

Appendix S

Northern Section Multi-Criteria Analysis



Appendix A - MCA of Preliminary Options

Section 1, South eastern end of Grassmere Options Assessment – See TRIM 14/1374239

Section 1 TRIM 14/1374239	Safety (minimum requirement)	Coherence & Connectivity	Directness (distance and time)	Comfort	Attractiveness & Social Safety	Risks to Delivery
<p>Option A1 Greenway at south eastern end of Grassmere</p>	<p>☐ Traffic volumes are at the recommended threshold for a greenway. In its current form with very low density development and kerb and channel on one side only is not conducive to low speed environment. Could create Cul-de-Sac at end of Grassmere Street to reduce volumes and incorporate traffic calming to reduce speeds. Daily traffic volumes of cyclists and motor vehicles similar.</p>	<p>✓ Different facility type to further north on route and off-road link through reserve. Due to no side roads on Grassmere St this is unlikely to create any wayfinding confusion. Markings and signage could be used to assist with wayfinding. Other Neighbourhood Greenways are provided along the Papanui Parallel Route.</p>	<p>✓✓ Cyclists must join traffic at end of shared path through reserve, if the road is turned into a cul-de-sac it is unlikely that this would create delay. Grassmere has priority along entire length, once on route cyclists will not be delayed.</p>	<p>X Would require Grassmere Street to be closed off at this end to reduce traffic volumes and speeds. May not achieve desired low speeds to the rural nature of the surrounding land feeling more open. Greenway slightly less recognisable than separated facility however this can be overcome by wayfinding signage etc.</p>	<p>✓✓ Use of entire carriageway allows more interest elements to be added. Lighting currently provided on one side only - may need upgrade.</p>	<p>4 Need to close off Grassmere street as a cul-de-sac to ensure speeds and volumes are suitable for sharing with cyclists. Does not require land purchase</p>
<p>Option A2 Shared Path at South Eastern End of Grassmere</p>	<p>☐ Very few accessways are located along this section of Grassmere Street. Fences generally tend to be low and/or offer good sightlines on northern side.</p>	<p>✓✓ Would allow a continuous facility type from shared path through reserve however needs to cross currently unsealed section of Grassmere St at southernmost end, due to low traffic volumes on this section of road this is not considered a particularly complicated manoeuvre. Facility easy to follow</p>	<p>✓ Matches desire lines relatively well however needs to cross currently unsealed section of Grassmere St at southernmost end. Essentially no delays on route. Would need to manoeuvre around pedestrians however path is proposed to be wide and pedestrian numbers expected to be relatively low.</p>	<p>✓✓ Flat gradient, consistent standard of protection to shared path through reserve. Speeds adjacent to path will need to be managed.</p>	<p>✓✓ Provision of shared path has added advantage of providing for pedestrians on both sides of road. Lighting provided on one side only - may need upgrade. Some provision for additional landscaping can be incorporated.</p>	<p>7 Land purchase required. Additional no stopping required, however parking demand in this area is very low.</p>

Section 1, North western end of Grassmere Options Assessment – See TRIM 14/1374239

Section 1 TRIM 14/1374239		Safety (minimum requirement)	Coherence & Connectivity	Directness (distance and time)	Comfort	Attractiveness & Social Safety	Risks to Delivery					
Option B1 Greenway at Northern End of Grassmere	☐	More built up environment can be designed to be conducive to lower speeds, would need design features to lower speeds. Traffic volumes are at the recommended threshold for a neighbourhood greenway. However recommended changes at Main North/Grassmere intersection would reduce traffic volumes. Current lane widths would need to be altered to allow cyclists and vehicles to safely share lanes. Requires cyclists to enter/leave traffic at each end, creating two conflict points however Grassmere St is a relatively low volume road. Daily traffic volumes of cyclists and motor vehicles similar.	✓	Different facility type to further north on route and off-road link through reserve. Due to no side roads on Grassmere St this is unlikely to create any wayfinding confusion. Markings and signage could be used to assist with wayfinding. Other Neighbourhood Greenways are provided along the Papanui Parallel Route.	✓✓	Requires cyclists to enter/leave traffic at each end, creating a small delay. Cyclists would be given right of way over vehicles. Grassmere St has priority along entire length so no additional delay would be incurred once cyclists have entered the greenway.	☐	Flat gradient greenway slightly less recognisable than separated facility however this can be overcome by wayfinding signage etc. Traffic volumes could be at the limit of what is acceptable for a greenway if change to Grassmere/Main North intersection is not successful. Traffic speeds can be managed through design	✓✓	Would provide an attractive local street an allow incorporation of interest components and more landscaping. Allows all street trees to be retained.	5	Parking removal needed. Would need to shift relatively new existing kerb on one side at least.
Option B2 Bi-Directional Facility at Northern End of Grassmere	☐	2-way separated paths can have high risks associated due to drivers not being accustomed to needing to look in the contra flow direction for cyclists. However 1b does not cross any intersections, is only a short distance and only crosses residential driveways (relatively low volume and familiar users). It is expected that any safety risks can be managed.	✓✓	Direct and would be consistent with facility on Main North/Sawyers arms and through reserve to the south. Does not cross any intersections or require merging with traffic therefore no complicated manoeuvres. Very obvious and easy to follow.	✓✓	Allows cyclists to continue on from shared path directly without giving way to traffic. Cyclists have priority over all driveways therefore no delays. No detour, same side of Grassmere St to shared path and Main North Rd facility.	☐	Flat gradient, easily recognisable as an MCR. Crosses several driveways which would need to be managed carefully	✓	Relatively straight route does not reduce perception of distance. Could be less attractive option for a local street environment dependant on appearance of separators. Allows majority of street trees to be retained.	5	Removal of parking needed. Resulting traffic lanes could be very narrow.

Section 2 Grassmere/Main North/ Sawyers Arms – See TRIM 14/1516784

	Safety (minimum requirement)	Coherence & Connectivity	Directness (distance and time)	Comfort	Attractiveness & Social Safety	Risks to Delivery
Option 1 - bi-directional SBF on east side of Main North Rd	<p>□</p> <p>Easy transition from Grassmere St facility, no additional crossing points required compared to existing situation. Passes multiple driveways along Main North Rd, including some commercial (of particular concern for contraflow cyclists). Lack of physical separation for users wanting to access Northlands by Main North Rd entrance, unless they ride on the footpath, which causes conflict with pedestrians.</p>	<p>✓</p> <p>Logical route alignment. Minor concern that some users heading from Grassmere to Sawyers Arms may continue to the northern crossing at Sawyers Arms, which is for cyclists intending to continue north on Main North. Lack of connectivity with Northlands Main North Rd access.</p>	<p>✓</p> <p>Users wishing to access Northlands with separated facilities are limited to the Sisson Drive entrance. Will involve some delay to cyclists waiting to cross Main North Road at Sawyers Arms intersection.</p>	<p>✓✓</p> <p>Surface, widths etc designed to CCC standards. Few shared areas with pedestrians and good degree of separation from motor vehicles.</p>	<p>✓</p> <p>Attractiveness limited by the busy traffic environment on Main North Road - mitigated through design of an attractive facility. Good natural surveillance.</p>	<p>Land purchase required in two locations. Significant parking removal along Main North Rd.</p>
Option 2 - bi-directional SBF on west side of Main North Rd with midblock crossing at Grassmere	<p>✓✓</p> <p>Midblock crossing for cyclists and pedestrians - less potential for conflict with vehicles (secondary "see through" concern that motorists may confuse the midblock signals with those of adjacent intersection - to be mitigated through signal design). Avoids driveways on east side of Main North Rd. Elimination of conflicting right turn from Grassmere. Provision for users travelling in all directions.</p>	<p>✓✓</p> <p>Logical route alignment. The midblock crossing design is coherent, to avoid possibility that cyclists turn right onto the Main North footpath rather than cross at the crossing.</p>	<p>✓✓</p> <p>Most direct way of accessing Northlands, with two options available (Main North and Sisson Drive entrances). Midblock crossing will be double-cycled during interpeak periods - least delay to MCR users.</p>	<p>✓</p> <p>Surface, widths etc designed to CCC standards. Some areas shared with pedestrians which could cause confusion or conflict and thus decrease comfort. Good degree of separation from motor vehicles.</p>	<p>✓</p> <p>Attractiveness limited by the busy traffic environment on Main North Road - mitigated through design of an attractive facility. Good natural surveillance.</p>	<p>Land purchase required in one location. Significant parking removal along Main North Rd. Restriction of Grassmere Street to left-out / right-in only may be opposed by some Grassmere Street residents.</p>

