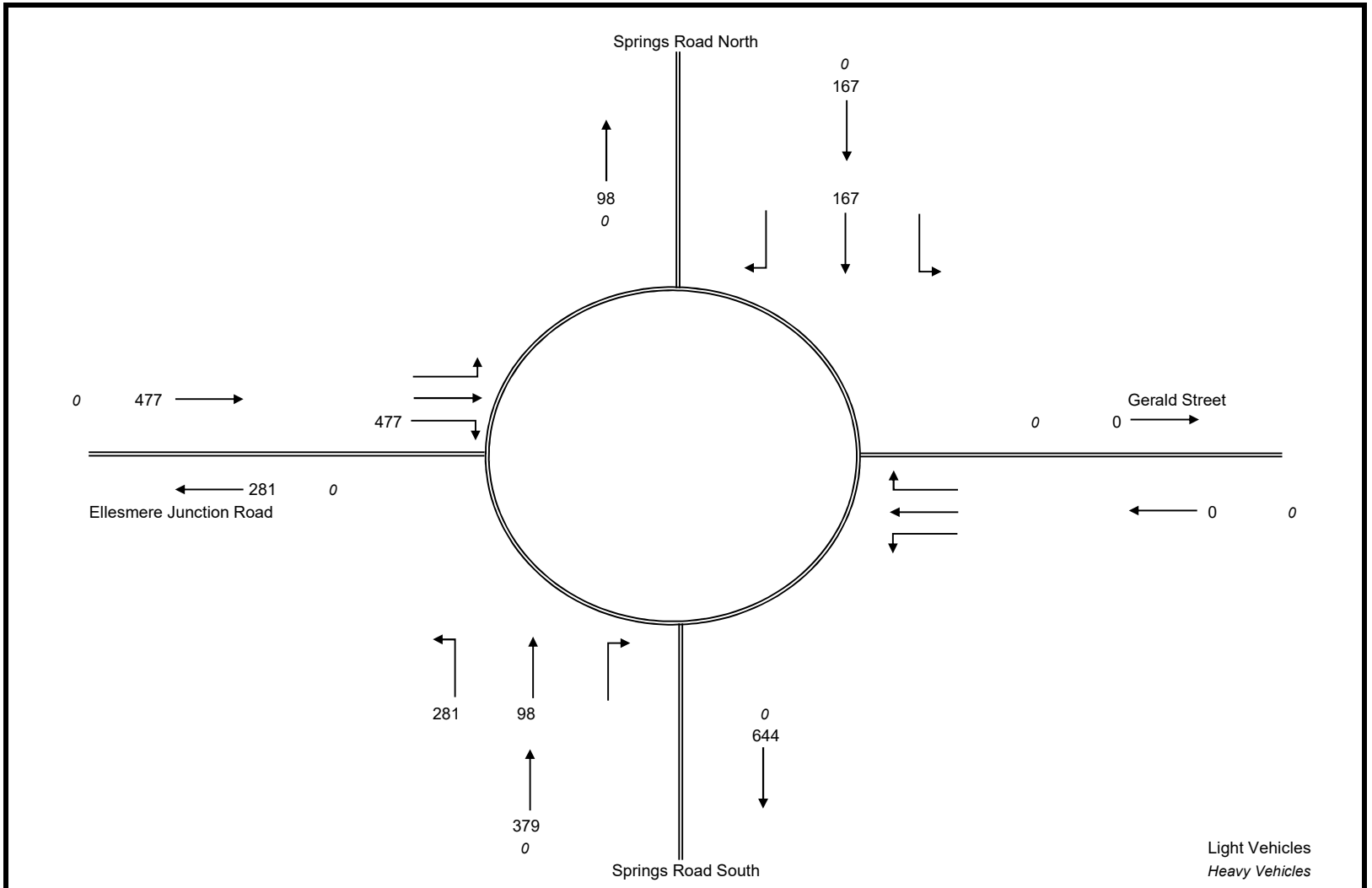
021-028: Lincoln South Plan Change

Ellesmere Junction Rd / Springs Rd / Gerald St

Lincoln South Traffic Volumes - AM Peak



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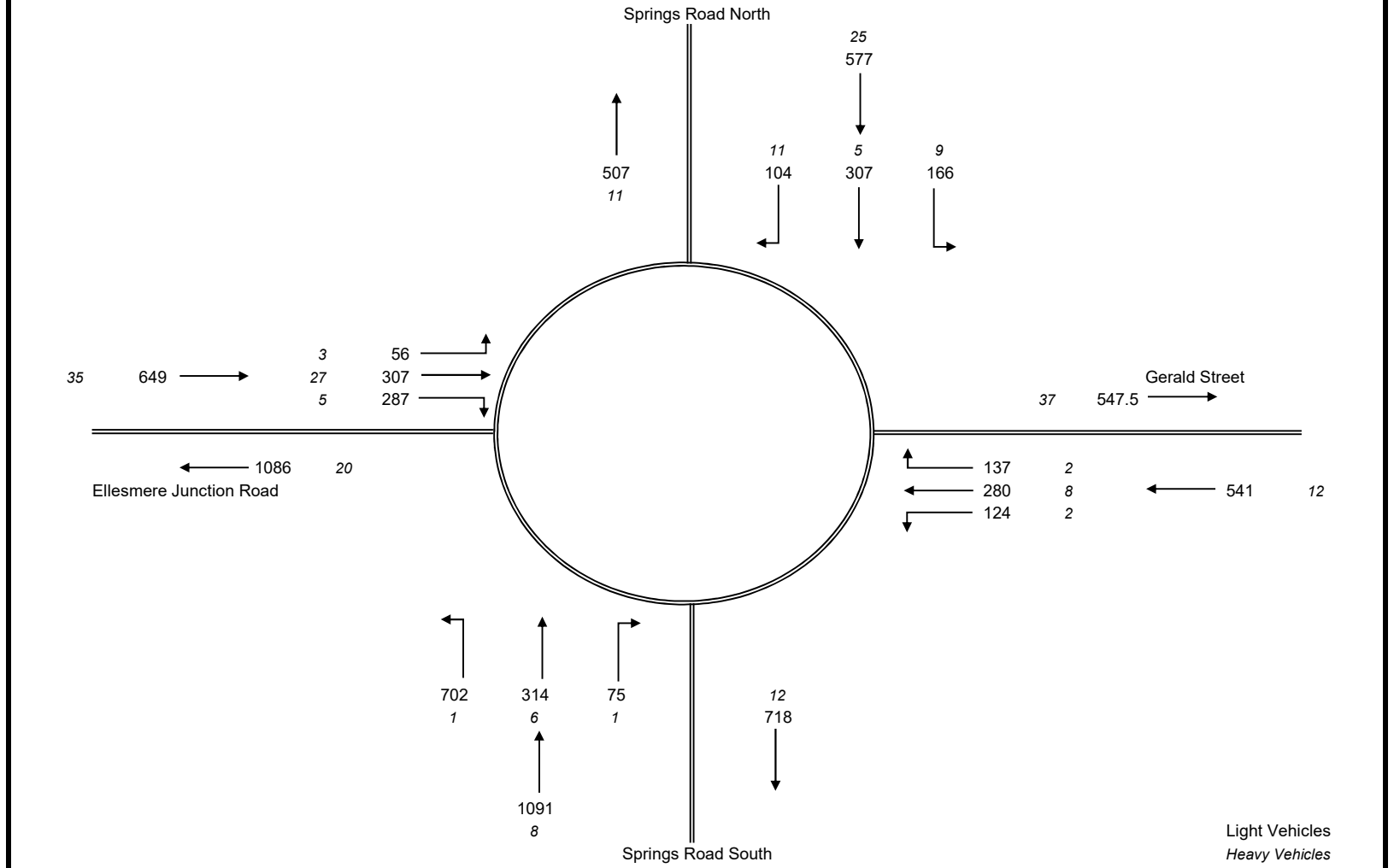
021-028: Lincoln South Plan Change
Ellesmere Junction Rd / Springs Rd / Gerald St
Lincoln South Traffic Volumes - PM Peak



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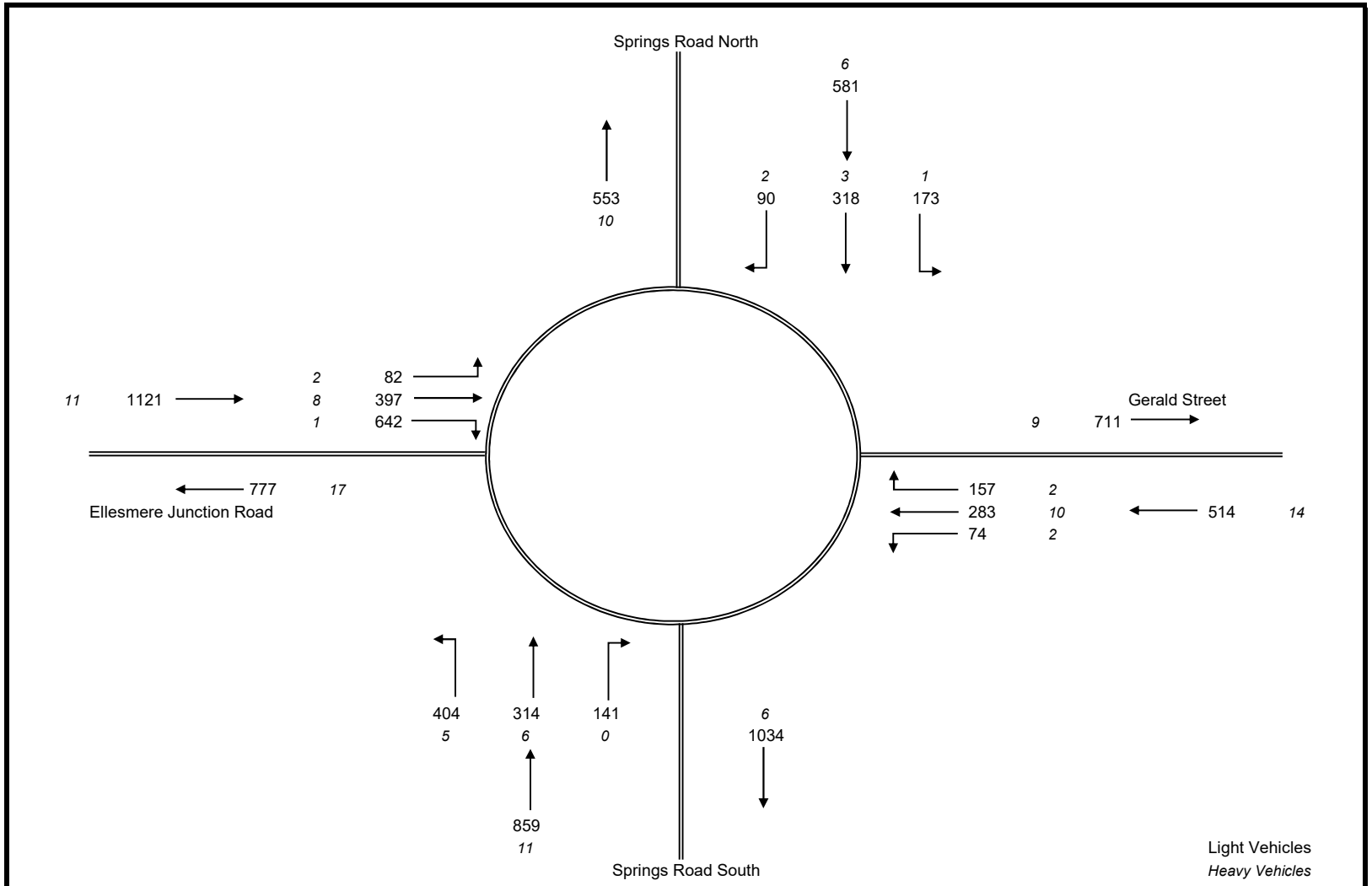
021-028: Lincoln South Plan Change
Ellesmere Junction Rd / Springs Rd / Gerald St
Base plus Lincoln South Traffic Volumes - AM Peak



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021-028: Lincoln South Plan Change
Ellesmere Junction Rd / Springs Rd / Gerald St
Base plus Lincoln South Traffic Volumes - PM Peak

Appendix 3

Springs Rd / Ellesmere Junction Rd / Gerald St Operation - Existing

MOVEMENT SUMMARY

Site: 101 [Springs Rd / Ellesmere Rd - 2020 AM Base (Site Folder: Springs Ellesmere)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Springs Rd														
1	L2	42	1	44	2.4	0.261	7.0	LOS A	1.5	10.5	0.63	0.75	0.63	51.2
2	T1	89	6	94	6.7	0.261	7.3	LOS A	1.5	10.5	0.63	0.75	0.63	52.2
3	R2	76	1	80	1.3	0.261	10.9	LOS B	1.5	10.5	0.63	0.75	0.63	52.1
Approach		207	8	218	3.9	0.261	8.6	LOS A	1.5	10.5	0.63	0.75	0.63	52.0
East: Gerald St														
4	L2	126	2	133	1.6	0.577	8.2	LOS A	5.2	36.9	0.80	0.85	0.89	50.9
5	T1	254	8	267	3.1	0.577	8.5	LOS A	5.2	36.9	0.80	0.85	0.89	51.8
6	R2	127	2	134	1.6	0.577	12.2	LOS B	5.2	36.9	0.80	0.85	0.89	51.6
Approach		507	12	534	2.4	0.577	9.3	LOS A	5.2	36.9	0.80	0.85	0.89	51.5
North: Springs Rd														
7	L2	171	9	180	5.3	0.789	18.0	LOS B	10.9	79.6	0.99	1.21	1.54	44.9
8	T1	235	5	247	2.1	0.789	18.0	LOS B	10.9	79.6	0.99	1.21	1.54	45.8
9	R2	115	11	121	9.6	0.789	22.3	LOS C	10.9	79.6	0.99	1.21	1.54	45.4
Approach		521	25	548	4.8	0.789	18.9	LOS B	10.9	79.6	0.99	1.21	1.54	45.5
West: Ellesmere Junction Rd														
10	L2	59	3	62	5.1	0.468	6.5	LOS A	3.2	24.2	0.62	0.68	0.62	51.8
11	T1	322	27	339	8.4	0.468	6.8	LOS A	3.2	24.2	0.62	0.68	0.62	52.7
12	R2	71	5	75	7.0	0.468	10.6	LOS B	3.2	24.2	0.62	0.68	0.62	52.5
Approach		452	35	476	7.7	0.468	7.4	LOS A	3.2	24.2	0.62	0.68	0.62	52.6
All Vehicles		1687	80	1776	4.7	0.789	11.7	LOS B	10.9	79.6	0.79	0.90	0.98	49.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Springs Rd / Ellesmere Rd - 2020 PM Base (Site Folder: Springs Ellesmere)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

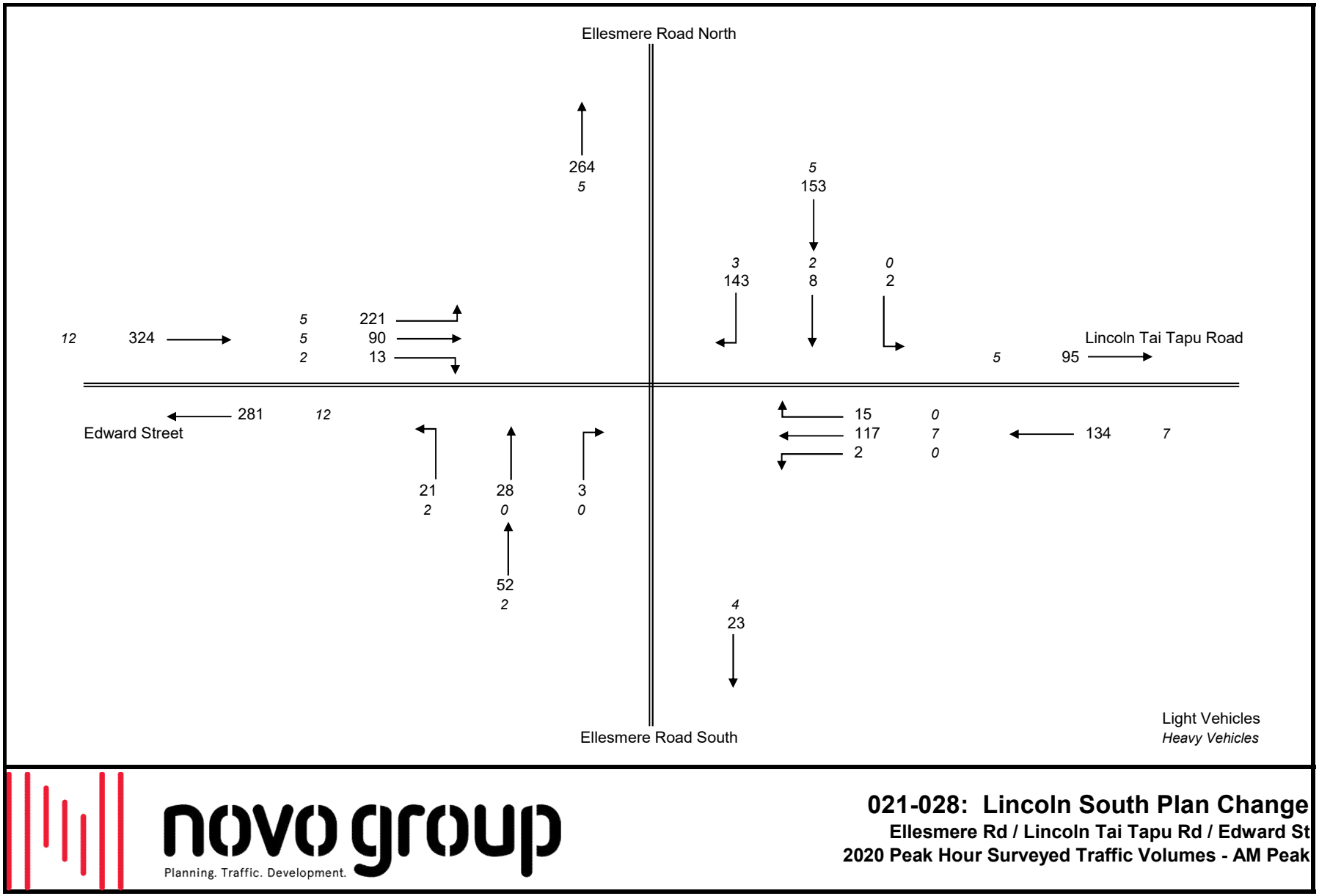
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Springs Rd														
1	L2	82	5	86	6.1	0.543	9.1	LOS A	4.2	29.9	0.76	0.89	0.87	50.1
2	T1	206	6	217	2.9	0.543	9.1	LOS A	4.2	29.9	0.76	0.89	0.87	51.3
3	R2	141	0	148	0.0	0.543	12.8	LOS B	4.2	29.9	0.76	0.89	0.87	51.1
Approach		429	11	452	2.6	0.543	10.3	LOS B	4.2	29.9	0.76	0.89	0.87	51.0
East: Gerald St														
4	L2	76	2	80	2.6	0.503	6.3	LOS A	3.7	26.3	0.64	0.69	0.64	51.6
5	T1	276	10	291	3.6	0.503	6.5	LOS A	3.7	26.3	0.64	0.69	0.64	52.6
6	R2	153	2	161	1.3	0.503	10.3	LOS B	3.7	26.3	0.64	0.69	0.64	52.4
Approach		505	14	532	2.8	0.503	7.6	LOS A	3.7	26.3	0.64	0.69	0.64	52.4
North: Springs Rd														
7	L2	164	1	173	0.6	0.675	15.8	LOS B	7.0	49.9	0.95	1.13	1.33	46.1
8	T1	127	3	134	2.4	0.675	16.2	LOS B	7.0	49.9	0.95	1.13	1.33	47.0
9	R2	92	2	97	2.2	0.675	20.0	LOS C	7.0	49.9	0.95	1.13	1.33	46.7
Approach		383	6	403	1.6	0.675	17.0	LOS B	7.0	49.9	0.95	1.13	1.33	46.5
West: Ellesmere Junction Rd														
10	L2	84	2	88	2.4	0.680	11.8	LOS B	7.6	53.8	0.90	1.00	1.17	48.8
11	T1	376	8	396	2.1	0.680	12.0	LOS B	7.6	53.8	0.90	1.00	1.17	49.7
12	R2	88	1	93	1.1	0.680	15.8	LOS B	7.6	53.8	0.90	1.00	1.17	49.5
Approach		548	11	577	2.0	0.680	12.6	LOS B	7.6	53.8	0.90	1.00	1.17	49.6
All Vehicles		1865	42	1963	2.3	0.680	11.6	LOS B	7.6	53.8	0.81	0.92	0.99	49.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Organisation: NOVO GROUP LIMITED | Licence: PLUS / 1PC | Processed: Sunday, 18 October 2020 10:51:00 am
Project: S:\Novo Projects\020-100 Favourites\021 Carter Group\021028 1491 Springs Road\04 Transport\Traffic Model\021-028 - Lincoln South Rev A.sip9

