TE TUPU NGĀTAHI
SUPPORTING GROWTH

Appendix A

Assessment of Alternatives

WAKA KOTAHI
NZ TRANSPORT AGENCY

New Zealand Government

TE TUPU NGĀTAHI
SUPPORTING GROWTH

VOLUME 2

South Frequent Transit Network Appendix A

October 2023

Version 1

WAKA KOTAHI
NZ TRANSPORT AGENCY

New Zealand Government

Document Status

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Revision Status

Version	Date	Reason for Issue
1.0	13/10/2023	Final for lodgement

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Glossary of Defined Terms and Acronyms

We note that 'Takaanini' (with double vowels is used throughout the Report Acknowledging the ongoing kōrero and guidance from Manawhenua on the cultural landscape. 'Takanini' is used where reference is made to a specific and existing named place (e.g., Takanini Road, Takanini Town Centre etc.). Manawhenua is also used throughout the Report as while gifting the programme name as Te Tupu Ngātahi, Manawhenua confirmed this was an appropriate spelling (capital 'M' and one word). Notwithstanding this, the term is spelled as two words in other fora and the proposed designation conditions – Mana Whenua.

Acronym/Term	Description
AT	Auckland Transport
AUP:OP	Auckland Unitary Plan – Operative in Part
CFAF	Corridor Form Assessment Framework
DBC	Detailed Business Case
EAST	Early Assessment Sifting Tool
ERP	Emissions Reduction Plan
FDS	Future Development Strategy
FTN	Frequent Transit Network
IBC	Indicative Business Case
GPS	Government Policy Statement on Land Transport
ISTN	Indicative Strategic Transport Network
LOS	Level of Service
MCA	Multi-criteria analysis
MDRS	Medium Density Residential Standards
NIMT	Trunk railway line
NoR	Notice of Requirement
NPS-FM	National Policy Statement on Freshwater Management
NPS-IB	National Policy Statement on Indigenous Biodiversity
NPS-UD	National Policy Statement on Urban Development
NZUP	NZ Upgrade Programme
P2D	Papakura-to-Drury
PBC	Programme Business Case
PC78	Plan Change 78

Acronym/Term	Description
RMA	Resource Management Act 1991
RASF	Roads and Streets Framework
SH1	State Highway 1
South FTN	South Frequent Transit Network
SME	Subject Matter Experts
SSBC	Single-Stage Business Case
Te Tupu Ngātahi	Te Tupu Ngātahi Supporting Growth
TFUG	Transport for Future Urban Growth (PBC)
VKT	Vehicle Kilometres Travelled
Waka Kotahi	Waka Kotahi NZ Transport Agency

1 Introduction

1.1 Purpose of this report

This assessment of alternatives report has been prepared by Te Tupu Ngātahi Supporting Growth (**Te Tupu Ngātahi**)[1], and supports the Notices of Requirement (**NoRs**) for the South Frequent Transit Network (**South FTN**). Four NoRs are proposed to authorise transport upgrades along key sections of roads which fall within the South FTN network. Auckland Transport (**AT**) is the Requiring Authority for the NoRs under the Resource Management Act 1991 (**RMA**).

The South FTN comprises a range of road upgrades including bus priority measures, new and upgraded active mode facilities, and intersection improvements along existing arterial road corridors in South Auckland. In particular, the proposed road upgrades provide for:

- Operation of high-quality Frequent Transit Network (**FTN**)[2] bus services along Great South Road between Manukau and Drury (the **Great South Road FTN** route);
- Operation of high-quality FTN bus services along existing roads between Manurewa, Takaanini, and Papakura (the **Takaanini FTN** route); and
- Upgrade of adjoining **Key Connections** to the FTN – Popes Road, and the Drury section of Great South Road between Waihoehoe Road and State Highway 1 (**SH1**).

Collectively, this transport package is referred to as the South FTN. The total extent of the South FTN network is shown in Figure 1-1.

Section 171(1)(b) of the RMA requires that when making a recommendation on an NoR, a territorial authority shall consider whether adequate consideration has been given to alternative sites, routes, and methods in circumstances where the requiring authority does not have an interest in the land sufficient for undertaking the work; or where it is likely that the work will have a significant adverse effect on the environment. There are several principles for a requiring authority to apply and adhere to when undertaking an assessment of alternatives. Of note are the following:

- The process should be adequately transparent and robust, and clearly recorded so that it can be understood by others;
- An appropriate, but not necessarily exhaustive range of alternatives should be considered; and
- The extent of options considered, and the assessment of these options, should be proportional to the potential effects of the options being considered.

AT does not have sufficient interest in the land required for the South FTN and as such is required to give adequate consideration to alternatives sites, routes, and methods. The purpose of this report is to document the consideration given to alternative sites, routes, and methods for the South FTN.

1.2 The South FTN network

The South FTN is intended to address deficiencies in the existing transport network between Manukau and Drury including a lack of provision for high-quality public transport, and a lack of safe active mode facilities which result in an over-reliance on public vehicles. Without network upgrades,

[1] Te Tupu Ngātahi is a collaboration between Auckland Transport (**AT**) and Waka Kotahi NZ Transport Agency (**Waka Kotahi**) to investigate, plan, and undertake route protection for the strategic transport networks needed to support Auckland's growth over the next 30 years.
[2] FTN services are defined in AT's Regional Public Transport Plan (RPTP) as bus routes operating at least every 15 minutes between 7am-7pm, 7 days-a-week, often supported by priority measures such as bus or transit lanes.

these deficiencies will be exacerbated by planned growth and increased travel demand. The South FTN is intended to alleviate these existing transport deficiencies, support planned urban growth, and enable mode shift to public transport and active modes in South Auckland.

Of the full South FTN network extent shown in Figure 1-1, only a portion falls within the proposed NoRs (see Figure 1-2). This is because the proposed corridor upgrades do not always require additional land take, can be undertaken within the existing road reserve, and therefore do not require new designations.

1.3 The NoRs – proposed spatial extent

For clarity, it is noted that not all of the optioneering documented in this report has resulted in proposed transport upgrades which require additional land take. This is because the proposed corridor upgrades can be undertaken within the existing road reserve controlled by the Requiring Authority, AT. Accordingly, some of the alternatives/options assessment outlined in this report covers options which will assist to deliver the South FTN network, but do not require NoRs and have not been included in the NoRs now proposed to enable the South FTN. These instances are documented where relevant in the report.

Consequently, only a portion of the full South FTN network extent (shown in Figure 1-1) falls within the NoRs (see Figure 1-2).

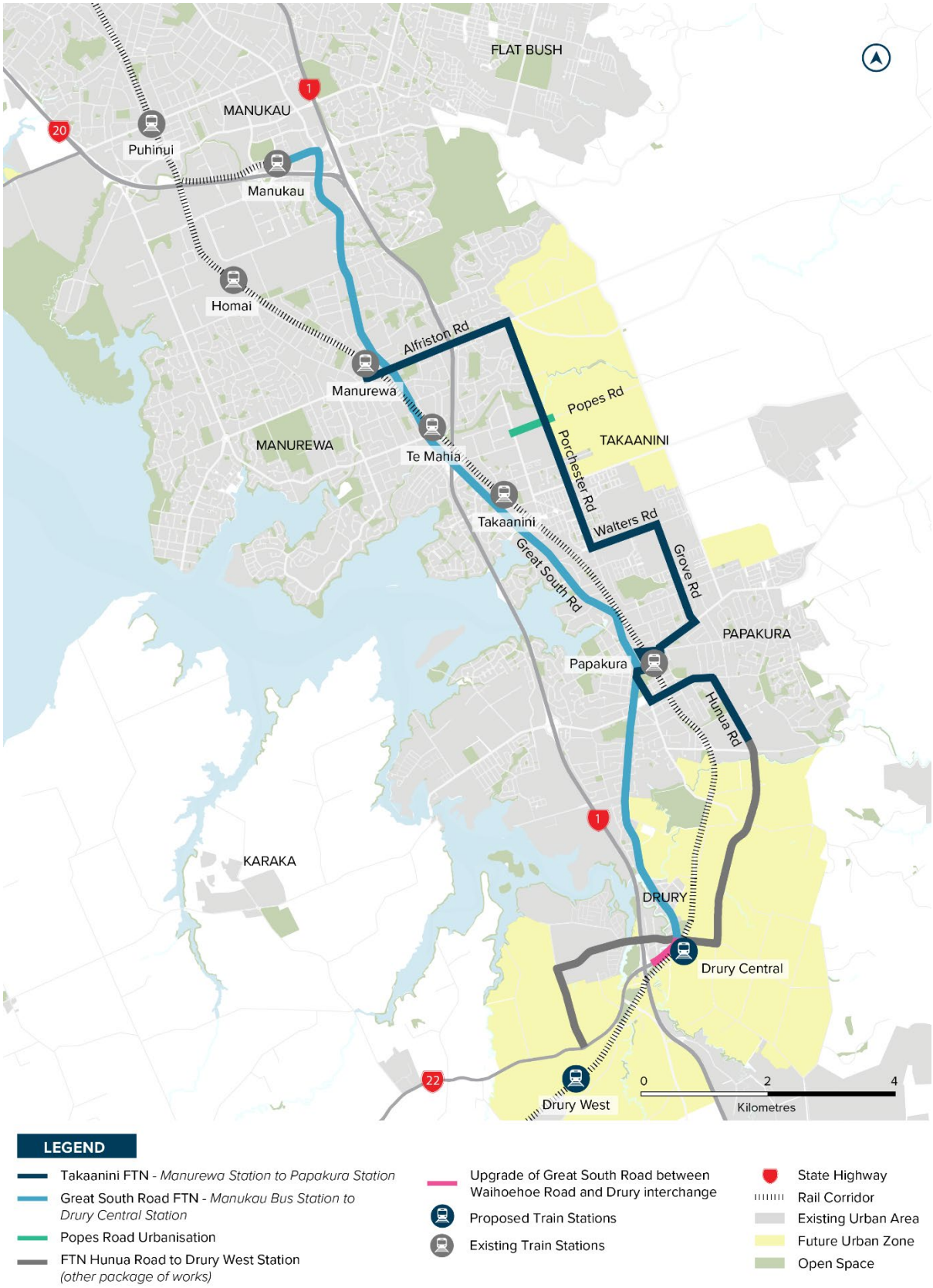

Figure 1-1: South FTN extent

Figure 1-2: South FTN - NoR extents

1.4 Report structure

This report is divided into two key parts (Parts A and B) to separate out optioneering considerations that are relevant to the whole of the South FTN (Part A) from the optioneering considerations relevant to each of the constituent routes/connections. Each part in turn comprises sections outlining the relevant optioneering processes. This structure is summarised at Table 1-1 below.

Table 1-1: South FTN Alternatives Assessment – report structure

Part	Section	Matters covered
Part A – Whole-of-South FTN considerations	2	Business case context
		Gap analysis – South Indicative Business Case (**IBC**) to South FTN Detailed Business Case (**DBC**)
	3	General methodology
Part B– Assessment of Alternatives	4	Great South FTN
	5	Takaanini FTN
	6	Key Connections
	7	Alternative statutory methods
	8	Conclusion

PART A: WHOLE-OF-SOUTH FTN CONSIDERATIONS

2 Previous business case process

2.1 Summary of the business case process

Te Tupu Ngātahi was formed to investigate, plan, and undertake route protection for the strategic transport networks needed to support growth in Auckland over the next 30 years. These networks are developed through a business case process, and route protection is generally secured subsequently through designations under the RMA. The South FTN is one of the projects identified by Te Tupu Ngātahi through the business case process. The alternatives assessment for the South FTN documented in this report was undertaken initially as part of the business case process.

The business case process for Te Tupu Ngātahi is iterative, and has comprised:

- A Programme Business Case (**PBC**) was completed in 2016 and identified a high-level preferred transport network across all of Auckland's growth areas;
- Four Indicative Business Cases (**IBC**) were completed in 2019 (for the Warkworth, Northern, North-Western, and the Southern growth areas), each identifying an Indicative Strategic Transport Network (**ISTN**) for each sub-region; and
- A total of nine Detailed Business Cases (**DBC**) each covering a package of projects derived from the wider ISTN. One DBC specifically covered the South FTN (see Figure 1-1).

The analysis in each successive business case becomes more detailed and spatially focused, with each building on the last. The initial focus at the PBC and IBC stage is on identifying networks at a regional and sub-regional level. The focus subsequently localises to a project-specific level of analysis at the DBC stage. The optioneering process for the South FTN documented in this report is therefore largely derived from the South FTN DBC options assessment, which in turn used earlier IBC analysis and the ISTN as a starting point.

As shown in Figure 2-1, the South FTN DBC was undertaken in parallel with other DBCs progressing other parts of the ISTN – in particular, the Takaanini Level Crossings (**TLC**) DBC. Because both the TLC and South FTN considered east-west crossings of the North Island Main Trunk (**NIMT**) railway, some aspects of early optioneering were undertaken concurrently between the two projects. This is noted where relevant in this report.

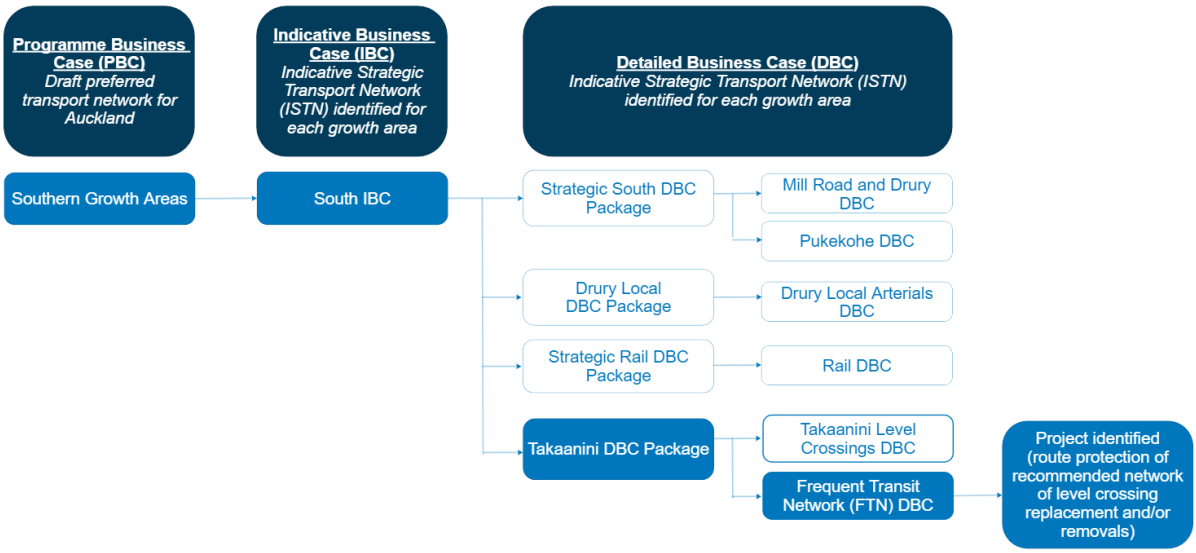

Figure 2-1: Business case process leading to the identification of the South FTN

2.2 Relevant recommendations of the South IBC

As noted above, the ISTN identified through the South IBC was the starting point for further option assessment through DBCs. The South IBC was itself the subject of an extensive optioneering process in 2018-2019. The initial IBC option longlist comprised some 484 network and corridor options for transport interventions for the entire southern growth area. This was narrowed down to an amalgamated longlist of 151 options following a screening process, which were sorted according to relevant modes/intervention categories for shortlisting and assessment through Multi-Criteria Assessments (**MCA**). The relevant assessments to the South FTN are summarised below.

2.2.1 Mass transit option grouping

The 'strategic connections' shortlist included 'Mass Transit – Bus' options, intended to "provide access to and from areas not well serviced by the rail corridor… improve connecting public transport services to support rail… [and] provide high quality public transport directly into new urban areas".[3]

Following multiple multi-criteria assessments, the following four FTN options were identified as part of the recommendations of the IBC, and included in the ISTN (see Figure 2-2):

- **Option MT3C** – FTN on Great South Road from Drury to Manukau;
- **Option MT4I** – FTN between Drury and Takaanini via Jesmond Road, Bremner Road, Waihoehoe Road, the proposed Ōpāheke North-South Arterial, Porchester Road, Popes Road, Rangi Road (subsequently crossing SH1 and the NIMT to join option MT3C on Great South Road);
- **Option MT4K** – FTN between Drury and Puhinui via SH1 bus shoulders, Mahia Road, and Roscommon Road; and
- **Option MT4L** – Express bus transit between Drury and Manukau via SH1 bus shoulders, Orams Road, and Druces Road.

[3] South IBC Appendix B – Options Assessment Report, p. 223.

2.2.2 Other option groupings

In addition to these FTN options, the IBC shortlist also included option groupings for 'Drury-Ōpāheke eastern arterials' (see Figure 2-3), and 'Takaanini East-West Crossings' (see Figure 2-4). A number of options from these shortlist groupings interact with the FTN options and were included in the ISTN, most relevantly including:

- **Option AR10** – comprising the proposed Ōpāheke North-South arterial (forming part of FTN option MT4I noted above), and the urbanisation of Hunua Road and Croskery Road (see Figure 2-3); and
- **Option EW9B** – comprising a series of east-west connections in the Takaanini area with grade-separated rail crossing. This option included an east-west corridor comprising a viaduct over SH1 and the NIMT connecting Rangi Road to Mahia Road, and urbanisation of Rangi Road and Popes Road (see Figure 2-4). This route forms part of option MT4I.

Each of the options listed above were included in the ISTN (see Figure 2-5), and thus formed the starting point for the South FTN DBC.