<p>Option 3 - bi-directional SBF with route diversion via Shearer Ave</p>	<p>✓</p>	<p>Diagonal crossing uncommon, may feel unsafe to some users. Some concern for users wanting to access Northlands by Main North Rd entrance. Avoids driveways on east side of Main North Rd.</p>	<p>☐</p>	<p>Diagonal crossing is uncommon and may not be understood by all new users.</p>	<p>☐</p>	<p>Least direct option, involves increased travel distance over initial route alignment. Users wishing to access Northlands with separated facilities are limited to the Sisson Drive entrance. Will involve some delay to cyclists waiting to cross Main North Road at Sawyers Arms intersection.</p>	<p>✓✓</p>	<p>Surface, widths etc designed to CCC standards. Few shared areas with pedestrians and good degree of separation from motor vehicles.</p>	<p>✓</p>	<p>Attractiveness limited by the busy traffic environment on Main North Road - mitigated through design of an attractive facility. Good natural surveillance.</p>	<p>Land purchase required in two locations. Significant parking removal along Main North Rd.</p>
<p>Option 4 - underpass connecting bi-directional facilities</p>	<p>✓✓</p>	<p>Avoids all conflict points. Some concern for personal security - to be addressed through design.</p>	<p>✓</p>	<p>High level of coherence for cyclists, but may be misunderstood by pedestrians. Lack of connectivity with Northlands Main North Rd access.</p>	<p>✓</p>	<p>Shortest travel distance and no delay for users traveling along route. Users wishing to access Northlands with separated facilities are limited to the Sisson Drive entrance.</p>	<p>✓</p>	<p>Maximum possible separation from motor vehicles. Some potential decrease in comfort due to being enclosed, without forward visibility to exit for the entire length.</p>	<p>☐</p>	<p>Attractiveness to be addressed through careful aesthetic design. Limited natural surveillance, to be addressed through provision of CCTV, skylight etc.</p>	<p>Land purchase required in two locations. Some parking removal required along Main North Road. Alignment has not been considered with respect to underground service locations. Significant disruptions to operations and traffic management considerations for construction.</p>
<p>Option 5 - bi-directional SBF from Shearer Ave on north side of Sawyers Arms between Main North and Sisson</p>	<p>✓</p>	<p>Easy transition from Shearer Ave St facility, no additional crossing points required compared to existing situation. Avoids multiple driveways along Main North Rd. Some concern for users wanting to access Northlands by Main North Rd entrance.</p>	<p>☐</p>	<p>Lack of connectivity with Northlands Main North Rd access. Concern that users may continue along the footpath on the east of Main North Road to attempt to access Northlands.</p>	<p>☐</p>	<p>Least direct option, involves increased travel distance over initial route alignment. Users wishing to access Northlands with separated facilities are limited to the Sisson Drive entrance. Will involve some delay to cyclists waiting to cross Main North Road at Sawyers Arms intersection.</p>	<p>✓✓</p>	<p>Surface, widths etc designed to CCC standards. Few shared areas with pedestrians and good degree of separation from motor vehicles.</p>	<p>✓</p>	<p>Attractiveness limited by the busy traffic environment on Main North Road - mitigated through design of an attractive facility. Good natural surveillance.</p>	<p>Land purchase required in two locations.</p>

Section 2 Sawyers Arms Road – See TRIM 14/1516784

	Safety (minimum requirement)	Coherence & Connectivity	Directness (distance and time)	Comfort	Attractiveness & Social Safety	Risks to Delivery
Option A – bi-directional facility, south side along entire route	<p>Rated among the safest options through conflict modelling but still has some inherent safety concerns (that have been mitigated but not completely eliminated through design): Crosses heavy vehicle accesses on south side. Multiple residential driveways, especially of concern for cyclists in contra-flow direction.</p>	<p>Related to choice of intersection layout at Main North Road - most appropriate to have route on south side for connectivity with Northlands Mall.</p>	<p>Related to choice of intersection layout at Main North Road - most direct geometrically to have route on south side for access to Northlands Mall. Some delay to cyclists on Sawyers Arms at Sisson Dr intersection. Permeability of separators to allow access to / from SBF.</p>	<p>Surface, widths etc designed to CCC standards. Few shared areas with pedestrians and good degree of separation from motor vehicles. Some discomfort crossing heavy vehicle accesses.</p>	<p>Reasonably attractive route, with good separation from motor traffic and good widths in SBF. Runs adjacent to Papanui Domain. Good level of natural surveillance.</p>	<p>Will involve some opposition due to substantial parking removal.</p>
Option B – uni-directional facilities on both sides along entire route	<p>Rated the least safe of the options through conflict modelling but not inherently unsafe to the point that it is not a viable option. Crosses multiple residential driveways, especially of concern for cyclists in contra-flow direction and at head of T at Sissons Dr intersection. Uncontrolled crossings at side streets (Nyoli in particular of concern due to its high volumes).</p>	<p>Related to choice of intersection layout at Main North Road - route on north side limits connectivity with Northlands Mall.</p>	<p>Related to choice of intersection layout at Main North Road - less direct geometrically to have route on north side in terms of access to Northlands Mall. No delay to cyclists on Sawyers Arms at Sisson Dr intersection. Permeability of separators to allow access to / from SBF.</p>	<p>Surface, widths etc designed to CCC standards. Few shared areas with pedestrians. May be some discomfort associated with uncontrolled crossing at Nyoli St.</p>	<p>Reasonably attractive route, with good separation from motor traffic and good widths in SBF. Good level of natural surveillance.</p>	<p>Will involve some opposition due to substantial parking removal.</p>
Option C – bi-directional facility, north side between Main North and Sisson; then bi-directional facility, south side between Sisson and railway crossing	<p>Rated among the safest options through conflict modelling but still has some inherent safety concerns (that have been mitigated but not completely eliminated through design): Multiple residential driveways, and minor side street - especially of concern for cyclists in contra-flow direction.</p>	<p>Related to choice of intersection layout at Main North Road - route on north side limits connectivity with Northlands Mall.</p>	<p>Related to choice of intersection layout at Main North Road - less direct geometrically to have route on north side in terms of access to Northlands Mall. Some delay to cyclists on Sawyers Arms at Sisson Dr intersection. Permeability of separators to allow access to / from SBF.</p>	<p>Surface, widths etc designed to CCC standards. Few shared areas with pedestrians. May be some discomfort associated with signalised diagonal crossing at Sisson Dr.</p>	<p>Reasonably attractive route, with good separation from motor traffic and good widths in SBF. Runs adjacent to Papanui Domain. Good level of natural surveillance.</p>	<p>Will involve some opposition due to substantial parking removal.</p>

Section 2 Northern Line Crossing – See TRIM 14/1516784

	Safety (minimum requirement)		Coherence & Connectivity		Directness (distance and time)		Comfort		Attractiveness & Social Safety		Risks to Delivery	
Option 1 – island refuge with kerb extensions	✓	Uncontrolled crossing, therefore some chance that some users may attempt to cross unsafely. In general, sufficient gaps in traffic and good design to enable safe crossing opportunities.	✓✓	Provides for users travelling in all directions on / between Papanui Parallel and Northern Line MCRs.	✓	LOS A according to crossing evaluation.	✓✓	Recognisable, route alignment improved on current crossing provision.	✓	Attractive design		
Option 2 – signalised crossing	x	Likely to cause undue delay which results in unsafe crossing behaviour and development of bad habits among frequent users.	✓✓	Provides for users travelling in all directions on / between Papanui Parallel and Northern Line MCRs.	□	Likely to result in undue delays to users.	✓✓	Recognisable, route alignment improved on current crossing provision.	✓	Attractive design		Would require significant construction process, complicated by railway lines.