Appendix 4

Edward St / Ellesmere Rd / Lincoln Tai Tapu Rd Traffic Volumes



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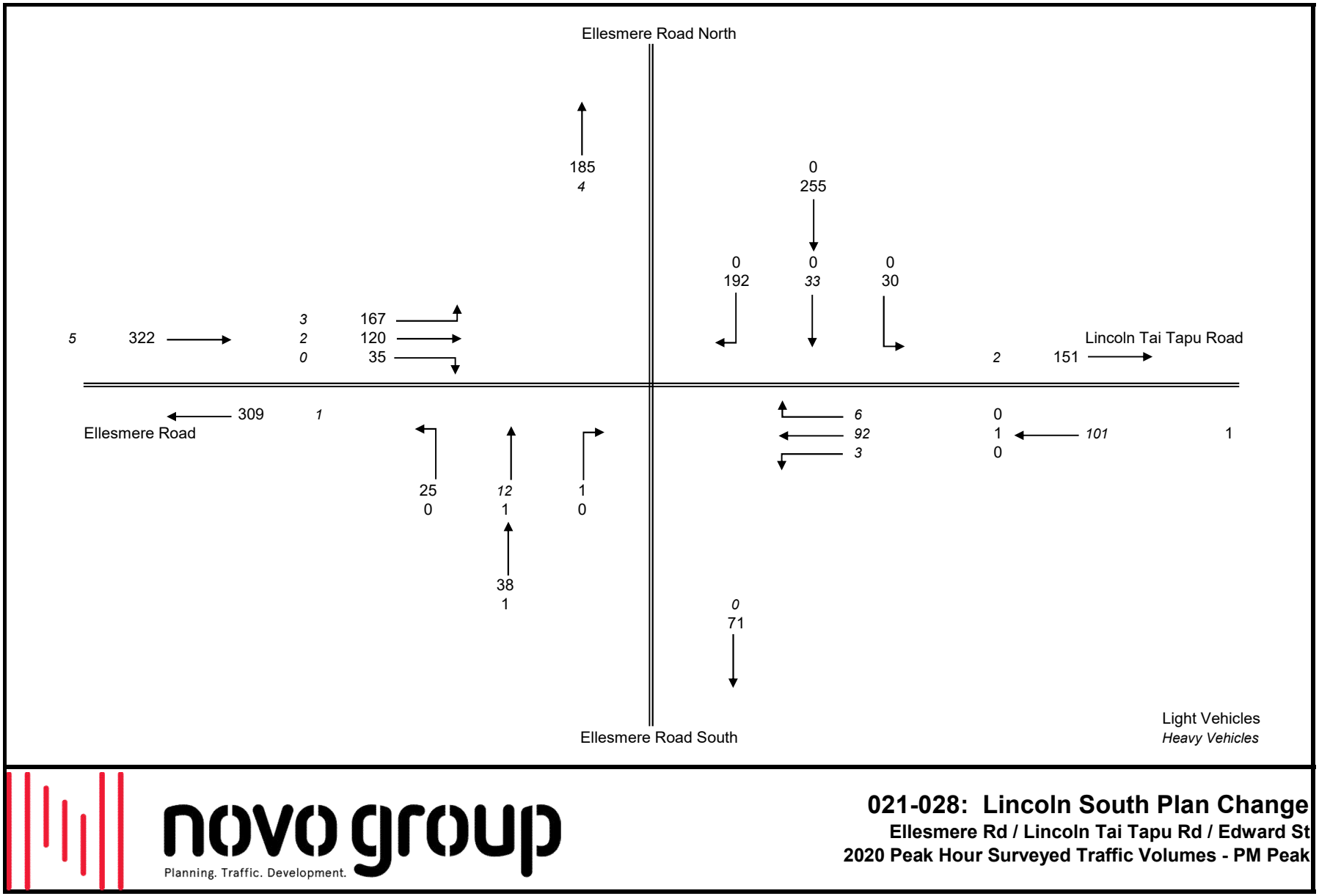
021-028: Lincoln South Plan Change
Ellesmere Rd / Lincoln Tai Tapu Rd / Edward St
2020 Peak Hour Surveyed Traffic Volumes - AM Peak



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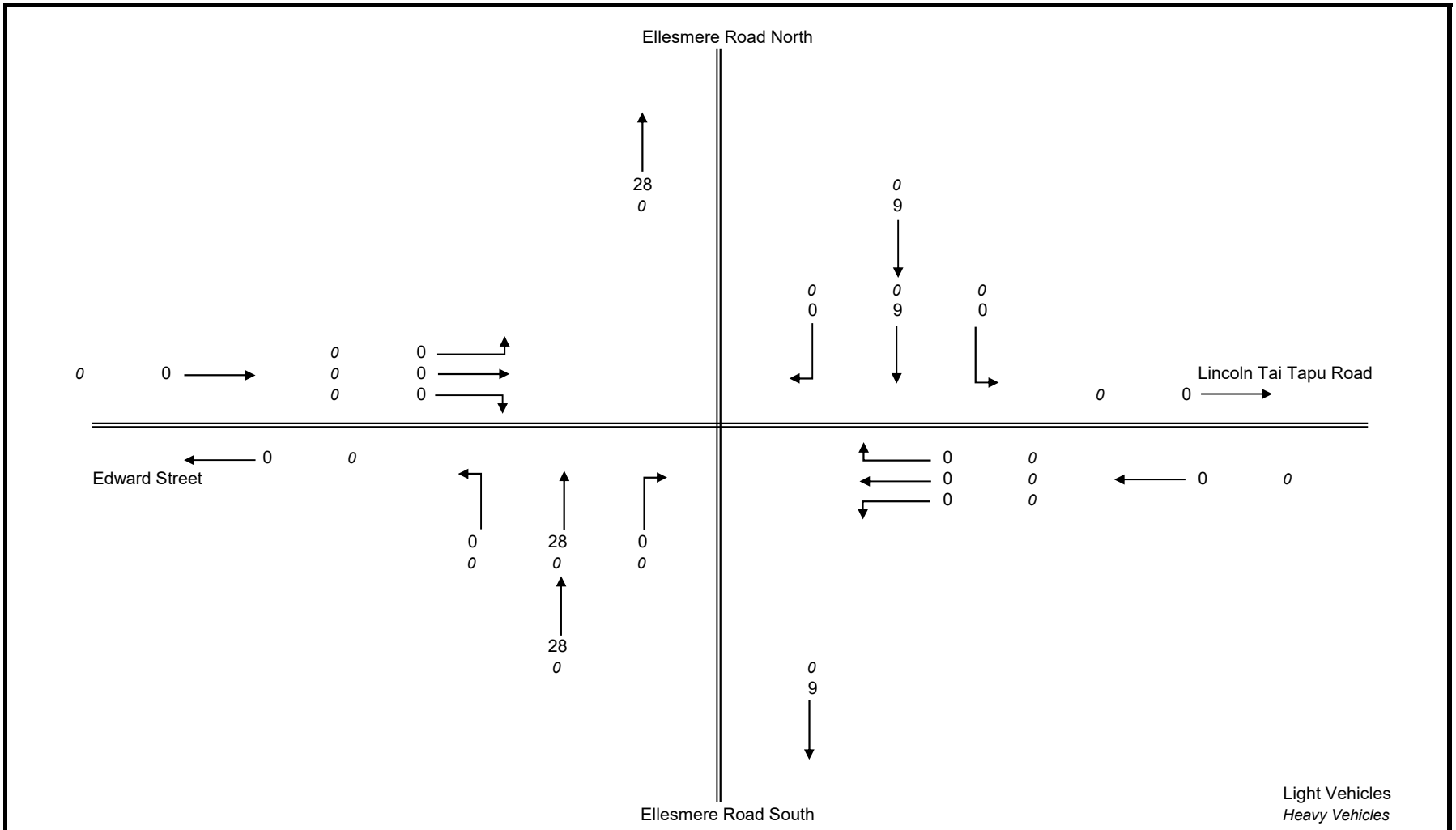
021-028: Lincoln South Plan Change

Ellesmere Rd / Lincoln Tai Tapu Rd / Edward St

2020 Peak Hour Surveyed Traffic Volumes - PM Peak



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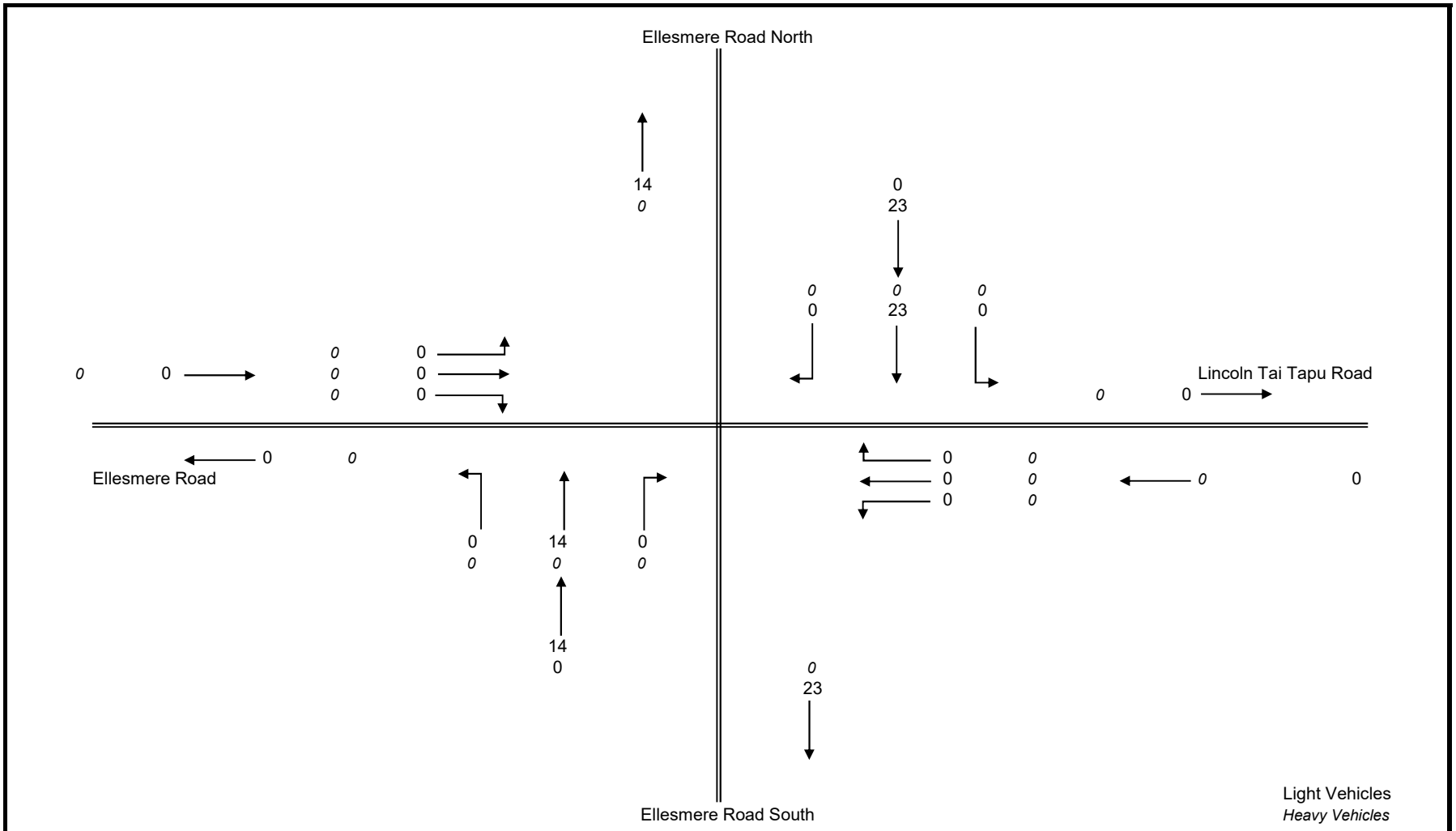
021-028: Lincoln South Plan Change

Ellesmere Rd / Lincoln Tai Tapu Rd / Edward St

Verdeco Park Additional Traffic Volumes - AM Peak



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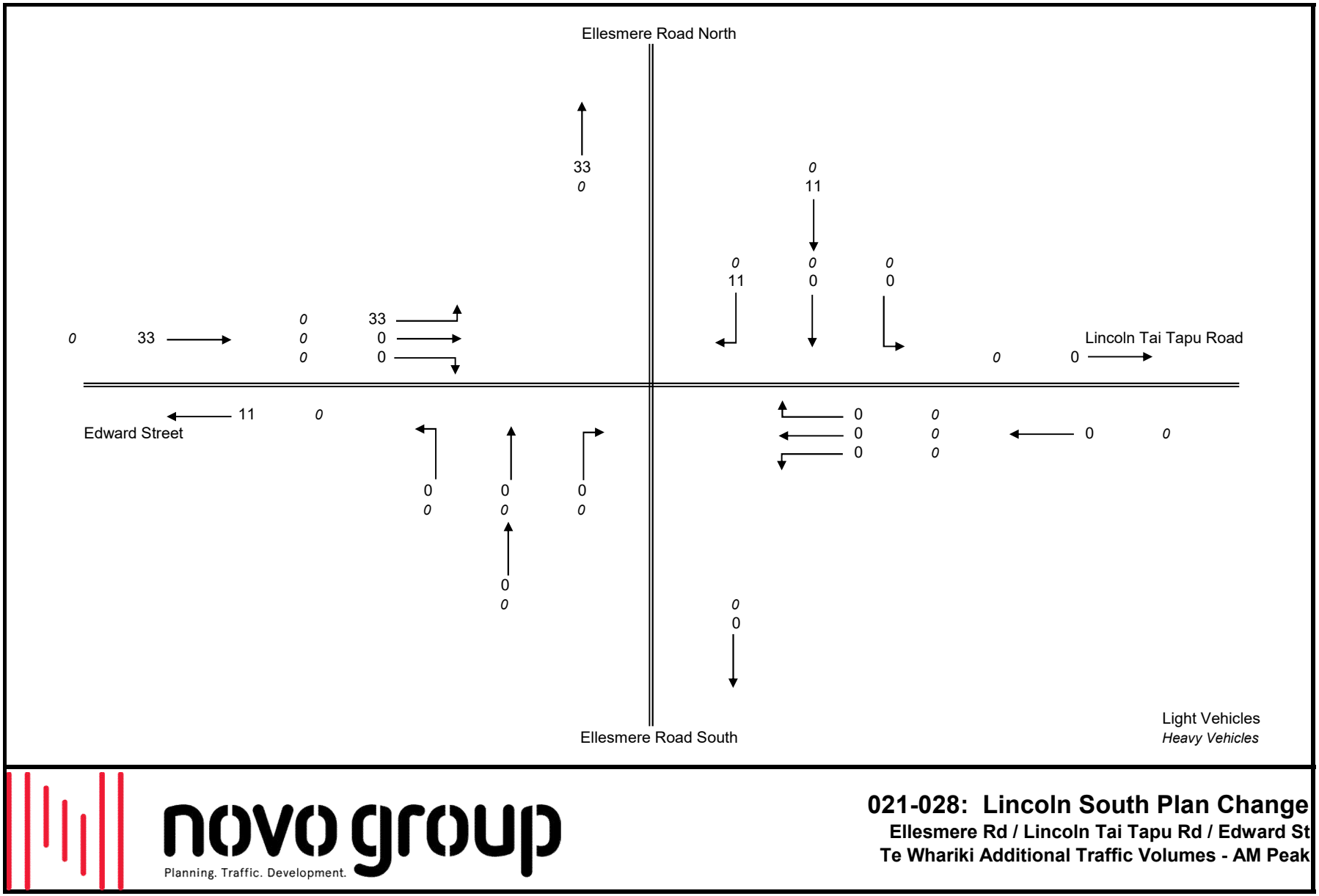
021-028: Lincoln South Plan Change
Ellesmere Rd / Lincoln Tai Tapu Rd / Edward St
Verdeco Park Additional Traffic Volumes - PM Peak



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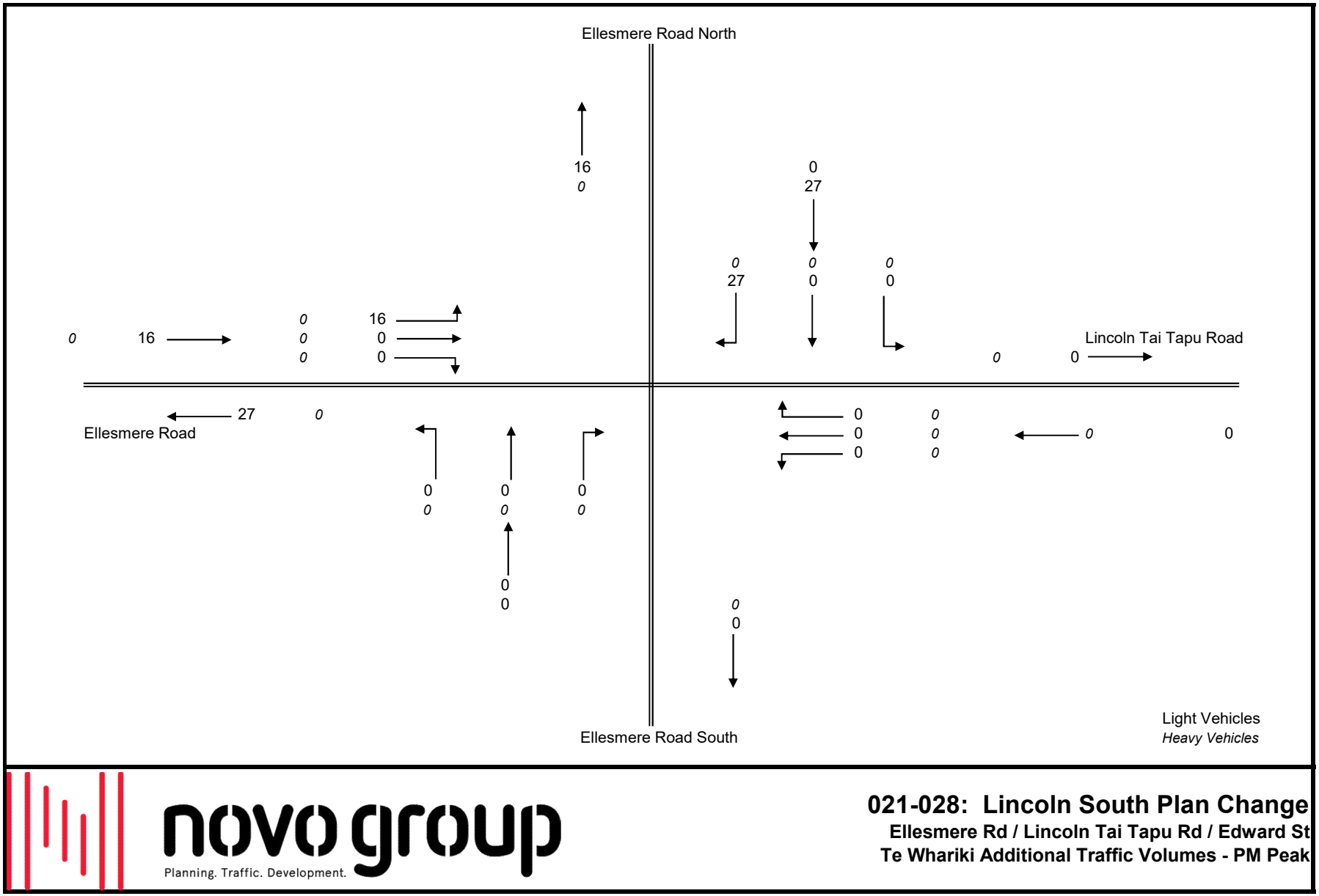
021-028: Lincoln South Plan Change
Ellesmere Rd / Lincoln Tai Tapu Rd / Edward St
Te Whariki Additional Traffic Volumes - AM Peak



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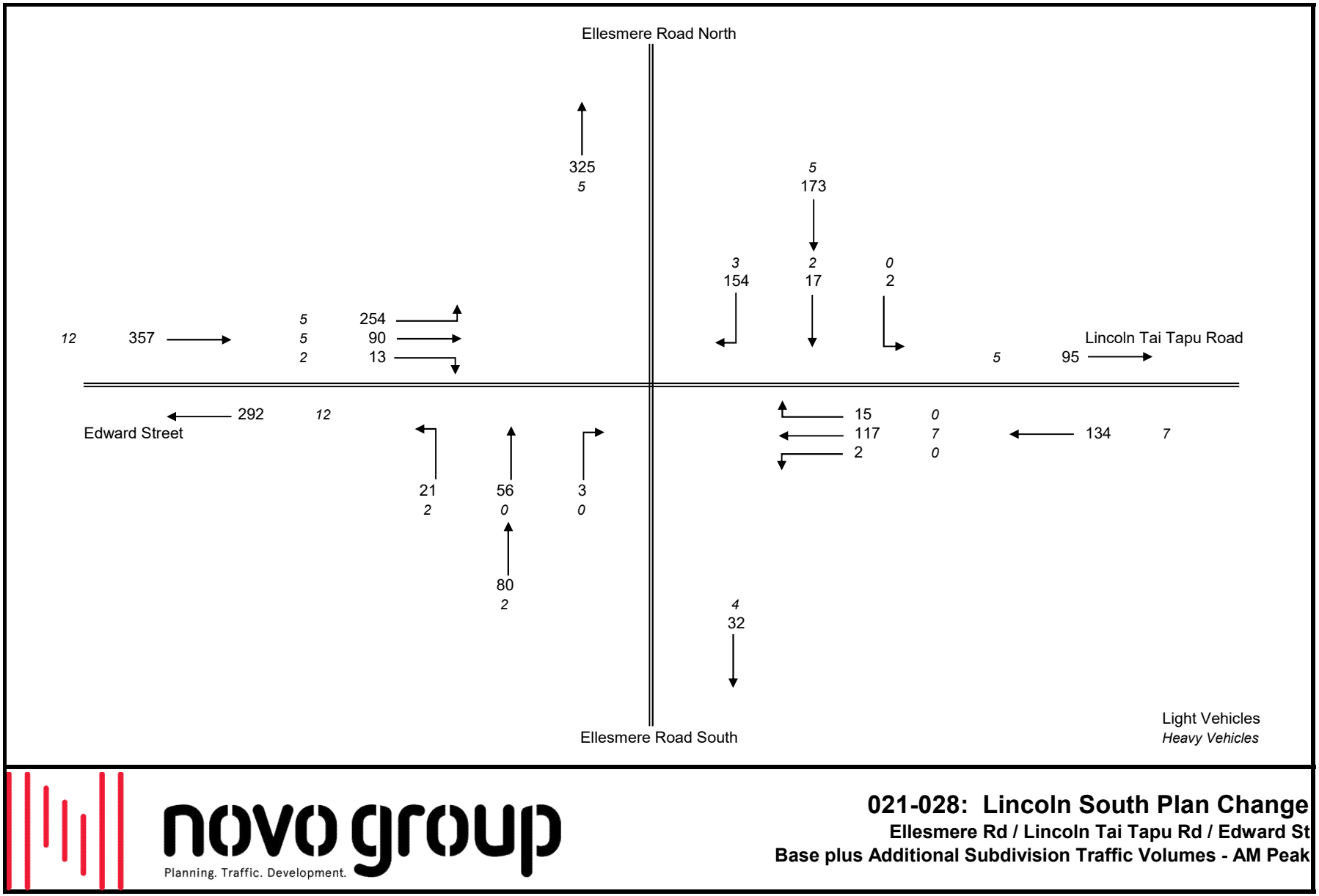
021-028: Lincoln South Plan Change
Ellesmere Rd / Lincoln Tai Tapu Rd / Edward St
Te Whariki Additional Traffic Volumes - PM Peak