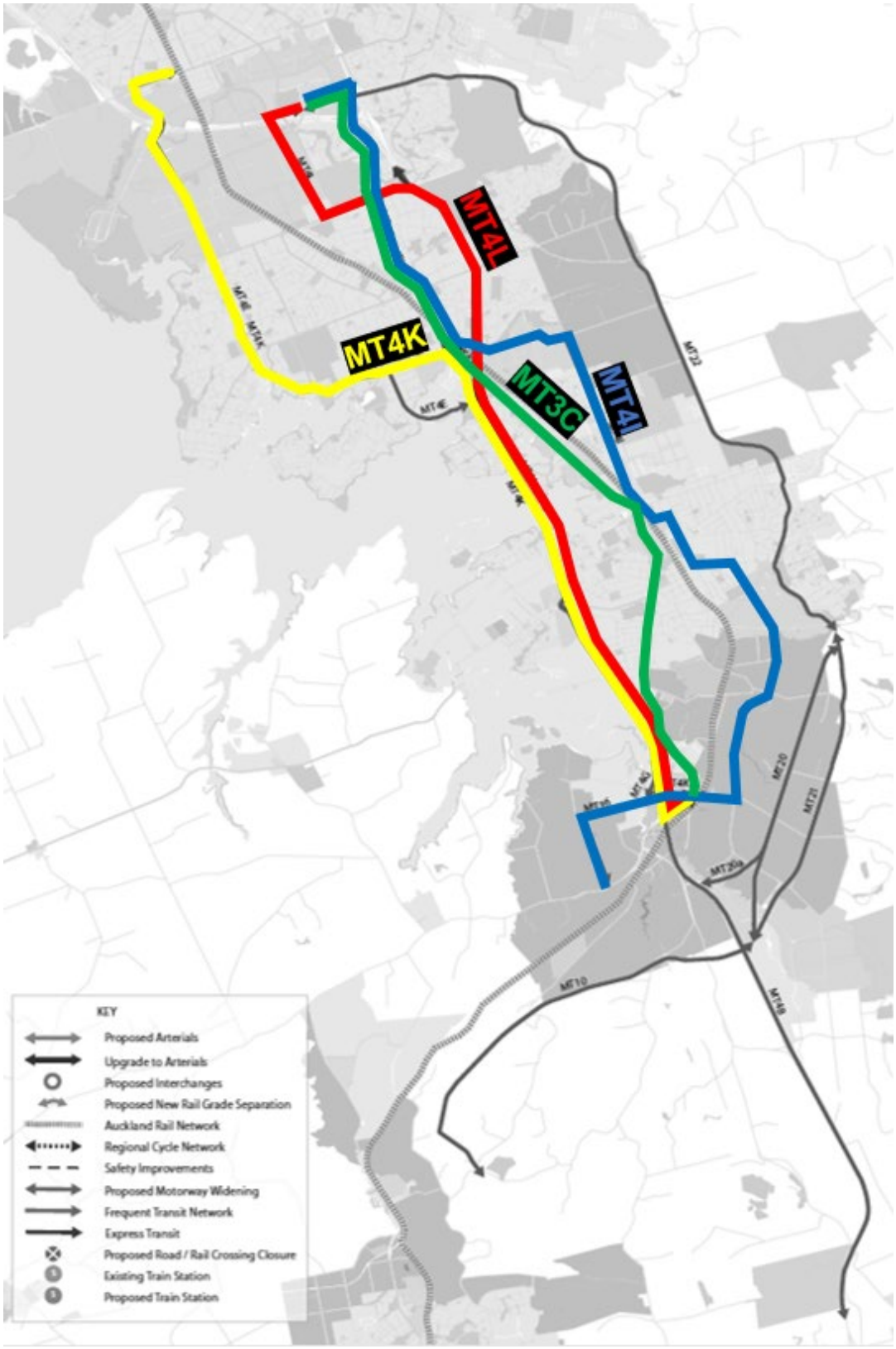

Figure 2-2: FTN options included in the ISTN – MT3C, MT4I, MT4K, and MT4L. Other FTN routing options which were discarded at the IBC shortlisting stage are shown in grey.

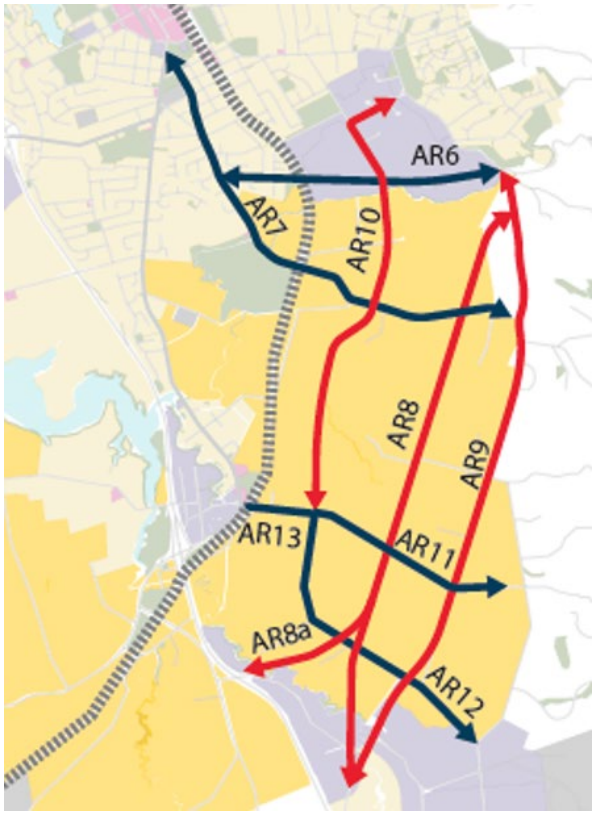

Figure 2-3 Shortlisted IBC options for Drury-Ōpāheke eastern arterial options – note option AR10 (included in the ISTN) which includes the Ōpāheke North-South arterial, the urbanisation of Hunua Road, and Croskery Road which forms part of FTN option

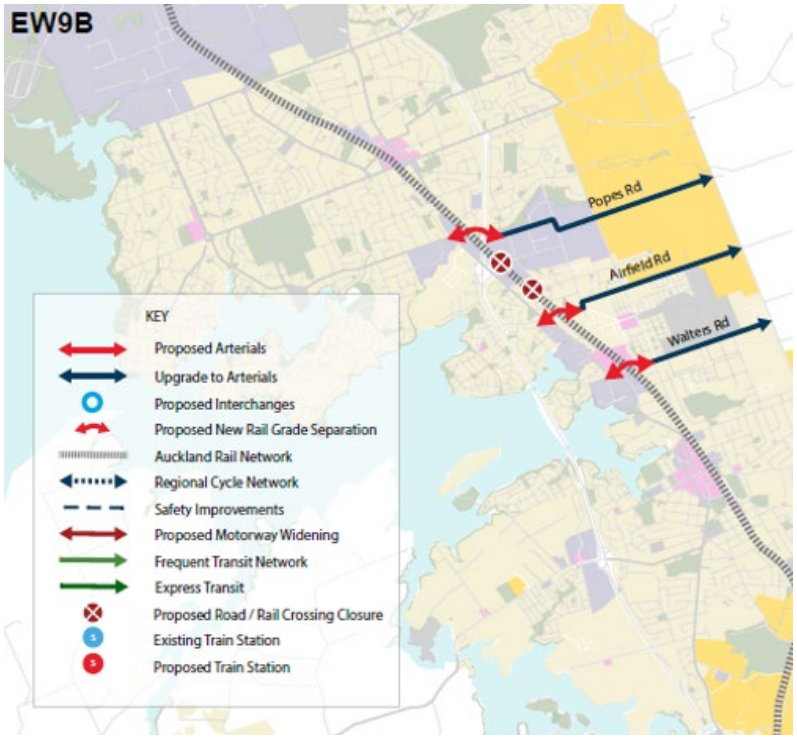

Figure 2-4: Preferred IBC option for Takaanini east-west crossings as included in the ISTN, including the northernmost corridor encompassing a Rangi Road viaduct, and upgrades to Rangi Road and Popes Road

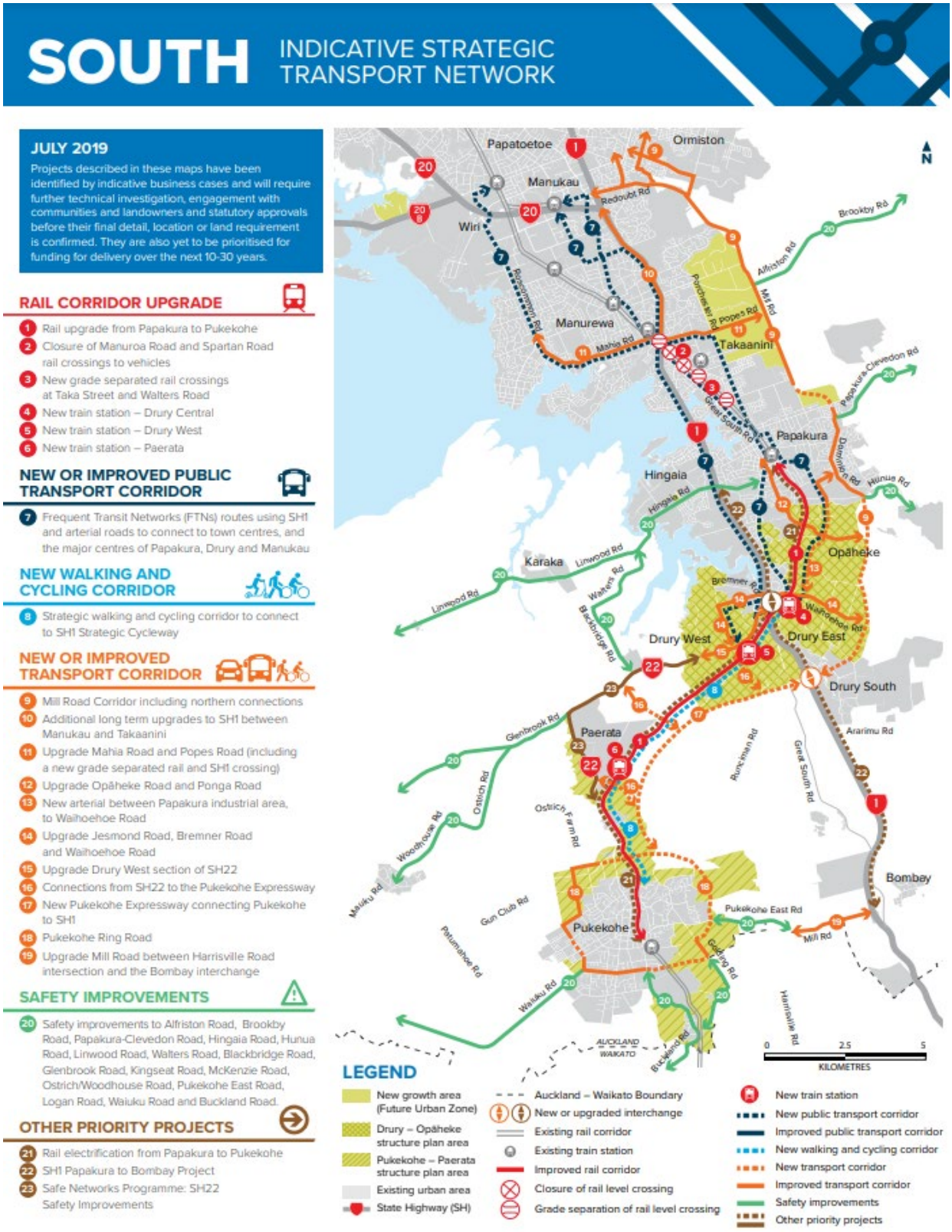

Figure 2-5: South Indicative Strategic Transport Network – note the four FTN routes identified in the IBC shown in dark blue annotated as '7' and the east-west crossing including the Rangi Road viaduct shown in orange annotated as '11'

2.3 Gap analysis – IBC to DBC

At the outset of the South FTN DBC, a gap analysis was undertaken to capture changes in the strategic context that have occurred since the completion of the South IBC; and test the IBC assessment and conclusions in the context of new information. This process recognises that the IBC was completed in 2019, that changes in the context for the South FTNhave occurred in the intervening period; and that such changes could change the scope of optioneering required for the DBC and/or the merits of conclusions in the IBC.

The key contextual changes that are directly relevant to the scope and merits of options for the South FTN are summarised in Table 2-1 below.

Table 2-1: Key contextual changes since the South IBC pertinent to the South FTN

Change	Explanation / relevance to South FTN optioneering
Changes to related transport projects	
Decision to progress the southern portion of IBC option MT4I as part of the Drury Arterials Package	The portion of IBC FTN route option MT4I between Drury and Papakura is proposed to utilise Jesmond Road, Bremner Road, Waihoehoe Road, a new Ōpāheke north-south arterial road, and Hunua Road. This part of the route follows IBC option AR10 shown above. With the exception of Croskery Road, these corridors have subsequently been progressed as part of the Drury Arterials DBC by Te Tupu Ngātahi, and are now designated. Accordingly, this section of the corridor is out of scope with no further optioneering required (apart from Croskery Road which is now in the scope of the South FTN DBC).
Decision to progress SH1 shoulder lanes as part of the Waka Kotahi Papakura-to-Drury (**P2D**) Project.	Two of the FTN route options identified in the IBC (options MT4K and MT4L) utilise sections of SH1 between Drury and Manukau. The shoulder lanes necessary to support such services now fall within the scope of Waka Kotahi's P2D Project, and accordingly are now outside the scope of the South FTN. Accordingly, no further optioneering has taken place progressing options utilising SH1. It is noted that these options also utilised a section of Great South Road east of the Drury Interchange. The decision to discard these options results in the need to examine this section of Great South Road separately (see Section 6 of this report).
Decision to progress Mahia and Roscommon Road corridors separately from South FTN DBC.	One of the FTN route options identified in the IBC (option MT4K) utilises the Mahia and Roscommon Road corridors. These two corridors are now being progressed as part of a separate project by AT, and funding was secured to run a new FTN route along these corridors as part of Auckland Council's 2022-23 Annual Budget. Moreover, an FTN connection from Mahia/Roscommon to Puhinui Station as envisaged in option MT4K was confirmed to no longer be supported by AT subject matter experts (**SME**). Accordingly, no further optioneering has taken place progressing options utilising Mahia and Roscommon Roads.
Progress on Single-Stage Business Cases (**SSBC**) for shorter-term interventions on Great South Road	Great South Road north of Papakura was a part of the Connected Communities programme of business cases to identify shorter-term bus, active mode, and safety improvements. Part of this extent overlaps with the option MT3C identified in the South IBC which proposed a longer-term FTN along Great South Road between Manukau and Drury. Accordingly, the South FTN DBC has given due consideration to these SSBCs to ensure alignment between the proposed short and long-term interventions along Great South Road.

Change	Explanation / relevance to South FTN optioneering
Decision to re-scope Mill Road under the NZ Upgrade Programme (**NZUP**)	The Mill Road Project was proposed as a four-lane strategic corridor between Manukau and Drury in the South IBC. It has subsequently been rescoped as a two-lane corridor focused on safety improvements at its northern end by 2028, with the remainder of the corridor to be route protected subsequently. The relevance of this is that two perpendicular east-west corridors – Popes Road and Croskery Road – still likely have strategic significance as connections to Mill Road. These are now included in the South FTN DBC as complementary (non-FTN) corridors (see Section 6 of this report).
Decision to implement NZUP Drury package	In addition to the P2D Project, two projects identified in the South IBC – the Drury Central Station and the urbanisation of Waihoehoe Road – have since been designated/consented (in the case of Drury Central) and designated (in the case of Waihoehoe Road), and funded under NZUP with a view towards implementation by 2025. This has left an adjoining short section of Great South Road in Drury in need of corresponding planning for urbanisation to ensure that the projects form a cohesive whole. This section of Great South Road is now in the scope of the South FTN DBC as a complementary (non-FTN) corridor.
Growth and Land Use	
Legislation and policy directing councils to enable increased housing supply	The National Policy Statement on Urban Development (**NPS-UD**) and the Medium Density Residential Standards (**MDRS**) (legislated through the Resource Management (Enabling Housing Supply and Other Matters) Amendment Act 2021 set clear direction for councils to enable increased housing supply in high-growth areas. Auckland Council's response came in the form of Plan Change 78 (**PC78**) which was notified in August 2022. These changes signal that growth in South Auckland will continue to be provided for, which in turn will result in travel demands necessitating multi-modal transport improvements such as the South FTN.
Updates to Auckland Forecasting Centre (**AFC**) growth scenarios	The DBC considers changes in land use assumptions, and utilises the most current land use assumptions available from the AFC. Since the completion of the IBC, there have been updates to growth scenarios used in Auckland which are reflected in this DBC. Scenario I11.6 has been used in this DBC which is consistent with current regional models, and no significant changes have been identified in comparison with the previous version I11.4 which was used in the IBC.
Private Plan Changes	Since the IBC, Plan Changes 52 and 58 have been approved along Great South Road in the Ōpāheke area; and Plan Change 67 has also upzoned parts of the Hingaia Peninsula. Recently approved plan Changes 48, 49, 50, 51, and 61 in the Drury area will enable significant urbanisation at the southern end of South FTN extent. Moreover, the Project Team is aware that pre-lodgement discussions are underway for large Plan Changes in the Alfriston and Ardmore areas. These Plan Changes signal that growth in South FTN project area is continuing to be planned and provided for, which in turn will result in travel demands necessitating multi-modal transport improvements such as the South FTN.
Transport and Climate Change legislation and policy	
Government Policy Statement on Land Transport (**GPS**) 2021 (and indicative GPS 2024)	The current GPS signals greater focus on projects that provide for better travel options/mode shift to sustainable modes, and contribute to a low-carbon transport system that supports emissions reduction. This direction is further strengthened in the indicative 2024 GPS which elevates emissions reduction to being the overarching focus for transport investment. The South FTN is well-aligned with these directives.

Change	Explanation / relevance to South FTN optioneering
Passage of the Zero Carbon Act and associated long-term target and Emissions Reduction Plans (**ERP**)(and parallel amendments to the RMA)	The Climate Change Response (Zero Carbon) Amendment Act 2019 set in place a framework for emissions reduction comprising a long-term target of net-zero greenhouse gas emissions by 2050, and a system of quintennial emissions budgets and ERPs as 'stepping stones' to the long-term target. The first ERP, published in 2022, sets a target of reducing vehicle kilometres travelled (VKT) by 20 percent by 2035 through providing better travel options. The South FTN is well-aligned with this objective. In parallel, sections 70A and 104E of the RMA have been amended to enable the consideration of greenhouse gas emissions on climate change in both plan-making and consenting decisions. Furthermore, sections 61, 66, and 74 of the RMA have been amended to require that local authorities must have regard to ERPs and national adaptation plans when making and amending regional policy statements, regional plans, and district plans. Finally, the NPS-UD set under the RMA sets an objective that New Zealand's urban environments support reductions in greenhouse gas emissions; and a related policy requiring planning decisions to contribute to well-functioning urban environments, which urban environments which support reductions in greenhouse gas emissions. All of the above considerations place an increased onus for transport projects to demonstrate how they contribute to greenhouse gas emissions reduction.
Changes in environmental planning context	
New NPS for Freshwater Management and Indigenous Biodiversity	In addition to the NPS-UD discussed above, new NPS's on Freshwater Management (**NPS-FM**) and Indigenous Biodiversity (**NPS-IB**) have come into effect since the completion of the IBC. The Project Team have considered the implications of these in the process of developing and assessing options to the extent relevant (noting that the NPS-IB has only come into effect recently).
Updated flooding data from Auckland Council Healthy Waters	Flooding data from Auckland Council Healthy Waters has been updated since the IBC. This has informed the development and assessment of DBC options.

The contextual changes summarised in Table 2-1 have directly informed the scope of the South FTN and the optioneering documented in this report. In particular:

- Changes to related projects have resulted in a reduced scope of optioneering to be taken forward in the DBC compared with the FTN options identified in the IBC. The four FTN routes identified in the IBC are now reduced to two routes as a result of decisions to remove SH1, Mahia Road, and Roscommon Road from the scope (see Figure 2-6);
- Some sections of the remaining routes have already been designated as part of the Drury Arterials package[4] (i.e. the Ōpāheke North-South Arterial between Papakura and Drury). However, this package omitted adjoining sections of Hunua Road and Croskery Road, which are now part of the South FTN DBC (see Figure 2-6);
- Changes to land use, transport, and climate change legislation and policy are strongly aligned with the South FTN, and provide strong justification to proceed with further investigation of options for the remaining FTN options; and
- Decisions on the scope of NZUP projects, in particular Mill Road and the Drury package, have informed the need to include complementary corridors (Popes Road and Great South Road at Drury) in the South FTN DBC scope.

[4] Also a project within Te Tupu Ngātahi.