Appendix T

Via Strada report MCR signalised intersections



MCR Signalised Intersections




Papanui Parallel route:
Main North Road / Sawyers Arms Road
Sawyers Arms Road / Sisson Drive



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1. Main North / Sawyers Arms intersection

1.1. Existing factors

- Three phase operation:
 - Main North traffic, with pedestrian crossing across Sawyers Arms and filter turning into Sawyers Arms.
 - Southbound Main North, with protected right turn from Main North and protected left turn from Sawyers Arms.
 - Pedestrian crosswalks across Main North with filter left turning from Sawyers Arms.
 - Right turn from Main North to a GP's car park within the intersection; this may happen during a change to a lag right turn phase
- 19 recorded crashes in ten years:
 - 16 from Main North approaches, including 5 LB (right turn against) and 4 FE (rear end).
 - 3 from Sawyers arms approach
 - Three of these crashes involved cyclists:

Table 1-1: Main North / Sawyers Arms crash history 2004–2014 with bicycle involvement

Description	Date and time	Severity
Vehicle turning right from Sawyers Arms failed to give way and hit cyclist northbound on Main North Road.	18/01/2006 Wednesday 10:40am	Minor
Vehicle turning left from Main North Road sideswiped cyclist.	25/11/2008 Tuesday 18:10pm	Non-injury
Cyclist riding across at pedestrian crossing did not stop at steady red light and was hit by vehicle northbound on Main North Road.	07/05/2009 Thursday 13:32pm	Non-injury

- In addition, it is worth noting that two crashes involving cyclists have been recorded at the adjacent Main North / Grassmere intersection:

Table 1-2: Main North / Grassmere crash history 2004–2014 with bicycle involvement

Description	Date and time	Severity
Vehicle turning left from Main North Road sideswiped cyclist.	20/10/2005 Thursday 15:00pm	Minor
Vehicle turning right from Grassmere failed to give way to cyclist southbound on Main North Road.	09/02/2009 Monday 9:35am	Minor

The traffic data for the intersection are as follows:



Table 1-3: Main North / Sawyers Arms volumes (QTP model for current¹ situation)

Approach	Mode	AM Peak				PM Peak			
		L	T	R	Total	L	T	R	Total
Main North (N)	General		974	168	1142		593	141	734
	Freight		8	2	10		3	1	5
	Bus		16	0	16		18	0	18
	Cycle		50	6	56		20	5	26
Main North (S)	General	51	441		492	122	927		1049
	Freight	1	15		17	0	5		5
	Bus	3	15		18	2	17		19
	Cycle	3	15		18	7	23		31
Sawyers Arms (W)	General	83		73	157	363		110	473
	Freight	1		0	2	6		0	6
	Bus			3	3	0		2	2
	Cycle	7		2	9	9		1	10

1.2. Key considerations

Note that directions are given based on the simplification that Main North Road is oriented north-south in this location and similarly that Grassmere Street and Sawyers Arms Road run west-east.

- Multiple buses run along Main North Road through the intersection with Sawyers Arms Road – numbers 28, 107, 108 125, Blue line and Orbiter.
 - Bus 108 turns left into and right out of Sawyers Arms Road.
 - All other buses go along Main North Road.
 - Note that while there is currently a bus route along Grassmere Street, this is not included in ECan’s intended future routes.
- CCC had indicated that the preferred style of MCR provision in this location is a bi-directional facility that runs along the northern side of Grassmere Street, the eastern side of Main North Road and then the southern side of Sawyers Arms Road.
 - CCC had also indicated that the appropriateness of this style of provision should be further explored.
 - The choice of facility type should be informed by the number and type of conflict points along the route.

1.3. Options presented

Five options have been developed for this intersection; the associated scheme plans are given in Appendix 1.

¹ Note that the QTP model is based on 2006 traffic data. While some more recent intersection counts are available, we consider that these data are sufficient for the design purposes, and they allow consistency between the design and the model.



1.3.1. Option 1 –SBF on east side of Main North Rd

- One cyclist / pedestrian signalised crossing on either side of Sawyers Arms.
- Land acquisition required at medical centre and adjacent property to allow for shared space on east side, and sufficient intervisibility at medical centre driveway.
- Large and busy driveway to cross (and additional driveways south of intersection).
- As identified in 2013 MNR corridor study, bus lane north of intersection will improve PT.
- Major issues: loss of all car parking on south-east side of MNR, including in front of new hair dressing salon, as well as land purchase in two locations (head of T and north-west corner).

1.3.2. Option 2 –SBF on west side of Main North Rd with midblock crossing at Grassmere St

- Bill Sissons' initial impression is that it might not work well with the existing co-ordination strategy on MNR (requires testing by QTP).
- Route efficiency is potentially the major issue with this option.
- Requires land purchase in one location (north-west corner)

1.3.3. Option 3– route diversion via Shearer Ave

- Divert MCR through Shearer playground to Shearer Ave, shared path on east side of Main North, only one driveway crossing (residential), then angled crossing down to south west corner to connect to MCR.
- Major issue is that it requires same land purchases as option 1 (head of T and north-west corner). Purchase at the head of the T is still required because a connection for cyclists is required from the bi-directional facility on the north approach of Main North Road to the southbound cycle lane on the south departure. These cyclists will include existing cyclists and a portion of MCR users who choose to continue on Main North Road rather than along the MCR on Sawyers Arms Road.

1.3.4. Option 4 –underpass connecting facilities

- Grade separation to address major issues identified with previous three options.
- Requires land purchase (frontage of two residential properties).
- Option has been developed as an 'alignment sketch' only (identifies alignment and ramp length – nothing else).
- Potential to mitigate concerns related to curved underpass by having a light shaft area on the south west corner of the Main North / Sawyers Arms intersection.

1.3.5. Option 5 – bi-directional SBF from Shearer Ave on north side of Sawyers Arms between Main North and Sisson

- Divert MCR through Shearer playground to Shearer Ave, shared path on east side of Main North, only one driveway crossing (residential), MCR crossing on North leg of Main North Road, adjacent to existing pedestrian crossing. Bi-directional facility on north side of Sawyers Arms Road from Main North to Sisson, diagonal



crossing at Sisson intersection with bi-directional facility continuing along south side for the remainder of the Sawyers Arms route.

- Note that this option is currently at concept stage only.
- Land purchase likely to be required in two locations (head of T and north-west corner).
- If a scheme design is developed some of the severities assigned to the various issues may change and new issues may be identified.

1.4. Comparison of options

Table 1-4 presents the colour-coding scheme relating to the various advantages and disadvantages listed in Table 1-5.

Table 1-4: Relative weighting levels for advantages and disadvantages

Advantages			Disadvantages		
High	Medium	Low	Low	Medium	High



Table 1-5: Comparison of options for Main North / Sawyers Arms

Option 1 – bi-directional SBF on east side of Main North Rd	Option 2 – bi-directional SBF on west side of Main North Rd with midblock crossing at Grassmere	Option 3 – bi-directional SBF with route diversion via Shearer Ave	Option 4 ² – underpass connecting bi-directional facilities	Option 5 ³ – bi-directional SBF from Shearer Ave on north side of Sawyers Arms between Main North and Sisson
Easy transition from Grassmere St facility, no additional crossing points required compared to existing situation.	Requires new signalised crossing on Main North Rd, close to Sawyers Arms signalised intersection to the north and mall entrance midblock crossing to the south.	Diagonal MCR crossing accommodated within existing signalised intersection at Main North / Sawyers.	Easy transition from Grassmere St facility to Sawyers Arms Rd facility.	Parallel crossing on north leg of Main North / Sawyers Arms intersection; same operation as for existing pedestrian crosswalk.
Users wishing to access Northlands Mall will either have to leave the MCR, travel along the on-road cycle lane on Main North Road and cross at the midblock pedestrian crossing or continue along to the shared path at Sisson Drive.	Will achieve direct access to Northlands mall via the Main North Road access, or via the Sisson Drive shared path and back entrance.	Users wishing to access Northlands Mall will either have to leave the MCR, travel along the on-road cycle lane on Main North Road (a greater distance than for Options 1 and 4) and cross at the midblock pedestrian crossing or continue along to the shared path at Sisson Drive.	Users wishing to access Northlands Mall will either have to leave the MCR, travel along the on-road cycle lane on Main North Road and cross at the midblock pedestrian crossing or continue along to the shared path at Sisson Drive.	Users wishing to access Northlands Mall will either have to leave the MCR, travel along the on-road cycle lane on Main North Road (a greater distance than for Options 1, 3 and 4) and cross at the midblock pedestrian crossing or continue along to the shared path at Sisson Drive.
No change in efficiency with respect to current situation as MCR crossing is provided parallel to existing pedestrian crosswalk.	Bill Sissons estimates that the addition of a new signalised crossing would probably decrease the efficiency of the corridor; needs further testing.	Diagonal MCR crossing cannot be operated at same time as heavy right turn movements into Sawyers Arms Road – decrease in efficiency.	No change in intersection efficiency with respect to current situation as MCR has no effect on the intersection operation.	No change in efficiency with respect to current situation as MCR crossing is provided parallel to existing pedestrian crosswalk.
	Location of the new signalised crossing in close proximity to adjacent signalised intersection and crossing may reduce safety as motorists may confuse the traffic signals belonging to each location.			
	Pedestrians to and from Grassmere are likely to use MCR crossing, which will result in a safety issue as timing will be based on cyclist crossing speeds. Alternatively, could accommodate pedestrians, which would decrease efficiency of MNR corridor.		Underpass will not be designed for pedestrians (in terms of gradients and widths etc) but some pedestrians may choose to use the facility – could cause conflicts between pedestrians and cyclists.	
Increased efficiency for cyclists heading south on Main North Road – can continue through at head of T whilst	No benefit in efficiency to cyclists compared with options 1 and 3 as the crossing will be part of the coordinated network and therefore operated with	Increased efficiency for cyclists heading south on Main North Road – can continue through at head of T whilst	Large efficiency benefit to cyclists – no delay waiting for signalised crossings (note: some minor geometric delay associated with up-ramp, but also some	Increased efficiency for cyclists heading south on Main North Road – can continue through at head of T whilst

² Note that the scheme for this option is based on alignment only, issues such as location of underground services have not been investigated. This may affect the issues identified and their assigned severities.