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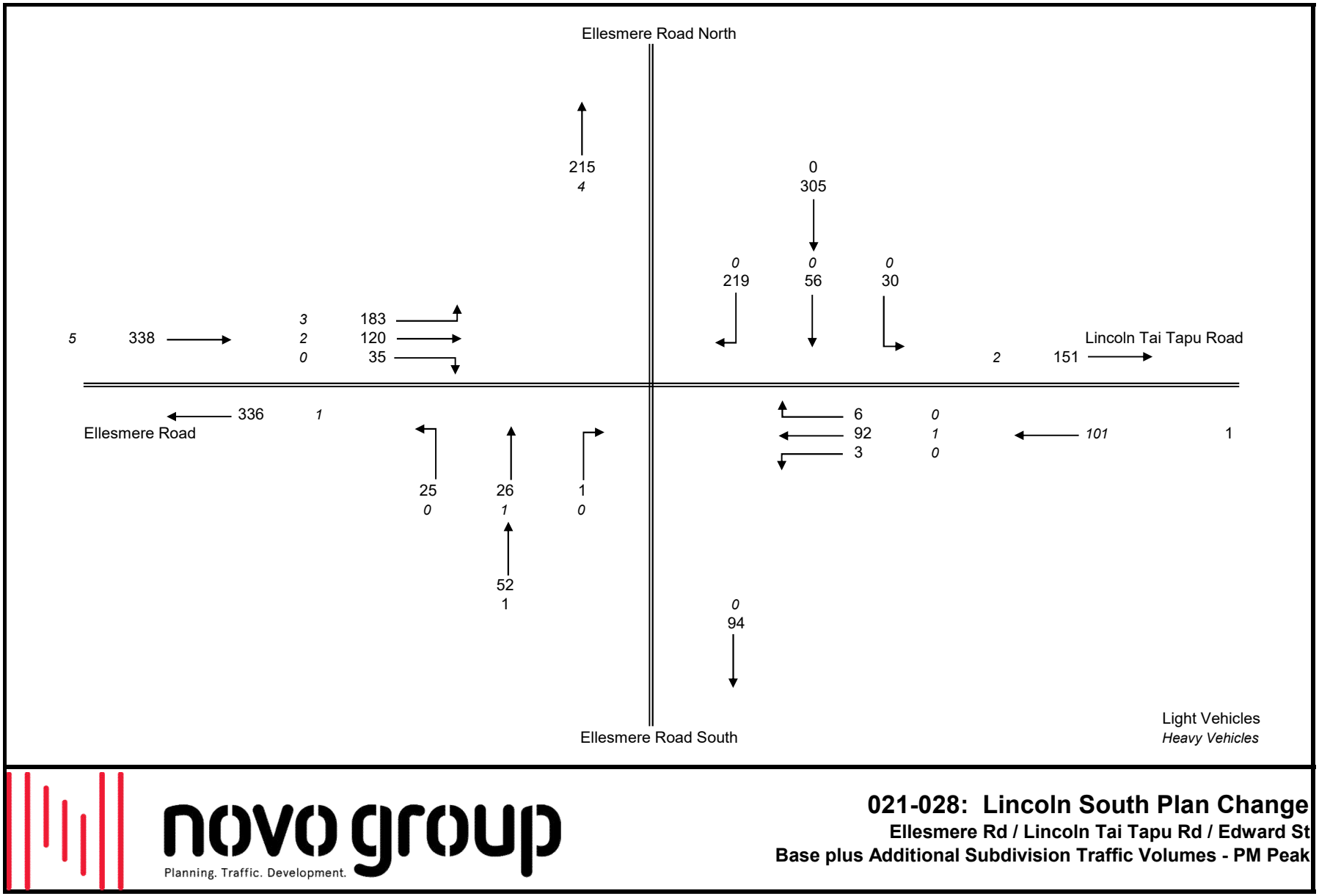
021-028: Lincoln South Plan Change

Ellesmere Rd / Lincoln Tai Tapu Rd / Edward St

Base plus Additional Subdivision Traffic Volumes - AM Peak

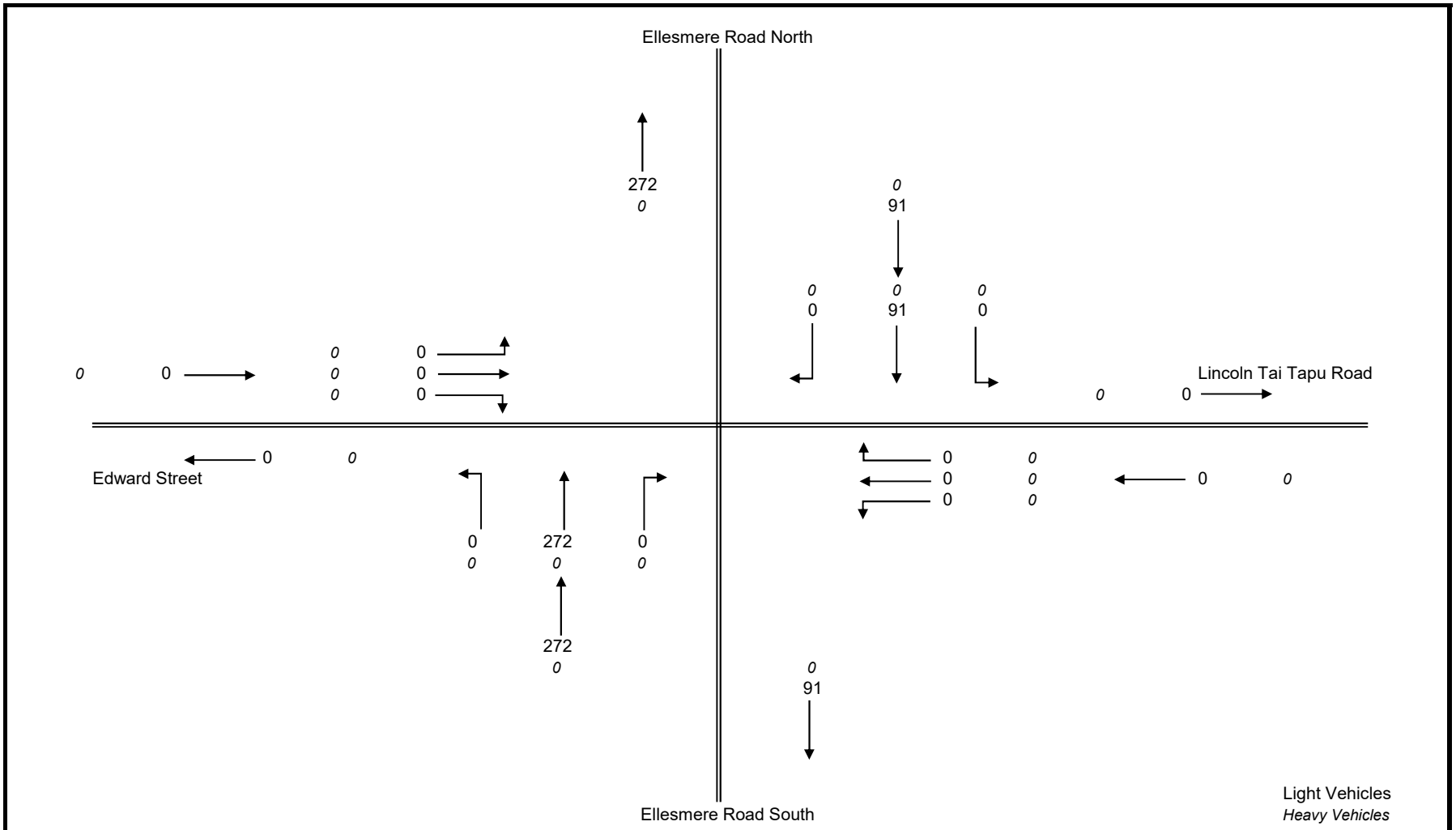


Planning. Traffic. Development.

021-028: Lincoln South Plan Change

Ellesmere Rd / Lincoln Tai Tapu Rd / Edward St

Base plus Additional Subdivision Traffic Volumes - PM Peak



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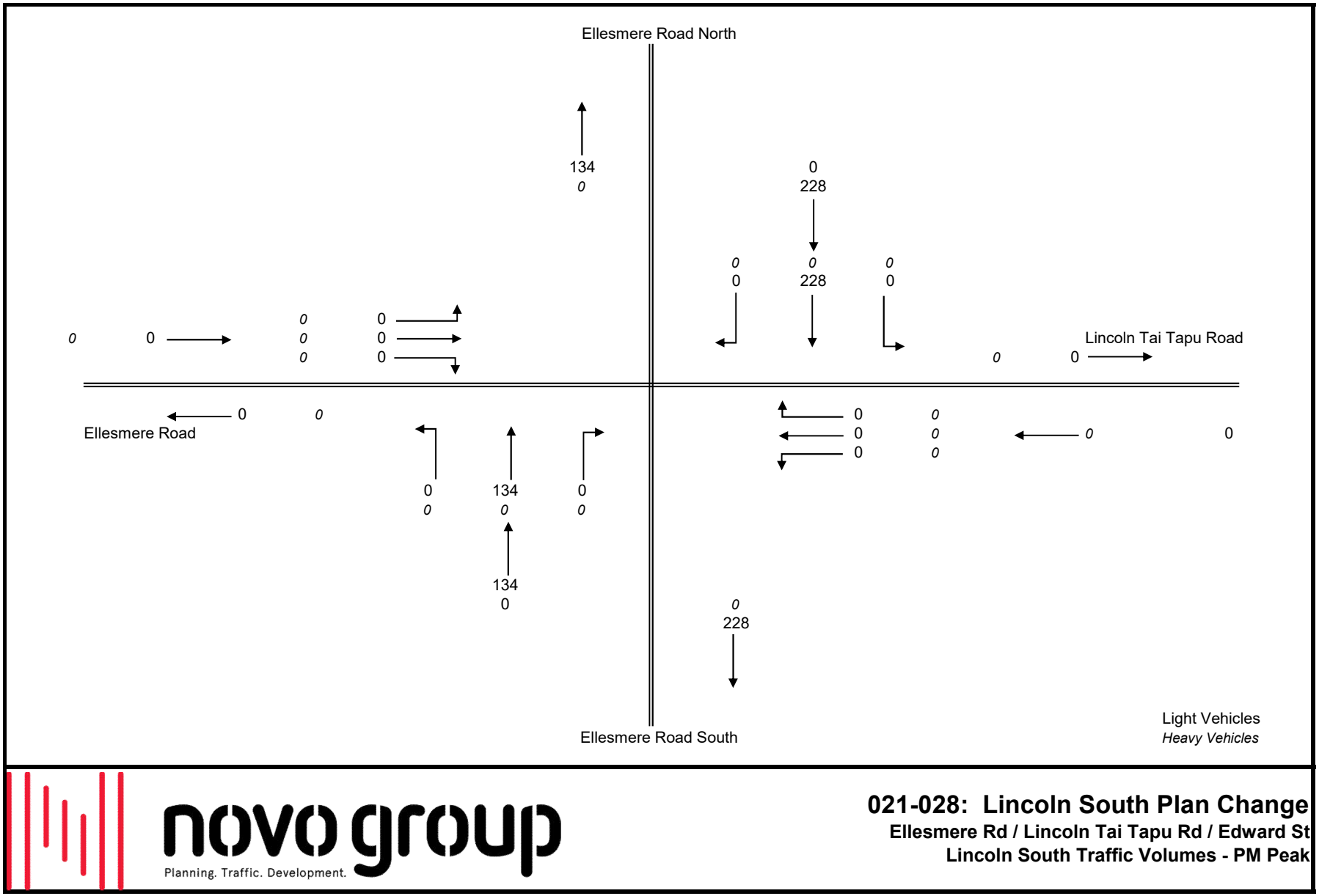
021-028: Lincoln South Plan Change

Ellesmere Rd / Lincoln Tai Tapu Rd / Edward St

Lincoln South Traffic Volumes - AM Peak



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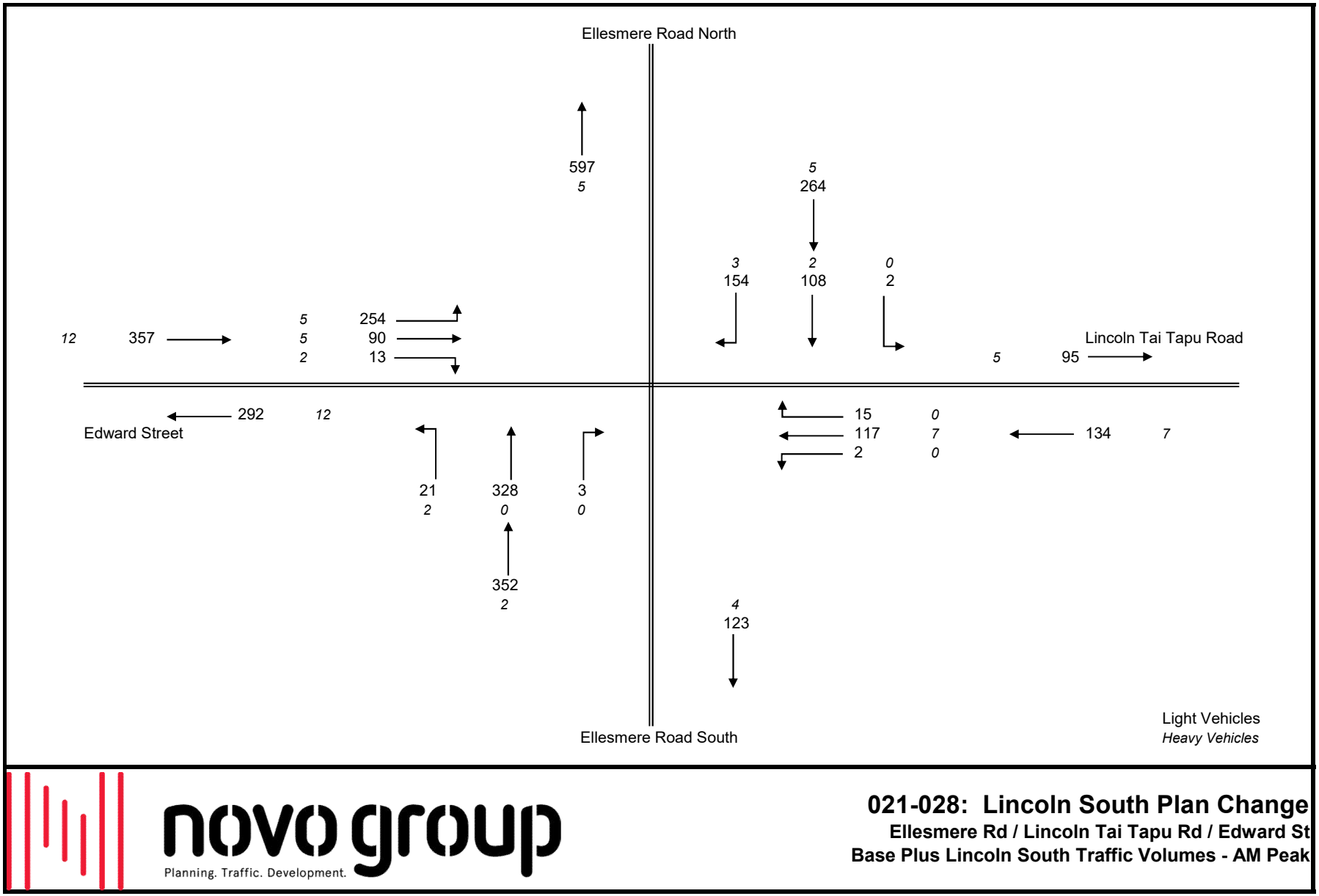
021-028: Lincoln South Plan Change
Ellesmere Rd / Lincoln Tai Tapu Rd / Edward St
Lincoln South Traffic Volumes - PM Peak



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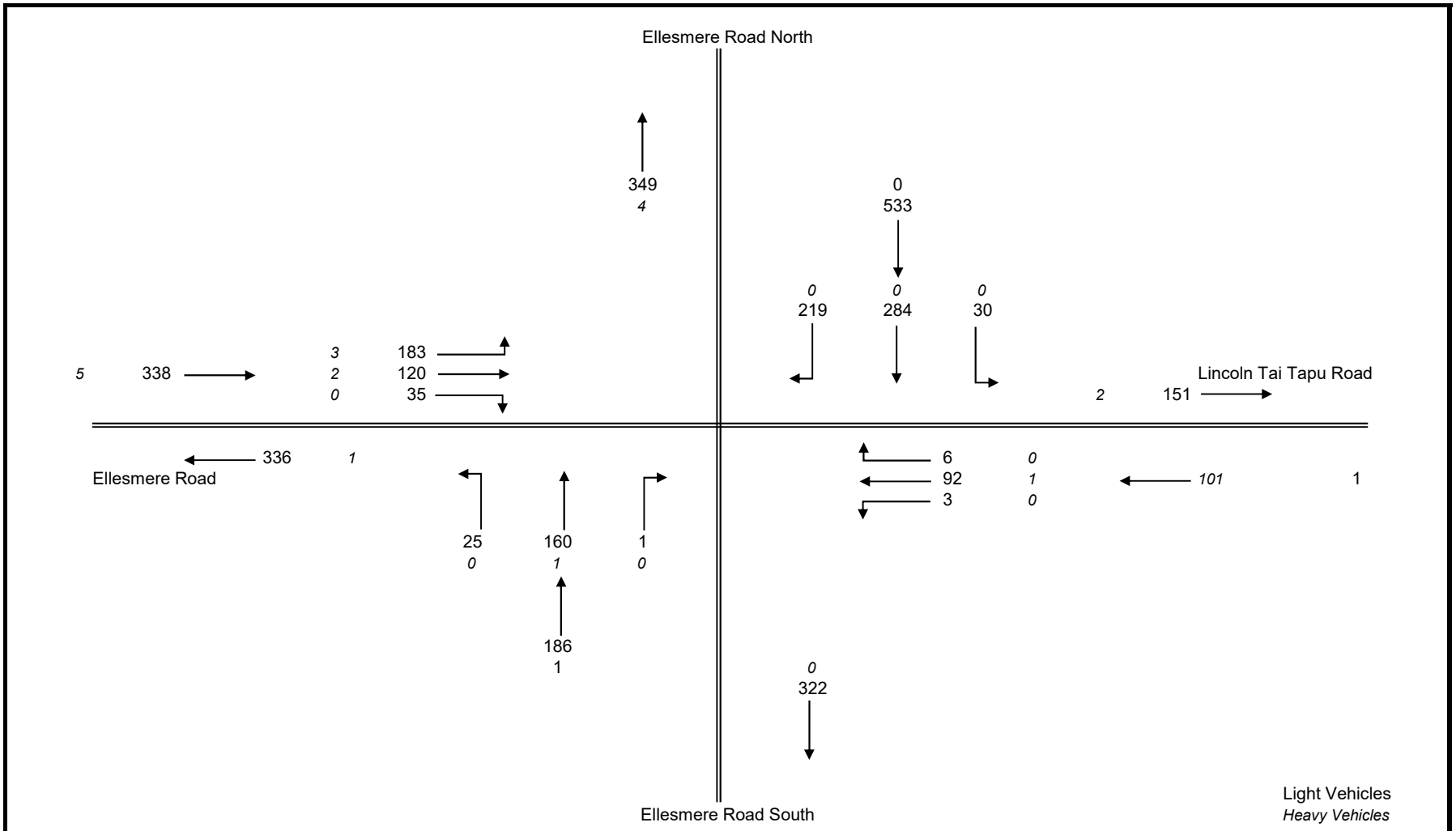
021-028: Lincoln South Plan Change

Ellesmere Rd / Lincoln Tai Tapu Rd / Edward St

Base Plus Lincoln South Traffic Volumes - AM Peak



Planning. Traffic. Development.