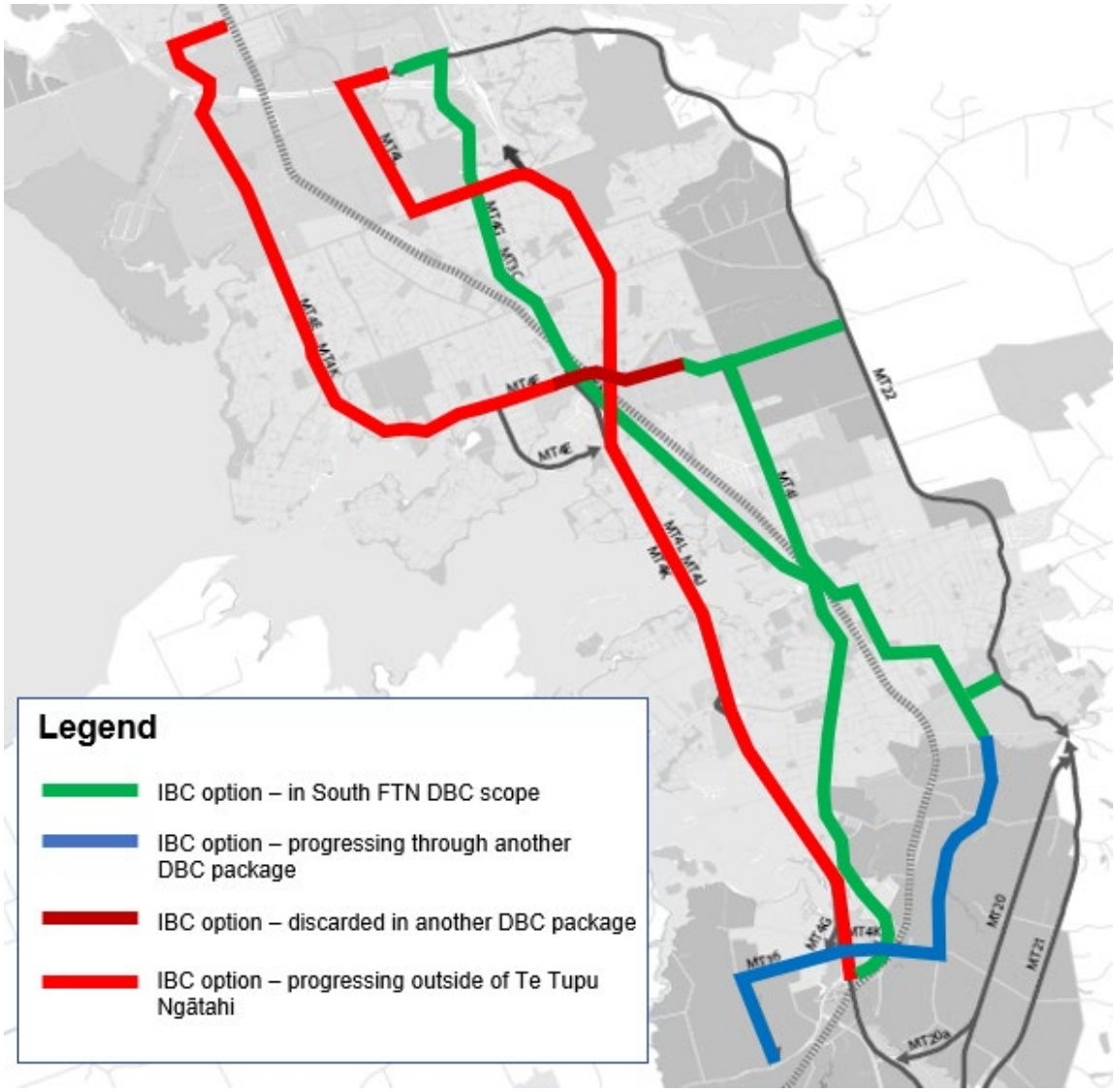

Figure 2-6: Status of IBC FTN options at the commencement of the South FTN DBC process (N.B. Alignments through DBC process evolved as outlined later in this report).

3 General methodology

3.1 Process summary

The optioneering process applied to each of the South FTN corridors is shown in Figure 3-1. In essence, the process can be split into the following deductive steps:

- Steps to identify the preferred **routes** for the South FTN
- Steps to identify the preferred **form and function** for each part of the South FTNto determine its physical extent; and
- Steps to refine the detailed **location** of any road widening/realignment required to accommodate the preferred form and function along the preferred route.

The process is described in greater detail below.

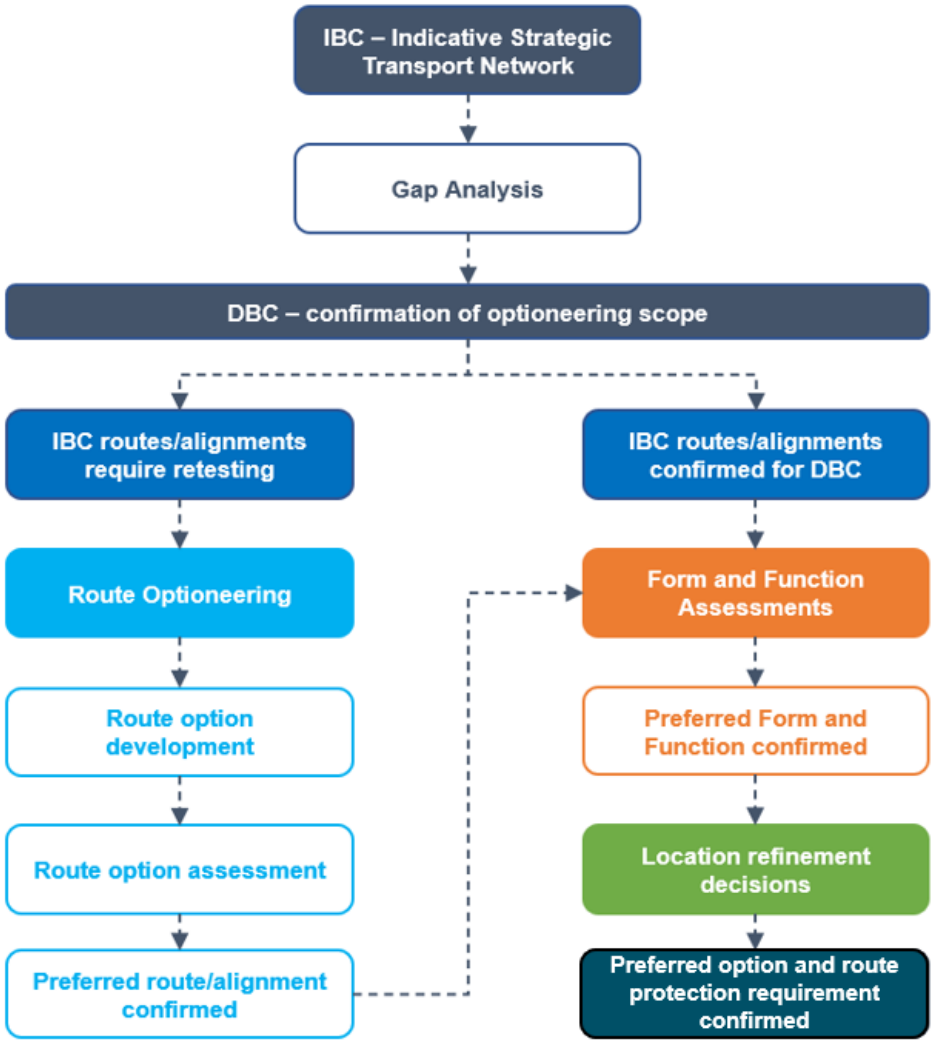

Figure 3-1: DBC optioneering process

3.1.1 Gap analysis and confirmation of DBC optioneering scope

As summarised in Section 2, the South IBC recommended several FTN corridors and related arterial roads for inclusion in the ISTN. The South FTN DBC advances this subset of projects from the ISTN, and therefore uses the ISTN as a starting point for further optioneering.

The first optioneering stage is a gap analysis which captures the contextual changes that have occurred between the IBC and DBC processes. As noted in Section 2.3, this process recognises that the IBC was completed in 2019, that changes in the project context have occurred in the intervening period; and that such changes could change the scope of optioneering required for the DBC and/or the merits of conclusions in the IBC.

The contextual changes identified in the gap analysis that are pertinent to optioneering for the whole South FTN re summarised in Section 2.3 of this report. The localised optioneering for each part of the South FTN(in Part B of this report) identifies which changes from this wider summary are of particular relevance to the route or section in question.

The key aim of the gap analysis process is to confirm the necessary scope of optioneering for the DBC. In the case of the South FTN, the key scoping matter to be determined at the outset is whether or not the IBC route/alignment in question needs to be retested in light of contextual changes. This can include the identification of new options beyond the scope of previously assessed options; and retesting of previously discarded options.

Where retesting is needed, a process of further route optioneering is initiated. Where retesting is not needed, the step is omitted, and the IBC route is validated and taken forward as the basis for subsequent form and function assessment and location refinement.

3.1.2 Route optioneering

Where retesting of an IBC route option is needed, a process of further route optioneering is undertaken. This includes both the development of options to meet the DBC investment objectives, and the assessment of those options. As noted above, where the IBC route is validated through the gap analysis process, this step of further route optioneering is not undertaken.

Option Development

The purpose of option development is to ensure that an appropriate range of routes/alignments to meet the DBC investment objectives are identified for assessment. Inputs to option development included the use of Waka Kotahi's Early Assessment Sifting Tool (**EAST**), consideration of bus routing options provided by AT Metro in Remix software, as well as desktop assessment and constraints analysis.

Option Assessment

The MCA Framework developed for Te Tupu Ngātahi was the primary method used to assess route options where this level of assessment was necessary. This process required all options in a group of options to be scored by relevant SMEs against the DBC investment objectives, and a set of MCA criteria (see Table 3-1). This assessment used an eleven-point scoring scale (see Table 3-2), and also required the experts to provide commentary and rationale for their scores.

Table 3-1: Te Tupu Ngātahi MCA Framework

MCA topic	No.	Criterion	Measure
Investment Objectives			Refer to Appendix A for the DBC investment objectives for South FTN and Key Connections.
Heritage	1a	Heritage	See MCA Framework appendix (Appendix A) for detailed explanation of measures for each criterion.
	1b	Manawhenua[5]	
Socio-economic impacts	2a	Land use futures	
	2b	Urban design	
	2c	Land requirement	
	2d	Social cohesion	
	2e	Human health and wellbeing	
Natural Environment	3a	Landscape and Visual	
	3b	Stormwater	
	3c	Ecology	
	3d	Natural Hazards	
Transport	4a	Transport System Integration	
	4b	User Safety	
Construction Impacts	5a	Construction impacts on utilities / infrastructure	
	5b	Construction Disruption	
	6	Construction costs / risk / value capture	
Non-Scored Criteria		Stakeholder / Project Partner feedback	
		Policy Analysis	
		Indicative costs	
		Manawhenua	

Table 3-2: MCA Scoring Scale

	-5	-4	-3	-2	-1	0	1	2	3	4	5
Type	Adverse					Neutral					Positive
Magnitude	High				Low		Low				High
Significance	Regional				Local		Local				Regional
Extent	Substantial				Low		Low				Substantial
Duration	>20 years				<1 year		<1 year				>20 years

In identifying a preferred route/alignment option, aggregate scoring or weighting of MCA criteria were not produced. This ensured that preferred options were reached through balanced consideration of all

[5] Note Manawhenua did not wish to score this criterion numerically, and accordingly it was excluded from scoring.

criteria, and that the MCA would not prejudice further feedback received through the engagement process from Project partners, stakeholders, and the public which also informed option assessment.

3.1.3 Form and Function assessment

Following the identification of a preferred route for each part of the South FTN the preferred form and function of the proposed transport upgrade/corridor was then identified to determine its physical extent. The assessment informing the physical extent was divided into corridors (i.e. midblocks), and intersections using the following processes described in the following sections.

These assessment tools discussed below are designed to enable project teams to select appropriate form and function options from a set of modular concept designs developed at a Programme-wide level for both midblock cross-sections and intersection forms. This approach is undertaken on the basis that it provides for a suitable level of detail for route protection and design efficiency, whilst allowing for future design flexibility and changes at the time of implementation. However, in case of the South FTN, the process of defining a preferred form and function has required some refinement and further development of the modular designs to account for local contextual constraints, and the wide range of present-day (i.e. existing urban) road configuration starting points. These are documented where relevant in Part B of this report.

As part of the below processes, the preferred form and function options were also the subject of consultation and endorsement by owner organisation SMEs.

3.1.3.1 Corridor Form and Function (CFAF) process

The CFAF process has been established by Te Tupu Ngātahi to provide a consistent methodology to define the form and functional requirements for transport corridors, and ensure that all modes are considered. It is based on the AT Roads and Streets Framework (**RASF**) guidance which considers a combination of both ‘movement’ and ‘place’ significance on the individual setting:

- **Place factors** consider the existing land use, future land use plans and trip generators present in the catchment area. It also includes an assessment of the future density of residential, industrial, or mixed land use and local/regional trip attraction areas e.g. metro stations, schools, hospitals; and

- **Movement factors** consider the hierarchy of the corridor in the regional road network public transport network, strategic freight network), modal priorities for the corridor and existing and future traffic volumes to determine the future typology and recommendations for a corridor function. Movement is considered at both local and network levels to ensure that duplication of facilities is avoided, and the corridors have targeted modal functions.

In practice, the process systematically considers a range of transport inputs denoting the ‘movement’ significance for each transport mode (e.g. predicted future traffic volumes, bus network planning and predicted bus volumes, and status as freight or active mode routes); and factors denoting the ‘place’ significance such as adjoining land use. The typical output of the process is the identification of a suitable midblock cross-section from a suite of modular concept designs. The cross-section forms the basis for route protection for the corridors.

3.1.3.2 Intersection Assessment process

In parallel to the CFAF process, an intersection assessment process is undertaken to identify which intersections along each route require upgrades, which indicative intersection controls are to be applied where upgrades are required, and the resultant footprint implications.

For the purposes of the intersection assessment the following factors are considered:

- Safety;
- Transport network function (movement) and land use function (place);
- Form and Level of Service (**LOS**) / Quality of service required for different modes;
- Land use integration;
- Site specific constraints;
- Urban form;
- Design constraints;
- Roundabout vs signals guidance;
- Network staging and route protecting;
- Future land use assumptions; and
- Future transport network assumptions.

For each intersection control chosen, design features were also considered to ensure that the intersection meets the needs of different users safely and effectively, and responds to the site-specific factors. The guidance adopts a 'Safe System' approach and recommends roundabouts as the first choice for at-grade intersections due to the safety benefits for vehicular traffic resulting from slowing down through traffic and reducing the number of conflict points. However, where roundabouts are not considered appropriate (for example due to engineering constraints, bus priority implications, existing lane layouts, or land use implications) signalised intersections were then considered.

In identifying which intersections require upgrades as part of the Project, a filtering process was applied which selected intersections based on the following considerations:

- Whether an intersection upgrade would provide for more efficient and reliable bus services – reducing the number of intersections that cause disruption to bus through movement. As part of this, spacing between proposed signalised intersections was considered;
- Whether an intersection upgrade would provide safe crossing points for pedestrians and cyclists to access the public transport network and connect to amenities based on walking catchments;
- Whether there were any site-specific safety concerns such as poor visibility, horizontal/vertical grade issues, and existing uncontrolled intersections at crossroads;
- Side road factors – i.e. the traffic volumes, complexity, status within the road hierarchy; and whether the side road provides access to key destinations such as schools, rapid transit stations, or the wider strategic road network; and
- T-intersections with local roads are generally priority controlled now, and it has been assumed that they will remain priority-controlled in the future.

Following this filtering process, 37 intersections were identified within the extents of the South FTN corridors which are further discussed in Part B of this report. Intersections with local roads are generally priority-controlled and are assumed they will remain priority-controlled in the future.

SIDRA modelling was undertaken to assess the impacts of the intersection form on the wider network. It should be noted that in some cases modelling constraints resulted in limited turning volumes. In these cases, high level assumptions on likely turning movements were utilised.

3.1.4 Location refinement

Following the identification of a preferred form and function for each part of the South FTN, the inal step of the optioneering process was to identify and refine alignment and footprint for each part of South FTN. This step required reconciliation of a number of expert and technical inputs in a workshop setting, considering factors such as:

- Opportunities to avoid or reduce impacts on known environmental and cultural features, values, and/or constraints;[6] and
- If required:
  - The need to set designation boundaries which ensure that reasonable access to and use of adjoining properties and buildings can be maintained;
  - Any advantages or disadvantages associated with requiring land that relate to its ownership status (e.g. publicly or privately-owned) or zoning/planning controls (e.g. urban or future urban); and
  - The need for designation boundaries to provide for the construction, operation, and maintenance of South FTN.

3.1.5 Identification of preferred option

Following the above location refinement considerations, the emerging preferred option was able to be defined and progressed to concept design. This included consideration of vertical and horizontal alignment, allowances for earthworks, the configuration of access for affected properties, and stormwater requirements including indicative attenuation and treatment devices (see Section 3.2 below). The relevant details of the design process are further discussed in Part B of report to the extent necessary to document optioneering.

3.1.6 Finalising the route protection requirement

Following the above documented optioneering process, the spatial requirements for route protection were identified in a concept design relative to the existing corridor road extent and identified constraints. As noted above at Section 3.1.5, the variability in existing corridor conditions and range of constraints identified was such that the concept design phase was iterative.

The final consideration in the alternatives assessment was whether there is a clear case to proceed with route protection (via designation or alternative method – see Section 7) now. This qualitative assessment considered a range of factors which inform the strategic context for route protection in each part of the South FTN. These are listed in Table 3-3 below.

Finally, where a route protection requirement was confirmed through this assessment and new designation was identified as the preferred route protection mechanism (see Section 7 of this report), the proposed packaging of NoRs is finalised. The rationale for packaging decisions is documented where relevant in this report.

[6] These were the subject of analysis reconciling of a number of expert and technical inputs, and in the first instance included matters identified in Part 2 of the RMA, matters for which RMA policy documents direct avoidance, and provisions cascading from those policies (e.g. AUP:OP overlays).

Table 3-3: Factors determining the strategic merit of route protection

Factor	Explanation
Transport / urban form benefits of route protection	• The benefits of route protection from a transport and urban form perspective will vary – the greater these benefits, the stronger the case for route protection (and vice versa).
Scale / cost of route protection	• The third-party land requirements associated with the preferred option vary by location – the greater the scale/cost of the requirements relative to the transport/urban form benefits, the weaker the case for route protection (and vice versa).
Route protection benefit / development pressure	• Conventionally, route protection is proposed to ensure that no development precluding/hindering the proposed works can proceed, and the South FTN is located in a largely urbanised context. • However, the zoning applying to South FTN project area (particularly under PC78) allows for a higher intensity of development than exists in many locations. Accordingly, there is still an opportunity to route protect and future-proof for the transport demands resulting from this intensification (particularly where existing development does not represent highest and best use of land). Conversely, where current development opportunities have been realised land use change may be more stable.
Interdependent projects	• The South FTN interfaces other planned transport corridors. Concurrent planning activities can strengthen the case for route protection given the opportunity to integrate plans and future-proof for an integrated network. • Conversely, insufficient information on interfacing projects may present risks/difficulties for making sound route protection decisions.
Likelihood of future funding prioritisation + land use certainty	• While route protection is premised on the likelihood of long-term implementation, the case for route protection is strengthened where there is a likelihood of future funding prioritisation. • The case for route protection is similarly strengthened with greater certainty that future land use will continue to necessitate South FTN.

3.2 Stormwater infrastructure design and management approach

As part of route protection, the South FTN is required to identify and appropriately protect the land necessary to enable the future construction, operation, and maintenance of required transport corridors/infrastructure. The design has therefore considered the appropriate stormwater management methods to meet likely catchment needs and achieve the future regulatory requirements.