³ Note that this option is currently at concept stage only; when a scheme design has been developed some of the severities assigned to the various issues may change and new issues may be identified.



Option 1 – bi-directional SBF on east side of Main North Rd	Option 2 – bi-directional SBF on west side of Main North Rd with midblock crossing at Grassmere	Option 3 – bi-directional SBF with route diversion via Shearer Ave	Option 4 ² – underpass connecting bi-directional facilities	Option 5 ³ – bi-directional SBF from Shearer Ave on north side of Sawyers Arms between Main North and Sisson
adjacent motorists have red light.	the same cycle time as the adjacent Main North / Sawyers intersection.	adjacent motorists have red light.	geometric savings due to alignment).	adjacent motorists have red light.
Passes multiple driveways along Main North Rd, including hairdressers (high volumes of motorists having poor familiarity / experience with the site) and a medical centre (a driveway servicing 3 parking spaces likely to be used by staff who are more familiar with the site; the access to the medical centre’s main carpark is off the head of the T at the intersection).	MCR alignment avoids driveways along east side of Main North Rd. (And while southbound cyclists on Main North Road will still have to pass these driveways the scheme is still an improvement with respect to current provision in this location).	Route alignment avoids driveways along east side of Main North Rd. (And while southbound cyclists on Main North Road will still have to pass these driveways the scheme is still an improvement with respect to current provision in this location).		Route alignment avoids driveways along east side of Main North Rd.
Requires land purchase in two locations: 1) Across head of T (so that bi-directional facility can be continued to cater for transition from southbound cycle lane before intersection and northbound cyclists leaving the MCR to head north on Main North Rd). 2) North west corner (so that left turning trucks can be accommodated.	Requires land purchase in one location: North west corner (so that left turning trucks can be accommodated.	Requires land purchase in two locations: 1) Across head of T (so that bi-directional facility can be continued to cater for cyclists leaving the MCR to head south on Main North Rd). 2) North west corner (so that left turning trucks can be accommodated.		Likely to require land purchase in two locations: 1) Across head of T (so that bi-directional facility can be continued to cater for cyclists leaving the MCR to head south on Main North Rd). 2) North west corner (so that left turning trucks can be accommodated.
		Increases potential for conflict between vehicles exiting / entering driveway at head of T and MCR users as the diagonal crossing is non-standard and perhaps unexpected.		
	Minor potential for conflict between MCR users and pedestrians on zebra crossing on south-west corner.	Minor potential for conflict between MCR users and pedestrians on zebra crossing on south-west corner.		
Significant loss of parking along east side of Main North Road, including outside newly established hair salon and medical centre.	Significant loss of parking along east side of Main North Road, including outside newly established hair salon and medical centre. Subject to detailed design and possible compromises on desired facility widths, it may be possible to retain some parking.	Significant loss of parking along east side of Main North Road, including outside newly established hair salon and medical centre. Subject to detailed design and possible compromises on desired facility widths, it may be possible to retain some parking.	Some loss of parking along east side of Main North Road, hair salon and on Sawyers Arms road upstream of mall loading bays.	No loss of parking on Main North Road anticipated.
Facility crosses two accesses to heavy vehicle loading area on Sawyers Arms	Facility crosses two accesses to heavy vehicle loading area on Sawyers Arms	Facility crosses two accesses to heavy vehicle loading area on Sawyers Arms	Bypasses the two accesses to heavy vehicle loading area on Sawyers Arms	Avoids the two accesses to heavy vehicle loading area on Sawyers Arms Road. (But as it passes multiple driveways and



Option 1 – bi-directional SBF on east side of Main North Rd	Option 2 – bi-directional SBF on west side of Main North Rd with midblock crossing at Grassmere	Option 3 – bi-directional SBF with route diversion via Shearer Ave	Option 4 ² – underpass connecting bi-directional facilities	Option 5 ³ – bi-directional SBF from Shearer Ave on north side of Sawyers Arms between Main North and Sisson
Road.	Road.	Road.	Road.	a side road, it is less safe in this respect than the underpass option)
			May be some security issues associated with curved alignment – lack of visibility from start to finish of underpass. Can be mitigated by including light shaft, CCTV surveillance etc.	
Accommodates new shared bus-cycle lane on Main North Road north of intersection.	Accommodates new shared bus-cycle lane on Main North Road north of intersection.			Likely to accommodate new shared bus-cycle lane on Main North Road north of intersection.



1.5. Phasing and operation

The phasing diagrams for the Main North / Sawyers Arms intersection are presented in Appendix 2. This section of the report gives a brief description of the phasing operation.

Table 1-6: Phasing operation summary for Main North / Sawyers Arms intersection options

Current operation	A phase (Main North Road) allows for left and right filter turning into Sawyers Arms Road,	B phase operates the right turn from Main North in conjunction with the through southbound traffic and the left turn from Sawyers Arms (this is operated as a lead right turn, i.e. before the A phase)	C phase caters for the left and right turn from Sawyers Arms filtering through pedestrian crossings on both Main North legs.
Option 1 – bi-directional SBF on east side of Main North Rd	A phase remains the same as current operation.	<p>B phase (for the case where the cycle crossings across Main North are not called) remains the same</p> <p>B1 phase introduced for MCR cycle crossing and pedestrian crossing on south Main North leg;</p> <ul style="list-style-type: none"> requires southbound Main North traffic to be stopped run after or before the main B phase, depending on whether the pedestrian crossing is called or not. 	<p>C phase remains the same</p> <p>C1 phase introduced to incorporate the cycle crossing on the north Main North leg; requires left turn from Sawyers Arms to be stopped</p> <p>C2 phase introduced for when pedestrian crossing on south Main North leg has not been called (or has timed out); allows for left turn into Sawyers Arms.</p>
Option 2 – bi-directional SBF on west side of Main North Rd with midblock crossing at Grassmere	A phase no longer allows the filter right turn into Sawyers Arms.	<p>B phase (for the case where the cycle crossings across Main North are not called) remains the same</p> <p>B1 phase introduced for MCR cycle crossing and pedestrian crossing on south Main North leg;</p> <ul style="list-style-type: none"> requires southbound Main North traffic to be stopped <p>run after or before the main B phase, depending on whether the pedestrian crossing is called or not.</p>	<p>C phase remains the same</p> <p>C1 phase introduced to incorporate the cycle crossing on the north Main North leg; requires left turn from Sawyers Arms to be stopped</p> <p>C2 phase introduced for when pedestrian crossing on south Main North leg has not been called (or has timed out); allows for left turn into Sawyers Arms.</p>
<p>The Grassmere crossing would operate according to a simple, 2-phase arrangement, the timing of which would be dependent on the coordination of Main North Road and thus the cycle times of the adjacent intersections. During off-peak periods it should be possible to double-cycle this crossing.</p>			
Option 3 – bi-directional SBF with route diversion via Shearer Ave	A phase remains the same as current operation.	<p>B phase (for the case where the cycle crossings across Main North are not called) remains the same</p> <p>B1 phase introduced for MCR diagonal cycle crossing and pedestrian crossing on south Main North leg;</p> <ul style="list-style-type: none"> requires southbound Main North traffic to be stopped run after the main B phase, if the cycle crossing is called. 	<p>C phase remains the same</p> <p>C1 phase introduced to incorporate the parallel cycle crossing on the north Main North leg; requires left turn from Sawyers Arms to be stopped</p>

Note that phasing will not change for Option 4 (underpass) and phasing for Option 5 has not been detailed as the scheme plan for the intersection layout has not been developed. It is likely that this option would operate as per the existing operation, but with an additional C1 phase where the MCR crossing on the north Main North leg is operated and the left turn from Sawyers Arms is therefore stopped.



1.6. Recommended option

All the options presented have their various strengths and weaknesses with no particular option being a clear winner.

Subject to modelling analysis to address the concerns with respect to efficiency, Option 2 is the recommended option as this is the most convenient way for MCR users to access Northlands Mall, which is considered to be a major attraction.