021-028: Lincoln South Plan Change

Ellesmere Rd / Lincoln Tai Tapu Rd / Edward St

Base Plus Lincoln South Traffic Volumes - PM Peak

Appendix 5

Edward St / Ellesmere Rd / Lincoln Tai Tapu Rd Operation – Existing

MOVEMENT SUMMARY

Site: 101 [Edward St / Ellesmere Rd - 2020 AM Base (Site Folder: Ellesmere Edward)]

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h]	INPUT VOLUMES [HV] veh/h	DEMAND FLOWS [Total veh/h]	DEMAND FLOWS [HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh]	95% BACK OF QUEUE [Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Ellesmere Rd														
1	L2	23	2	24	8.7	0.069	9.8	LOS A	0.2	1.8	0.32	0.94	0.32	59.5
2	T1	28	0	29	0.0	0.069	11.6	LOS B	0.2	1.8	0.32	0.94	0.32	61.8
3	R2	3	0	3	0.0	0.069	10.0	LOS B	0.2	1.8	0.32	0.94	0.32	61.7
Approach		54	2	57	3.7	0.069	10.8	LOS B	0.2	1.8	0.32	0.94	0.32	60.8
East: Lincoln Tai Tapu Rd														
4	L2	2	0	2	0.0	0.082	8.1	LOS A	0.1	1.0	0.11	0.08	0.11	72.6
5	T1	124	7	131	5.6	0.082	0.2	LOS A	0.1	1.0	0.11	0.08	0.11	77.6
6	R2	15	0	16	0.0	0.082	7.8	LOS A	0.1	1.0	0.11	0.08	0.11	72.0
Approach		141	7	148	5.0	0.082	1.1	NA	0.1	1.0	0.11	0.08	0.11	76.9
North: Ellesmere Rd														
7	L2	2	0	2	0.0	0.273	9.5	LOS A	1.1	7.8	0.52	1.00	0.55	60.7
8	T1	10	2	11	20.0	0.273	12.9	LOS B	1.1	7.8	0.52	1.00	0.55	55.1
9	R2	146	3	154	2.1	0.273	12.3	LOS B	1.1	7.8	0.52	1.00	0.55	59.7
Approach		158	5	166	3.2	0.273	12.3	LOS B	1.1	7.8	0.52	1.00	0.55	59.4
West: Edward St														
10	L2	226	5	238	2.2	0.194	7.0	LOS A	0.2	1.3	0.04	0.44	0.04	66.7
11	T1	95	5	100	5.3	0.194	0.1	LOS A	0.2	1.3	0.04	0.44	0.04	71.9
12	R2	15	2	16	13.3	0.194	7.5	LOS A	0.2	1.3	0.04	0.44	0.04	62.4
Approach		336	12	354	3.6	0.194	5.1	NA	0.2	1.3	0.04	0.44	0.04	67.9
All Vehicles		689	26	725	3.8	0.273	6.4	NA	1.1	7.8	0.19	0.54	0.20	66.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Edward St / Ellesmere Rd - 2020 PM Base (Site Folder: Ellesmere Edward)]

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Ellesmere Rd														
1	L2	25	0	26	0.0	0.042	9.2	LOS A	0.2	1.1	0.22	0.93	0.22	62.6
2	T1	13	1	14	7.7	0.042	11.8	LOS B	0.2	1.1	0.22	0.93	0.22	59.9
3	R2	1	0	1	0.0	0.042	10.4	LOS B	0.2	1.1	0.22	0.93	0.22	62.1
Approach		39	1	41	2.6	0.042	10.1	LOS B	0.2	1.1	0.22	0.93	0.22	61.6
East: Lincoln Tai Tapu Rd														
4	L2	3	0	3	0.0	0.057	7.8	LOS A	0.1	0.4	0.07	0.06	0.07	73.3
5	T1	93	1	98	1.1	0.057	8.1	LOS A	0.1	0.4	0.07	0.06	0.07	76.4
6	R2	6	0	6	0.0	0.057	7.6	LOS A	0.1	0.4	0.07	0.06	0.07	72.6
Approach		102	1	107	1.0	0.057	8.8	NA	0.1	0.4	0.07	0.06	0.07	77.9
North: Ellesmere Rd														
7	L2	30	0	32	0.0	0.383	10.1	LOS B	2.0	13.7	0.49	1.00	0.59	60.8
8	T1	33	0	35	0.0	0.383	11.7	LOS B	2.0	13.7	0.49	1.00	0.59	60.5
9	R2	192	0	202	0.0	0.383	12.5	LOS B	2.0	13.7	0.49	1.00	0.59	60.3
Approach		255	0	268	0.0	0.383	12.1	LOS B	2.0	13.7	0.49	1.00	0.59	60.4
West: Edward St														
10	L2	170	3	179	1.8	0.186	7.1	LOS A	0.3	2.4	0.07	0.38	0.07	67.5
11	T1	122	2	128	1.6	0.186	8.1	LOS A	0.3	2.4	0.07	0.38	0.07	72.6
12	R2	35	0	37	0.0	0.186	7.0	LOS A	0.3	2.4	0.07	0.38	0.07	67.7
Approach		327	5	344	1.5	0.186	4.5	NA	0.3	2.4	0.07	0.38	0.07	69.4
All Vehicles		723	7	761	1.0	0.383	6.9	NA	2.0	13.7	0.23	0.58	0.26	66.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Appendix 6

TRICS Residential Trip Rates

Calculation Reference: AUDIT-191301-201024-1030

TRIP RATE CALCULATION SELECTION PARAMETERS:

Land Use : 03 - RESIDENTIAL
Category : A - HOUSES PRIVATELY OWNED
TOTAL VEHICLES

Selected regions and areas:

02	SOUTH EAST		
	IW	ISLE OF WIGHT	1 days
	KC	KENT	2 days
	WS	WEST SUSSEX	1 days
03	SOUTH WEST		
	SM	SOMERSET	2 days
04	EAST ANGLIA		
	CA	CAMBRIDGESHIRE	1 days
	SF	SUFFOLK	1 days
05	EAST MIDLANDS		
	LE	LEICESTERSHIRE	1 days
09	NORTH		
	TW	TYNE & WEAR	1 days
12	CONNAUGHT		
	CS	SLIGO	2 days

This section displays the number of survey days per TRICS® sub-region in the selected set

Primary Filtering selection:

This data displays the chosen trip rate parameter and its selected range. Only sites that fall within the parameter range are included in the trip rate calculation.

Parameter: No of Dwellings
Actual Range: 8 to 207 (units:)
Range Selected by User: 0 to 5000 (units:)

Parking Spaces Range: All Surveys Included

Parking Spaces per Dwelling Range: All Surveys Included

Bedrooms per Dwelling Range: All Surveys Included

Percentage of dwellings privately owned: All Surveys Included

Public Transport Provision:
Selection by: Include all surveys

Date Range: 01/01/12 to 19/11/19

This data displays the range of survey dates selected. Only surveys that were conducted within this date range are included in the trip rate calculation.

Selected survey days:

Tuesday	4 days
Thursday	4 days
Friday	4 days

This data displays the number of selected surveys by day of the week.

Selected survey types:

Manual count	12 days
Directional ATC Count	0 days

This data displays the number of manual classified surveys and the number of unclassified ATC surveys, the total adding up to the overall number of surveys in the selected set. Manual surveys are undertaken using staff, whilst ATC surveys are undertaking using machines.

Selected Locations:

Neighbourhood Centre (PPS6 Local Centre)	11
Free Standing (PPS6 Out of Town)	1

This data displays the number of surveys per main location category within the selected set. The main location categories consist of Free Standing, Edge of Town, Suburban Area, Neighbourhood Centre, Edge of Town Centre, Town Centre and Not Known.

Selected Location Sub Categories:

Village	11
Out of Town	1

This data displays the number of surveys per location sub-category within the selected set. The location sub-categories consist of Commercial Zone, Industrial Zone, Development Zone, Residential Zone, Retail Zone, Built-Up Zone, Village, Out of Town, High Street and No Sub Category.

Secondary Filtering selection:

Use Class:

C3	12 days

This data displays the number of surveys per Use Class classification within the selected set. The Use Classes Order 2005 has been used for this purpose, which can be found within the Library module of TRICS®.

Population within 500m Range:

All Surveys Included

Population within 1 mile:

1,000 or Less	3 days
1,001 to 5,000	6 days
5,001 to 10,000	2 days
10,001 to 15,000	1 days

This data displays the number of selected surveys within stated 1-mile radii of population.

Population within 5 miles:

5,000 or Less	2 days
25,001 to 50,000	3 days
50,001 to 75,000	3 days
75,001 to 100,000	2 days
125,001 to 250,000	1 days
250,001 to 500,000	1 days

This data displays the number of selected surveys within stated 5-mile radii of population.

Car ownership within 5 miles:

0.6 to 1.0	1 days
1.1 to 1.5	7 days
1.6 to 2.0	4 days

This data displays the number of selected surveys within stated ranges of average cars owned per residential dwelling, within a radius of 5-miles of selected survey sites.

Travel Plan:

No	12 days

This data displays the number of surveys within the selected set that were undertaken at sites with Travel Plans in place, and the number of surveys that were undertaken at sites without Travel Plans.

PTAL Rating:

No PTAL Present	12 days

This data displays the number of selected surveys with PTAL Ratings.

LIST OF SITES relevant to selection parameters

1 CA-03-A-06 MIXED HOUSES CAMBRIDGESHIRE
CRAFT'S WAY
NEAR CAMBRIDGE
BAR HILL
Neighbourhood Centre (PPS6 Local Centre)
Village
Total No of Dwellings: 207
Survey date: FRIDAY *22/06/18* *Survey Type: MANUAL*

2 CS-03-A-03 MIXED HOUSES SLIGO
TOP ROAD
STRANDHILL
STRANDHILL
Neighbourhood Centre (PPS6 Local Centre)
Village
Total No of Dwellings: 30
Survey date: THURSDAY *27/10/16* *Survey Type: MANUAL*

3 CS-03-A-04 DETACHED & SEMI-DETACHED SLIGO
R292
STRANDHILL

Neighbourhood Centre (PPS6 Local Centre)
Village
Total No of Dwellings: 63
Survey date: THURSDAY *27/10/16* *Survey Type: MANUAL*

4 IW-03-A-01 DETACHED HOUSES ISLE OF WIGHT
MEDHAM FARM LANE
NEAR COWES
MEDHAM
Free Standing (PPS6 Out of Town)
Out of Town
Total No of Dwellings: 72
Survey date: TUESDAY *25/06/19* *Survey Type: MANUAL*

5 KC-03-A-05 DETACHED & SEMI-DETACHED KENT
ROCHESTER ROAD
NEAR CHATHAM
BURHAM
Neighbourhood Centre (PPS6 Local Centre)
Village
Total No of Dwellings: 8
Survey date: FRIDAY *22/09/17* *Survey Type: MANUAL*

6 KC-03-A-08 MIXED HOUSES KENT
MAIDSTONE ROAD
CHARING

Neighbourhood Centre (PPS6 Local Centre)
Village
Total No of Dwellings: 159
Survey date: TUESDAY *22/05/18* *Survey Type: MANUAL*

7 LE-03-A-02 DETACHED & OTHERS LEICESTERSHIRE
MELBOURNE ROAD
IBSTOCK

Neighbourhood Centre (PPS6 Local Centre)
Village
Total No of Dwellings: 85
Survey date: THURSDAY *28/06/18* *Survey Type: MANUAL*

8 SF-03-A-06 DETACHED & SEMI-DETACHED SUFFOLK
BURY ROAD
KENTFORD

Neighbourhood Centre (PPS6 Local Centre)
Village
Total No of Dwellings: 38
Survey date: FRIDAY *22/09/17* *Survey Type: MANUAL*

LIST OF SITES relevant to selection parameters (Cont.)

9	SM-03-A-02	MIXED HOUSES		SOMERSET
	HYDE LANE			
	NEAR TAUNTON			
	CREECH SAINT MICHAEL			
	Neighbourhood Centre (PPS6 Local Centre)			
	Village			
	Total No of Dwellings:		42	
	Survey date: TUESDAY		*25/09/18*	*Survey Type: MANUAL*
10	SM-03-A-03	MIXED HOUSES		SOMERSET
	HYDE LANE			
	NEAR TAUNTON			
	CREECH ST MICHAEL			
	Neighbourhood Centre (PPS6 Local Centre)			
	Village			
	Total No of Dwellings:		41	
	Survey date: TUESDAY		*25/09/18*	*Survey Type: MANUAL*
11	TW-03-A-03	MIXED HOUSES		TYNE & WEAR
	STATION ROAD			
	NEAR NEWCASTLE			
	BACKWORTH			
	Neighbourhood Centre (PPS6 Local Centre)			
	Village			
	Total No of Dwellings:		33	
	Survey date: FRIDAY		*13/11/15*	*Survey Type: MANUAL*
12	WS-03-A-07	BUNGALOWS		WEST SUSSEX
	EMMS LANE			
	NEAR HORSHAM			
	BROOKS GREEN			
	Neighbourhood Centre (PPS6 Local Centre)			
	Village			
	Total No of Dwellings:		57	
	Survey date: THURSDAY		*19/10/17*	*Survey Type: MANUAL*

This section provides a list of all survey sites and days in the selected set. For each individual survey site, it displays a unique site reference code and site address, the selected trip rate calculation parameter and its value, the day of the week and date of each survey, and whether the survey was a manual classified count or an ATC count.

TRIP RATE for Land Use 03 - RESIDENTIAL/A - HOUSES PRIVATELY OWNED
TOTAL VEHICLES
Calculation factor: 1 DWELLS
BOLD print indicates peak (busiest) period

	ARRIVALS			DEPARTURES			TOTALS		
Time Range	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate	No. Days	Ave. DWELLS	Trip Rate
00:00 - 01:00									
01:00 - 02:00									
02:00 - 03:00									
03:00 - 04:00									
04:00 - 05:00									
05:00 - 06:00									
06:00 - 07:00									
07:00 - 08:00	12	70	0.065	12	70	0.250	12	70	0.315
08:00 - 09:00	12	70	0.165	12	70	0.383	12	70	0.548
09:00 - 10:00	12	70	0.163	12	70	0.226	12	70	0.389
10:00 - 11:00	12	70	0.145	12	70	0.172	12	70	0.317
11:00 - 12:00	12	70	0.153	12	70	0.193	12	70	0.346
12:00 - 13:00	12	70	0.187	12	70	0.198	12	70	0.385
13:00 - 14:00	12	70	0.186	12	70	0.176	12	70	0.362
14:00 - 15:00	12	70	0.208	12	70	0.190	12	70	0.398
15:00 - 16:00	12	70	0.216	12	70	0.189	12	70	0.405
16:00 - 17:00	12	70	0.284	12	70	0.183	12	70	0.467
17:00 - 18:00	12	70	0.362	12	70	0.168	12	70	0.530
18:00 - 19:00	12	70	0.260	12	70	0.153	12	70	0.413
19:00 - 20:00									
20:00 - 21:00									
21:00 - 22:00									
22:00 - 23:00									
23:00 - 24:00									
Total Rates:			2.394			2.481			4.875

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

Parameter summary

Trip rate parameter range selected:	8 - 207 (units:)
Survey date date range:	01/01/12 - 19/11/19
Number of weekdays (Monday-Friday):	12
Number of Saturdays:	0
Number of Sundays:	0
Surveys automatically removed from selection:	0
Surveys manually removed from selection:	0

This section displays a quick summary of some of the data filtering selections made by the TRICS® user. The trip rate calculation parameter range of all selected surveys is displayed first, followed by the range of minimum and maximum survey dates selected by the user. Then, the total number of selected weekdays and weekend days in the selected set of surveys are show. Finally, the number of survey days that have been manually removed from the selected set outside of the standard filtering procedure are displayed.

Appendix 7

Springs Rd / Ellesmere Junction Rd / Gerald St Operation - Baseline

MOVEMENT SUMMARY

Site: 101 [Springs Rd / Ellesmere Rd - 2020 AM Base + Subdivisions (Site Folder: Springs Ellesmere)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Springs Rd														
1	L2	114	1	120	0.9	0.411	7.7	LOS A	2.6	18.8	0.73	0.82	0.74	51.2
2	T1	121	6	127	5.0	0.411	8.0	LOS A	2.6	18.8	0.73	0.82	0.74	52.2
3	R2	76	1	80	1.3	0.411	11.7	LOS B	2.6	18.8	0.73	0.82	0.74	52.0
Approach		311	8	327	2.6	0.411	8.8	LOS A	2.6	18.8	0.73	0.82	0.74	51.8
East: Gerald St														
4	L2	126	2	133	1.6	0.652	9.8	LOS A	6.7	48.0	0.87	0.94	1.05	49.9
5	T1	288	8	303	2.8	0.652	10.1	LOS B	6.7	48.0	0.87	0.94	1.05	50.9
6	R2	139	2	146	1.4	0.652	13.6	LOS B	6.7	48.0	0.87	0.94	1.05	50.7
Approach		553	12	582	2.2	0.652	10.9	LOS B	6.7	48.0	0.87	0.94	1.05	50.6
North: Springs Rd														
7	L2	175	9	184	5.1	0.860	24.4	LOS C	14.6	106.5	1.00	1.36	1.89	41.7
8	T1	246	5	259	2.0	0.860	24.5	LOS C	14.6	106.5	1.00	1.36	1.89	42.4
9	R2	115	11	121	9.6	0.860	28.8	LOS C	14.6	106.5	1.00	1.36	1.89	42.1
Approach		536	25	564	4.7	0.860	25.4	LOS C	14.6	106.5	1.00	1.36	1.89	42.1
West: Ellesmere Junction Rd														
10	L2	59	3	62	5.1	0.534	7.4	LOS A	4.2	31.0	0.70	0.75	0.73	51.3
11	T1	334	27	352	8.1	0.534	7.7	LOS A	4.2	31.0	0.70	0.75	0.73	52.2
12	R2	102	5	107	4.9	0.534	11.4	LOS B	4.2	31.0	0.70	0.75	0.73	52.0
Approach		495	35	521	7.1	0.534	8.4	LOS A	4.2	31.0	0.70	0.75	0.73	52.1
All Vehicles		1895	80	1995	4.2	0.860	14.0	LOS B	14.6	106.5	0.84	0.99	1.15	48.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Springs Rd / Ellesmere Rd - 2020 PM Base + Subdivisions (Site Folder: Springs Ellesmere)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h]	INPUT VOLUMES [HV] veh/h	DEMAND FLOWS [Total veh/h]	DEMAND FLOWS [HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh]	95% BACK OF QUEUE [Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Springs Rd														
1	L2	128	5	135	3.9	0.645	10.7	LOS B	6.0	43.1	0.85	0.99	1.07	49.1
2	T1	222	6	234	2.7	0.645	10.9	LOS B	6.0	43.1	0.85	0.99	1.07	50.2
3	R2	141	0	148	0.0	0.645	14.5	LOS B	6.0	43.1	0.85	0.99	1.07	50.0
Approach		491	11	517	2.2	0.645	11.9	LOS B	6.0	43.1	0.85	0.99	1.07	49.8
East: Gerald St														
4	L2	76	2	80	2.6	0.578	8.1	LOS A	5.0	35.6	0.76	0.83	0.84	50.8
5	T1	293	10	308	3.4	0.578	8.3	LOS A	5.0	35.6	0.76	0.83	0.84	51.8
6	R2	159	2	167	1.3	0.578	12.1	LOS B	5.0	35.6	0.76	0.83	0.84	51.6
Approach		528	14	556	2.7	0.578	9.4	LOS A	5.0	35.6	0.76	0.83	0.84	51.6
North: Springs Rd														
7	L2	174	1	183	0.6	0.879	34.8	LOS C	14.6	103.2	1.00	1.44	2.18	37.3
8	T1	154	3	162	1.9	0.879	35.1	LOS D	14.6	103.2	1.00	1.44	2.18	37.9
9	R2	92	2	97	2.2	0.879	39.0	LOS D	14.6	103.2	1.00	1.44	2.18	37.7
Approach		420	6	442	1.4	0.879	35.8	LOS D	14.6	103.2	1.00	1.44	2.18	37.6
West: Ellesmere Junction Rd														
10	L2	84	2	88	2.4	0.835	18.3	LOS B	13.9	98.9	1.00	1.24	1.66	44.8
11	T1	405	8	426	2.0	0.835	18.5	LOS B	13.9	98.9	1.00	1.24	1.66	45.6
12	R2	166	1	175	0.6	0.835	22.2	LOS C	13.9	98.9	1.00	1.24	1.66	45.4
Approach		655	11	689	1.7	0.835	19.4	LOS B	13.9	98.9	1.00	1.24	1.66	45.4
All Vehicles		2094	42	2204	2.0	0.879	18.4	LOS B	14.6	103.2	0.90	1.12	1.42	45.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Appendix 8