The type and location of stormwater infrastructure was based on a stormwater philosophy developed for South FTN and Te Tupu Ngātahi broadly which seeks to achieve the following objectives:

- Provide stormwater treatment and retention/detention for new impervious surfaces;
- Re-use and re-purpose existing infrastructure where possible;
- Enhance with green infrastructure and incorporate with urban design; and
- Provide treatment of existing surfaces where possible, including where existing runoff mixes with new prioritising high loading areas such as intersections.

It is noted that this approach sets out the overarching stormwater management philosophy and rationale for proposed stormwater management treatment across the South FTN project areas in the context of relevant stormwater related statutory requirements. This approach will be further refined through future consenting and the detailed design process. The process for identifying stormwater treatment form and function is summarised in Figure 3-2.

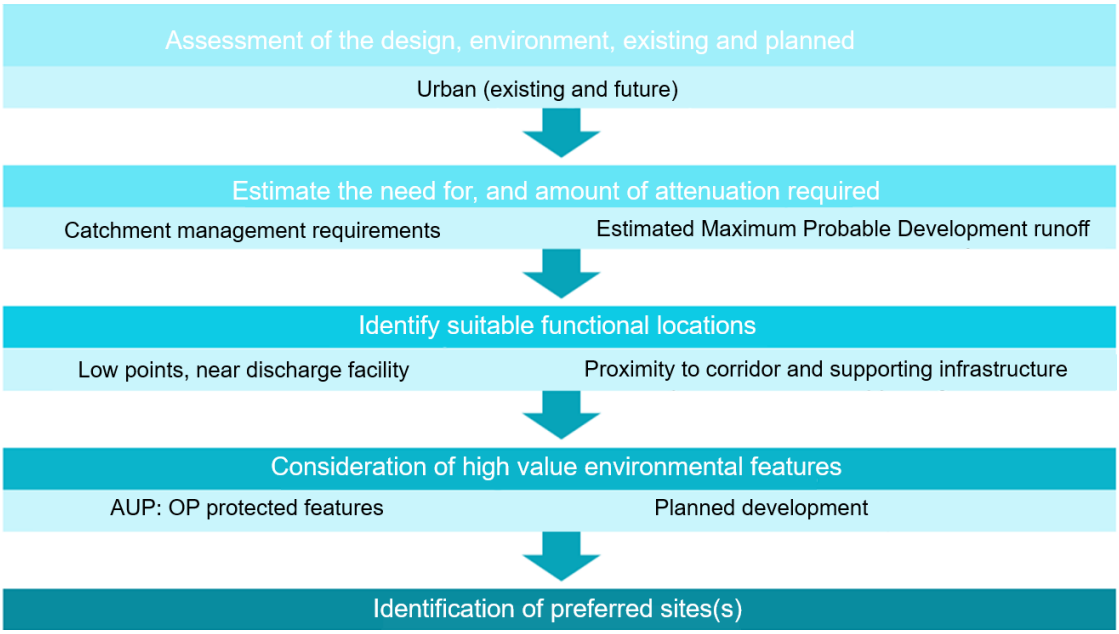

Figure 3-2: Stormwater infrastructure design and location approach

The type of stormwater management device in turn was identified based on a generic design framework which considered:

- The surrounding existing and planned land-use;
- Form of the transport route;
- Road hierarchy; and
- How connectivity to adjacent properties would be provided.

This approach is summarised in Table 3-4 below.

Table 3-4: Stormwater System Design Approach

	Stormwater Management Functions			
Design Environment	**Conveyance**	**Treatment**	**Retention**	**Detention (Attenuation)**
Existing Urban –within existing road reserve	Pits and pipes	Discharge across berm	Raingarden	Wetland / pond
Existing Urban – road widening	Pits and pipes	Raingardens or treatment wetland / pond, or as a lesser preference, proprietary treatment devices	Raingarden	Wetland / pond

The above approaches have been adapted into the process illustrated at Figure 3-3, which sets out how the specific stormwater management devices identified the context of the South FTN are

selected. This process demonstrates that the selection of stormwater management devices is the subject of a deductive process which considers:

- Whether stormwater management devices are required having regard to the AUP:OP and Auckland Council's GD01[7] guidelines. Under these regulations, stormwater management devices are required for high-use roads, contaminant-generating carparks, works areas involving new pavement areas of >5,000m^2, or works within Stormwater Management Area Flow (**SMAF**) areas;
- Where stormwater devices are required, the type of device is then chosen. This is chosen based on the location of works within the catchment, the existing performance of the stormwater network, and consequently what the functional requirements of the device are (i.e. treatment, attenuation/detention, conveyance – see Table 3-4); and
- The scale of property impact associated with the stormwater management device is also considered. While wetlands have the benefit of providing for both stormwater detention/attenuation and stormwater treatment, they also have the most significant land requirement. Opportunities to provide for at-source treatment (i.e. raingardens, swales) are therefore considered where these devices can provide for the stormwater management functions needed where impact on existing built form is prioritised.

Once the type of stormwater management device for the works was chosen, the location and sizing of the devices was identified. It is noted that:

- The location of wetlands is generally chosen based on low points within the catchment traversed by the works, while the location of at-source treatment devices (i.e. raingardens, swales) are located within the road corridor;
- Where wetlands were identified as a requirement, an additional consideration to low points in the catchment was the ability to utilise land already required for a transport purpose to rationalise the property requirements of South FTN as a whole;
- Wetland sizing was based on the following assumptions (see Figure 3-3):
    - 10% of catchment area where 100-year attenuation is needed;
    - 6% of total catchment where 10-year attenuation is required; and
    - 3% of total catchment if water quality treatment and detention is needed.

Finally, it is noted that in locations in which the proposed transport upgrades do not require stormwater treatment (for example where works do not trigger the need for treatment at >5,000m^2 new impervious area), or where a suitable existing stormwater management system is available, new stormwater management devices are generally not proposed on the basis that no additional stormwater management capacity is considered necessary. The calculations underpinning these assumptions were made on a localised section-by-section basis (based on the corridor segmentation set out at Section 3.3 below).

[7] *Stormwater Management Devices in the Auckland Region* – Guideline Document 2017/001 Incorporating Amendment 2. Auckland Council, 2017.

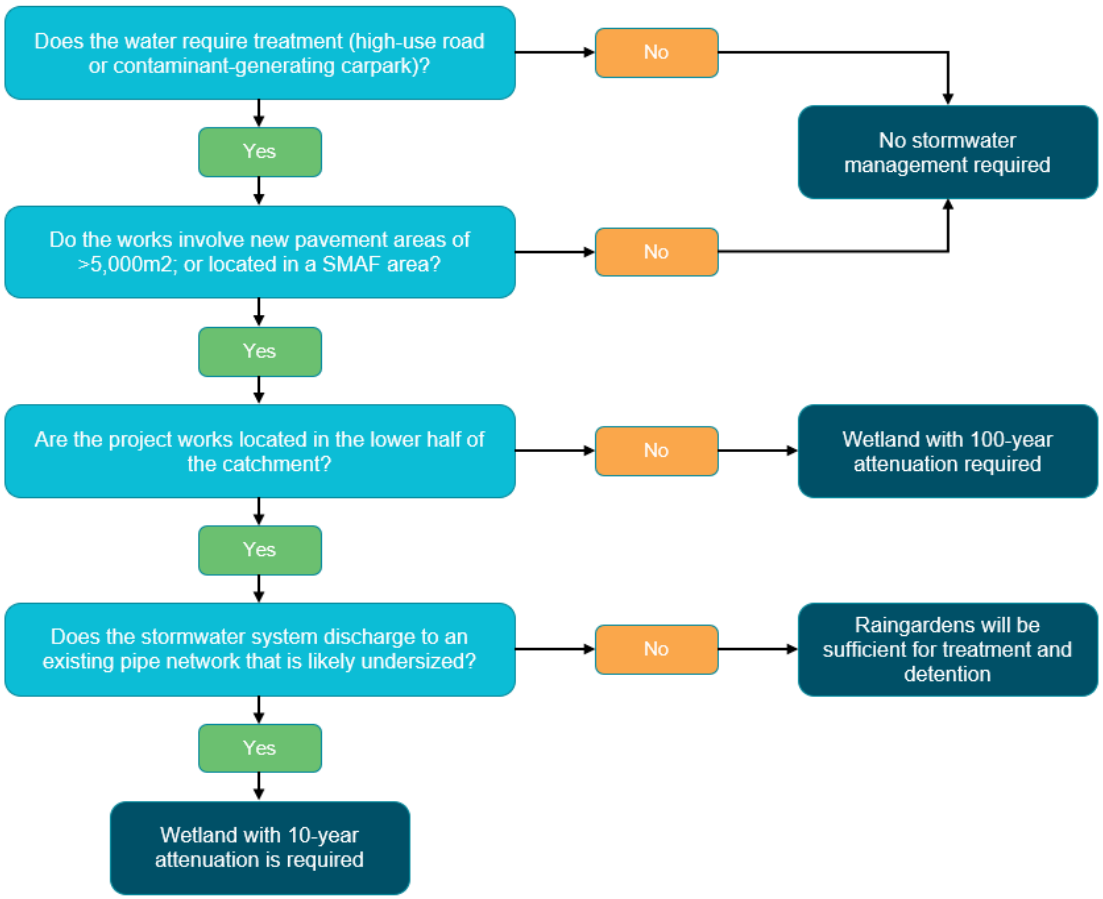

Figure 3-3: Process of identifying stormwater management devices for the South FTN

3.3 Corridor Segmentation

To apply the above optioneering process on a localised basis, South FTN corridors have been divided into sections as shown in Table 3-5 and Figure 3-4. Localised optioneering was necessary given the significant contextual differences that exist over the study area. Segmentation sought to break the corridor into manageable areas for further localised assessment and documentation, and took account of a number of factors including areas of similar land use along the corridor, as well as the location of interfacing railway stations. The various sections are referred to throughout the remainder of this report as necessary. Segmentation is summarised in Table 3-5 for ease of report navigation.

It is noted that the segmentation outlined in Table 3-5 was not able to be undertaken until **after** routes were confirmed in cases where further route optioneering was required (see Section 3.1.2 above).

Table 3-5: Corridor Sections

Report reference	Route	Section	Extent	Length
Part B Section 4	Great South Road FTN	1a	Manukau Station Road (Davies Avenue to Great South Road)	4.8km
		1b	Great South Road (Manukau Station Road to Browns Road)	

Report reference	Route	Section	Extent	Length
		1c	Great South Road (Browns Road to Northcrest Way)	
		2	Great South Road (Weymouth Road to Mahia Road)	1.0km
		3	Great South Road (Mahia Road to Takaanini Station)	1.6km
		4	Great South Road (Takaanini Station to Subway Road)	3.6km
		5	Great South Road (Wellington Street to Waihoehoe Road)	4.5km
Part B Section 5	Takaanini FTN	6	Weymouth Road and Alfriston Road (Selwyn Road to Porchester Road)	2.3km
		7	Porchester Road (Alfriston Road to Airfield Road)	3.8km
		8	Porchester Road, Walters Road, Grove Road, Clevedon Road, Railway Street	5.4km
		9	Wood Street, Ōpāheke Road, Settlement Road, Hunua Road	2.5km
Part B Section 6	Key Connections	Popes Road (Takanini School Road to Mill Road)		2.2km
		Great South Road (Waihoehoe Road to SH1)		0.5km

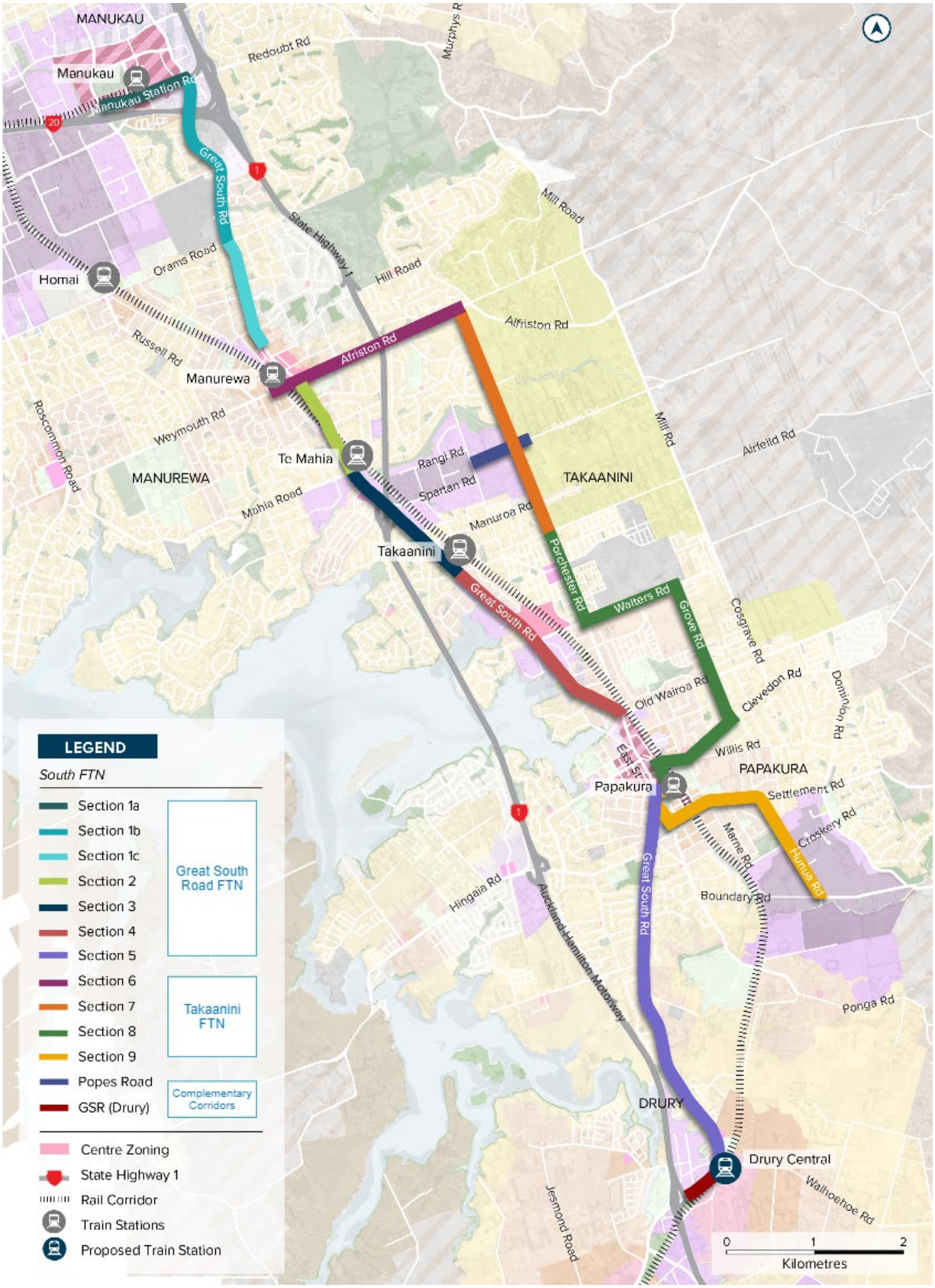

Figure 3-4: South FTN Corridor Segmentation

PART B: ASSESSMENT OF ALTERNATIVES

4 Great South Road FTN Upgrade

4.1 Gap analysis and confirmation of optioneering scope

As noted in Section 2.2, the ISTN included an FTN route on Great South Road between Drury and Manukau (referred to in the IBC as option MT3C as shown at Figure 2-2). This route was the starting point for DBC optioneering on the Great South Road FTN route. The methodology outlined in Section 3 requires the implications of new information identified in the gap analysis to be considered with a view to establishing the necessary scope of further optioneering in the DBC.

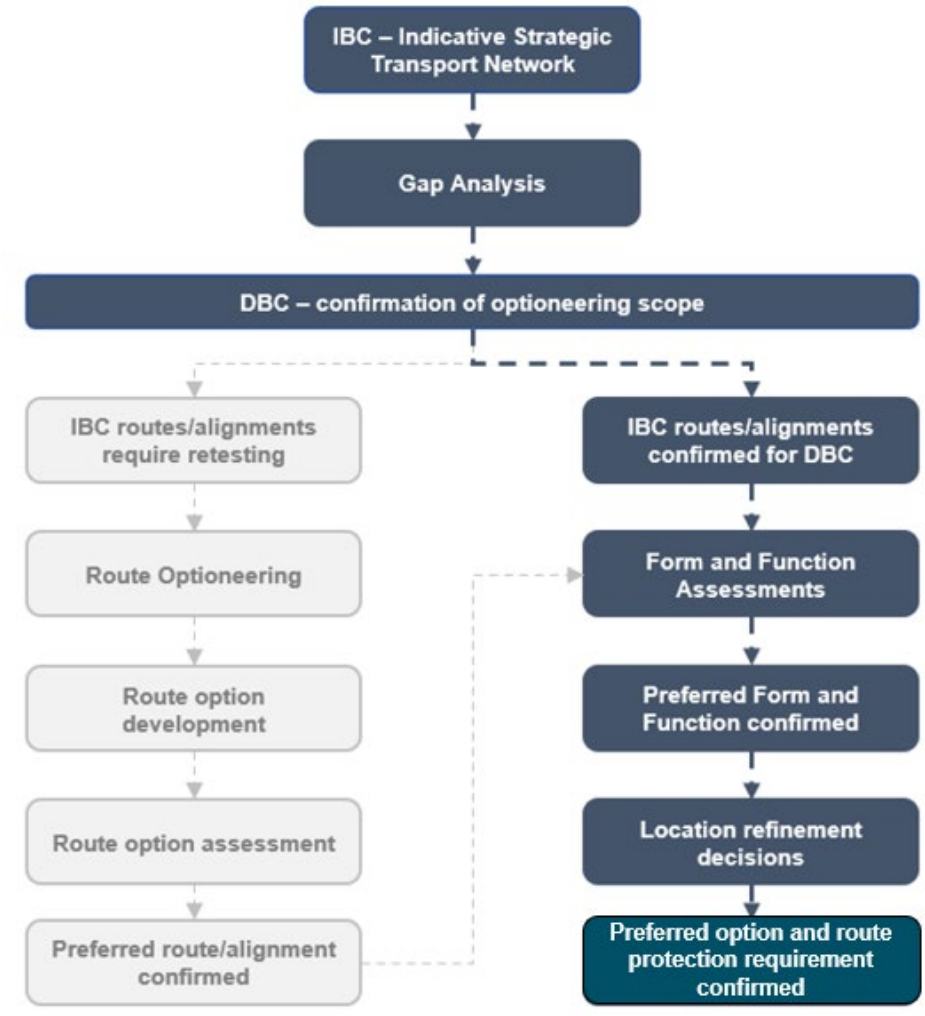

Figure 4-1: Optioneering process adapted for the Great South Road FTN. Note omission of the route optioneering process steps.