2. Sawyers Arms / Sisson intersection

2.1. Existing factors

- Currently operates as a priority intersection
 - To be signalised as part of the MCR project
- One crash has in the last ten years⁴ been recorded in the NZTA CAS database.
 - No crashes involving cyclists in the last ten years have been recorded

The traffic data for the intersection are as follows:

Table 2-1: Sawyers Arms / Sisson volumes (QTP model for current⁵ situation)

Approach	Mode	AM Peak				PM Peak			
		L	T	R	Total	L	T	R	Total
Sawyers Arms (E)	General	101	82		182	106	146		252
	Freight	1	3		4	0	1		2
	Bus	0	3		3	0	2		2
	Cycle	8	6		14	6	5		11
Sisson (S)	General	20		50	70	107		289	395
	Freight	0		1	1	1		2	2
	Bus	0		0	0	0		0	0
	Cycle	1		4	4	2		10	12
Sawyers Arms (W)	General		87	128	215		153	43	196
	Freight		1	0	1		5	0	5
	Bus		3	0	3		2	0	2
	Cycle		2	2	4		4	1	5

2.2. Key considerations

- The 108 bus runs along the Sawyers Arms section of the Papanui Parallel in the vicinity of the Sisson Drive intersection.
 - There will be no ECan bus turning movements at this intersection.
 - However, the site does have high volumes of private charter buses (e.g. school trips to the swimming pool, and buses servicing Papanui High School) and heavy vehicles servicing the Northlands mall site.
- CCC has indicated that the preferred style of MCR provision in this location is a bi-directional facility that runs along the northern side of Grassmere Street, the south-eastern side of Main North Road and then the south-western side of Sawyers Arms Road.
 - CCC has also indicated that the appropriateness of this style of provision should be further explored.

⁴ Note that although this is a relatively new intersection, Google imagery shows that Sisson Drive was built prior to April 2004 and therefore a ten-year crash history analysis is appropriate.

⁵ Note that the QTP model is based on 2006 traffic data. While some more recent intersection counts are available, we consider that these data are sufficient for the design purposes, and they allow consistency between the design and the model.



- The choice of facility type should be informed by the number and type of conflict points along the route:

Table 2-2: Potential conflict points for MCR on Sawyers Arms Road

South side	North side
6 driveways servicing 13 residential properties	39 driveways servicing 66 residential properties One driveway situated on the head of the T at the Sawyers Arms / Sisson intersection.
1 side street: <ul style="list-style-type: none"> • Sisson Drive – predicted 2021 PM peak turning movements: <ul style="list-style-type: none"> ○ 171 left turns out ○ 298 right turns out ○ 53 left turns in ○ 69 right turns in <p>Will be signalised to provide protection to MCR traffic.</p>	2 side-streets: <ul style="list-style-type: none"> • Nyoli Street – predicted 2021 PM peak turning movements: <ul style="list-style-type: none"> ○ 48 left turns out ○ 22 right turns out ○ 75 left turns in ○ 161 right turns in • Leander Street - cul-de-sac <ul style="list-style-type: none"> ○ 29 residential properties
2 heavy vehicle loading accesses (just west of Main North intersection) 1 commercial accesses servicing 9 parking spaces 2 sporting facilities with approximately 32 and 70 parking spaces respectively	No additional access types

Two possibilities have been considered for midblock provision along Sawyers Arms Road:

- Uni-directional facilities on each side of Sawyers Arms Road
- Bi-directional facility on the south side of Sawyers Arms Road

Based on an analysis that estimates the relative risks of residential driveways, commercial driveways, large car parks, side streets and signalised intersection crossings, the bi-directional facility on the south side is considered significantly safer than two uni-directional facilities. This is predominantly due to the relatively high volumes of traffic at the priority controlled Nyoli St intersection. Further information on this investigation, including a spreadsheet, has been provided to Gemma Dioni at CCC.

Thus we support CCC’s initial intention of providing a bi-directional facility on the south side of Sawyers Arms Road and the development of options for the Sawyers Arms / Sisson intersection has only considered this type of midblock provision approaching the intersection.



2.3. Proposed solution

Given the decision to design for a bi-directional SBF on the south side of Sawyers Arms Road and the various geometric / operational constraints at the Sawyers Arms / Sisson intersection one main option has been developed for this location. This is accompanied by a sub-option which involves a minor change to the kerb alignment on the south west corner to enlarge the existing shared path on the west side of Sisson Drive which will experience increased use due to MCR traffic. The associated scheme plans for this intersection are presented in Appendix 3.

Table 2-3 presents the colour-coding scheme relating to the various advantages and disadvantages listed in Table 2-4. Note that some of the items identified are related to the underlying decision to signalise the intersection and others are related to the fact that it will involve a bi-directional facility.

Table 2-3: Relative weighting levels for advantages and disadvantages

Advantages			Disadvantages		
High	Medium	Low	Low	Medium	High

Table 2-4: Advantages and disadvantages of Sawyers Arms / Sisson solution

Option 1 – Intersection improvements to incorporate uni-directional SBFs
Parking removal required at approaches
Loss of existing on-road cycle lane on Sisson Drive
Decreased efficiency due to protection required for MCR crossing
Avoids conflict with driveway on head of T on north side
Option 1a – additional possibility of widening shared path at south west corner:
Additional width provided at point of potential conflict between pedestrians and cyclists where user volumes will increase compared to the existing situation due to MCR users.

Note that this does not include the possibility of a diagonal crossing at the intersection, as per the scheme relating to Option 5 for the Main North / Sawyers Arms intersection.

2.4. Phasing and operation

The intersection is currently priority controlled. As per the intended phasing diagram (shown in Appendix 4), the intersection, once signalised will be operated as follows:

A1 phase: bi-directional cycle crossing with adjacent through traffic on Sawyers Arms Road and parallel pedestrian crossing across Sisson Drive. Left and right turns from Sawyers Arms are held on red.

A phase: cycle crossing is held on red and left filter turning from Sawyers Arms is permitted. Right turn from Sawyers Arms is not allowed (the alignment of the right turn lane on the west Sawyers Arms leg would result in right turners who pull into the



intersection waiting for a gap in oncoming traffic to either be in the path of oncoming through traffic or block the through traffic coming from behind them).

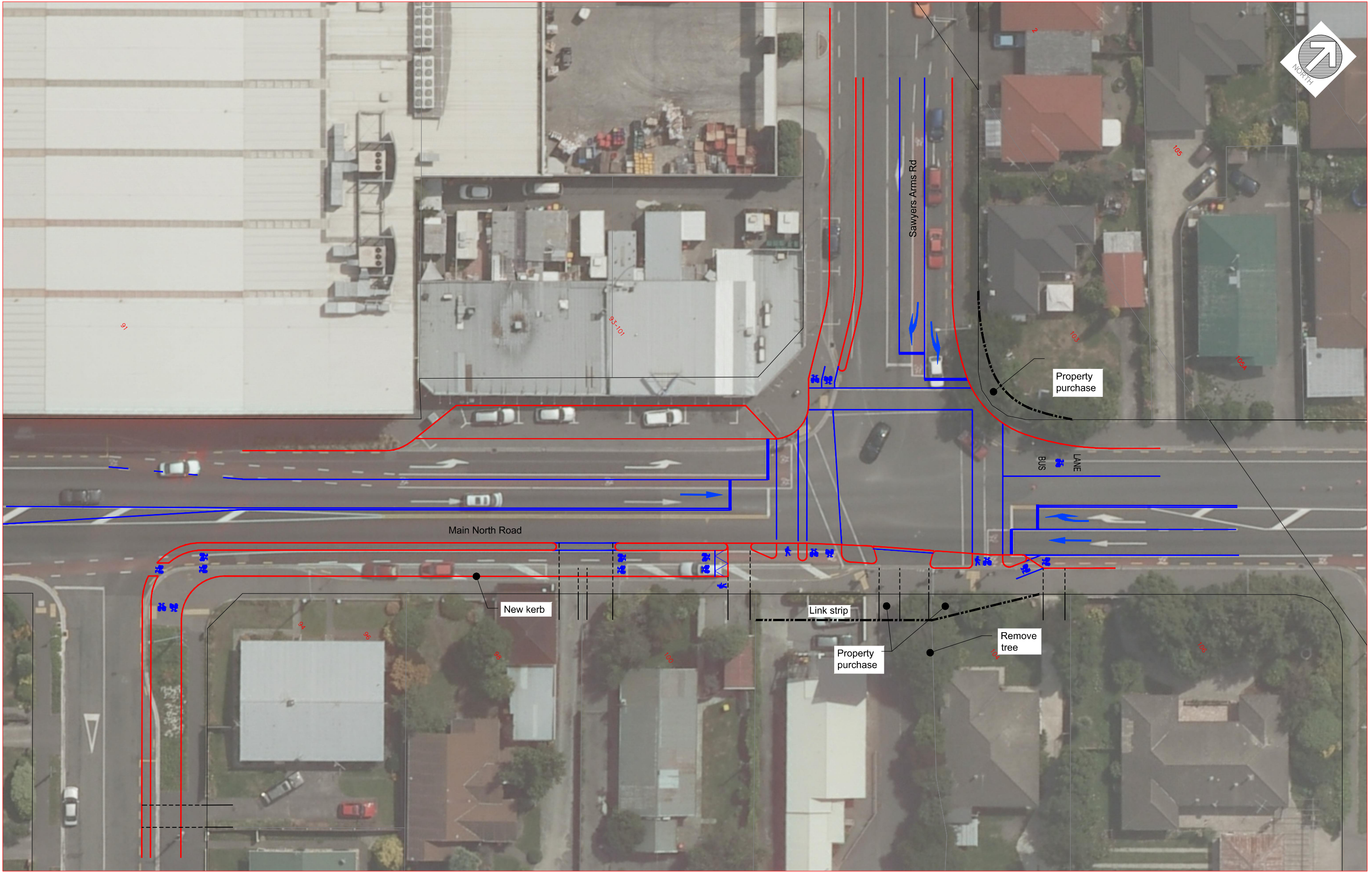
B phase: lag right turn from Sawyers Arms in conjunction with adjacent through movement and left turn out of Sisson.