Springs Rd / Ellesmere Junction Rd / Gerald St Operation – With Subdivision

MOVEMENT SUMMARY

Site: 101 [Springs Rd / Ellesmere Rd - 2020 AM Base + Plan Change (Site Folder: Springs Ellesmere)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Springs Rd														
1	L2	703	1	740	0.1	1.393	366.5	LOS F	223.1	1571.3	1.00	7.14	15.72	8.5
2	T1	320	6	337	1.9	1.393	366.8	LOS F	223.1	1571.3	1.00	7.14	15.72	8.5
3	R2	76	1	80	1.3	1.393	370.5	LOS F	223.1	1571.3	1.00	7.14	15.72	8.5
Approach		1099	8	1157	0.7	1.393	366.9	LOS F	223.1	1571.3	1.00	7.14	15.72	8.5
East: Gerald St														
4	L2	126	2	133	1.6	0.744	14.8	LOS B	9.1	64.9	0.96	1.15	1.41	46.8
5	T1	288	8	303	2.8	0.744	15.1	LOS B	9.1	64.9	0.96	1.15	1.41	47.6
6	R2	139	2	146	1.4	0.744	16.8	LOS B	9.1	64.9	0.96	1.15	1.41	47.4
Approach		553	12	582	2.2	0.744	16.0	LOS B	9.1	64.9	0.96	1.15	1.41	47.3
North: Springs Rd														
7	L2	175	9	184	5.1	1.296	292.5	LOS F	107.8	781.2	1.00	4.58	10.44	10.3
8	T1	312	5	328	1.6	1.296	292.5	LOS F	107.8	781.2	1.00	4.58	10.44	10.3
9	R2	115	11	121	9.6	1.296	296.9	LOS F	107.8	781.2	1.00	4.58	10.44	10.3
Approach		602	25	634	4.2	1.296	293.3	LOS F	107.8	781.2	1.00	4.58	10.44	10.3
West: Ellesmere Junction Rd														
10	L2	59	3	62	5.1	0.814	14.7	LOS B	12.7	92.7	0.99	1.11	1.45	46.4
11	T1	334	27	352	8.1	0.814	15.0	LOS B	12.7	92.7	0.99	1.11	1.45	47.1
12	R2	292	5	307	1.7	0.814	16.6	LOS B	12.7	92.7	0.99	1.11	1.45	47.1
Approach		685	35	721	5.1	0.814	16.5	LOS B	12.7	92.7	0.99	1.11	1.45	47.1
All Vehicles		2939	80	3094	2.7	1.393	204.1	LOS F	223.1	1571.3	0.99	4.08	8.62	13.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Springs Rd / Ellesmere Rd - 2020 PM Base + Plan Change (Site Folder: Springs Ellesmere)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Springs Rd														
1	L2	409	5	431	1.2	1.131	138.6	LOS F	88.2	624.0	1.00	3.73	7.55	18.1
2	T1	320	6	337	1.9	1.131	138.8	LOS F	88.2	624.0	1.00	3.73	7.55	18.3
3	R2	141	0	148	0.0	1.131	142.5	LOS F	88.2	624.0	1.00	3.73	7.55	18.2
Approach		870	11	916	1.3	1.131	139.3	LOS F	88.2	624.0	1.00	3.73	7.55	18.2
East: Gerald St														
4	L2	76	2	80	2.6	0.774	17.9	LOS B	10.3	73.9	1.00	1.24	1.59	44.9
5	T1	293	10	308	3.4	0.774	18.2	LOS B	10.3	73.9	1.00	1.24	1.59	45.6
6	R2	159	2	167	1.3	0.774	21.9	LOS C	10.3	73.9	1.00	1.24	1.59	45.5
Approach		528	14	556	2.7	0.774	19.3	LOS B	10.3	73.9	1.00	1.24	1.59	45.5
North: Springs Rd														
7	L2	174	1	183	0.6	1.464	442.9	LOS F	138.9	980.7	1.00	5.31	12.79	7.2
8	T1	321	3	338	0.9	1.464	443.2	LOS F	138.9	980.7	1.00	5.31	12.79	7.2
9	R2	92	2	97	2.2	1.464	447.1	LOS F	138.9	980.7	1.00	5.31	12.79	7.2
Approach		587	6	618	1.0	1.464	443.7	LOS F	138.9	980.7	1.00	5.31	12.79	7.2
West: Ellesmere Junction Rd														
10	L2	84	2	88	2.4	1.522	483.6	LOS F	275.9	1947.3	1.00	8.09	18.02	6.7
11	T1	405	8	426	2.0	1.522	483.8	LOS F	275.9	1947.3	1.00	8.09	18.02	6.8
12	R2	643	1	677	0.2	1.522	487.6	LOS F	275.9	1947.3	1.00	8.09	18.02	6.8
Approach		1132	11	1192	1.0	1.522	486.0	LOS F	275.9	1947.3	1.00	8.09	18.02	6.8
All Vehicles		3117	42	3281	1.3	1.522	302.2	LOS F	275.9	1947.3	1.00	5.19	11.33	10.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Appendix 9

Springs Rd / Ellesmere Junction Rd / Gerald St Council Traffic Signals Operation

MOVEMENT SUMMARY

Site: 101 [Springs Rd / Ellesmere Rd - 2020 AM Council (Site Folder: Springs Ellesmere)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Springs Rd														
1	L2	703	1	740	0.1	1.317	344.4	LOS F	184.1	1296.5	1.00	1.99	2.98	8.8
2	T1	320	6	337	1.9	*1.317	338.8	LOS F	184.1	1296.5	1.00	1.99	2.98	8.9
3	R2	76	1	80	1.3	0.745	71.6	LOS E	5.1	35.8	1.00	0.85	1.21	27.2
Approach		1099	8	1157	0.7	1.317	323.9	LOS F	184.1	1296.5	1.00	1.91	2.85	9.3
East: Gerald St														
4	L2	126	2	133	1.6	1.020	123.1	LOS F	11.9	84.5	1.00	1.18	1.96	19.6
5	T1	288	8	303	2.8	*1.590	581.7	LOS F	65.8	471.7	1.00	2.36	3.99	5.5
6	R2	139	2	146	1.4	0.637	61.4	LOS E	8.5	59.9	1.00	0.82	1.02	29.5
Approach		553	12	582	2.2	1.590	346.4	LOS F	65.8	471.7	1.00	1.70	2.78	8.7
North: Springs Rd														
7	L2	175	9	184	5.1	0.144	10.3	LOS B	3.0	21.9	0.35	0.65	0.35	50.6
8	T1	312	5	328	1.6	0.375	22.5	LOS C	12.4	87.9	0.70	0.60	0.70	43.8
9	R2	115	11	121	9.6	*1.194	246.2	LOS F	16.3	123.4	1.00	1.46	2.68	11.4
Approach		602	25	634	4.2	1.194	61.7	LOS E	16.3	123.4	0.66	0.78	0.98	29.2
West: Ellesmere Junction Rd														
10	L2	59	3	62	5.1	0.219	53.7	LOS D	3.2	23.5	0.91	0.75	0.91	31.4
11	T1	334	27	352	8.1	*1.309	337.5	LOS F	57.8	432.4	1.00	2.07	3.04	8.9
12	R2	292	5	307	1.7	1.135	198.3	LOS F	37.0	262.8	1.00	1.35	2.30	13.6
Approach		685	35	721	5.1	1.309	253.7	LOS F	57.8	432.4	0.99	1.65	2.54	11.2
All Vehicles		2939	80	3094	2.7	1.590	258.1	LOS F	184.1	1296.5	0.93	1.58	2.38	11.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: 101 [Springs Rd / Ellesmere Rd - 2020 PM Council (Site Folder: Springs Ellesmere)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Springs Rd														
1	L2	409	5	431	1.2	1.460	472.3	LOS F	151.7	1075.5	1.00	2.39	3.53	6.7
2	T1	320	6	337	1.9	*1.460	466.8	LOS F	151.7	1075.5	1.00	2.39	3.53	6.7
3	R2	141	0	148	0.0	*1.370	395.0	LOS F	26.2	183.5	1.00	1.72	3.34	7.7
Approach		870	11	916	1.3	1.460	457.7	LOS F	151.7	1075.5	1.00	2.28	3.50	6.8
East: Gerald St														
4	L2	76	2	80	2.6	0.351	58.7	LOS E	4.4	31.5	0.96	0.77	0.96	30.1
5	T1	293	10	308	3.4	*1.502	504.3	LOS F	62.4	449.6	1.00	2.27	3.73	6.3
6	R2	159	2	167	1.3	0.727	63.5	LOS E	10.0	70.7	1.00	0.85	1.10	29.0
Approach		528	14	556	2.7	1.502	307.4	LOS F	62.4	449.6	0.99	1.63	2.54	9.6
North: Springs Rd														
7	L2	174	1	183	0.6	0.164	12.3	LOS B	3.6	25.5	0.42	0.67	0.42	49.3
8	T1	321	3	338	0.9	0.653	37.4	LOS D	16.6	116.8	0.89	0.77	0.89	37.2
9	R2	92	2	97	2.2	0.908	80.3	LOS F	6.6	47.2	1.00	0.99	1.55	25.6
Approach		587	6	618	1.0	0.908	36.7	LOS D	16.6	116.8	0.77	0.77	0.86	37.3
West: Ellesmere Junction Rd														
10	L2	84	2	88	2.4	0.157	37.8	LOS D	3.7	26.7	0.76	0.74	0.76	36.4
11	T1	405	8	426	2.0	0.832	45.7	LOS D	24.3	172.9	0.95	0.92	1.07	34.3
12	R2	643	1	677	0.2	*1.494	504.2	LOS F	138.3	969.3	1.00	1.92	3.66	6.3
Approach		1132	11	1192	1.0	1.494	305.6	LOS F	138.3	969.3	0.96	1.47	2.52	9.7
All Vehicles		3117	42	3281	1.3	1.502	297.7	LOS F	151.7	1075.5	0.94	1.59	2.48	9.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Appendix 10

Springs Rd / Ellesmere Junction Rd / Gerald St Upgraded Traffic Signals Operation

MOVEMENT SUMMARY

Site: 101 [Springs Rd / Ellesmere Rd - 2020 AM (Site Folder: Springs Ellesmere)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Springs Rd														
1	L2	703	1	740	0.1	0.646	15.5	LOS B	19.6	137.5	0.58	0.76	0.58	48.6
2	T1	320	6	337	1.9	0.583	44.9	LOS D	12.9	91.8	0.93	0.77	0.93	34.7
3	R2	76	1	80	1.3	*0.652	68.8	LOS E	4.9	34.7	1.00	0.81	1.10	27.9
Approach		1099	8	1157	0.7	0.652	27.7	LOS C	19.6	137.5	0.71	0.76	0.72	41.6
East: Gerald St														
4	L2	126	2	133	1.6	0.333	49.8	LOS D	6.6	46.9	0.89	0.78	0.89	32.9
5	T1	288	8	303	2.8	0.770	50.2	LOS D	17.4	124.5	0.99	0.90	1.07	33.0
6	R2	139	2	146	1.4	*0.682	63.2	LOS E	8.6	61.3	1.00	0.83	1.07	29.1
Approach		553	12	582	2.2	0.770	53.4	LOS D	17.4	124.5	0.97	0.85	1.03	31.9
North: Springs Rd														
7	L2	175	9	184	5.1	0.397	44.6	LOS D	9.2	66.9	0.87	0.80	0.87	34.1
8	T1	312	5	328	1.6	*0.695	41.9	LOS D	16.7	118.5	0.94	0.80	0.94	35.6
9	R2	115	11	121	9.6	0.597	62.0	LOS E	7.0	53.0	1.00	0.80	1.00	29.4
Approach		602	25	634	4.2	0.695	46.5	LOS D	16.7	118.5	0.93	0.80	0.93	33.8
West: Ellesmere Junction Rd														
10	L2	59	3	62	5.1	0.710	41.5	LOS D	20.3	151.1	0.90	0.79	0.90	37.1
11	T1	334	27	352	8.1	*0.710	35.1	LOS D	20.3	151.1	0.90	0.79	0.90	37.8
12	R2	292	5	307	1.7	0.424	46.1	LOS D	9.6	68.2	0.87	0.79	0.87	34.0
Approach		685	35	721	5.1	0.710	40.4	LOS D	20.3	151.1	0.89	0.79	0.89	36.0
All Vehicles		2939	80	3094	2.7	0.770	39.3	LOS D	20.3	151.1	0.84	0.79	0.86	36.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: 101 [Springs Rd / Ellesmere Rd - 2020 PM (Site Folder: Springs Ellesmere)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Springs Rd														
1	L2	409	5	431	1.2	0.393	11.5	LOS B	7.8	55.2	0.41	0.68	0.41	50.5
2	T1	320	6	337	1.9	0.843	58.1	LOS E	15.4	109.2	0.98	0.90	1.14	30.8
3	R2	141	0	148	0.0	* 0.872	74.0	LOS E	9.8	68.3	1.00	0.96	1.37	26.8
Approach		870	11	916	1.3	0.872	38.8	LOS D	15.4	109.2	0.71	0.81	0.83	36.7
East: Gerald St														
4	L2	76	2	80	2.6	0.297	52.5	LOS D	5.5	39.4	0.89	0.76	0.89	32.9
5	T1	293	10	308	3.4	0.745	50.3	LOS D	16.0	114.9	0.98	0.87	1.04	32.9
6	R2	159	2	167	1.3	* 0.839	70.2	LOS E	10.7	75.7	1.00	0.92	1.28	27.5
Approach		528	14	556	2.7	0.839	56.6	LOS E	16.0	114.9	0.98	0.87	1.09	31.1
North: Springs Rd														
7	L2	174	1	183	0.6	0.500	51.3	LOS D	10.1	71.2	0.93	0.81	0.93	32.2
8	T1	321	3	338	0.9	* 0.875	59.0	LOS E	20.9	147.7	1.00	1.01	1.24	30.5
9	R2	92	2	97	2.2	0.353	55.9	LOS E	5.2	37.0	0.94	0.78	0.94	30.9
Approach		587	6	618	1.0	0.875	56.2	LOS E	20.9	147.7	0.97	0.91	1.10	31.1
West: Ellesmere Junction Rd														
10	L2	84	2	88	2.4	0.865	49.0	LOS D	29.0	206.8	0.90	0.91	1.05	34.5
11	T1	405	8	426	2.0	* 0.865	42.5	LOS D	29.0	206.8	0.90	0.91	1.05	35.1
12	R2	643	1	677	0.2	0.770	47.1	LOS D	23.6	165.2	0.93	0.85	0.96	33.9
Approach		1132	11	1192	1.0	0.865	45.6	LOS D	29.0	206.8	0.92	0.88	1.00	34.4
All Vehicles		3117	42	3281	1.3	0.875	47.6	LOS D	29.0	206.8	0.88	0.86	0.99	33.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Appendix 11

Edward St / Ellesmere Rd / Lincoln Tai Tapu Rd Operation - Baseline

MOVEMENT SUMMARY

Site: 101 [Edward St / Ellesmere Rd - 2020 AM Base + Subdivisions (Site Folder: Ellesmere Edward)]

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Ellesmere Rd														
1	L2	23	2	24	8.7	0.117	9.9	LOS A	0.4	3.1	0.38	0.97	0.38	59.0
2	T1	56	0	59	0.0	0.117	12.1	LOS B	0.4	3.1	0.38	0.97	0.38	61.2
3	R2	3	0	3	0.0	0.117	16.2	LOS B	0.4	3.1	0.38	0.97	0.38	61.1
Approach		82	2	86	2.4	0.117	11.4	LOS B	0.4	3.1	0.38	0.97	0.38	60.6
East: Lincoln Tai Tapu Rd														
4	L2	2	0	2	0.0	0.083	8.3	LOS A	0.1	1.0	0.12	0.08	0.12	72.5
5	T1	124	7	131	5.6	0.083	8.2	LOS A	0.1	1.0	0.12	0.08	0.12	77.6
6	R2	15	0	16	0.0	0.083	8.0	LOS A	0.1	1.0	0.12	0.08	0.12	71.9
Approach		141	7	148	5.0	0.083	1.2	NA	0.1	1.0	0.12	0.08	0.12	76.9
North: Ellesmere Rd														
7	L2	2	0	2	0.0	0.322	9.8	LOS A	1.4	10.1	0.55	1.03	0.65	59.9
8	T1	19	2	20	10.5	0.322	12.7	LOS B	1.4	10.1	0.55	1.03	0.65	56.8
9	R2	157	3	165	1.9	0.322	13.2	LOS B	1.4	10.1	0.55	1.03	0.65	58.9
Approach		178	5	187	2.8	0.322	13.1	LOS B	1.4	10.1	0.55	1.03	0.65	58.7
West: Edward St														
10	L2	259	5	273	1.9	0.212	7.0	LOS A	0.2	1.3	0.04	0.46	0.04	66.6
11	T1	95	5	100	5.3	0.212	8.1	LOS A	0.2	1.3	0.04	0.46	0.04	71.6
12	R2	15	2	16	13.3	0.212	7.5	LOS A	0.2	1.3	0.04	0.46	0.04	62.2
Approach		369	12	388	3.3	0.212	5.3	NA	0.2	1.3	0.04	0.46	0.04	67.6
All Vehicles		770	26	811	3.4	0.322	7.0	NA	1.4	10.1	0.21	0.58	0.23	66.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Edward St / Ellesmere Rd - 2020 PM Base + Subdivisions (Site Folder: Ellesmere Edward)]

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Ellesmere Rd														
1	L2	25	0	26	0.0	0.063	9.2	LOS A	0.2	1.6	0.26	0.94	0.26	62.2
2	T1	27	1	28	3.7	0.063	11.6	LOS B	0.2	1.6	0.26	0.94	0.26	60.8
3	R2	1	0	1	0.0	0.063	10.7	LOS B	0.2	1.6	0.26	0.94	0.26	61.8
Approach		53	1	56	1.9	0.063	10.5	LOS B	0.2	1.6	0.26	0.94	0.26	61.5
East: Lincoln Tai Tapu Rd														
4	L2	3	0	3	0.0	0.057	7.8	LOS A	0.1	0.4	0.07	0.06	0.07	73.3
5	T1	93	1	98	1.1	0.057	0.1	LOS A	0.1	0.4	0.07	0.06	0.07	78.4
6	R2	6	0	6	0.0	0.057	7.7	LOS A	0.1	0.4	0.07	0.06	0.07	72.6
Approach		102	1	107	1.0	0.057	0.8	NA	0.1	0.4	0.07	0.06	0.07	77.9
North: Ellesmere Rd														
7	L2	30	0	32	0.0	0.469	10.6	LOS B	2.8	19.7	0.54	1.04	0.74	59.9
8	T1	56	0	59	0.0	0.469	12.5	LOS B	2.8	19.7	0.54	1.04	0.74	59.6
9	R2	219	0	231	0.0	0.469	13.6	LOS B	2.8	19.7	0.54	1.04	0.74	59.4
Approach		305	0	321	0.0	0.469	13.1	LOS B	2.8	19.7	0.54	1.04	0.74	59.5
West: Edward St														
10	L2	186	3	196	1.6	0.195	7.0	LOS A	0.3	2.4	0.07	0.39	0.07	67.5
11	T1	122	2	128	1.6	0.195	0.1	LOS A	0.3	2.4	0.07	0.39	0.07	72.5
12	R2	35	0	37	0.0	0.195	7.0	LOS A	0.3	2.4	0.07	0.39	0.07	67.6
Approach		343	5	361	1.5	0.195	4.6	NA	0.3	2.4	0.07	0.39	0.07	69.2
All Vehicles		803	7	845	0.9	0.469	7.7	NA	2.8	19.7	0.26	0.63	0.34	65.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Appendix 12

Edward St / Ellesmere Rd / Lincoln Tai Tapu Rd Operation – With Subdivision

MOVEMENT SUMMARY

Site: 101 [Edward St / Ellesmere Rd - 2020 AM Base + Plan Change (Site Folder: Ellesmere Edward)]

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Ellesmere Rd														
1	L2	23	2	24	8.7	0.569	12.1	LOS B	3.9	27.6	0.64	1.12	1.05	55.8
2	T1	328	0	345	0.0	0.569	15.7	LOS C	3.9	27.6	0.64	1.12	1.05	57.8
3	R2	3	0	3	0.0	0.569	14.1	LOS B	3.9	27.6	0.64	1.12	1.05	57.7
Approach		354	2	373	0.6	0.569	15.5	LOS C	3.9	27.6	0.64	1.12	1.05	57.7
East: Lincoln Tai Tapu Rd														
4	L2	2	0	2	0.0	0.083	8.3	LOS A	0.1	1.0	0.12	0.08	0.12	72.5
5	T1	124	7	131	5.6	0.083	0.2	LOS A	0.1	1.0	0.12	0.08	0.12	77.6
6	R2	15	0	16	0.0	0.083	8.0	LOS A	0.1	1.0	0.12	0.08	0.12	71.9
Approach		141	7	148	5.0	0.083	1.2	NA	0.1	1.0	0.12	0.08	0.12	76.9
North: Ellesmere Rd														
7	L2	2	0	2	0.0	0.595	12.6	LOS B	3.7	26.3	0.70	1.15	1.24	54.9
8	T1	110	2	116	1.8	0.595	15.0	LOS C	3.7	26.3	0.70	1.15	1.24	54.3
9	R2	157	3	165	1.9	0.595	21.8	LOS C	3.7	26.3	0.70	1.15	1.24	54.1
Approach		269	5	283	1.9	0.595	19.0	LOS C	3.7	26.3	0.70	1.15	1.24	54.2
West: Edward St														
10	L2	259	5	273	1.9	0.212	7.0	LOS A	0.2	1.3	0.04	0.46	0.04	66.6
11	T1	95	5	100	5.3	0.212	0.1	LOS A	0.2	1.3	0.04	0.46	0.04	71.6
12	R2	15	2	16	13.3	0.212	7.5	LOS A	0.2	1.3	0.04	0.46	0.04	62.2
Approach		369	12	388	3.3	0.212	5.3	NA	0.2	1.3	0.04	0.46	0.04	67.6
All Vehicles		1133	26	1193	2.3	0.595	11.2	NA	3.9	27.6	0.39	0.78	0.65	61.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Edward St / Ellesmere Rd - 2020 PM Base + Plan Change (Site Folder: Ellesmere Edward)]