In making this determination, the following conclusions on the Great South Road FTN were reached through the gap analysis process (summarised in Section 2.3):

- None of the related transport projects outlined in 2.1 are a substitute for a Great South Road FTN. Therefore, the various changes to and decisions on these projects that have occurred since 2019 do not weaken the case for a Great South Road FTN. The closest related project identified are the Connected Communities SSBCs for Great South Road north of Papakura, which are not a substitute for the longer-term interventions extending south to Drury envisaged in the South IBC and this DBC. Changes to and decisions on the remaining projects do not weaken the case for a Great South Road FTN, and in some cases (e.g. Mill Road rescoping) arguably strengthen it;
- Legislative and policy direction to enable increased housing supply, updates to AFC growth scenarios, and Private Plan Changes all signal that the areas on and around Great South Road between Manukau and Drury will continue to experience urban growth and increased demand on the transport network. PC78 proposes to enable significant growth in this area over and above the currently operative provisions of the AUP:OP; and recently approved plan changes 52 and 58 (in Ōpāheke), 67 (in Hingaia); and 48, 59, 50, 51, and 61 (in Drury) all signal continued growth in travel demand on Great South Road;
- The type of multi-modal interventions envisaged for Great South Road – namely enhanced FTN bus services and active mode improvements – are consistent with the transport and climate change legislation and policy directives outlined in Table 2-1;
- In addition to the above, Great South Road remains a strategically significant north-south arterial route for all transport modes given the lack of alternative routes in the network. This is reflected in AT's Future Connect classifications, and AT Metro's future network planning. While additional north-south connections and network improvements are planned to increase network capacity and resilience, none are considered a direct substitute or replacement for Great South Road; and
- The road already exists, and any parallel corridors will not be functionally equivalent.

For the above reasons, there was not considered to be any reason to further retest the route for the Great South Road FTN – accordingly IBC option MT3C was validated and confirmed as the route and extent in the DBC for the Great South Road FTN. The route optioneering process step was therefore omitted, and the corridor proceeded directly to the form and function assessment and location refinement (see Figure 4-1).

At this point, the Great South Road FTN route was divided into five sections as outlined in Section 3.3 to allow for localised form and function assessment and location refinement optioneering.

4.2 Form and Function

4.2.1 Corridor Form and Function

As noted in Section 3.1.3.1 of the general methodology, the CFAF process, as developed and applied at the Programme-wide level, is intended to use land use and transport planning inputs to define functional requirements for the corridor in question, and identify a suitable midblock cross-section from a set of modular concept designs. This approach is taken on the basis that it provides for a suitable level of detail for route protection and design efficiency, whilst allowing for future design changes and flexibility at the time of implementation.

In the case of the Great South Road FTN, the initial output of the CFAF process was the application of a four-lane FTN arterial cross-section to the entire length of the route (see Figure 4-2). This

conceptual design incorporates one general traffic lane and one bus lane per direction, separated active mode facilities in each direction, and space for berms and a central median (see Figure 4-2). This cross-section was initially applied, with care taken to use the location refinement principles outlined in Section 3.1.4 where third-party land was identified as being needed.

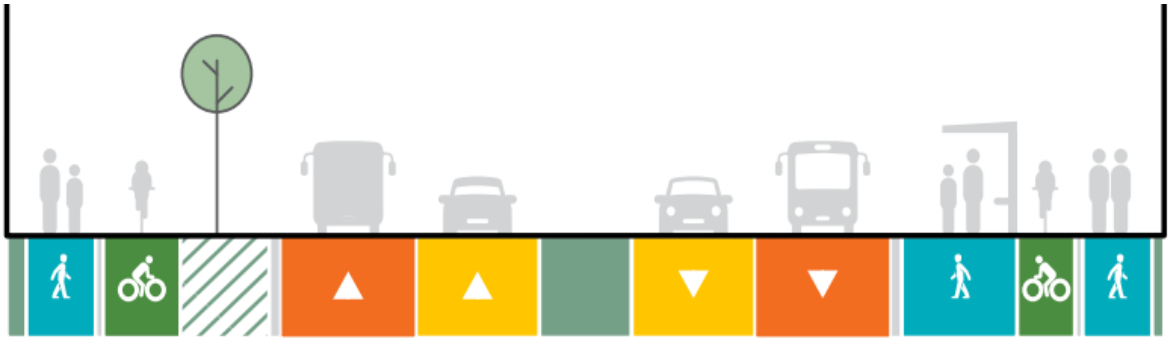

Figure 4-2: Four-lane FTN arterial cross-section

This initial approach was ultimately not followed for the Great South Road FTN for several reasons as follows:

- Significant third-party land requirements along the corridor, with over 1,300 properties directly affected along its 15.5km length. This significant property requirement in large part resulted in high costs and effects not justified by South FTN's level of strategic benefit;
- The application of a generic cross-section did not account for local contextual constraints, and the wide range of present-day road configurations along Great South Road – in short, some sections have the necessary width already, while others require significant third-party land;
- The application of a generic cross-section also triggers land requirements even where third-party land is not required to meet the desired transport functions – for instance where reconfiguration of the corridor layout requires additional stormwater treatment not otherwise required. This was a significant contributor to the third-party land requirements for the generic cross section; and
- The nature of transport demands is relatively tidal in a number of sections of the corridor, meaning that there are opportunities to meet the investment objectives with a less impactful cross-section configuration (e.g. northbound bus lane only).

Given the above issues, a bespoke reassessment of the required form and function for each section of the Great South Road corridor was undertaken on a section-by-section basis to confirm the preferred physical form of the section to be taken forward to the location refinement stage. Several approaches were considered in this process as summarised in Table 4-1. Examples of a cross-section representing each approach are shown in the table.

Table 4-1: Approaches considered in form and function reassessment

Premise	Approach	
Fit within (or largely within) existing road reserve and retain existing kerblines	**A**	Prioritise a transport mode (e.g. full bus lanes or active mode improvements but not both). 
	B	Remove an element from cross-section (e.g. bus lanes in one direction only) 
	C	Existing road reserve already sufficient to accommodate all desired cross-section elements (variable).
Full road space reallocation and/or road widening	**D**	Apply full four-lane FTN arterial cross-section (>26.5m width). 

The results of this reassessment are summarised in Table 4-2 below. It is noted that the applicability of the various approaches differs according to the different circumstances along the corridor, and accordingly, that not every approach is compared in every section.

Table 4-2: Summary of preferred form and function approaches

Section	Existing width	Approaches considered				Key reasons for preferred approach
		A	B	C	D	
1a	>30m	N/A	N/A	Preferred	Not progressed	• Existing road width sufficient – no/minimal third-party land requirements. • Avoids property impacts associated with Approach D (e.g. stormwater treatment). • Achieves desired level of service for public transport, and maintains/improves level of service for active modes.
1b	>30m	N/A	N/A	Preferred	Not progressed	
1c	20m	Not progressed	Preferred	N/A	Not progressed	• Achieves a northbound bus lane which is the direction of highest anticipated travel demand. • Ensures separated facilities for active modes. • Lesser third-party land requirement than other approaches.
2	20m	Not progressed	Preferred	N/A	Not progressed	
3	30m	N/A	N/A	Preferred	Not progressed	• Note some variation within section 4 – hence both approach B and C preferred. • Existing road width sufficient – no/minimal third-party land requirements. • Achieves desired level of service for public transport, and maintains/improves level of service for active modes.
4	20-30m	N/A	Preferred	Preferred	Not progressed	
5	<27m	Not progressed	Preferred	N/A	Not progressed	• Achieves a northbound bus lane which is the direction of highest anticipated travel demand. • Ensures separated facilities for active modes. • Lesser third-party land requirement than other approaches.

4.2.2 Intersection Assessment

As noted in Section 3.1.3.2 of the general methodology, an intersection assessment process was undertaken in parallel to the CFAF to identify which intersections required upgrades, the indicative intersection controls in these locations, and the resultant footprint implications. Similarly, to the CFAF process, the approach developed and applied across the programme for the intersection assessment was to use land use and transport planning inputs to define functional requirements for the corridor in question, and identify a suitable intersection layout from a set of modular intersection designs.

The intersection filtering process identified sixteen intersections requiring interventions along the Great South Road FTN route between Manukau and Drury. These were identified based on the considerations listed in Section 3.1.3.2 of the general methodology and are listed in Table 4-3.

As noted in Section 3.1.3.2, the intersection form at each site was identified based on a range of factors including safety, operational efficiency, urban design/land use integration, public transport operations, engineering and environmental constraints, property constraints, and other site-specific factors. While roundabouts are the typical first choice for at-grade intersections recommended in 'Safe System' guidance, it is recommended that the majority of intersections along the Great South Road FTN route are signalised. The key reasons for the adoption of signals in these locations are:

- Complex existing intersections with multi-lane approaches;
- A highly urbanised context with limited space available without significant property impacts;
- Very high vehicular traffic volumes; and
- Strategic walking and cycling network functions and a need to allow for safe crossing facilities in the context of high traffic volumes.

Table 4-3 summarises the forms identified for key intersections following this assessment, along with key location-specific considerations informing the proposed form (in addition to the above noted considerations).

Table 4-3: Proposed intersection forms resulting from intersection assessment

Corridor section	Intersection	Key transport planning considerations	Existing form	Proposed form
1b	Great South Road / Manukau Station Road / Redoubt Road	Key arterials intersecting, SH1 access	Signals	Signals
	Great South Road / SH1 offramp	SH1 access	Signals	Signals
	Great South Road / Kerrs Road / Pacific Events Centre Drive	Key arterials intersecting	Signals	Signals
	Great South Road / Browns Road / Orams Road	Key arterials intersecting	Signals	Signals
1c	Great South Road / Grand Vue Road	SH1 access, safety concerns for rat-running	Priority (stop)	Signals
	Great South Road / Hill Road / Station Road	SH1 access	Signals	Signals

Corridor section	Intersection	Key transport planning considerations	Existing form	Proposed form
2	Great South Road / Weymouth Road / Alfriston Road	Key FTN routes and arterials intersecting	Signals	Signals
	Great South Road / McAnnalley Street	Alternative to Myers Rd (due to significant engineering constraint)	Priority (stop)	Signals
	Great South Road / Mahia Road	Key arterials intersecting	Signals	Signals
4	Great South Road / Taka Street	Key arterials intersecting	Signals	Signals
	Great South Road / Walters Road	Key arterials intersecting, safety concerns	Dual lane roundabout	Dual-lane roundabout
	Great South Road / Subway Road	Key arterials intersecting, 11,000 vpd (current)	Signals	Signals
5	Great South Road / Wellington Street	General traffic/ freight bypass route via Wellington St	Signals	Signals
	Great South Road / Beach Road	Key arterials intersecting, key E-W connection	Signals	Signals
	Great South Road / Rosehill Drive	Rosehill Dr is part of the future indicative bus network	Priority (stop)	Signals
	Great South Road / Park Estate Road	Links to a motorway crossing and Hingaia 1 development area	Priority (stop)	Signals

4.3 Location refinement

As noted in Section 3.1.4 of the general methodology, a process of reconciling expert and technical inputs in a workshop setting applied to decisions on the location of any road widening and realignment (i.e. third-party land requirements) to accommodate the preferred form and function along the preferred routes.

Table 4-4 sets out the key matters identified for each section which have informed the extent and location of third-party land requirements to enable South FTN. These generally emphasise where environmental features and/or identified constraints constitute differentiators that informed any justify variation to a standardised cross section taking into account relative costs and benefits in an urban context.

Table 4-4: Key differentiating features/constraints informing application of location refinement principles

Section (as shown in Figure 3-4)	Third-party land requirement?	Key differentiating features/constraints informing application of location refinement principles
1a	None	N/A

Section (as shown in Figure 3-4)	Third-party land requirement?	Key differentiating features/constraints informing application of location refinement principles
1b	None	N/A
1c	Moderate	• Preference to avoid or reduce impacts on Sikh Temple (east side, chainage 3950), Presbyterian Church (east side, chainage 4300), historic heritage place at Cenotaph Park (east side, chainage 4450), scheduled military milepost (east side, chainage 3800), notable tree (east side, chainage 3800) and a Rest Home (west side, chainage 3280). • Several new-build medium-density multi-unit residential developments on both sides. Each presents a challenge in terms of avoidance of impact (i.e. the ability to maintain a 1.5m front yard in the first instance), and/or boundary setting where the street frontage unit will need to be acquired.
2	High	• Lack of clear differentiating factors.
3	Low	• Lack of clear differentiating factors.
4	Low	• Preference to avoid or reduce impacts on notable trees (east side, chainage 9600 and 10000; and west side at chainage 10200), significant ecological area (**SEA**) to the west of the Longford Park esplanade reserve and Awhinatia Health centre (west side, chainage 9600), fire station (east side, chainage 10100), historic heritage buildings (churches) at chainage 10200-10500 (west side). • Several new-build medium-density multi-unit residential developments on both sides. Each presents a challenge in terms of avoidance of impact (i.e. the ability to maintain a 1.5m front yard in the first instance), and/or boundary setting where street frontage units will need to be acquired. • Large industrial premises including a Fonterra distribution facility (west side, chainage 8200).
5	Moderate	• Desire to avoid or reduce impacts on historic heritage feature (War Memorial) at the corner of Ōpāheke Road and Great South Road (east side), Papakura Cemetery (east side, chainage 11400-11700), SEAs (bush areas on both sides of road at chainage 12000), notable trees at chainage 12300-12500 (east side), Drury Presbyterian Cemetery (west side, chainage 15100), Drury School (east side, chainage 15000). • Plan Changes 52 and 58 and associated frontage controls on the eastern side (between Park Estate Road and Parkhaven Drive). • Effects on Otūwairoa / Slippery Creek to be considered.

4.4 Preferred Option (NoR 1)

4.4.1 Summary

Following the application of the above process and principles, a preferred option for the Great South Road FTN was identified. The form and function of the preferred option for the entire Great South Road FTN is shown conceptually in Figure 4-3, and includes:

- Provision for bus lanes in both directions to the north of Browns Road, and between Mahia Road and Tironui Road;
- Provision for bus lanes in one direction (northbound) between Browns Road and Mahia Road; and south of Tironui Road (excluding centres);
- Improved active mode (walking and cycling) facilities for the full route extent; and
- 16 intersection upgrades.

The proposed alignment and extent are shown in the General Arrangement drawings in Volume 3 of the application.

4.4.2 Design Considerations

The key considerations and assumptions applied in developing the concept design arising from the preferred option are summarised in Section 9 of the Assessment of Effects on the Environment (**AEE**).

It is noted for completeness that the approach to stormwater management devices was subject to an assessment of alternatives. Following the process set out in Section 3.2 of this report, localised raingardens within the road corridor have been identified as the preferred stormwater management device for the Great South Road. The need for raingardens relates specifically to the localised parts of the Great South Road corridor triggering the need for new stormwater management devices following the process set out in Section 3.2, which in turn generally correspond to areas where additional land (and therefore increased impervious area) are required (i.e. within the proposed NoR – see below).

4.4.3 Route protection requirements for the preferred option (NoR 1)

Most of the preferred option for the Great South Road FTN is able to be accommodated within the existing road reserve along Great South Road. Route protection via the current package of NoRs is only required for the parts of the preferred option requiring third-party land, and the remainder of the transport upgrades comprising the preferred option are assumed to be either permitted activities or readily consentable in the future.

The land required for intersection upgrades to enable the Great South Road FTN upgrade to comprise of eight separate sections centred on intersections along the route. These eight sections are packaged within a single NoR referred to within the proposed package of NoRs as **NoR 1**.

In assessing the strategic merit of proceeding with route protection, a qualitative assessment considering the range of factors set out in Table 3-3 was carried out. In short, the eight sections comprising NoR 1 were recommended for route protection because:

- The Great South Road FTN transport upgrades were assessed as providing high transport benefits. The proposed upgrades in the eight locations enable significant improvements to the performance of public transport, and the safety and attractiveness of active modes, along Great South Road;
- Great South Road is a strategically significant north-south arterial route and has no equivalent parallel route. Accordingly, there is a high reliance on the route today, and it will need to accommodate continued increases in transport demands resulting from planned growth. The proposed upgrades in the eight locations will ensure that the road is appropriately future-proofed to efficiently serve the demands associated with planned growth;

- The scale of property requirements and associated costs associated with route protection were assessed as moderate relative to the above benefits. NoR 1 directly affects some 170 properties, with the vast majority of these only partially or temporarily affected; and
- While the Great South Road FTN traverses mostly urbanised areas, there is still a route protection benefit to be derived from future-proofing transport upgrades to provide for the urban intensification enabled by the AUP:OP.

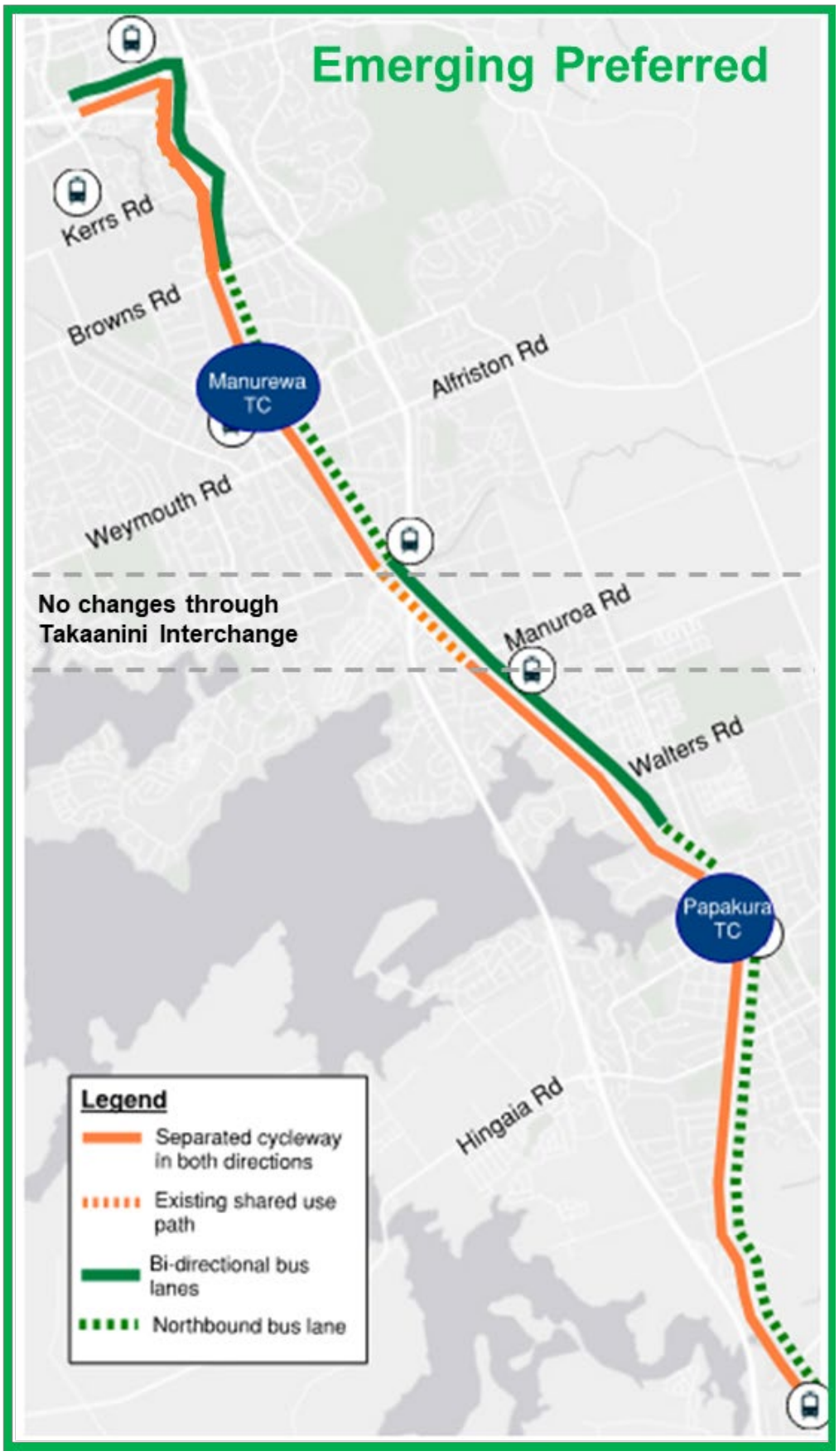

Figure 4-3: Great South Road FTN recommended option

5 Takaanini FTN

5.1 Gap analysis and confirmation of optioneering scope

As noted in Section 2.2, the ISTN included an FTN route between Drury and Takaanini serving existing urban and FUZ areas generally east of SH1 and the NIMT, before connecting to Great South Road to the west of SH1 and the NIMT (referred to in the IBC as option MT3C; which also included sections of options EW9B and AR10 as shown at Figure 2-2, Figure 2-3, Figure 2-4). This route was the starting point for DBC optioneering on the Takaanini FTN route. The methodology outlined in Section 3 requires the implications of new information identified in the gap analysis to be considered with a view towards establishing the necessary scope of further optioneering in the DBC.