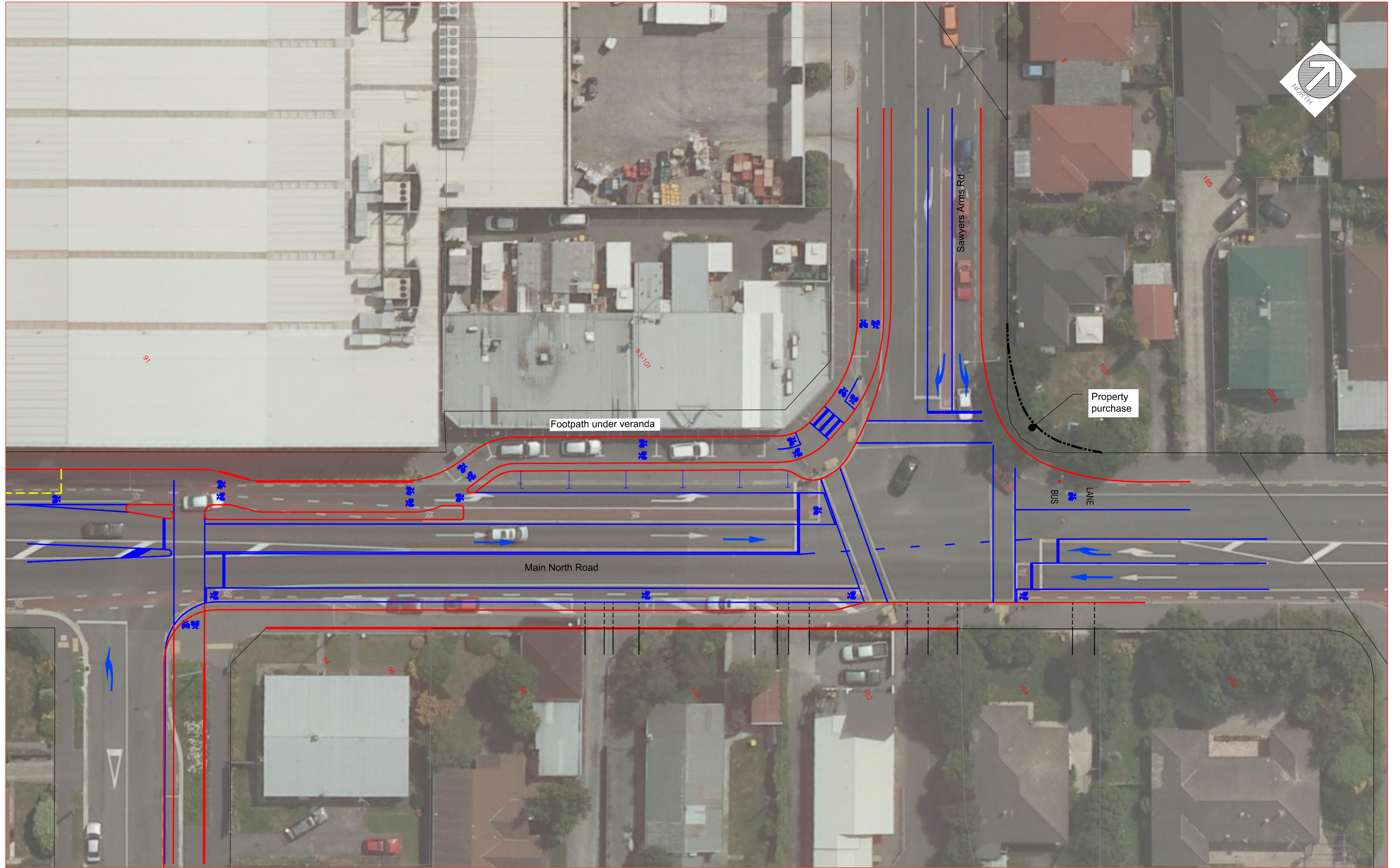
C phase: pedestrian crossing across Main North (west leg) in conjunction with left filter turn and right turn from Sisson and left turn from Sawyers Arms.

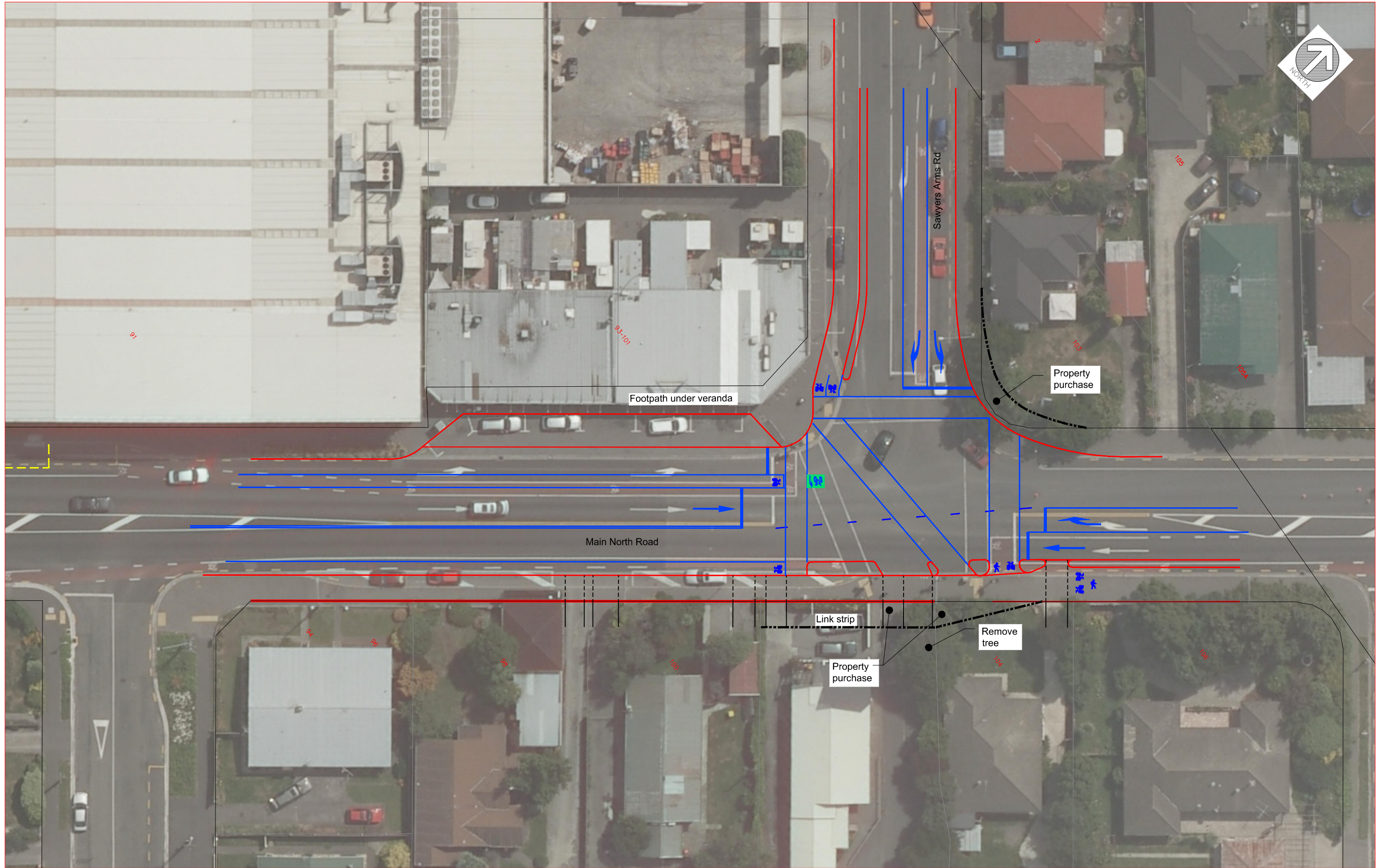


Appendix 1 Plans – Main North / Sawyers Arms











RAMP 1:12

UNDERPASS

LIGHTSHAFT

RAMP 1:12



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Major Cycle Routes
Signalised intersections
Papanui Parallel