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Ellesmere Rd														
1	L2	25	0	26	0.0	0.265	9.3	LOS A	1.1	7.6	0.43	1.00	0.44	61.4
2	T1	161	1	169	0.6	0.265	11.9	LOS B	1.1	7.6	0.43	1.00	0.44	60.9
3	R2	1	0	1	0.0	0.265	14.1	LOS B	1.1	7.6	0.43	1.00	0.44	61.0
Approach		187	1	197	0.5	0.265	11.6	LOS B	1.1	7.6	0.43	1.00	0.44	61.0
East: Lincoln Tai Tapu Rd														
4	L2	3	0	3	0.0	0.057	7.8	LOS A	0.1	0.4	0.07	0.06	0.07	73.3
5	T1	93	1	98	1.1	0.057	8.1	LOS A	0.1	0.4	0.07	0.06	0.07	78.4
6	R2	6	0	6	0.0	0.057	7.7	LOS A	0.1	0.4	0.07	0.06	0.07	72.6
Approach		102	1	107	1.0	0.057	8.8	NA	0.1	0.4	0.07	0.06	0.07	77.9
North: Ellesmere Rd														
7	L2	30	0	32	0.0	0.843	17.7	LOS C	12.3	85.9	0.78	1.38	2.14	52.5
8	T1	284	0	299	0.0	0.843	20.5	LOS C	12.3	85.9	0.78	1.38	2.14	52.3
9	R2	219	0	231	0.0	0.843	25.1	LOS D	12.3	85.9	0.78	1.38	2.14	52.1
Approach		533	0	561	0.0	0.843	22.2	LOS C	12.3	85.9	0.78	1.38	2.14	52.2
West: Edward St														
10	L2	186	3	196	1.6	0.195	7.0	LOS A	0.3	2.4	0.07	0.39	0.07	67.5
11	T1	122	2	128	1.6	0.195	8.1	LOS A	0.3	2.4	0.07	0.39	0.07	72.5
12	R2	35	0	37	0.0	0.195	7.0	LOS A	0.3	2.4	0.07	0.39	0.07	67.6
Approach		343	5	361	1.5	0.195	4.6	NA	0.3	2.4	0.07	0.39	0.07	69.2
All Vehicles		1165	7	1226	0.6	0.843	13.4	NA	12.3	85.9	0.45	0.91	1.07	59.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Appendix 13

Edward St / Ellesmere Rd / Lincoln Tai Tapu Rd Roundabout Operation – With Subdivision

MOVEMENT SUMMARY

Site: 101v [Edward St / Ellesmere Rd - 2020 AM Base + Plan Change - Conversion (Site Folder: Ellesmere Edward)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Ellesmere Rd														
1	L2	23	2	24	8.7	0.357	8.2	LOS A	2.4	17.2	0.60	0.66	0.60	60.9
2	T1	328	0	345	0.0	0.357	8.5	LOS A	2.4	17.2	0.60	0.66	0.60	64.8
3	R2	3	0	3	0.0	0.357	13.1	LOS B	2.4	17.2	0.60	0.66	0.60	64.4
Approach		354	2	373	0.6	0.357	8.5	LOS A	2.4	17.2	0.60	0.66	0.60	64.5
East: Lincoln Tai Tapu Rd														
4	L2	2	0	2	0.0	0.147	7.4	LOS A	0.9	6.5	0.52	0.62	0.52	63.3
5	T1	124	7	131	5.6	0.147	8.2	LOS A	0.9	6.5	0.52	0.62	0.52	63.3
6	R2	15	0	16	0.0	0.147	12.6	LOS B	0.9	6.5	0.52	0.62	0.52	64.5
Approach		141	7	148	5.0	0.147	8.6	LOS A	0.9	6.5	0.52	0.62	0.52	63.4
North: Ellesmere Rd														
7	L2	2	0	2	0.0	0.229	6.4	LOS A	1.7	12.2	0.41	0.60	0.41	62.4
8	T1	110	2	116	1.8	0.229	7.1	LOS A	1.7	12.2	0.41	0.60	0.41	63.4
9	R2	157	3	165	1.9	0.229	11.7	LOS B	1.7	12.2	0.41	0.60	0.41	62.9
Approach		269	5	283	1.9	0.229	9.8	LOS A	1.7	12.2	0.41	0.60	0.41	63.1
West: Edward St														
10	L2	259	5	273	1.9	0.408	8.5	LOS A	3.1	22.2	0.70	0.73	0.70	63.2
11	T1	95	5	100	5.3	0.408	9.2	LOS A	3.1	22.2	0.70	0.73	0.70	63.8
12	R2	15	2	16	13.3	0.408	14.1	LOS B	3.1	22.2	0.70	0.73	0.70	60.8
Approach		369	12	388	3.3	0.408	8.9	LOS A	3.1	22.2	0.70	0.73	0.70	63.2
All Vehicles		1133	26	1193	2.3	0.408	9.0	LOS A	3.1	22.2	0.58	0.66	0.58	63.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101v [Edward St / Ellesmere Rd - 2020 PM Base + Plan Change - Conversion (Site Folder: Ellesmere Edward)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Ellesmere Rd														
1	L2	25	0	26	0.0	0.194	7.6	LOS A	1.2	8.5	0.56	0.63	0.56	63.7
2	T1	161	1	169	0.6	0.194	8.3	LOS A	1.2	8.5	0.56	0.63	0.56	65.0
3	R2	1	0	1	0.0	0.194	12.8	LOS B	1.2	8.5	0.56	0.63	0.56	64.8
Approach		187	1	197	0.5	0.194	8.2	LOS A	1.2	8.5	0.56	0.63	0.56	64.9
East: Lincoln Tai Tapu Rd														
4	L2	3	0	3	0.0	0.134	9.2	LOS A	0.9	6.1	0.70	0.71	0.70	62.4
5	T1	93	1	98	1.1	0.134	9.9	LOS A	0.9	6.1	0.70	0.71	0.70	63.5
6	R2	6	0	6	0.0	0.134	14.4	LOS B	0.9	6.1	0.70	0.71	0.70	63.5
Approach		102	1	107	1.0	0.134	10.1	LOS B	0.9	6.1	0.70	0.71	0.70	63.5
North: Ellesmere Rd														
7	L2	30	0	32	0.0	0.458	7.0	LOS A	4.1	28.7	0.56	0.62	0.56	62.4
8	T1	284	0	299	0.0	0.458	7.7	LOS A	4.1	28.7	0.56	0.62	0.56	63.8
9	R2	219	0	231	0.0	0.458	12.3	LOS B	4.1	28.7	0.56	0.62	0.56	63.5
Approach		533	0	561	0.0	0.458	9.5	LOS A	4.1	28.7	0.56	0.62	0.56	63.6
West: Edward St														
10	L2	186	3	196	1.6	0.305	6.8	LOS A	2.2	15.7	0.48	0.59	0.48	64.0
11	T1	122	2	128	1.6	0.305	7.5	LOS A	2.2	15.7	0.48	0.59	0.48	65.6
12	R2	35	0	37	0.0	0.305	12.0	LOS B	2.2	15.7	0.48	0.59	0.48	65.6
Approach		343	5	361	1.5	0.305	7.6	LOS A	2.2	15.7	0.48	0.59	0.48	64.7
All Vehicles		1165	7	1226	0.6	0.458	8.8	LOS A	4.1	28.7	0.55	0.62	0.55	64.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akcelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Appendix D2

Addendum Transport Assessment

16 February 2021

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Selwyn District Council

Attention: Jocelyn Lewes

By email: Jocelyn.Lewes@selwyn.govt.nz

Dear Jocelyn,

PC200069: LINCOLN SOUTH TRANSPORT RESPONSE TO RFI

1. Further to your Request for Further Information (RFI), this letter provides a response to the transport related queries that fall within the remit of the Integrated Transport Assessment. This is considered to be points 53 to 65 of the RFI. This letter addresses these matters in the order they have been raised.

> *53. Council operates a Paramics Transport model for Lincoln which has been recently updated. The traffic assessment provided with the request does not appear to have utilised this model to consider the effects of the proposal on the existing Lincoln township and wider network. It is requested that the applicant liaise with Council to expand the model to incorporate this plan change area and this model is then used to inform the ITA for this request. Following this, Council will require any traffic modelling, results and analysis to be peer reviewed by Abley Consultants.*

2. Updated traffic modelling has been undertaken by Abley Consultants Ltd and is included as **Attachment 1** of this letter. This modelling has been undertaken for three scenarios, being:

   - Base Model: The original model prior to adding the Plan Change traffic;
   - With Development: Including the Plan Change traffic, but not the Lincoln Bypass Connection between Ellesmere Junction Road and Springs Road; and
   - With Western Arterial: Including the Plan Change traffic and the completed Lincoln Bypass.

3. In addition to the above, the following changes were made compared to the assumptions in the ITA (and that of the base model):

   - The Council's proposed intersection arrangement has been adopted at the Springs Road / Ellesmere Junction Road / Gerald Street intersection; and
   - The primary access into the Plan Change site from Springs Road has been modelled as traffic signals (rather than a roundabout).

Intersection Results

4. The operation of the key intersections is summarised in Table 4.3 and Table 4.4 of the Abley report. This indicates that the intersections are all predicted to operate satisfactorily with the inclusion of the Plan Change traffic and no intersection is predicted to operate worse than Level of Service D overall.

5. The operation of individual turning movements at the intersection is also set out in **Attachment 1**. This identifies that no movement is predicted to operate worse than Level of Service D. Overall, this is considered to indicate the network can satisfactorily accommodate the traffic predicted from the proposed Plan Change.

University Access Operation

6. The operation of the University access points has been included within the traffic model. This would not normally be reported on, as it relates to private property access rather than the public roading network and therefore is typically not provided with the same level of scrutiny. However, the following discusses the operation of these accesses given the data is available.

7. The northern entrance to the University from Springs Road (at Farm Road that is currently unformed, although assumed to be formed within the model) is predicted to have the right turn out operating at Level of Service F during the AM peak hour when the Plan Change traffic is added to the road network without the Lincoln Bypass. This improves to Level of Service E with the Western Arterial / Lincoln Bypass added. That said, this Level of Service is predicted to only affect two to five vehicles in the peak hour. This operation is considered to be satisfactory given the very low volume of traffic that is affected.

8. The right turn into the southern University access (at Engineering Drive) is predicted to operate at Level of Service F in the AM peak when the Plan Change traffic is added to the road network. This improves to Level of Service E within the inclusion of the Lincoln Bypass. We understand that this does not affect the operation of through traffic on Springs Road, as the queueing is contained within the flush median. Whilst not ideal, this is considered tolerable as there is no effect on the operation of Springs Road.

9. Furthermore, Lincoln University has additional options for access, most notably access to / from Ellesmere Junction Road. This would further alleviate potential issues or delays and would assist in optimising the traffic network.

Modelling Summary

10. It is considered that the traffic modelling undertaken indicates the traffic effects of the Plan Change will be acceptable on the surrounding road network.

> *54. Council abandoned the concept of the Lincoln Southern Bypass due to the practical difficulties with poor soil conditions, high water tables and natural flowing (and culturally sensitive) springs within the area, combined with the refusal of the Lincoln University to allow any extension of Weedons Road through to at least Verdeco Park. The high cost compared to low use was also a predominate factor in Councils decision at the time not to proceed with the bypass. Therefore, please provide an assessment of how dependent the proposal is on a roading/bypass connection between Ellesmere Junction Road/Weedons Road and Springs Road to cater for this development? The applicant is advised that as Council has*

formally rejected perusing such a connection, the full responsibility to provide it if required would be on the applicant.

11. The above traffic modelling included options with and without the Bypass. Whilst the modelling indicates the network will operate better with the Bypass than without, the operation without the Bypass is acceptable. As such, the Plan Change is not dependent on the Bypass.

> *55. As raised above, there are no vehicle transport connections provided from the Verdeco Park and Te Whāriki subdivisions to the north of the plan change area, and the applicant is requested to consider the suitability of the roading layout if these connections cannot be secured. It is critical that the sufficient roading, pedestrian and other similar linkages are made to the adjoining Lincoln Township network for integration and permeability, yet there are no proposals on how this will be achieved in detail for ODP requirements.*

12. This matter has been addressed by others.

> *56. Moirs Lane includes an important cycleway link for the Little River Rail Trail along it and beyond to River Road. How would this be catered for in an off road facility and road/intersection crossing points?*

13. The existing legal road width for Moirs Lane is approximately 20m. There is sufficient width for 2× 3.5m lanes plus 1.5m shoulder plus 3.0m shared path on the northern side and 3.0m wide berm / reserve on the southern. The shared path would then connect to the existing formed road crossing at Ellesmere Road.

14. The traffic volumes on Ellesmere Road are predicted to increase by between 127 and 165 vehicles per hour as a result of this Plan Change. The peak hour traffic volumes will in the order of 330 vehicles per hour. No specific cycle crossing (beyond the current formed crossing) is considered to be necessary on Ellesmere Road given these volumes.

> *57. The existing Springs/Collins Road intersection is not suited for substantial increases in use. What are the proposals for this being upgraded?*

15. The Springs Road / Collins Road intersection is not predicted to experience a notable increase in traffic as a result of this development. The Collins Road eastern approach is predicted to have an increase in traffic of between 20 and 23 vehicles per hour as a result of the Plan Change. As such, no alteration to the existing intersection form is considered necessary.

> *58. Please clarify what status and form Collins Road is proposed to have. Please also advise if it is proposed that sites will have individual access off Collins Road.*

16. Collins Road will be a Local Road and formed as such. Direct property access will be provided to this road.

> *59. As part of any localised network upgrade, along with Collins Rd being formed and sealed as would be expected, a bridge and new carriageway through to Ellesmere Road would also be an outcome required to cater for access to the southern development areas as opposed to just relying on one northern connection off Ellesmere Road. This is made more important, as it may eventuate with no other local roading connections north into the existing township roading network able to being made by the proposal, making this connection even more important to provide.*

17. The extension of Collins Road has not been assumed in the Abley traffic modelling, which indicates that the effects of the Plan Change on the surrounding road network are acceptable. Therefore, it is not proposed to upgrade Collins Road beyond the site frontage.

> *60. The ITA refers to no direct (lot) access to Springs Road. What is the rational for this approach? Direct access has been supported for the existing subdivisions to the north, thereby facilitating urban frontage upgrades and speed limit changes to integrate the area into an urban form setting. As such it is an outcome that is desired for the plan change area.*

18. The rational for no direct (lot) access to Springs Road is based on the Te Whariki Stage 4 approach where there is no direct (lot) access due to the overhead 33kV power lines. From a traffic perspective, direct (lot) access to Spring Road can be accommodated. Therefore, direct (lot) access to Springs Road is dependent on how the 33kV power lines are dealt with. Further options regarding undergrounding the cables or keeping them as-is with a 5m wide easement will be discussed with Orion and decided during the subdivision design stage prior to subdivision application. Therefore, the ODP has been updated accordingly not prohibiting direct (lot) access.

> *61. Please advise how management of the existing stock underpass, which is shown as a pedestrian link, will address CPTED principles.*

19. This is addressed in the RFI response document.

> *62. The applicant is requested to confirm that all the upgrades to existing roads (widening, sealing, intersections and urban frontage upgrades etc.) are at the developers cost in addition to all new roads and transport requirements related to the proposal. It is noted for example a more significant upgrade of the Gerald/Springs/Ellesmere Junction Road intersection is proposed in the ITA, yet this requires third party land from the likes of the Lincoln University and Ag Research that Council know will not be forthcoming. Please advise how the applicant will obtain all the necessary land and undertake the upgrades identified necessary different to the current plans in train.*

20. The Plan Change will cover the costs of the following works (in their entirety):

    a. Collins Road along the frontage of the Plan Change site;

    b. Springs Road along the frontage of the Plan Change site;

    c. The access intersections (and internal road network); and

    d. Moirs Lane (including associated segment of Rail Trail cycle route).

21. The Plan Change is proposed to include Development Contributions to assist Council in delivering the following upgrades:

    a. Ellesmere Junction Road / Springs Road / Gerald Street traffic signals (including any land acquisition);

    b. Ellesmere Road / Edward Street roundabout;

    c. Ellesmere Road upgrade north of Edward Street;

d. Ellesmere Road (given some of this will require upgrading as the residential land south of Edward Street gets developed and the road link through the Plan Change site serves a wider benefit).

22. With regards to land purchase to facilitate the intersection improvements, the modelling has identified that the Council's proposed intersections at Ellesmere Junction Road / Springs Road / Gerald Street and Ellesmere Road / Edward Street will be sufficient and no additional land is required. Similarly, the road corridor improvements are anticipated to occur within the existing legal road width, so no additional land is required.

> *63. Council is planning to fully upgrade Gerald St from east to west over the 10 years as part of an arterial road and town centre upgrade for Lincoln. How does this development impact on those plans and details – bypass or otherwise with the increased or redirected traffic generated by the proposed development? The upgrade was agreed on the basis a bypass was not what Council wanted in comparison.*

23. The Plan Change is predicted to increase traffic on Gerald Street by approximately 230 to 250 vehicles per hour (without the Bypass) and 240 to 270 vehicles per hour with the Bypass. This is not considered to materially affect the plans for the Gerald Street upgrade.

> *64. Council is planning to upgrade the Ellesmere Road arterial between Lincoln and the City with a coordinated widening and intersection safety upgrade programme. How does this development impact on those plans and details, considering the application identifies the upgrade of Ellesmere Rd south of Edward St (but needed to Collins Rd), but not north?*

24. Paragraph 83 of the ITA set out a threshold of 3,000 vehicles per day as the capacity of a 6.0m wide rural carriageway. Although this calculation was undertaken with regard to Ellesmere Road south of Edward Street, it is also applicable to Ellesmere Road north of Edward Street. The existing traffic volumes on Ellesmere Road north of Edward Street are in the order of 3,250 vehicles per day[1], indicating this road should already be upgraded.

25. Whilst the Plan Change will add traffic to Ellesmere Road (north of Edward Street), this will largely be dependent on the staging of the subdivision and the timing of the connection to Ellesmere Road. In addition, the timing of the upgrade is immediate and therefore is not affected by the Plan Change.

> *65. Through the development of Te Whāriki, Council has experienced having to deal with numerous road construction issues experienced by that developer due to poor soils, high water tables that have created settlements of both roads and footpaths. The proposed development area extends further south into allegedly worse areas than in Te Whāriki with increased the risk of these issues being exacerbated. Council does not want roading assets vested in it that then lead to a continuation of problems it then has to bear the cost on for perpetuity. How will this risk be addressed by the applicant and what long term protections will be there for Council?*

26. This is addressed in the RFI responses by Inovo. We would expect that new roads will be constructed appropriately and will be fit-for-purpose.

[1] From the Mobile Road website.

27. We trust this letter satisfactorily addresses the transport matters raised in the Council's RFI.

Yours sincerely,

Novo Group Limited

Nick Fuller

Senior Transport Engineer

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021-032-TL001D

Attachment 1: Abley Modelling Note

Transport + Location Intelligence

South Lincoln Private Plan Change Modelling

Prepared for:	Rolleston Industrial Developments Ltd
Job Number:	RIDL-J001
Revision:	Revised draft
Issue Date:	15 February 2021
Prepared by:	Chris Blackmore, Senior Transportation Planner
Reviewed by:	Evan Stranks, Senior Transportation Engineer

1. Development Overview

Ableyy were commissioned by Rolleston Industrial Developments Ltd (RIDL) to model a residential development, totalling around 2,000 households, in South Lincoln.

Modelling was carried out within the Lincoln s-Paramics microsimulation model. This model has been developed by Abley for Selwyn District Council (SDC), and permission has been granted by SDC to use the model for this work.

Diagrams of the proposed development area were provided by RIDL for inclusion in the Lincoln model, shown in **Figure 1.1**.

Trip generation from the residential development was provided by RIDL for use in the modelling, morning and evening peak generation for inbound and outbound trips is shown in **Table 1.1**. Other trip generation and distribution, including expanding the peak hour generation to a two-hour level and then distributing the generated volumes onto the network have been informed by similar residential developments within the existing Lincoln model.

Trip generation and distribution for the small 450sqm GFA commercial / retail development has been based on the existing commercial and retail activity within the model. No additional passby reductions have been made at this time.

The model runs a two-hour morning period from 07:00 to 09:00 and a two-hour evening period from 16:00 to 18:00. From these results are reported for a peak hour in the morning from 08:00 to 09:00 and in the evening from 17:00 to 18:00.

Paramics microsimulation is a stochastic modelling package, which means there is some inherent variability between modelling runs. To account for this the results presented are the averages of five model runs. Generally, outlier results are excluded from the analysis however this has not been required for any of the results reported here.