In making this determination, the following conclusions on the Takaanini FTN were reached through the gap analysis process (summarised in Section 2.3):

- A number of factors identified in the gap analysis have prompted a retesting of the Rangi Road Viaduct assumed as part of IBC option MT4I (and the associated sections of options MT4K and EW9B). Given that the Rangi Road Viaduct also formed part of the ISTN for Takaanini level crossing removal, these matters were considered concurrently as part of optioneering for both the TLC and South FTN DBCs. The key factors prompting this retesting included:
    - The high likely cost, complexity, and levels of embodied carbon likely associated with the Rangi Road Viaduct relative to other options for providing an east-west connection (noting that the Viaduct would be over 500m long, and would traverse SH1, the NIMT, the Papakura Stream, and Transpower's electricity transmission corridor). The embodied carbon issue was of particular relevance given the recently increased emphasis in legislation and policy (see Table 2-1) on greenhouse gas emissions reduction, which includes embodied carbon from transport infrastructure assets; and
    - The confirmation by AT SMEs that the routing option along Mahia and Roscommon Road to Puhinui Station (part of option MT4K) was no longer supported as part of the FTN scope. This affects the logic underpinning the need for a Rangi Road Viaduct in terms of connections from the west (see Figure 2-2).
- The decision to progress IBC option AR10 (and by extension the southern portion of option MT4I) as part of the Drury Arterials package means that optioneering and route protection for this section is already complete. Accordingly, this section of the corridor is now out of scope with no further optioneering needed. The southern end of the Takaanini FTN can connect to the already designated Ōpāheke North-South Arterial at the intersection of Boundary and Hunua Roads to complete the route envisaged in the IBC;
- Legislative and policy direction to enable increased housing supply, updates to AFC growth scenarios, and Private Plan Changes all signal that most areas around the Takaanini FTN Project area will continue to experience urban growth and place increased demand on the transport network. A small proportion of this increased demand in the very long term may be reduced if the removal of the Takaanini Future Urban Zone (**FUZ**) is confirmed as a result of Auckland Council's Future Development Strategy (**FDS**); and
- The type of multi-modal interventions envisaged for the Takaanini FTN – namely FTN bus services and active mode improvements – are consistent with the transport and climate change legislation and policy directives outlined in Table 2-1.

In light of the above, there remains a strong case for the Takaanini FTN but a clear need to further retest the route and extent of the corridor. Accordingly, the route optioneering step was required to confirm a route and extent for the Takaanini FTN prior to proceeding to the form and function assessment and option refinement (see Figure 5-1).

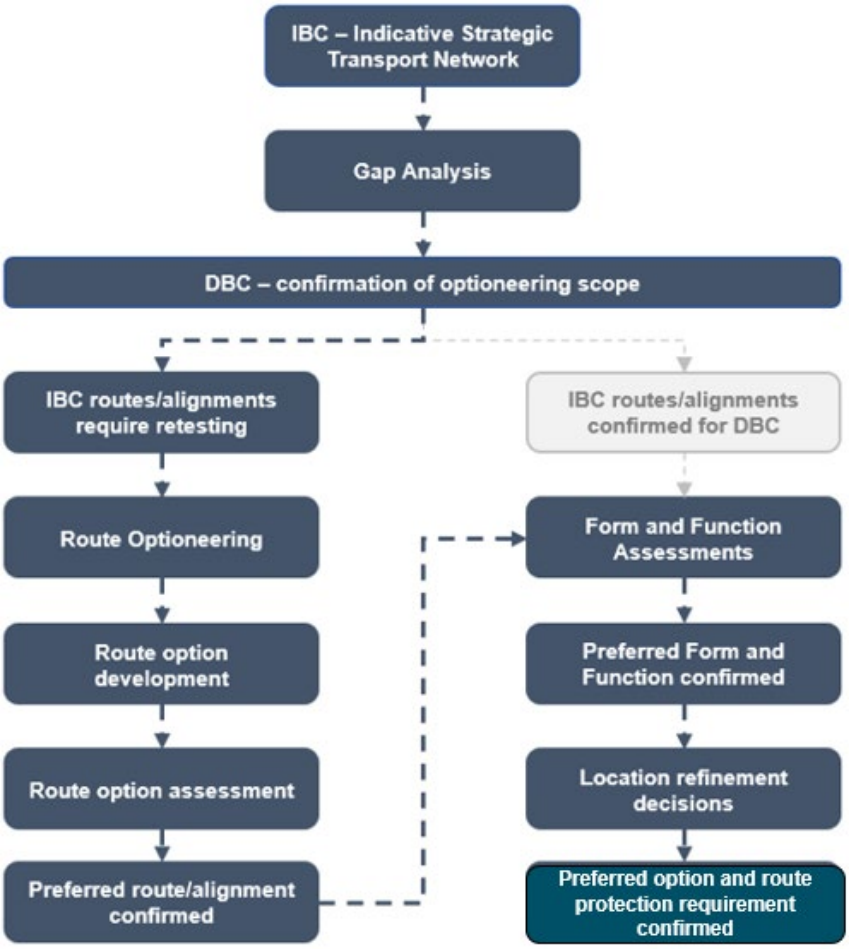

Figure 5-1: Optioneering process adapted for the Takaanini FTN

5.2 Route optioneering

5.2.1 Route option development

5.2.1.1 Longlist screening

As outlined in Section 3.1.2, the EAST tool from Waka Kotahi was used to undertake an initial screening of route options. This process identified a longlist of eighteen options for different sections of the route with the intent of identifying a shortlist for assessment through an MCA process. The options in this instance comprise sections of a route with a view towards different sections being 'mixed and matched' to form a preferred route. The longlisted options can be divided into the following three categories:

- **North-south route sections** to provide connectivity generally between Manurewa and Papakura to the east of the NIMT and SH1 (noting that the need to proceed further south of Papakura as originally envisaged in IBC option MT3C has been negated by the Drury Arterials DBC). It is noted

that option MT3C used Porchester Road, Ingram Street, Prictor Street, Marne Road, and Settlement Road as its north-south route in this area;

- **East-west route sections** to provide connectivity from the areas served by north-south route sections to the east of the NIMT and SH1, and areas to the west. It is noted that option MT3C used Popes Road and Rangi Road as its east-west connection connecting Porchester and Great South Roads. As noted above, the decision to discount the Rangi Road Viaduct from the TLC DBC means that this route is no longer possible, and an alternative east-west route is required; and
- **Route sections from AT Metro Remix files** – these were included to ensure all possible combinations of routes under consideration by AT Metro transport planners in this area were considered as options for FTN routing.

The eighteen longlisted options are shown in Figure 5-2, and the results of the EAST assessment are summarised in Table 5-1.

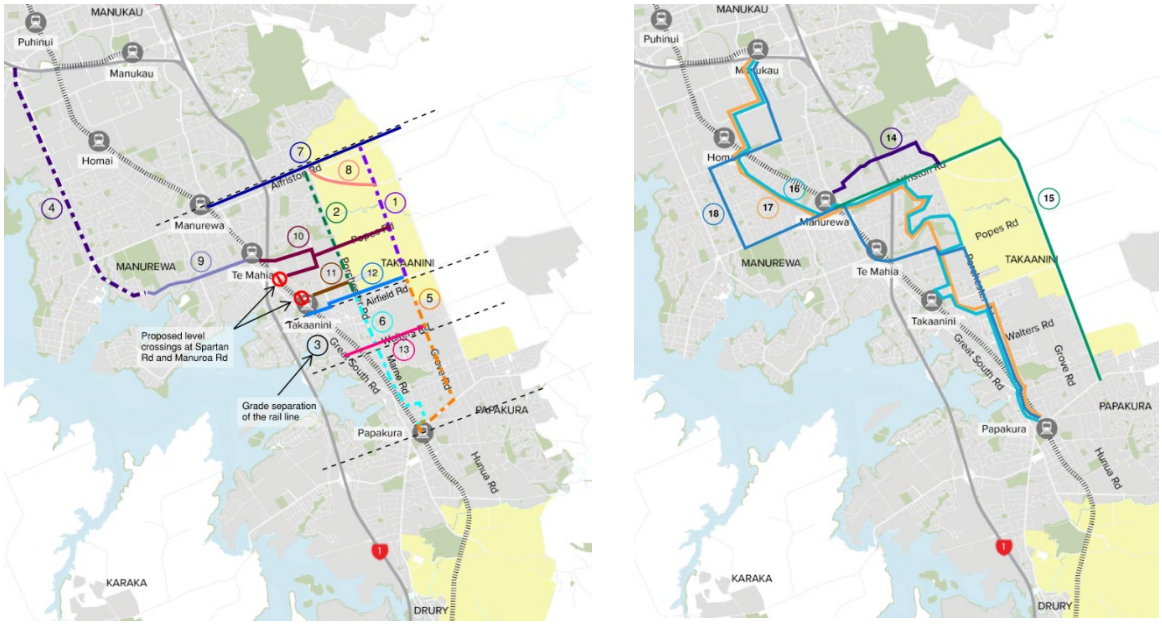

Figure 5-2: North-south and east-west route sections (left) and route sections from AT Metro remix files (right)

Table 5-1: Summary of longlist EAST assessment

No.	Option	Progress to shortlist?	Comment
North-South Route Sections (north of Airfield Road)			
1	Wastney Road / new road between Alfriston and Airfield Roads	Yes	North-south option through FUZ, new section of road needed.
2	Porchester Road between Alfriston and Airfield Roads	Yes	North-south option using existing roads, bisects existing urban area to west and FUZ to east.
3	Grade-separation of the NIMT between Alfriston and Walters Roads	No	Option does not address investment objectives as it competes with rail.

No.	Option	Progress to shortlist?	Comment
4	Roscommon Road	No	Option is being progressed separately by AT and provides no connectivity east of NIMT/SH1.
North-South Route Sections (south of Airfield Road)			
5	New road (continuing option 1) / Grove Road between Airfield Road and Papakura	Yes	North-south option through FUZ, new section of road needed.
6	Porchester Road and Marne Road between Airfield Road and Papakura (continuing option 2)	Yes	North-south option using existing roads.
East-West Route Sections (north of Airfield Road)			
7	Alfriston Road and Ranfurly Road east of Manurewa	Yes	East-west routes linking Takaanini FUZ and Manurewa Station / Great South Road.
8	Alfriston Road between Manurewa and Wastney / new road (adjoins option 1)	Yes	
9	Mahia Road west of Great South Road (adjoins option 10)	No	Option being progressed separately by AT (as noted in section 2).
10	Rangi Road and Popes Road between Great South Road and new road (adjoins option 1)	Yes	Option includes Rangi Road Viaduct (noting clear need to re-test this option was identified through gap analysis – see section 2).
11	Manuroa Road and Station Road east of Takaanini Station	Yes	Provides a link from Takaanini FUZ to Takaanini Station and Great South Road.
12	Airfield Road and Taka Street between Great South Road and new road (adjoins option 5)	Yes	
East-West Route Sections (south of Airfield Road)			
13	Walters Road between Great South Road and Grove Road	Yes	AT SMEs have identified this as a key east-west connection, providing access to Bruce Pulman Park.
AT Metro Remix Route Sections			
14	Alternative east-west connection via Hill Road	No	A less direct alternative to the Alfriston Road options.
15	Alternative north-south and east-west connections via Mill Road and Alfriston Road	No	Mill Road addressed in separate project.
16	Manukau Station to Papakura Station via Russell Road, Magic Way, and Porchester Road	No	Each of these options includes collector roads and will result in a circuitous route.
17	Manukau Station to Papakura Station via Russell Road, Takanini School Road, and Porchester Road	No	
18	Manukau Station to Papakura Station via Druces Road, Browns Road, Rowandale Avenue, Weymouth Road, Great South Road, Rangi Road, Popes Road, and Porchester Road.	No	

For the reasons outlined in the above summarised EAST assessment, the longlist of eighteen route sections was rationalised to a shortlist of ten route sections for shortlist MCA assessment.

5.2.1.2 Shortlisted options

The ten options identified from the EAST assessment for shortlist assessment were split into two option groupings for assessment – north-south options and east-west options. These are summarised below.

North-South Options

The EAST assessment identified four north-south options. Two options north of Airfield Road and two options south of Airfield Road. These are referred to as follows (see Figure 5-3).

- **Option 1.1** – Porchester and Marne Road between Airfield Road and Papakura (referred to in the EAST assessment as option 6);
- **Option 1.2** – Porchester Road between Alfriston Road and Airfield Road (referred to in the EAST assessment as option 2);
- **Option 2.1** – New Road / Grove Road between Airfield Road and Papakura (referred to in the EAST assessment as option 5); and
- **Option 2.2** – Wastney Road / New Road between Alfriston and Airfield Roads (referred to in the EAST assessment as option 1).

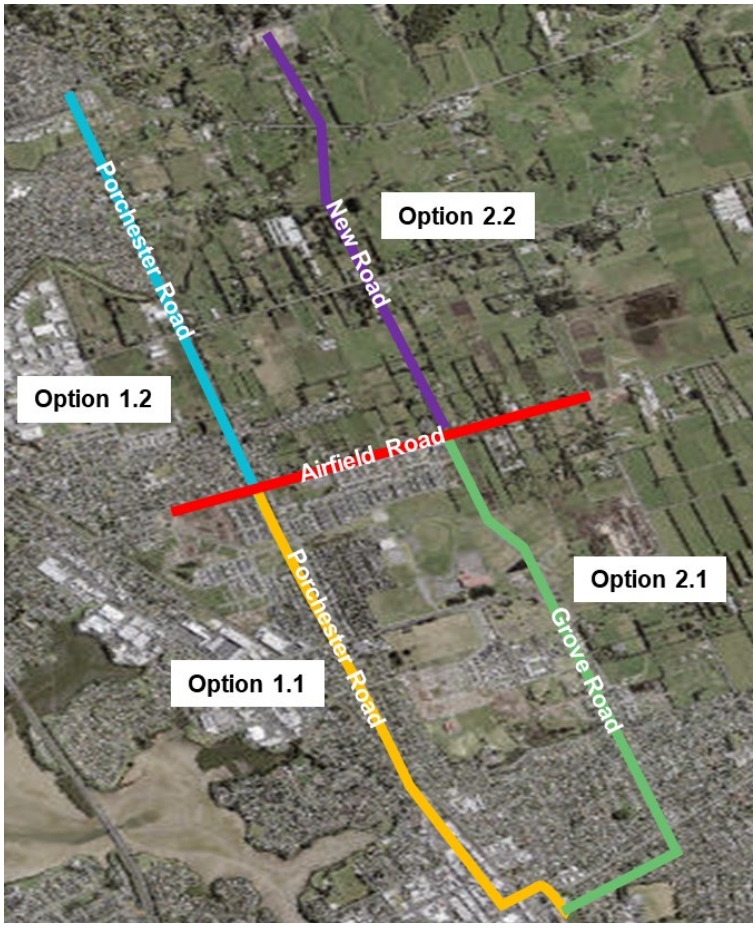

Figure 5-3: North - South shortlisted options

East-West Options

The six east-west options from the EAST assessment were split out into a shortlist of six sub-options north of Manuroa Road (see Figure 5-4) and five south of (and including) Manuroa Road (see Figure 5-5) to allow for more localised assessment:

Shortlisted options north of Manuroa Road were:

- **Options 1.1, 1.2, and 1.3** (derived from Options 7 and 8 from the EAST assessment) – respectively comprising:
  - Alfriston Road between Manurewa and Porchester Road;
  - Alfriston/Ranfurly Roads from Porchester Road to Wastney Road; and
  - Alfriston Road from Ranfurly Road to Wastney Road.
- **Options 2.1, 2.2, and 2.3** (derived from Option 10 in the EAST assessment) – respectively comprising:
  - Rangi Road between Great South Road and Porchester Road via the Rangi Road Viaduct;
  - Spartan Road and Popes Road between Great South Road and Porchester Road; and
  - Popes Road between Porchester Road and New Road (see north-south Option 2.2).

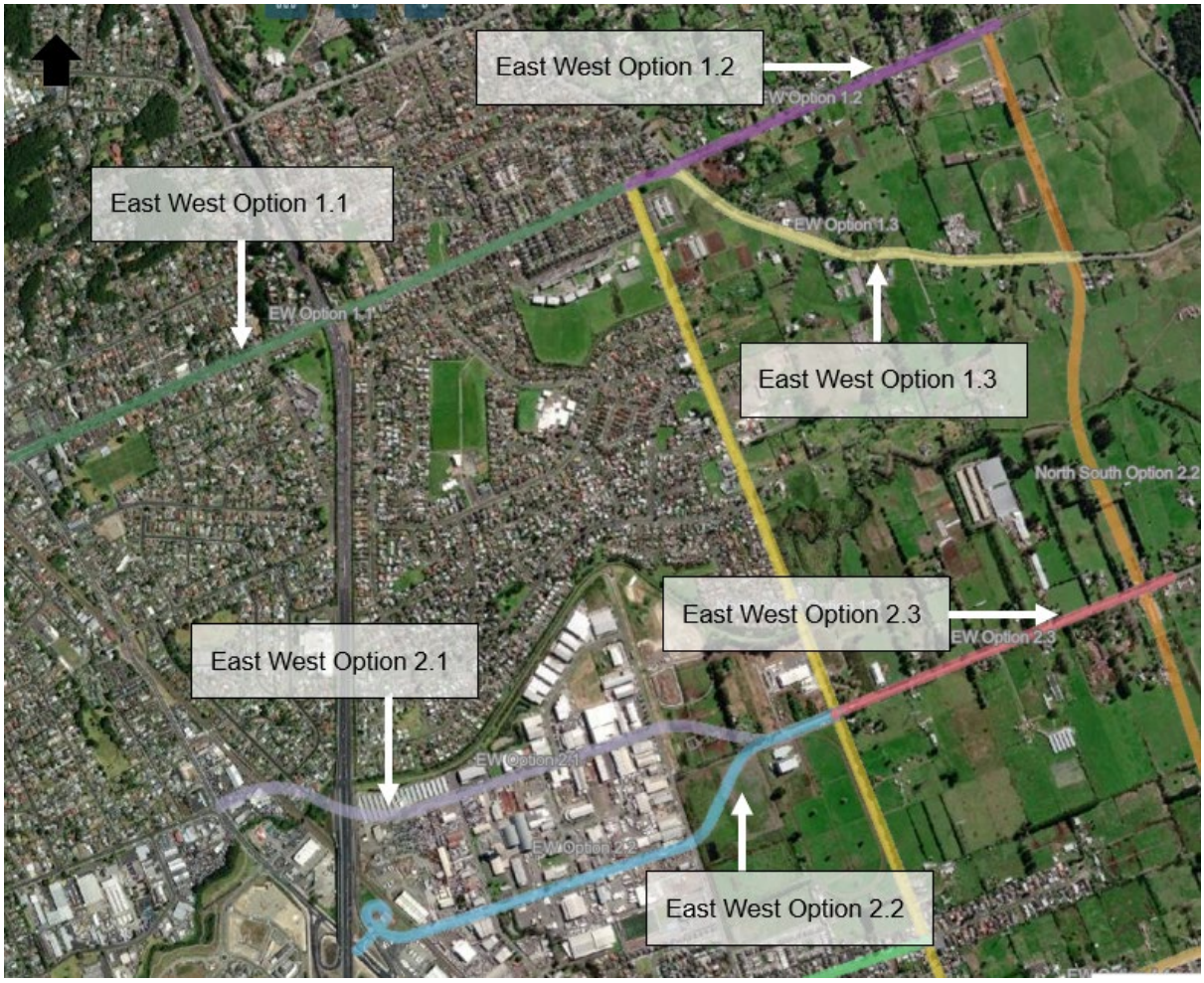

Figure 5-4: East-west shortlisted options north of Manuroa Road

Shortlisted options south of (and including) Manuroa Road were:

- **Option 3** (referred to in the EAST assessment as Option 11) – Manuroa Road and Station Road east of Takaanini Station.
- **Options 4.1 and 4.2** (derived from Option 12 in the EAST assessment) – respectively comprising:
  - Airfield Road between Porchester Road and New Road (see north-south Options 2.1 and 2.2); and
  - Taka Street and Airfield Road between Great South Road and Porchester Road.
- **Options 5.1 and 5.2** (derived from Option 13 in the EAST assessment) – respectively comprising:
  - Walters Road between Porchester Road and Grove Road; and
  - Walters Road west of Porchester Road.