Main North Rd / Sawyers Arms Rd - Option 4

Bi directional SBF underpass

Date. Oct 2014	Drawn by. JA	Scale (A3) 1:500 @ A3
Drawing No. 1037 / 4 - M4-1		Rev



Leander St.

Shearer

Maybe have diagonal crossing at Sisson Drive. Cross MNR north of intersection, and going along Shearer Ave, the busy doctors' drive way can be completely avoided. Leander St is a cul-de-sac, i.e. not that busy. Image Landsat

Dr Shearer Park

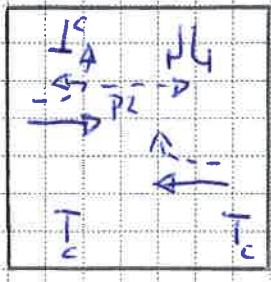
Google earth

2004

Appendix 2 Phasing – Main North / Sawyers Arms

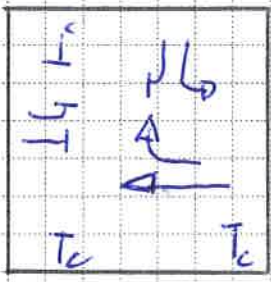


A



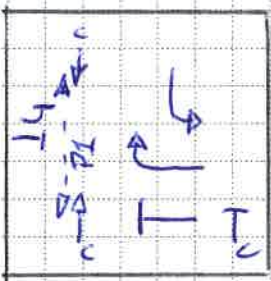
- Main cycle crossing cells
- B1 phase
- C1 phase enables cyclists coming from Grassmere to proceed north along MNR

B

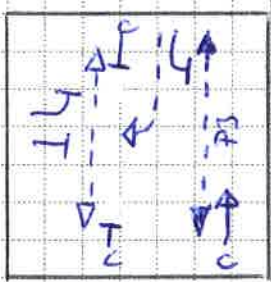


- If P1 is not called, can run different sequence: A B1 B C1 C2

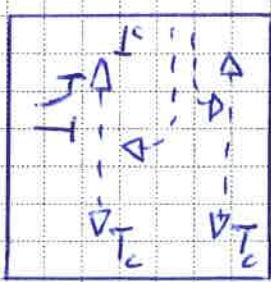
B1



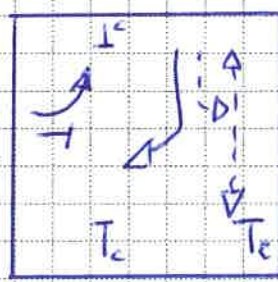
C1



C



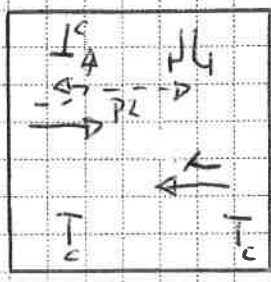
C2



Sequence: A B B1 C1 C C2

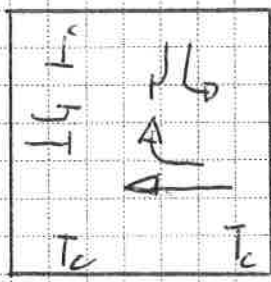


A



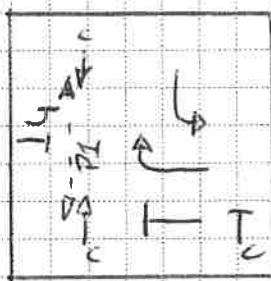
- Main cycle crossing calls B1 phase
- C1 phase enables cyclists coming from Grassmere to proceed north along MNR

B



- If P1 is not called, can run different sequence: A B1 B C1 C2

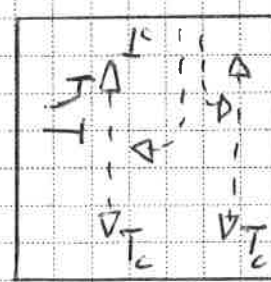
B1



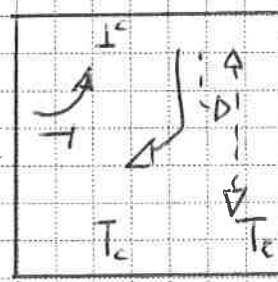
C1



C



C2

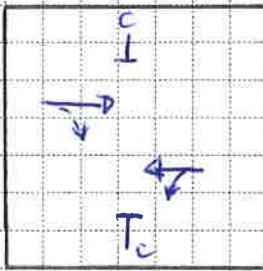


Sequence:

A B B1 C1 C C2

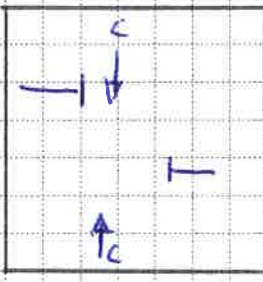


A



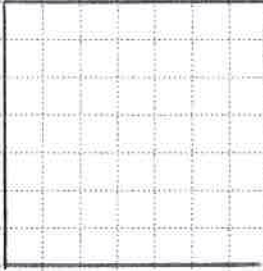
Simple two phase mid-block crossing adjacent to Grassmere Street.

B

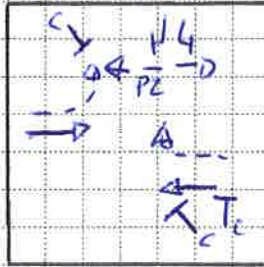


Most efficient if for cyclists only.

Could have a shared cyclists/peds crossing facility, but it would require a much larger greensplit.

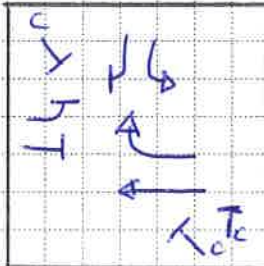


A



- Main cycle Crossing calls B1 phase
- C1 phase enables cyclists coming from Shearer Ave to proceed north along MNR.