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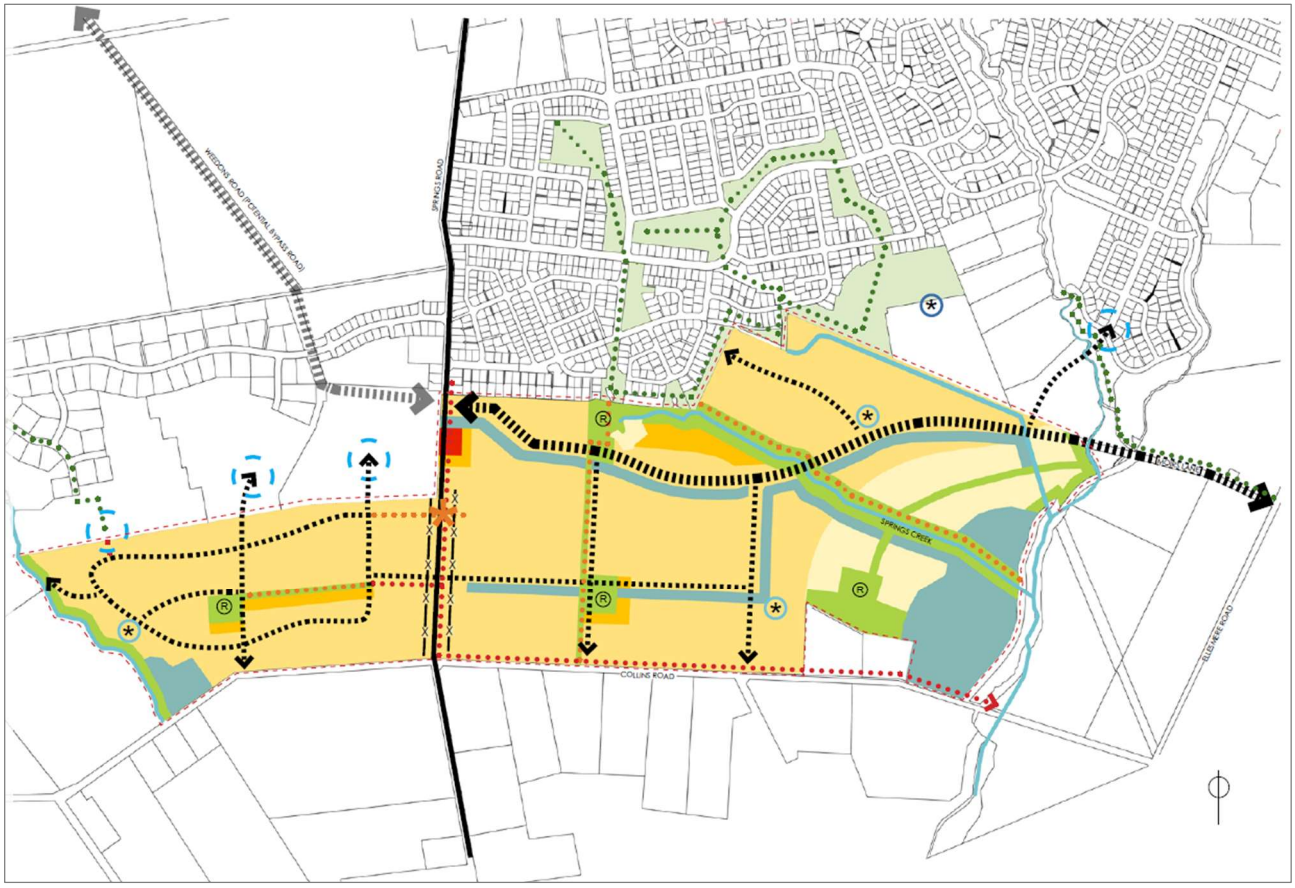

Figure 1.1 Overview of South Lincoln Development, supplied by RIDL

Table 1.1 Trip Generation per Developed Household, supplied by RIDL

Period	Arrivals	Departures	Total
Morning Peak Hour	0.175	0.525	0.7
Evening Peak Hour	0.441	0.259	0.7
Daily	3.5	3.5	7.0

2. Modelled Network

2.1 Base Network

The base network utilised for this analysis corresponds to the 2031 future model developed for SDC. This includes development of all current ODP areas, including Verdeco Park and residential development south of Southfield Dr, which are both currently under construction. This model also includes infrastructure included by SDC as part of the draft 2021-2024 Long Term Plan in line with other modelling conducted for SDC in Lincoln.

Small changes to corridor operation have been included to ensure vehicle behaviour along key links, especially Springs Rd, is realistic and responses to vehicle congestion are appropriate. These changes have been maintained across all model networks to maintain a fair comparison.

A significant improvement to routing choice has been made in the northern exits to and from Christchurch. Vehicles travelling along the Springs Rd and Shands Rd corridors are now able to react to delay on each corridor and can make a choice between the two routes. This is improved from previous modelling where the corridor choice was deterministic and fixed. As with the minor changes, this has been kept consistent across the model networks.

The base network used is shown in **Figure 2.1**.

Figure 2.1 Base Model Network

2.2 Inclusion of South Lincoln Development

Road connections were included in line with the plans shown in **Figure 1.1**. Infrastructure included at intersections was agreed with RIDL and represents intersection forms which would typically be associated with Connector class roads.

The network including development is shown in **Figure 2.2**.

Figure 2.2 Network including South Lincoln Development

2.3 Inclusion of Western Arterial

The alignment used for the Western Arterial connection is as per the supplied plans shown in **Figure 1.1**. It connects to the southern approach of the Ellesmere Jct / Weedons roundabout, forms connections with Farm Rd and Verdeco Blvd before ending at the western approach of the newly formed intersection with Springs Rd and the unnamed Development Connector road.

The network including both development and the Western Arterial is shown in **Figure 2.3**.

Figure 2.3 Network including South Lincoln Development and Western Arterial

3. Included Modelling Assumptions

The main assumptions relied on in this modelling are listed below. While these would have an impact on results if not included, they are in line with previous modelling undertaken for SDC and provide a consistent basis with which to analyse the impact of the South Lincoln Development.

- Lincoln University activity, especially the main car park, remains located in the south-eastern corner of the University land. While there has been discussion of the formation of a large carpark on the north-western corner of the Springs Rd / Ellesmere Jct intersection there is no publicly available information at this time.
- The University access at Springs Rd / Farm Rd is currently unformed. This is assumed to become a formed access in the future network to allow a second access to the University off Springs Rd. There is no formal announcement from the University to undertake this development, however this assumption is in line with other modelling conducted for SDC.
- The Western Arterial forms an intersection with Farm Rd, along with the formation of the Farm Rd / Springs Rd intersection this is assumed to provide a new western entrance and east-west route for vehicles to enter and exit the University.
- The trip distribution for the residential and commercial development is assumed to follow the same patterns as existing residential vehicle trips, i.e. the residents of the new development access the town centre, supermarket and other destinations at the same rate as existing residents. This also means that residents of the new development travel to and from Christchurch and Rolleston at the same rate as existing residents.

4. Outputs Provided

4.1 Volumes

The 'With Development' model shows that increases in traffic volumes in both peaks are primarily along Springs Rd and Ellesmere Jct / Gerald St, with other collectors also seeing some increase. When the Western Arterial connection is included around 300 vehicles divert from Springs Rd to the arterial corridor. Refer to **Table 4.1**, **Figure 4.1** and **Figure 4.2** for the morning peak results and **Table 4.2**, **Figure 4.3** and **Figure 4.4** for evening peak results.

Table 4.1 Two-Way Volumes on Key Corridors in the Morning Peak (08:00-09:00)

Measurement point	No Development	With Development	With Western Arterial
Springs N of Verdeco	410	1246	969
Springs S of Ellesmere Jct / Gerald	803	1482	1249
Springs N of Ellesmere Jct / Gerald	586	1060	927
Ellesmere Jct W of Uni	959	1125	770
Weedons N of Ellesmere Jct	600	749	918
Gerald W of Springs	1056	1287	1295
W Art N of Verdeco	0	0	383
Days N of Collins	0	30	3
Ellesmere S of Edward	203	328	330

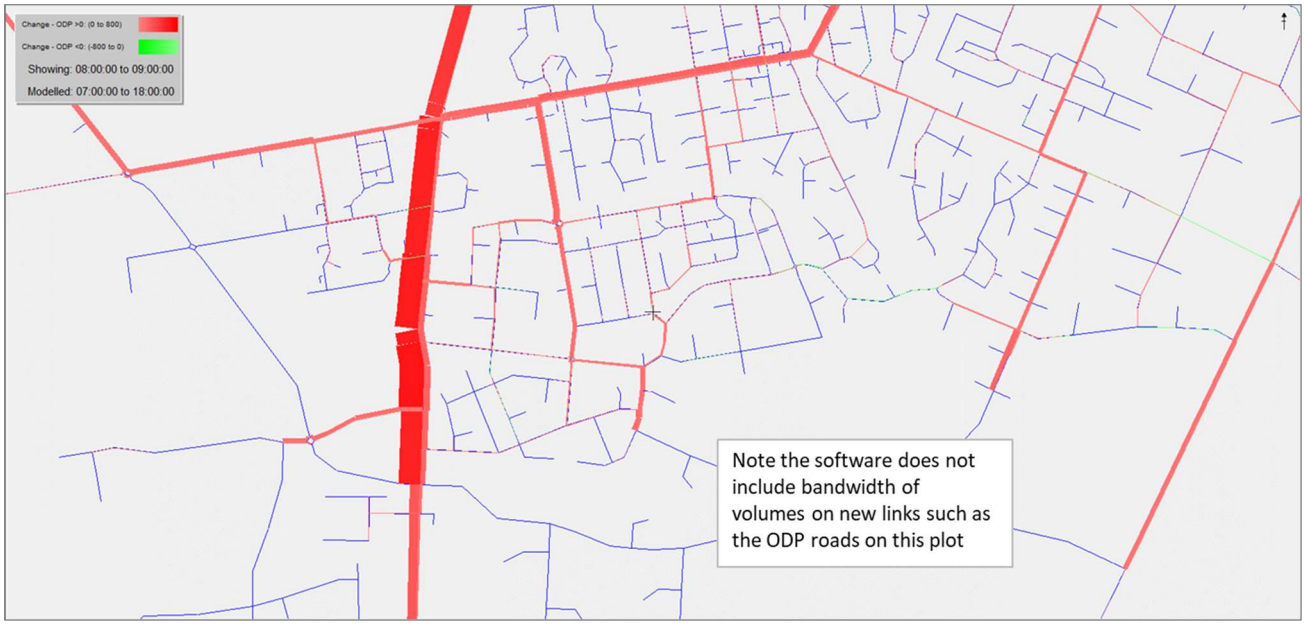

Figure 4.1 Change in Volume between No Development and Development in the Morning Peak (08:00-09:00)

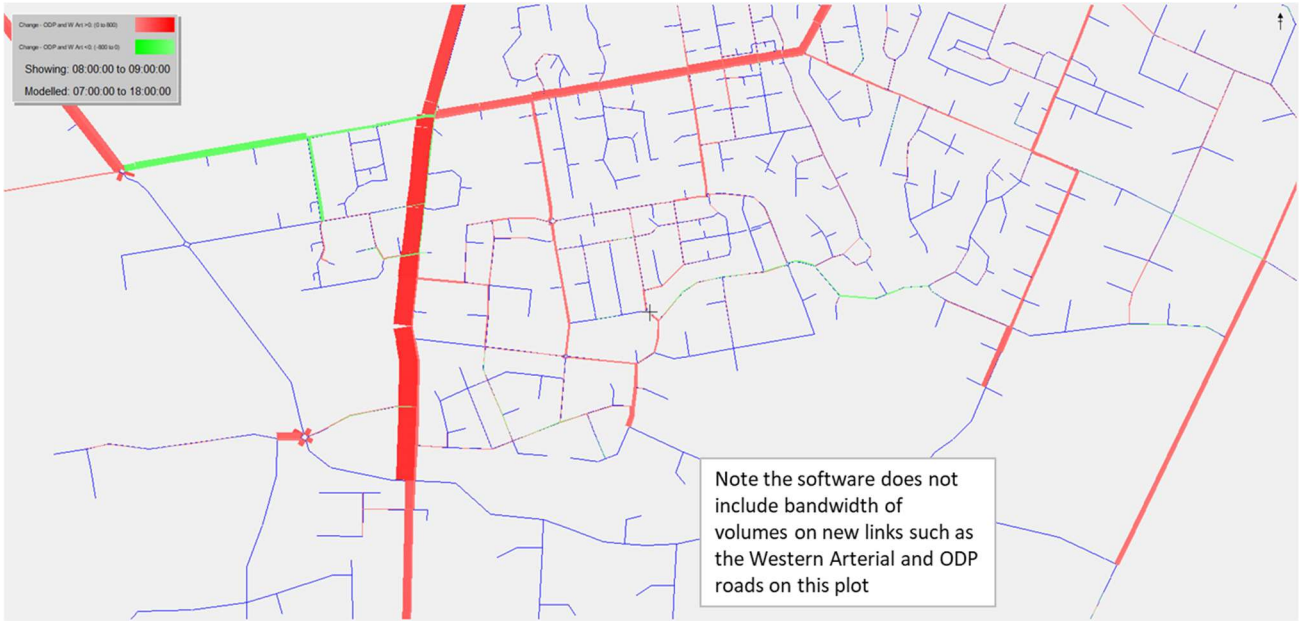

Figure 4.2 Change in Volume between No Development and Development with Western Arterial in the Morning Peak (08:00-09:00)

Table 4.2 Two-Way Volumes on Key Corridors in the Evening Peak (17:00-18:00)

Measurement point	No Development	With Development	With Western Arterial
Springs N of Verdeco	539	1055	836
Springs S of Ellesmere Jct / Gerald	903	1343	1134
Springs N of Ellesmere Jct / Gerald	510	625	563
Ellesmere Jct W of Uni	825	928	701
Weedons N of Ellesmere Jct	448	523	589
Gerald W of Springs	1125	1383	1395
W Art N of Verdeco	0	0	252
Days N of Collins	0	18	5
Ellesmere S of Edward	158	319	323

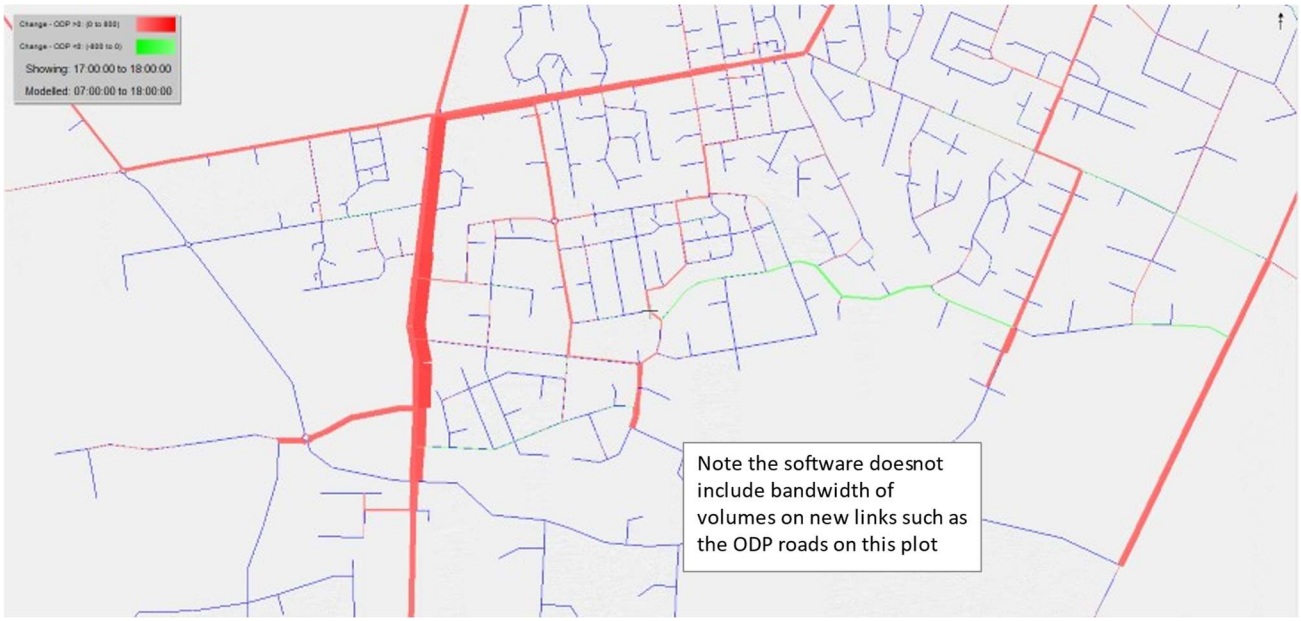

Figure 4.3 Change in Volume between No Development and Development in the Evening Peak (17:00-18:00)

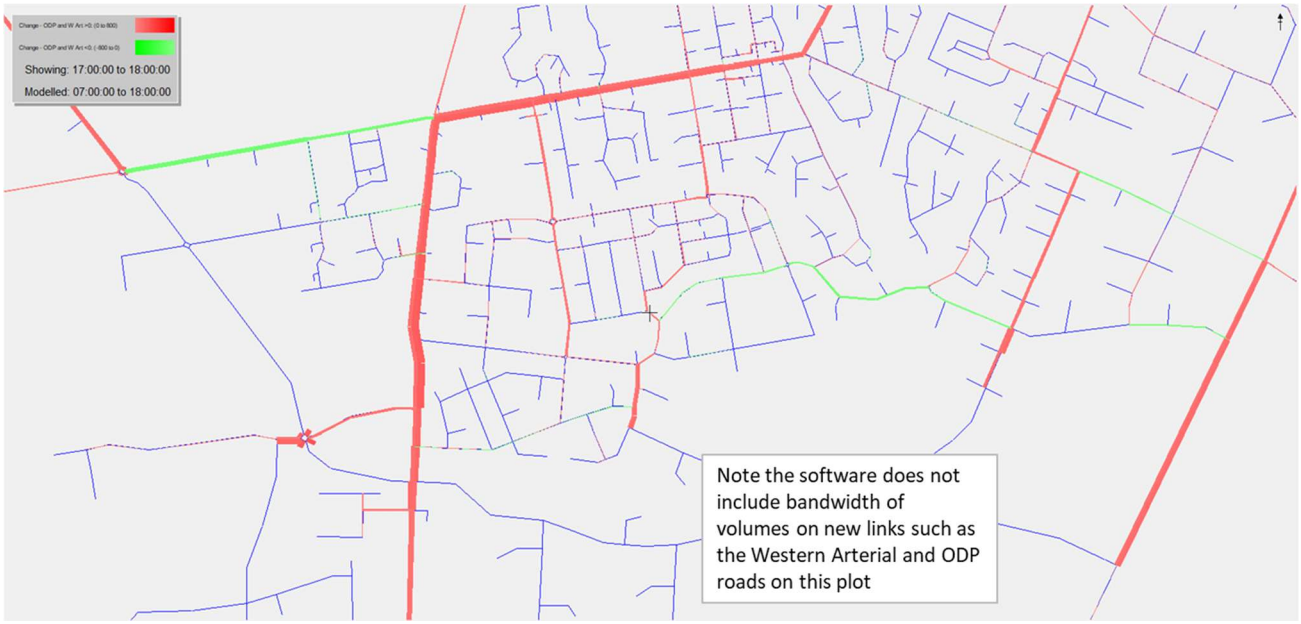

Figure 4.4 Change in Volume between No Development and Development with Western Arterial in the Evening Peak (17:00-18:00)

4.2 Intersection Performance

The delay and Level of Service (LOS) of key intersections have been evaluated and compared between the 'without development', 'with development', and 'with Western Arterial' models. LOS is calculated for roundabouts and signalised intersections on the basis of average weighted approach while for priority control intersections it is calculated as the worst approach averaged across movements. The performance of key intersections in the morning peak hour is demonstrated in **Table 4.3** and the evening peak hour in **Table 4.4**. Further breakdowns of the individual movements are attached as Appendix A.

Table 4.3 Intersection Performance at Key Intersections in the Morning Peak (08:00-09:00)

Intersection	No Development			With Development			With Western Arterial		
	Vol	Delay	LOS	Vol	Delay	LOS	Vol	Delay	LOS
Springs / Gerald / Ellesmere Jct Signals	1626	17	B	2373	34	C	2098	26	C
Gerald / James / Edward Signals	1298	12	B	1545	13	B	1546	13	B
Weedons / Ellesmere Jct RAB	957	5	A	1125	6	A	1313	8	A
Springs / Anaru Priority	474	2	A	1293	3	A	1027	2	A
Springs / Southfield Priority	496	5	A	1315	31	D	1042	16	C
Springs / Verdeco Priority	421	4	A	1275	23	C	983	14	B
Springs / West Arterial Signals	254	1	A	1046	17	B	1103	17	B
Springs / ODP Access South Priority	140	3	A	500	7	A	440	6	A
Springs / Collins Priority	141	3	A	160	3	A	139	4	A

Table 4.4 Intersection Performance at Key Intersections in the Evening Peak (17:00-18:00)

Intersection	No Development			With Development			With Western Arterial		
	Vol	Delay	LOS	Vol	Delay	LOS	Vol	Delay	LOS
Springs / Gerald / Ellesmere Jct Signals	1668	17	B	2116	21	C	1895	18	B
Gerald / James / Edward Signals	1375	11	B	1510	12	B	1528	12	B
Weedons / Ellesmere Jct RAB	827	4	A	928	4	A	1004	5	A
Springs / Anaru Priority	483	2	A	1021	2	A	789	2	A
Springs / Southfield Priority	567	4	A	1092	12	B	869	7	A
Springs / Verdeco Priority	552	4	A	1086	8	A	852	7	A
Springs / West Arterial Signals	571	2	A	1061	17	B	1144	16	B
Springs / ODP Access South Priority	195	3	A	434	5	A	417	5	A
Springs / Collins Priority	195	2	A	176	4	A	173	4	A

4.3 Accessway Performance

Accessway performance for the Lincoln University accesses onto Springs Rd have been collected for the northern (Farm Rd) and southern (main carpark) intersections. The LOS for priority control intersections it is calculated as the worst approach averaged across movements. The performance of the accesses in the morning peak hour is demonstrated in **Table 4.5** and the evening peak hour in **Table 4.6**. Further breakdowns of the individual movements are included within Appendix A.