Figure 5-5: East-west shortlisted options south of (and including) Manuroa Road

5.2.2 Options assessment

5.2.2.1 North-South options

Initial MCA Assessment

The shortlisted north-south options were assessed using MCA Framework for Te Tupu Ngātahi described in Section 3.1.2. The assessment scoring is summarised in Table 5-2 below.

Table 5-2: Summary of initial north-south route option MCA assessment

Criteria	Scoring			
	South of Airfield Road		North of Airfield Road	
	Option 1.1	Option 2.1	Option 1.2	Option 2.2
IO 1: Access	2	1	3	4
IO 2: Integration	1	-1	3	4
IO 3: Travel choice and climate change	2	1	3	4

Criteria	Scoring			
	South of Airfield Road		North of Airfield Road	
	Option 1.1	Option 2.1	Option 1.2	Option 2.2
Historic Heritage	-2	-2	-2	-2
Land Use Futures	3	-1	3	2
Urban Design	1	-3	2	2
Land Requirement	-4	-4	-3	-1
Social Cohesion	4	-1	3	2
Human Health and Wellbeing	-2	-2	-2	-1
Landscape / Visual	0	0	-1	-1
Stormwater	-1	-2	-1	-4
Ecology	-1	-2	-4	-4
Natural Hazards	-4	-3	-2	-3
Transport System Integration	3	1	3	3
User Safety	1	-3	1	2
Construction Impact	-2	-1	-1	-1
Construction Disruption	-2	-2	-2	-1
Construction costs/risks	-2	-3	-2	-3

The key outcomes from this assessment for options to the north of Airfield Road are that:

- **Option 1.2** performs well against the investment objectives although not as favourably as Option 2.2 given that Option 2.2 will better support growth in the Takaanini FUZ. It scores as highly adverse for ecology based on an assumed widening and potential impact on high value wetlands. However, route refinement will likely improve the score and is preferred over Option 2.2 given that it is existing infrastructure; and
- **Option 2.2** performs the best against the investment objectives. However, it scores highly adverse for stormwater and ecology as it is a new road to be built on peat soils which will be challenging from a stormwater perspective and will impact low-to-high value wetlands in the area. In addition, the uncertainty of the Takaanini FUZ means there is uncertainty in the expected catchment for this route.

For options to the south of Airfield Road:

- **Option 1.1** scores favourably against the investment objectives given that it services an existing residential catchment. It scores highly favourably against social cohesion as it will provide and improve connectivity between areas anticipating intensified residential development to community facilities. However, the option was assessed as highly adverse for natural hazards due to likely settlement of existing properties as a result of earthworks and underlying soil conditions; and
- **Option 2.1** scores poorly against investment objective 2 as the proposed alignment runs through the existing Bruce Pulman Park. This will have a negative impact as it does not integrate or align with the intended land use. It also scores moderately adverse against urban design as it will cause severance to the Bruce Pulman Park and the Holy Trinity Catholic Primary School.
- The negative scoring for **Option 2.1** was largely attributed to the option cutting through Bruce Pulman Park. Feedback from specialists indicated the scoring would change if the assessment only considered the corridor up to Walters Road to avoid severing the park. Accordingly, the team considered a modified option should be assessed to fairly ascertain the preferred option.

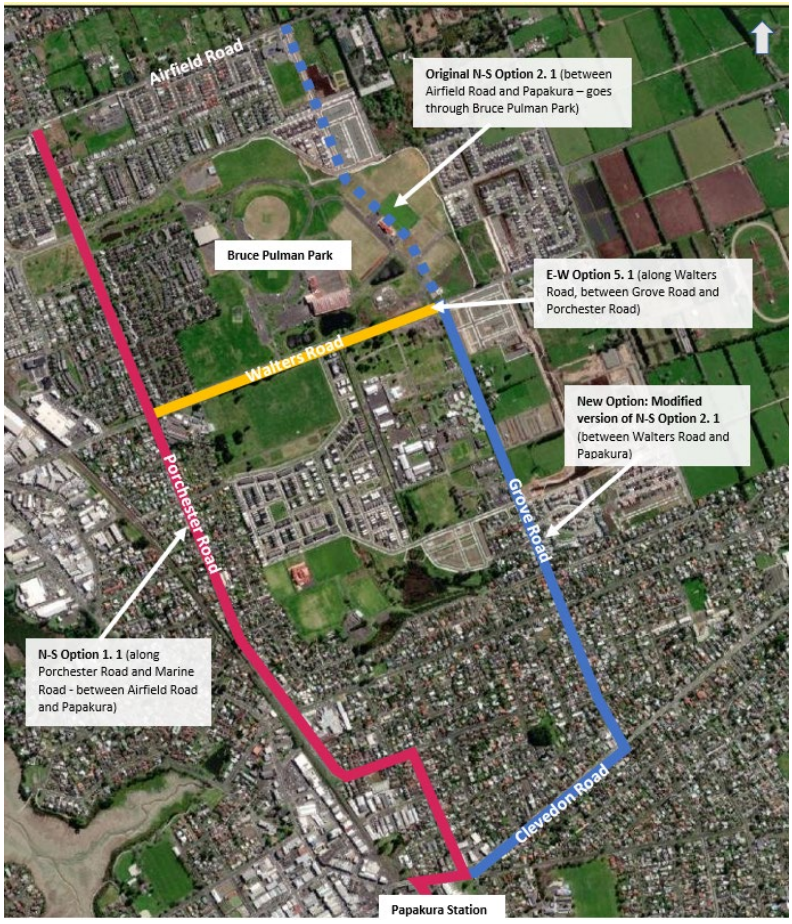

Figure 5-6: Modified Option 2.1, utilising Porchester Road north of Walters Road, Grove Road south of Walters Road, and Walters Road itself to connect them

Further North-South Assessment (south of Airfield Road)

Figure 5-6 shows the modified iteration of Option 2.1 south of Airfield Road for further assessment. This option utilises Porchester Road north of Walters Road (i.e. part of Option 1.1) to avoid impacts on Bruce Pulman Park, before turning east-west along Walters Road to connect with Grove Road and Clevedon Road (i.e. part of Option 2.1) to connect to Papakura.

The modified Option 2.1 was then tested against Option 1.1 using the MCA Framework. This assessment is summarised in Table 5-3 below.

Table 5-3: Summary of further north-south route option MCA assessment

Criteria	Scoring	
	Option 1.1	Modified Option 2.1
IO 1: Access	2	3
IO 2: Integration	1	2
IO 3: Travel choice and climate change	2	3
Historic Heritage	-2	-2
Land Use Futures	2	1
Urban Design	1	0
Social Cohesion	3	2
Human Health and Wellbeing	-2	-2
Landscape / Visual	0	1
Stormwater	-1	-2
Ecology	-1	-1
Natural Hazards	-4	-3
Transport System Integration	2	3
User Safety	1	2
Construction Impact	-2	-1
Construction Disruption	-2	-2
Construction costs/risks	-2	-3

The key outcomes from this assessment are that:

- **The modified Option 2.1** scores more favourably against the investment objectives and transport criteria than Option 1.1 as the option will provide existing residential areas to the east of the NIMT with high quality public transport which it currently lacks; and
- As noted in the initial assessment, **Option 1.1** was assessed as highly adverse against natural hazards due to likely settlement of existing properties as a result of earthworks and underlying soil conditions.

Accordingly, the modified Option 2.1 is the preferred route option south of Airfield Road.

South of Papakura

The above assessment identifies a preferred north-south route as far south as its connection with the Papakura metropolitan centre via Clevedon Road. Given that the intent of the Takaanini FTN (as envisaged in IBC option MT4I) is to ultimately connect with the Ōpāheke North-South Arterial (already route protected as part of the Drury Arterials package) at the intersection of Hunua and Boundary Roads, all routing options were assumed to end on Hunua Road. This means that the only routing matter to consider is how to get from Clevedon Road to the intersection of Hunua and Boundary Roads.

The Project Team identified four possible routes to connect these points (see Figure 5-7):

- **Option 1 – IBC route:** Follows Marne Road and Settlement Road;
- **Option 2 – Ron Keat:** Follows Ron Keat Drive, Onslow Road, Marne Road and Settlement Road;
- **Option 3 – Onslow**: Follows Railway Street West, Onslow Road, Marne Road and Settlement Road; and
- **Option 4 – Settlement:** Follows Railway Street West, Wood Street, Great South Road, Ōpāheke Road and Settlement Road.

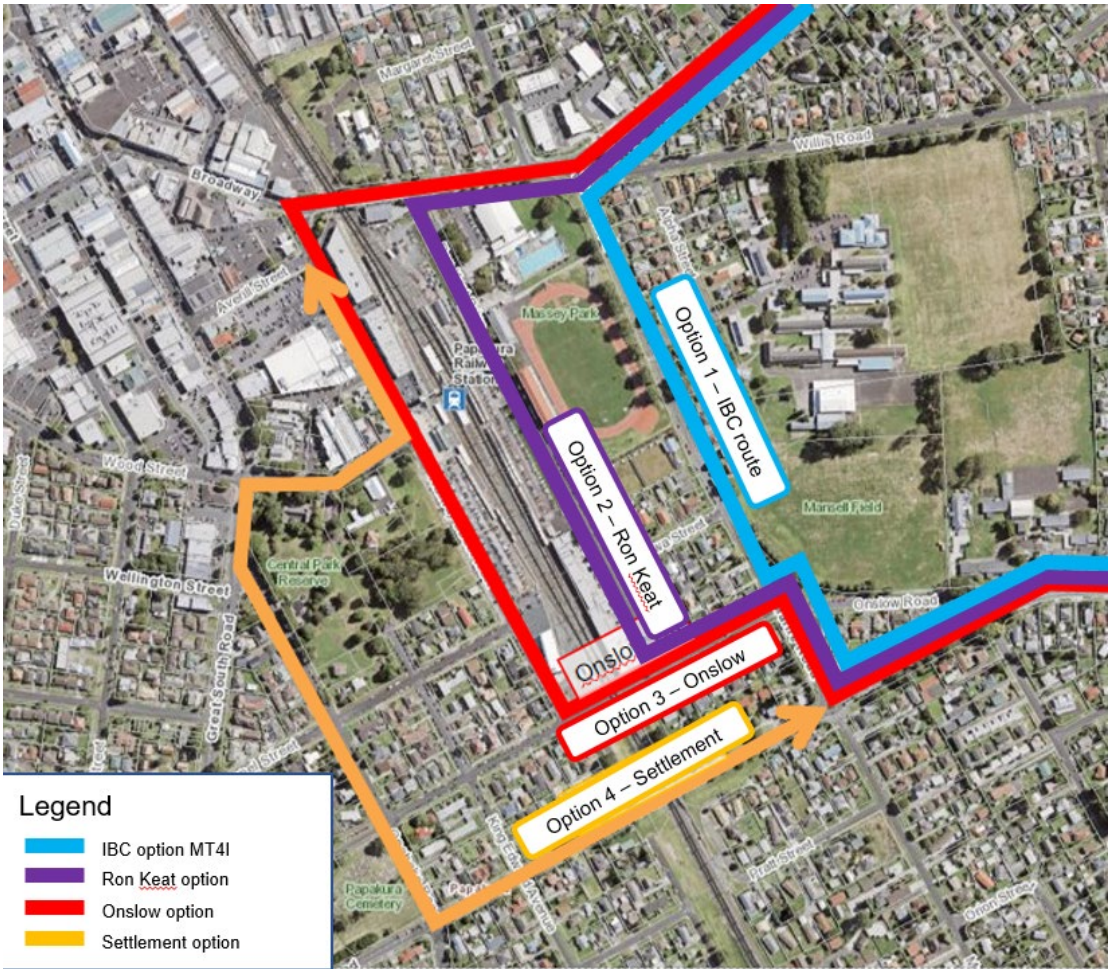

Figure 5-7: Options for connecting Clevedon Road with Hunua Road

A preferred option was identified in consultation with AT, following the option 4 route (as shown in Figure 5-9). There were a number of reasons why this option was preferred as follows:

- AT considered it was an important functional requirement that the route provide a direct interchange with the Papakura train station, and that the route cross the NIMT to directly serve the Papakura metropolitan centre on the west side of the rail tracks. This ruled out Options 1 (the IBC route) and Option 2 (Ron Keat Drive) (see Figure 5-7);
- There is one road-over-rail crossing to the north of the station (Clevedon Road), which is the logical point to cross the tracks (given that the route already follows Clevedon Road);
- The Settlement Road routing option (Option 4 – see Figure 5-7) was preferred to cross the tracks to the south of the station as possible future rationalisation of the Onslow and Settlement Road crossings has been indicated as a possibility as part of the future four-tracking of the NIMT (both existing crossings would need to be rebuilt to accommodate additional tracks). In this eventuality it was considered more likely that Settlement Road crossing remains, and that Onslow Road is closed given it is the more strategically significant east-west route for general traffic and freight (as indicated in AT's Future Connect portal);
- The Option 4 routing also utilised intersection widening designations already secured as part of the Drury Arterials Network (e.g. at the corner of Ōpāheke Road and Settlement Road), ensuring future land take efficiencies; and
- Given the earlier noted assumption of a connection at the intersection of Boundary and Hunua Roads, all four options followed Settlement and Hunua Roads.

Preferred North-South Route Option

The above assessment has indicated that:

- **Option 1.2 (Porchester Road)** is the preferred north-south route option to the north of Airfield Road;
- **Modified Option 2.1** (comprising a section of Option 1.1 (Porchester Road), Walters Road, and Grove Road) is the preferred north-south route option to the south of Airfield Road to Papakura; and
- **Option 4 (Settlement)** is the preferred route option between Papakura and the intersection of Hunua and Boundary Roads which follows Railway Street West, Wood Street, Great South Road, Ōpāheke Road, Settlement Road, and Hunua Road.

This preferred route option is shown in Figure 5-9 below.

Figure 5-8: Preferred North-South route option

5.2.2.2 East-West options

Implications of the North-South Assessment

The north-south and east-west route option assessments were undertaken sequentially, meaning that the outcomes of the north-south assessment influenced the scope of optioneering and outcomes undertaken for east-west route options. In particular:

- The preference for Porchester Road as a north-south route north of Walters Road (over a new alignment further to the east) has meant that east-west options further to the east of Porchester Road outlined in Section 5.2.1.2 can be discarded without further assessment as part of the FTN route (because the remaining east-west options were premised on connecting with a north-south alignment further to the east). This removed the need to assess Options 1.2, 1.3, 2.3, and 4.1; all of which were premised on connecting with a new north-south alignment further to the east of Porchester Road; and
- The inclusion of Walters Road as part of the preferred north-south route means that one of the east-west options (Option 5.1, see Figure 5-8) is already included as part of the preferred route.

Given the above, the eleven east-west options shortlisted in Section 5.2.1.2 were reduced to six for the purposes of MCA assessment as follows:

- **Option 1.1** – Alfriston Road between Manurewa and Porchester Road;
- **Option 2.1** – Rangi Road and Popes Road (via Rangi Road Viaduct);
- **Option 2.2** – Spartan Road and Popes Road between Great South Road and Porchester Road;
- **Option 3** – Manuroa Road and Station Road east of Takaanini Station;
- **Option 4.2** – Taka Street and Airfield Road between Great South Road and Porchester Road; and
- **Option 5.2** – Walters Road west of Porchester Road.

MCA Assessment

The shortlisted east-west options were assessed using the MCA Framework for Te Tupu Ngātahi described in Section 3.1.2. The assessment scoring is summarised in Table 5-4 below.

Table 5-4: Summary of east-west route option MCA assessment

Criteria	Scoring					
	Option 1.1	Option 2.1	Option 2.2	Option 3	Option 4.2	Option 5.2
IO 1: Access	3	1	1	2	2	1
IO 2: Integration	2	0	1	2	2	0
IO 3: Travel choice and climate change	2	1	1	2	2	1
Historic Heritage	-1	-2	-1	-1	-1	-1
Land Use Futures	2	1	2	2	2	2
Urban Design	1	-3	1	-1	-1	0

Criteria	Scoring					
	Option 1.1	Option 2.1	Option 2.2	Option 3	Option 4.2	Option 5.2
Land Requirement	-4	-2	-1	-4	-1	-1
Social Cohesion	3	2	2	3	3	3
Human Health and Wellbeing	-2	-1	-1	-2	-2	0
Landscape / Visual	0	-3	0	0	0	0
Stormwater	-1	-3	-2	-1	-1	-1
Ecology	-3	-3	-4	-1	-1	-1
Natural Hazards	-1	-3	-3	-4	-4	-4
Transport System Integration	4	4	-3	2	2	1
User Safety	1	1	-3	2	2	1
Construction Impact	-1	-2	-1	-1	-1	-1
Construction Disruption	-2	-3	-2	-2	-2	-2
Construction costs/risks	-1	-4	-3	-3	-3	-3

The key findings of the assessment were as follows:

- **Option 1.1** performs the best against the investment objectives, land use futures and transport system integration as it will provide for the existing residential community and integrate well with the existing environment. However, it was assessed as highly adverse for land requirement given the established residential community;
- **Option 2.2** (which included the Rangi Road Viaduct) was not preferred given the significant adverse effects associated with a large 500m viaduct traversing SH1, the NIMT, the Papakura Stream, and Transpower's electricity corridor – these are reflected in the urban design, landscape and visual, stormwater, ecology, natural hazards, and construction disruption criteria. Moreover, the high cost, complexity, and high levels of embodied carbon associated with the option are reflected in the scoring for construction costs/risks;
- **Option 2.2** is anticipated to only have low positive benefits against the investment objectives given the industrial land use, meaning that catchment is limited. The option was assessed as highly adverse against ecology due to the potential impact on mature exotic and native trees as well as floodplains assessed as having moderate value;
- **Option 3** scores similarly to Option 1.1 in terms of investment objectives with the exception of Investment Objective 1 as it is anticipated to have a smaller catchment, and accordingly benefitting fewer people. Similar to Option 1.1, significant land requirements were anticipated, hence the low

score. Option also assessed as highly adverse for natural hazards due to the soft soil conditions resulting in the risk of settlement and groundwater management required;

- **Option 4.2** scores similarly to Option 3 with respect to investment objectives and for similar reasons. Likewise, it scores highly adverse for natural hazards due to ground conditions and the associated risks; and
- **Option 5.2** was assessed as having low positive benefits in respect of the investment objectives. However, it was assessed as highly adverse against natural hazards due to the soft soil conditions and its associated risks.