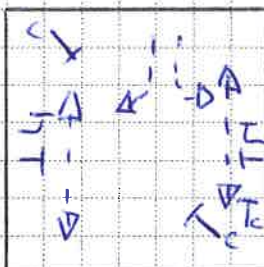
B



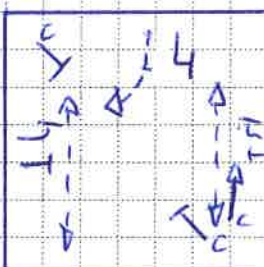
B1



C



C1

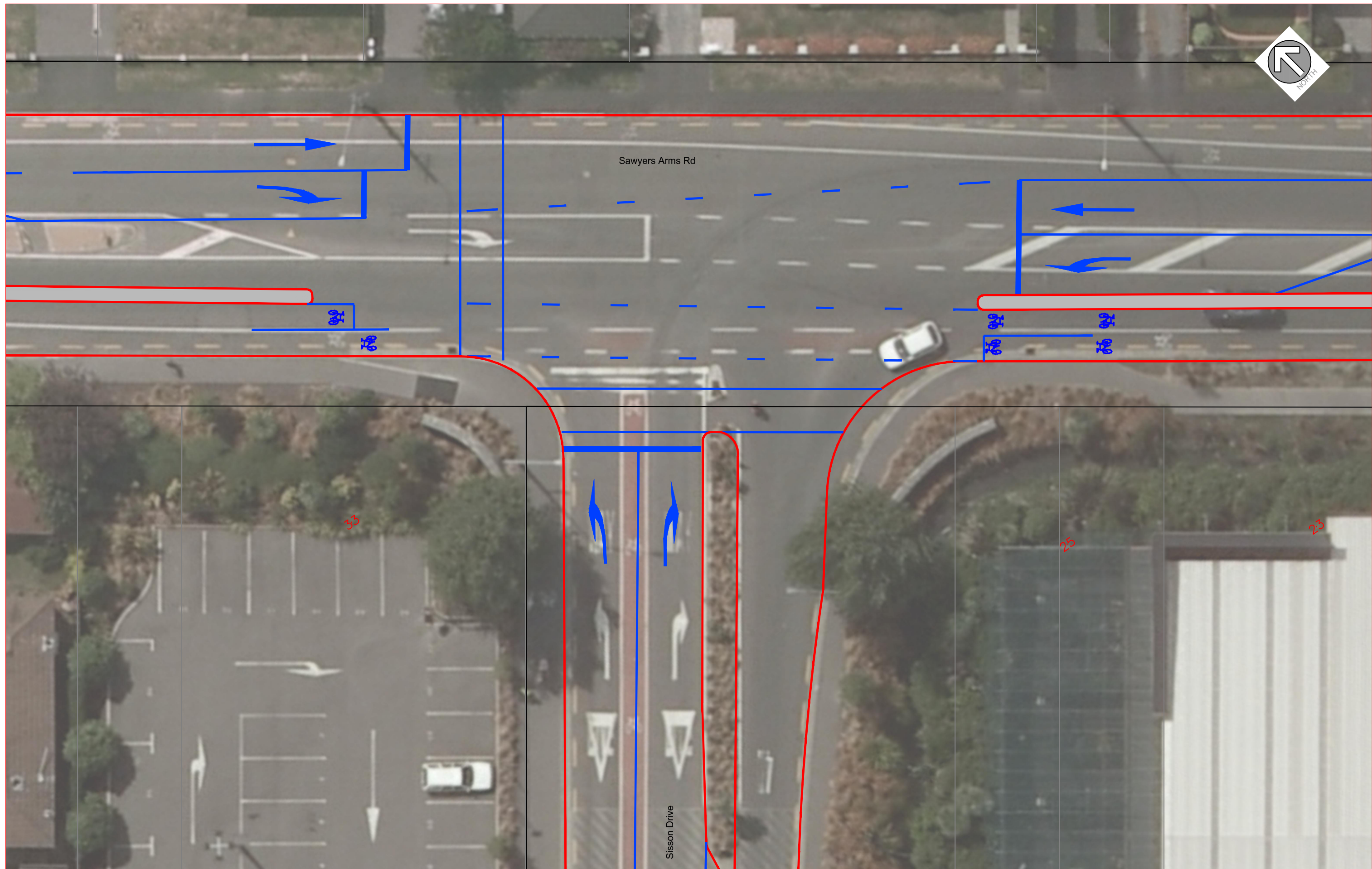


Sequence: A B B1 C1 C



Appendix 3 Plans – Sawyers Arms / Sisson





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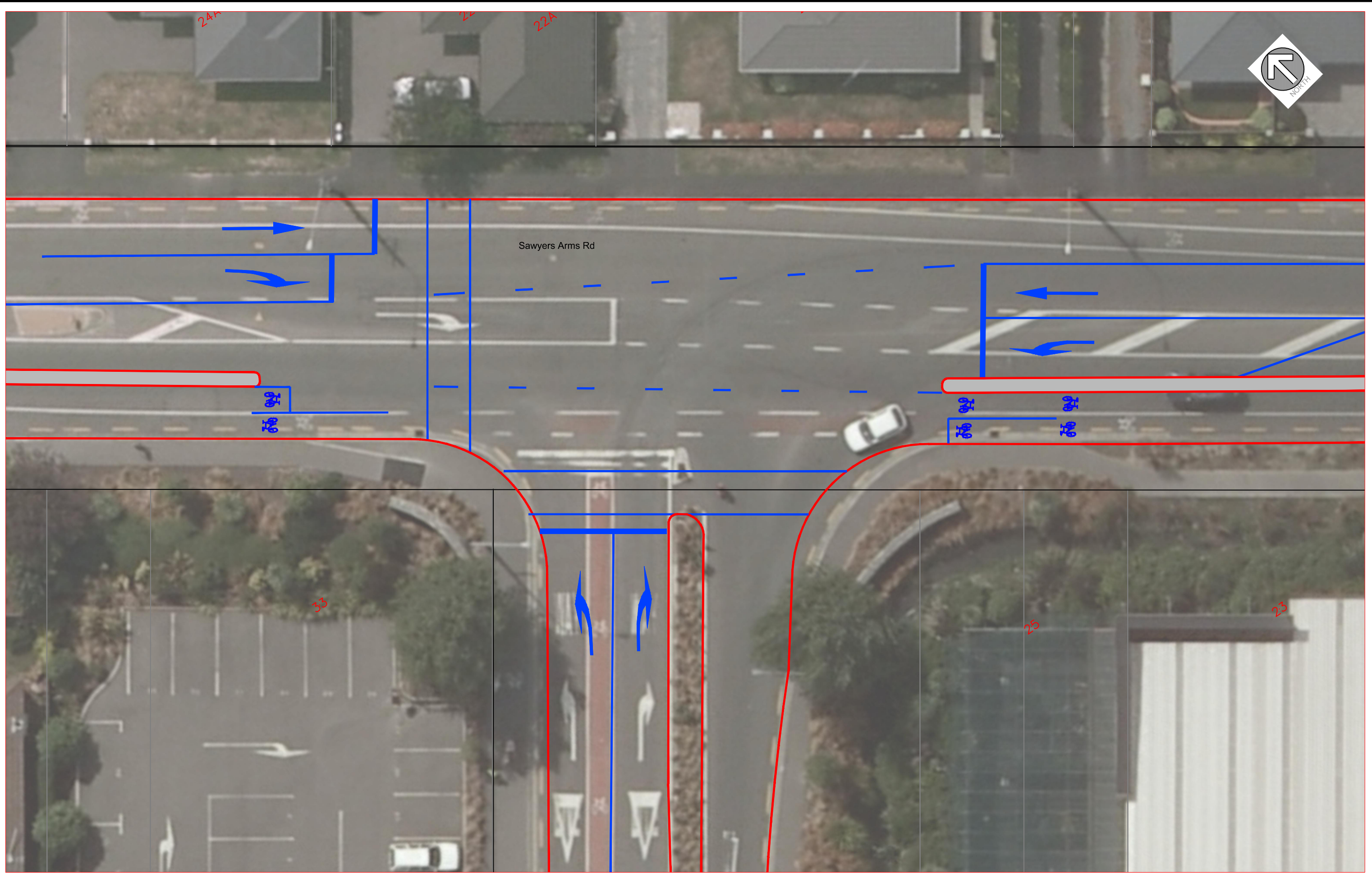


Major Cycle Routes
Signalised intersections
Papanui Parallel

Sawyers Arms Rd / Sisson Dr - Option 1

Bi directional SBF south side of Sawyers Arms Rd

Date. Oct 2014	Drawn by. JA	Scale (A3) 1:200 @ A3
Drawing No. 1037 / 4 - S1-1		Rev

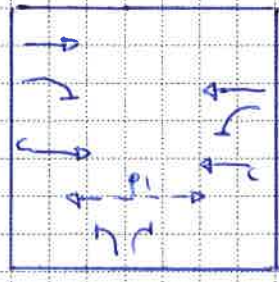


Appendix 4 Phasing – Sawyers Arms / Sisson

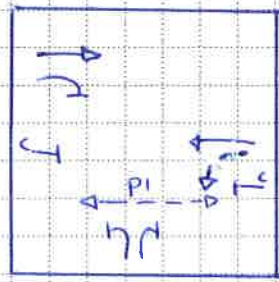


Sequence: A1, A, B, C

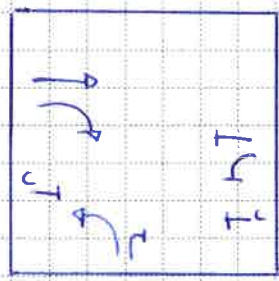
A1



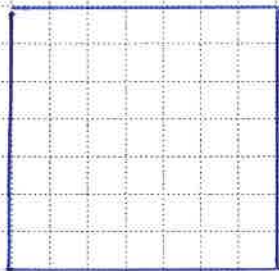
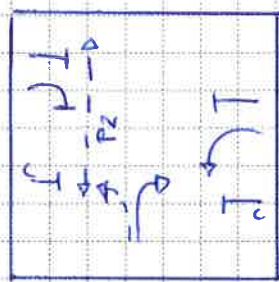
A



B



C



SEQUENCE = A B C1 C