Table 4.5 Access Performance in the Morning Peak (08:00-09:00)

Intersection	No Development			With Development			With Western Arterial		
	Vol	Delay	LOS	Vol	Delay	LOS	Vol	Delay	LOS
Springs Rd Uni Entrance North Priority	808	5	A	1488	29	D	1255	16	C
Springs Rd Uni Entrance South Priority	691	6	A	1389	27	D	1135	21	C

Table 4.6 Access Performance in the Evening Peak (17:00-18:00)

Intersection	No Development			With Development			With Western Arterial		
	Vol	Delay	LOS	Vol	Delay	LOS	Vol	Delay	LOS
Springs Rd Uni Entrance North Priority	906	10	B	1352	16	C	1141	13	B
Springs Rd Uni Entrance South Priority	728	4	A	1217	11	B	1009	7	A

Springs / Gerald / Ellesmere Jct Signals

Intersection Movement value is weighted delay for signals and roundabouts and worst movement for priority intersections

Approach values are only calculated for priority intersections

		No ODP												ODP, no West Art												ODP and West Art											
		AM Peak (0800-0900)						PM Peak (1700-1800)						AM Peak (0800-0900)						PM Peak (1700-1800)						AM Peak (0800-0900)						PM Peak (1700-1800)					
		Movement			Approach			Movement			Approach			Movement			Approach			Movement			Approach			Movement			Approach			Movement			Approach		
Approach	Movement	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS
Springs Rd North	Left	56	4	A				47	4	A				72	7	A				50	6	A				73	6	A				50	5	A			
Springs Rd North	Thru	206	14	B				59	13	B				217	33	C				128	12	B				178	31	C				81	12	B			
Springs Rd North	Right	12	16	B				9	24	C				13	53	D				9	23	C				15	38	D				10	20	B			
Gerald St East	Left	122	16	B				182	18	B				162	19	B				347	21	C				175	20	B				351	20	B			
Gerald St East	Thru	268	19	B				329	19	B				264	24	C				329	22	C				260	22	C				329	22	C			
Gerald St East	Right	80	32	C				46	25	C				138	28	C				45	27	C				107	24	C				46	29	C			
Springs Rd South	Left	24	13	B				94	16	B				102	34	C				112	21	C				16	25	C				46	16	B			
Springs Rd South	Thru	227	15	B				308	17	B				609	34	C				347	22	C				545	24	C				325	17	B			
Springs Rd South	Right	111	19	B				215	17	B				235	29	C				289	23	C				276	25	C				312	19	B			
Ellesmere Jct Rd West	Left	5	10	B				40	13	B				10	51	D				42	14	B				9	21	C				45	12	B			
Ellesmere Jct Rd West	Thru	396	17	B				299	16	B				393	47	D				306	17	B				380	34	C				286	16	B			
Ellesmere Jct Rd West	Right	119	23	C				42	20	C				157	53	D				111	33	C				63	33	C				12	24	C			
Intersection		1626	17	B				1668	17	B				2373	34	C				2116	21	C				2098	26	C				1895	18	B			

Gerald / James / Edward Signals

		No ODP												ODP, no West Art												ODP and West Art											
		AM Peak (0800-0900)						PM Peak (1700-1800)						AM Peak (0800-0900)						PM Peak (1700-1800)						AM Peak (0800-0900)						PM Peak (1700-1800)					
		Movement			Approach			Movement			Approach			Movement			Approach			Movement			Approach			Movement			Approach			Movement			Approach		
Approach	Movement	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS
James St North	Left	354	10	B				312	10	A				373	11	B				325	10	B				372	11	B				335	11	B			
James St North	Right	90	17	B				13	24	C				107	26	C				15	19	B				102	26	C				16	17	B			
Edward St East	Thru	261	10	B				299	8	A				405	9	A				356	8	A				420	9	A				351	8	A			
Edward St East	Right	285	7	A				467	8	A				301	7	A				463	8	A				299	7	A				461	8	A			
Gerald St West	Left	42	17	B				22	16	B				40	17	B				20	17	B				41	19	B				25	18	B			
Gerald St West	Thru	265	19	B				263	20	C				318	21	C				331	21	C				312	22	C				339	21	C			
Intersection		1298	12	B				1375	11	B				1545	13	B				1510	12	B				1546	13	B				1528	12	B			

Weedons / Ellesmere Jct RAB

		No ODP												ODP, no West Art												ODP and West Art											
		AM Peak (0800-0900)						PM Peak (1700-1800)						AM Peak (0800-0900)						PM Peak (1700-1800)						AM Peak (0800-0900)						PM Peak (1700-1800)					
		Movement			Approach			Movement			Approach			Movement			Approach			Movement			Approach			Movement			Approach			Movement			Approach		
Approach	Movement	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS
Weedons Rd North	Left	425	6	A				200	3	A				499	7	A				257	3	A				284	7	A				164	3	A			
Weedons Rd North	Thru	0	0	A				0	0	A				0	0	A				0	0	A				254	6	A				136	2	A			
Weedons Rd North	Right																																				
Ellesmere Jct Rd East	Left	0	0	A				0	0	A				0	0	A				0	0	A				0	0	A				1	0	A			
Ellesmere Jct Rd East	Thru	125	3	A				240	4	A				130	3	A				247	3	A				123	9	A				211	6	A			
Ellesmere Jct Rd East	Right	175	3	A				248	4	A				247	4	A				267	4	A				158	11	B				200	8	A			
West Arterial South	Left	0	0	A				0	0	A				0	0	A				0	0	A				20	3	A				42	5	A			
West Arterial South	Thru	0	0	A				0	0	A				0	0	A				0	0	A				220	3	A				90	5	A			
West Arterial South	Right	0	0	A				0	0	A				0	0	A				0	0	A				0	0	A				0	0	A			
Ellesmere Jct Rd West	Left																																				
Ellesmere Jct Rd West	Thru	232	6	A				139	6	A				248	8	A				158	6	A				206	12	B				125	7	A			
Ellesmere Jct Rd West	Right	0	0	A				0	0	A				0	0	A				0	0	A				49	12	B				34	6	A			
Intersection		957	5	A				827	4	A				1125	6	A				928	4	A				1313	8	A				1004	5	A			

Springs Rd Uni Entrance North Priority

		No ODP												ODP, no West Art												ODP and West Art											
		AM Peak (0800-0900)						PM Peak (1700-1800)						AM Peak (0800-0900)						PM Peak (1700-1800)						AM Peak (0800-0900)						PM Peak (1700-1800)					
		Movement			Approach			Movement			Approach			Movement			Approach			Movement			Approach			Movement			Approach			Movement			Approach		
Approach	Movement	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS
Springs Rd North	Thru	350	1	A	435	2	A	270	2	A	284	2	A	455	5	A	526	8	A	582	2	A	593	2	A	328	2	A	407	5	A	436	2	A	448	2	A
Springs Rd North	Right	85	6	A				15	8	A				71	27	D				11	10	A				78	18	C				11	8	A			
Springs Rd South	Left	6	2	A	353	1	A	2	1	A	485	2	A	10	3	A	940	4	A	3	2	A	630	2	A	8	2	A	826	1	A	2	3	A	566	2	A
Springs Rd South	Thru	347	1	A				483	2	A				931	4	A				627	2	A				818	1	A				564	2	A			
Uni Access West	Left	19	4	A	20	5	A	132	10	B	137	10	B	17	18	C	22	29	D	119	15	C	129	16	C	20	13	B	22	16	C	118	13	B	127	13	B
Uni Access West	Right	1	12	B				5	17	C				5	66	F				10	31	D				2	43	E				9	20	C			
Intersection		808	12	B	808	5	A	906	17	C	906	10	B	1488	66	F	1488	29	D	1352	31	D	1352	16	C	1255	43	E	1255	16	C	1141	20	C	1141	13	B

Springs Rd Uni Entrance South Priority

		No ODP												ODP, no West Art												ODP and West Art											
		AM Peak (0800-0900)						PM Peak (1700-1800)						AM Peak (0800-0900)						PM Peak (1700-1800)						AM Peak (0800-0900)						PM Peak (1700-1800)					
		Movement			Approach			Movement			Approach			Movement			Approach			Movement			Approach			Movement			Approach			Movement			Approach		
Approach	Movement	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS
Springs Rd North	Thru	133	1	A	354	6	A	249	1	A	277	1	A	290	4	A	463	27	D	565	2	A	593	2	A	169	1	A	331	21	C	423	2	A	447	2	A
Springs Rd North	Right	221	8	A				28	3	A				172	67	F				29	6	A				162	41	E				24	5	A			
Springs Rd South	Left	13	2	A	295	2	A	3	2	A	187	2	A	21	3	A	881	3	A	3	2	A	336	2	A	22	3	A	761	2	A	3	2	A	270	2	A
Springs Rd South	Thru	282	2	A				184	2	A				860	3	A				333	2	A				739	2	A				267	2	A			
Uni Access West	Left	38	4	A	42	5	A	242	4	A	264	4	A	35	15	C	45	17	C	232	10	B	287	11	B	38	11	B	43	12	B	245	7	A	292	7	A
Uni Access West	Right	4	11	B				22	6	A				10	23	C				55	15	C				5	19	C				47	12	B			
Intersection		691	11	B	691	6	A	728	6	A	728	4	A	1389	67	F	1389	27	D	1217	15	C	1217	11	B	1135	41	E	1135	21	C	1009	12	B	1009	7	A

Springs / Anaru Priority

		No ODP												ODP, no West Art												ODP and West Art											
		AM Peak (0800-0900)						PM Peak (1700-1800)						AM Peak (0800-0900)						PM Peak (1700-1800)						AM Peak (0800-0900)						PM Peak (1700-1800)					
		Movement			Approach			Movement			Approach			Movement			Approach			Movement			Approach			Movement			Approach			Movement			Approach		
Approach	Movement	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS
Springs Rd North	Left	6	2	A	137	2	A	9	1	A	276	2	A	5	2	A	301	2	A	15	3	A	628	2	A	4	0	A	175	2	A	13	1	A	478	2	A
Springs Rd North	Thru	131	2	A				267	2	A				296	2	A				613	2	A				171	2	A				465	2	A			
Anaru Rd East	Left	2	1	A	36	2	A	6	1	A	11	1	A	7	2	A	73	3	A	18	2	A	28	2	A	4	1	A	71	2	A	15	1	A	21	1	A
Anaru Rd East	Right	35	2	A				4	1	A				66	3	A				10	1	A				67	2	A				6	2	A			
Springs Rd South	Thru	295	2	A	301	2	A	187	2	A	197	2	A	881	2	A	919	2	A	337	2	A	365	2	A	762	2	A	781	2	A	270	2	A	290	2	A
Springs Rd South	Right	5	1	A				10	2	A				38	2	A				27	2	A				19	2	A				20	2	A			
Intersection		474	2	A	474	2	A	483	2	A	483	2	A	1293	3	A	1293	3	A	1021	3	A	1021	2	A	1027	2	A	1027	2	A	789	2	A	789	2	A

Springs / Southfield Priority

		No ODP												ODP, no West Art												ODP and West Art											
		AM Peak (0800-0900)						PM Peak (1700-1800)						AM Peak (0800-0900)						PM Peak (1700-1800)						AM Peak (0800-0900)						PM Peak (1700-1800)					
		Movement			Approach			Movement			Approach			Movement			Approach			Movement			Approach			Movement			Approach			Movement			Approach		
Approach	Movement	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS
Springs Rd North	Left	22	3	A	132	1	A	22	1	A	273	1	A	17	3	A	303	1	A	32	2	A	631	1	A	10	3	A	176	2	A	26	2	A	479	2	A
Springs Rd North	Thru	110	1	A				252	1	A				286	1	A				599	1	A				166	2	A				452	2	A			
Southfield Dr East	Left	25	2	A	89	5	A	43	3	A	51	4	A	25	23	C	75	31	D	40	11	B	48	12	B	27	7	A	91	16	C	47	7	A	53	7	A
Southfield Dr East	Right	64	6	A				8	5	A				51	34	D				8	18	C				64	19	C				7	8	A			
Springs Rd South	Thru	237	1	A	275	1	A	189	1	A	243	2	A	868	2	A	936	2	A	357	2	A	414	3	A	717	1	A	775	2	A	283	2	A	337	2	A
Springs Rd South	Right	38	3	A				54	4	A				68	5	A				57	8	A				58	3	A				54	5	A			
Intersection		496	6	A	496	5	A	567	5	A	567	4	A	1315	34	D	1315	31	D	1092	18	C	1092	12	B	1042	19	C	1042	16	C	869	8	A	869	7	A

Springs / Verdeco Priority

		No ODP												ODP, no West Art												ODP and West Art											
		AM Peak (0800-0900)						PM Peak (1700-1800)						AM Peak (0800-0900)						PM Peak (1700-1800)						AM Peak (0800-0900)						PM Peak (1700-1800)					
		Movement			Approach			Movement			Approach			Movement			Approach			Movement			Approach			Movement			Approach			Movement			Approach		
Approach	Movement	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS
Springs Rd North	Thru	80	2	A	135	2	A	244	2	A	296	2	A	225	2	A	309	4	A	476	2	A	642	3	A	152	3	A	193	4	A	391	3	A	503	3	A
Springs Rd North	Right	55	3	A				51	4	A				84	11	B				166	7	A				41	9	A				111	5	A			
Springs Rd South	Left	6	1	A	143	2	A	6	1	A	209	2	A	13	1	A	732	2	A	17	1	A	359	2	A	5	1	A	631	2	A	7	1	A	296	2	A
Springs Rd South	Thru	138	2	A				203	2	A				719	2	A				342	2	A				625	2	A				289	2	A			
Verdeco Dr West	Left	137	4	A	143	4	A	40	4	A	47	4	A	216	23	C	233	23	C	73	6	A	85	8	A	150	14	B	160	14	B	47	6	A	53	7	A
Verdeco Dr West	Right	6	4	A				7	4	A				18	24	C				12	18	C				10	12	B				6	12	B			
Intersection		421	4	A	421	4	A	552	4	A	552	4	A	1275	24	C	1275	23	C	1086	18	C	1086	8	A	983	14	B	983	14	B	852	12	B	852	7	A

Springs / West Arterial Signals

		No ODP												ODP, no West Art												ODP and West Art											
		AM Peak (0800-0900)						PM Peak (1700-1800)						AM Peak (0800-0900)						PM Peak (1700-1800)						AM Peak (0800-0900)						PM Peak (1700-1800)					
		Movement			Approach			Movement			Approach			Movement			Approach			Movement			Approach			Movement			Approach			Movement			Approach		
Approach	Movement	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS
Springs Rd North	Left	0	0	A				0	0	A				99	10	B				172	18	B				46	14	B				112	15	B			
Springs Rd North	Thru	100	1	A				314	2	A				154	13	B				360	21	C				106	14	B				303	17	B			
Springs Rd North	Right	0	0	A				0	0	A				0	0	A				0	0	A				24	21	C				34	17	B			
ODP Road East	Left	0	0	A				0	0	A				26	13	B				61	15	B				23	14	B				58	14	B			
ODP Road East	Thru	0	0	A				0	0	A				0	0	A				0	0	A				102	11	B				43	17	B			
ODP Road East	Right	0	0	A				0	0	A				362	19	B				88	17	B				298	17	B				65	19	B			
Springs Rd South	Left	0	0	A				0	0	A				0	0	A				0	0	A				36	22	C				47	11	B			
Springs Rd South	Thru	154	1	A				256	2	A				381	18	B				316	12	B				305	23	C				265	12	B			
Springs Rd South	Right	0	0	A				0	0	A				24	19	B				64	22	C				22	23	C				69	18	B			
West Arterial West	Left	0	0	A				0	0	A				0	0	A				0	0	A				36	9	A				18	17	B			
West Arterial West	Thru	0	0	A				0	0	A				0	0	A				0	0	A				68	15	B				77	18	B			
West Arterial West	Right	0	0	A				0	0	A				0	0	A				0	0	A				37	13	B				53	19	B			
Intersection		254	1	A				571	2	A				1046	17	B				1061	17	B				1103	17	B				1144	16	B			

Springs / ODP Access South Priority

		No ODP												ODP, no West Art												ODP and West Art											
		AM Peak (0800-0900)						PM Peak (1700-1800)						AM Peak (0800-0900)						PM Peak (1700-1800)						AM Peak (0800-0900)						PM Peak (1700-1800)					
		Movement			Approach			Movement			Approach			Movement			Approach			Movement			Approach			Movement			Approach			Movement			Approach		
Approach	Movement	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS
Springs Rd North	Left	0	0	A	31	3	A	0	0	A	140	3	A	9	2	A	87	4	A	25	2	A	223	3	A	10	2	A	77	3	A	23	2	A	213	3	A
Springs Rd North	Thru	31	3	A				140	3	A				23	3	A				87	3	A				23	3	A				91	3	A			
Springs Rd North	Right	0	0	A				0	0	A				55	4	A				111	4	A				45	4	A				100	4	A			
ODP Road East	Left	0	0	A	0	0	A	0	0	A	0	0	A	5	3	A	75	7	A	16	3	A	67	5	A	4	3	A	76	6	A	13	4	A	63	5	A
ODP Road East	Thru	0	0	A				0	0	A				17	3	A				33	4	A				16	3	A				29	4	A			
ODP Road East	Right	0	0	A				0	0	A				53	8	A				18	6	A				57	7	A				21	7	A			
Springs Rd South	Left	0	0	A	109	1	A	0	0	A	55	1	A	0	0	A	114	2	A	0	0	A	50	2	A	0	0	A	98	2	A	0	0	A	51	2	A
Springs Rd South	Thru	109	1	A				55	1	A				100	2	A				42	2	A				88	2	A				43	2	A			
Springs Rd South	Right	0	0	A				0	0	A				14	1	A				8	2	A				10	1	A				8	2	A			
ODP Road West	Left	0	0	A	0	0	A	0	0	A	0	0	A	199	4	A	224	4	A	73	3	A	93	3	A	163	3	A	188	3	A	72	2	A	91	3	A
ODP Road West	Thru	0	0	A				0	0	A				25	4	A				21	4	A				24	4	A				19	5	A			
ODP Road West	Right	0	0	A				0	0	A				1	0	A				0	0	A				1	0	A				0	0	A			
Intersection		140	1	A	140	3	A	195	2	A	195	3	A	500	4	A	500	7	A	434	3	A	434	5	A	440	3	A	440	6	A	417	3	A	417	5	A

Springs / Collins Priority

		No ODP												ODP, no West Art												ODP and West Art											
		AM Peak (0800-0900)						PM Peak (1700-1800)						AM Peak (0800-0900)						PM Peak (1700-1800)						AM Peak (0800-0900)						PM Peak (1700-1800)					
		Movement			Approach			Movement			Approach			Movement			Approach			Movement			Approach			Movement			Approach			Movement			Approach		
Approach	Movement	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS	Flow	Average Delay	LOS
Springs Rd North	Left	0	0	A	31	2	A	0	0	A	140	2	A	1	0	A	29	2	A	0	0	A	104	2	A	1	0	A	26	2	A	0	0	A	103	2	A
Springs Rd North	Thru	0	0	A				0	0	A				0	0	A				0	0	A				0	0	A				0	0	A			
Springs Rd North	Right	31	2	A				140	2	A				28	2	A				104	2	A				25	2	A				103	2	A			
Collins Rd East	Left	0	0	A	0	0	A	0	0	A	0	0	A	0	0	A	12	3	A	0	0	A	16	4	A	0	0	A	10	4	A	0	0	A	14	4	A
Collins Rd East	Thru	0	0	A				0	0	A				6	3	A				14	3	A				4	3	A				12	4	A			
Collins Rd East	Right	0	0	A				0	0	A				6	4	A				2	7	A				5	4	A				2	5	A			
Springs Rd South	Left	0	0	A	0	0	A	0	0	A	0	0	A	0	0	A	0	0	A	0	0	A	0	0	A	0	0	A	0	0	A	0	0	A	0	0	A
Springs Rd South	Thru	0	0	A				0	0	A				0	0	A				0	0	A				0	0	A				0	0	A			
Springs Rd South	Right	0	0	A				0	0	A				0	0	A				0	0	A				0	0	A				0	0	A			
Collins Rd West	Left	110	3	A	110	3	A	55	2	A	55	2	A	108	2	A	118	2	A	50	2	A	56	2	A	93	2	A	103	2	A	49	3	A	55	3	A
Collins Rd West	Thru	0	0	A				0	0	A				10	2	A				7	3	A				10	2	A				6	4	A			
Collins Rd West	Right	0	0	A				0	0	A				0	0	A				0	0	A				0	0	A				0	0	A			
Intersection		141	3	A	141	3	A	195	2	A	195	2	A	160	2	A	160	3	A	176	2	A	176	4	A	139	2	A	139	4	A	173	3	A	173	4	A