The assessment has identified **Option 1.1 (Alfriston Road)** as a preferred east-west route option as it best responds to the investment objectives by providing an east-west connection through to the Manurewa Station. Further, it is not anticipated to have the high adverse impacts on the natural environment as some of the other options, despite some of these options scoring similarly to Option 1.1 in terms of the investment objectives. **Option 5.1 (Walters Road)** is also an east-west connection forming part of the preferred option given it was already identified in the north-south route option assessment (see Section 5.2.2.1).

Decision to discount the Rangi Road Viaduct

A corollary of the above assessment is a decision to discount the Rangi Road Viaduct (part of Option 2.2) from further consideration. As noted above, the option was discounted due to high costs, high complexity, high environmental effects, and high levels of embodied carbon – all stemming from the inherent scale and complexity associated with a >500m viaduct traversing SH1, the NIMT, the Papakura Stream, and Transpower's electricity transmission corridor.

Given that the Rangi Road Viaduct formed part of the ISTN network for both Takaanini level crossing removal and the South FTN, this optioneering was undertaken concurrently between the TLC and South FTN DBCs. Accordingly, the Rangi Road Viaduct has been discounted as an option under both DBCs. This confirms that the ISTN options MT4I (and associated options MT4K and EW9B) will not be progressed in the form originally envisaged in the South IBC.

5.2.3 Preferred route

From the assessments summarised above (Sections 5.2.2.1 and 5.2.2.2), the preferred options for both north-south and east-west sections of the Takaanini FTN route were assembled into a single preferred option for the route as a whole. This is shown in Figure 5-9 below and forms the basis of all subsequent form and function and location refinement assessment.

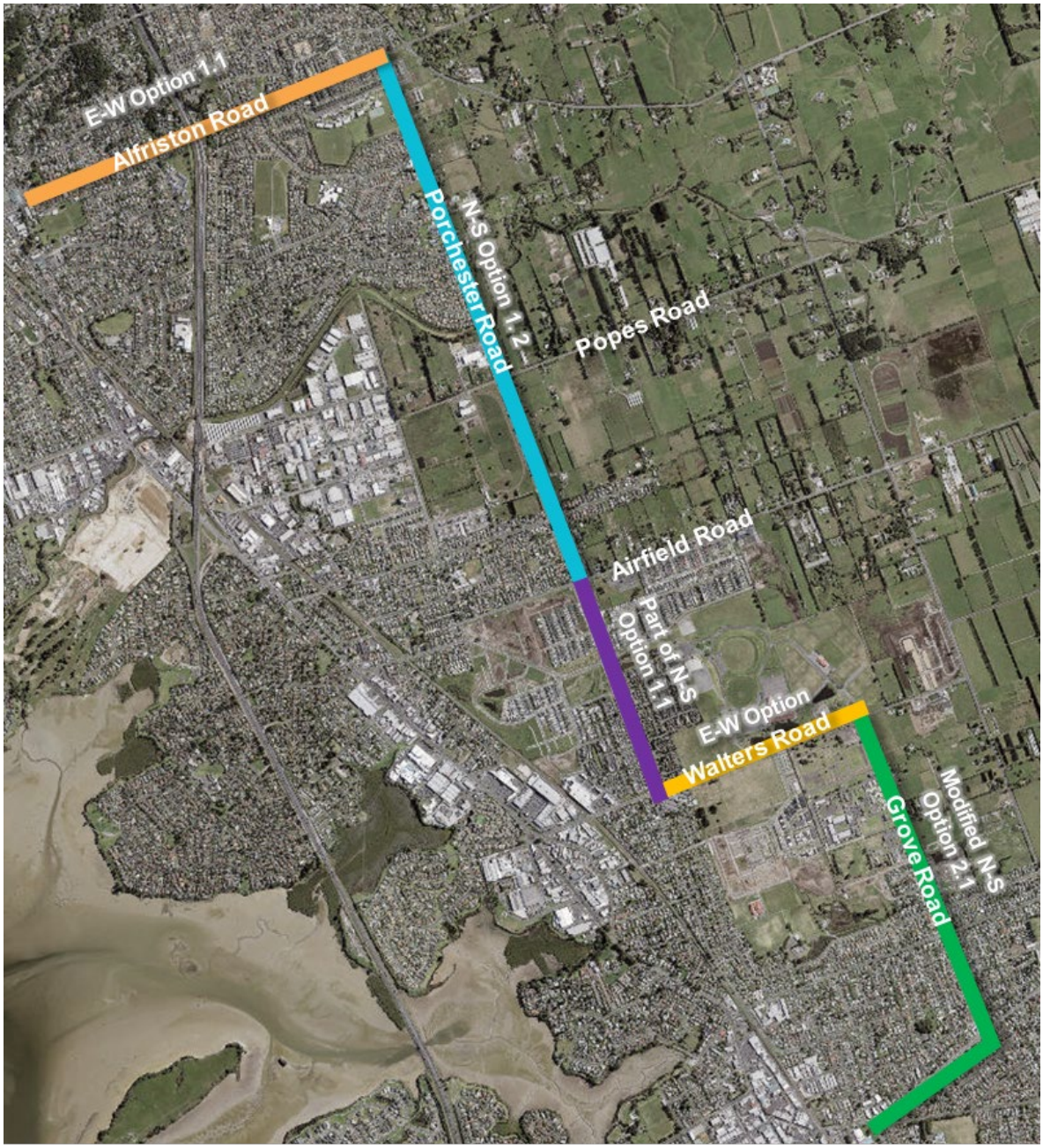

Figure 5-9: Preferred route for the Takaanini FTN

5.3 Form and function

5.3.1 Corridor Form and Function

As noted in Section 3.1.3 of the general methodology, the CFAF process as developed and applied at the Programme-wide level is intended to use land use and transport planning inputs to define functional requirements for the corridor in question, and identify a suitable midblock cross-section from a set of modular concept designs. This approach is taken on the basis that it provides for a suitable level of detail for route protection and design efficiency, whilst allowing for future design changes and flexibility at the time of implementation.

In the case of the Takaanini FTN, the outputs of the CFAF process was the application of:

- **A four-lane FTN arterial** cross-section to Alfriston Road (Section 6, refer to Figure 5-10 above), incorporating one general traffic lane and one bus lane per direction, separated active mode facilities in each direction, and space for berms and a median (see Figure 5-10); and
- **A two-lane FTN arterial** cross-section for the remainder of the route (Sections 7-9, refer to Figure 5-11 above) incorporating separated walking and cycling facilities (see Figure 5-11). No bus lanes are proposed for these sections of the route given the lower expected bus and general traffic volumes.

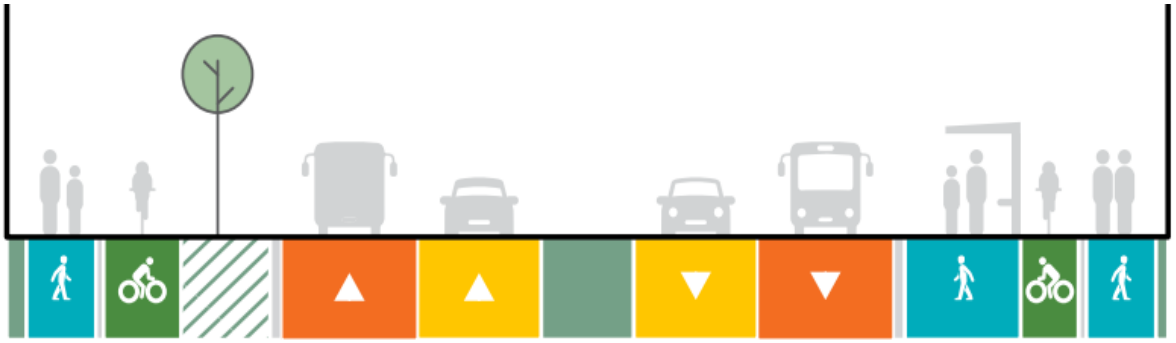

Figure 5-10: Four-lane FTN arterial as proposed for Alfriston Road (section 6 of the Takaanini FTN)

Figure 5-11: Two-lane FTN arterial as proposed for section 7-9 of the Takaanini FTN

Retesting of Alfriston Road

As was the case for sections of the Great South Road FTN, a reassessment of the Alfriston Road form and function was undertaken given the considerable third-party land/property cost implications of applying the four-lane FTN arterial as shown in Figure 5-10. This included assessment of a similar range of form and function approaches considered for the Great South Road FTN, including:

- Prioritisation of a transport mode (e.g. full bus lanes or active mode improvements but not both);
- Removal of an element from the cross-section (e.g. bus lanes in one direction only); or
- Full road space reallocation and/or road widening through applying the full four-lane FTN arterial cross-section shown in Figure 5-10.

Following this assessment, it was concluded that the four-lane FTN arterial cross-section remained the preferred form and function option for the Alfriston Road corridor west of Magic Way; with the

section to the east of Magic Way requiring eastbound bus lanes only. The reasons for generally retaining the four-lane FTN arterial cross-section, in spite of its third-party land requirements, are as follows:

- Lack of other east-west connections in the transport network which places significant demands on the Alfriston Road corridor for all modes;
- Significant predicted future bus volumes, with up to 26 buses per hour anticipated;
- The need to replace the SH1 and NIMT overbridges irrespective of corridor width;
- Poor outcomes for all transport modes and urban form without additional widening; and
- Inability to avoid significant property impacts with compromised solutions given the nature of land use along the corridor.

5.3.2 Intersection Assessment

As noted in Section 3.1.3.2 of the general methodology, an intersection assessment process was undertaken in parallel to the CFAF to identify which intersections required upgrades, the indicative intersection controls in these locations, and the resultant footprint implications. Similarly to the CFAF process, the approach developed and applied across the programme for the intersection assessment is to use land use and transport planning inputs to define functional requirements for the corridor in question, and identify a suitable intersection layout from a set of modular intersection designs.

The intersection filtering process identified twenty intersections requiring interventions along the Takaanini Road FTN route between Manukau and Drury. These were identified based on the considerations listed in Section 3.1.3.2 of the general methodology and are listed in Table 5-5 below.

As noted in Section 3.1.3.2, the intersection form at each site was identified based on a range of factors including safety, operational efficiency, urban design/land use integration, public transport operations, engineering and environmental constraints, property constraints, and other site-specific factors. While roundabouts are the typical first choice for at-grade intersections recommended in ‘Safe System’ guidance, it is recommended that the majority of intersections along the Alfriston Road section of the route are signalised for the following reasons:

- Complex existing intersections with multi-lane approaches; and
- A highly urbanised context with limited space available without significant property impacts.

The majority of the remainder of the route has a two-lane midblock (see Section 5.3.1 above). Accordingly, following the methodology outlined in Section 3.1.3.2 has resulted in the identification of single-lane roundabouts as the preferred intersection form in the majority of cases. The exceptions are where signals have been recommended due to:

- Proximity of schools in some cases and the resultant need for safer crossing movements;
- The need to enable efficient turning movements for FTN buses; or
- Engineering constraints in the case of the Hunua/Croskery Road intersection.

Table 5-5 summarises the forms identified for key intersections following this assessment, along with key location-specific considerations informing the proposed form (in addition to the above noted considerations).

Table 5-5: Proposed intersection forms resulting from intersection assessment

Corridor section	Intersection	Key transport planning considerations	Existing form	Proposed form
6	Weymouth Road / Manurewa Bus Interchange	Key bus movement out of interchange	Priority (stop)	Signals
	Alfriston Road / Claude Road	SH1 access, 12,000 vpd (current daily volume)	Signals	Signals
	Alfriston Road / Scotts Road	Reconfigured and assessed due to the construction of the SH1 bridge	Priority (stop)	Signals
	Alfriston Road / Magic Way	Part of the future indicative bus network (buses turn into Magic Way)	Signals	Signals
	Alfriston Road / Porchester Road	Key arterials intersecting, buses turn right	Signals	Signals
7	Porchester Road / Popes Road	Key E-W connection to Mill Road/ Takaanini industrial area	Priority (stop)	Dual-lane roundabout
	Porchester Road / Manuroa Road	SB buses expected to turn onto Manuroa Rd to tie into Takaanini Station	Single lane roundabout	Single-lane roundabout
	Porchester Road / Airfield Road	Key arterials intersecting. Key E-W connection to Ardmore/ Clevedon	Single lane roundabout	Single-lane roundabout
8	Porchester Road / Kauri Heart Avenue	SB buses expected to turn right out of Kauri Heart Ave after looping into the Station.	Signals	Signals
	Porchester Road / Walters Road	Key arterials intersecting, buses turning	Single lane roundabout	Signals
	Walters Road / Grove Road	Buses turning	Priority (give way)	Signals
	Grove Road / Old Wairoa Road	Safety concerns at current priority-controlled cross-roads	Priority (stop)	Single-lane roundabout
	Grove Road / Clevedon Road	Buses turning	Priority (stop)	Single-lane roundabout
	Clevedon Road / Marne Road / Willis Road	Key arterials intersecting, key E-W connection	Single lane roundabout	Single-lane roundabout
	Clevedon Road / Broadway	Buses turning	Signals	As existing
9	Great South Road / Ōpāheke Road	Buses turning	Priority (stop)	As existing
	Ōpāheke Road / Settlement Road	Buses turning	Signals	Single-lane roundabout
	Settlement Road / Marne Road	Safety concern (cross-roads), 13,000 vpd on Marne secondary arterial (current)	Single lane roundabout	Single-lane roundabout

Corridor section	Intersection	Key transport planning considerations	Existing form	Proposed form
	Settlement Road / Hunua Road	Buses turning	Priority (give way)	Single-lane roundabout
	Hunua Road / Croskery Road	Part of the urbanisation of Croskery Road	Priority (give way)	Signals

5.4 Location refinement

As noted in Section 3.1.4 of the general methodology, a process of reconciling expert and technical inputs in a workshop setting applied to decisions on the location of any road widening and realignment (i.e. third-party land requirements) to accommodate the preferred form and function along the preferred routes.

Table 5-6 sets out the key matters identified for each section which have informed the extent and location of third-party land requirements. These generally emphasise where environmental features and identified constraints constitute clear 'differentiators'.

Table 5-6: Key differentiating features/constraints informing application of location refinement

Section (as shown in Figure 3-4)	Third-party land requirement?	Key differentiating features/constraints informing application of location refinement principles
6	High	• Preference to avoid or reduce impacts on Church (north side, chainage 350), Cosmopolitan Club (north side, chainage 430), Housing for Elderly complex (south side, chainage 660), and Transpower pylon (north side, chainage 1400). • Numerous residential new builds including large apartment complex (north side, chainage 560). Each presents a challenge in terms of avoidance of impact (i.e. the ability to maintain a 1.5m front yard in the first instance), and/or boundary setting where street frontage units will need to be acquired. • The need to replace both SH1 and NIMT bridges to provide sufficient road width drive significant property requirements
7	Moderate	• General preference for any widening to be to the east given that land to the east of Porchester Road is zoned FUZ, while land to the west is already urbanised. • Notwithstanding a general preference to widen into FUZ, there is also numerous reasons to avoid the need to replace existing local network stormwater conveyance channels / table drains on the east side of Porchester Road – this is to: (a) avoid the need for extensive piping and/or wider and shallower replacement channels requiring additional land not otherwise required; and (b) avoid choosing an inappropriate conveyance device for the road prior to Auckland Council Healthy Waters confirming the urbanisation strategy for the wider Papakura Stream catchment. This has resulted in a preference to deviate Porchester slightly (<20m) westwards in this location, which has resulted in an offset in the upgrade of Popes / Porchester Road intersection.

Section (as shown in Figure 3-4)	Third-party land requirement?	Key differentiating features/constraints informing application of location refinement principles
		• Preference to avoid or reduce impacts on churches/temples (east side, chainage 0-900), Alfriston College (west side, chainage 200), potential large wetland between Taipan Place and Papakura Stream (east side, chainage 1200). • Medium density residential new build at intersection of Porchester Road / Manuroa Road / Berwyn Road – presents a challenge in terms of avoidance (i.e. the ability to maintain a 1.5m front yard in the first instance), and/or boundary setting where street frontage units will need to be acquired.
8	Moderate	• Transpower pylon on corner of Porchester and Airfield Roads. • Medium density residential new build at intersection of Walters Road / Grove Road – presents a challenge in terms of avoidance (i.e. the ability to maintain a 1.5m front yard in the first instance), and/or boundary setting where street frontage units will need to be acquired.
9	Moderate	• Preference to avoid or reduce impacts on historic heritage features (Papakura Old Central School and War Memorial), Papakura Cemetery, and notable tree in road reserve near Settlement Road rail bridge. • Medium density residential new build at intersection of Settlement Road and Marne Road – presents a challenge in terms of avoidance (i.e. the ability to maintain a 1.5m front yard in the first instance), and/or boundary setting where street frontage units will need to be acquired.

5.5 Preferred option (NoR 3 and NoR 4)

5.5.1 Summary

Following the application of the above principles and process, a preferred option for the Takaanini FTN was identified. The form and function of the preferred option is shown conceptually in Figure 5-12) and includes:

- Provision for bus lanes in both directions along Weymouth and Alfriston Roads between Selwyn Road and Magic Way;
- Improved active mode (walking and cycling) facilities for the full route extent; and
- 20 intersection upgrades.

There are continuous road widening requirements for the Takaanini FTN along the Weymouth Road, Alfriston Road, and Porchester Road to accommodate the proposed form and function. The preferred location of widening varies as follows:

- In the case of Weymouth and Alfriston Roads, the differentiating features and constraints along these routes (see Table 5-6) did not identify a clearly preferred side of the road for widening. Accordingly, widening is proposed on both sides with minor localised variations in alignment to avoid constraints and properties where practicable; and

- In the case of Porchester Road, a general preference was identified to widen to the east given that land to the east of Porchester Road is zoned FUZ while land to the west is already urbanised. The exception to this preference was where avoidance of existing stormwater conveyance channels was sought in the vicinity of Popes Road (see Table 5-6). This has resulted in a localised westward deviation (<20m) of Porchester Road at the Popes Road intersection.

The proposed alignment and extent are shown in the General Arrangement drawings in Volume 3 of the application.

5.5.2 Design Considerations

The key considerations and assumptions applied in developing the concept design arising from the preferred option are summarised in Section 9 of the AEE.

It is noted for completeness that the approach to stormwater management devices was subject to an assessment of alternatives. Following the process set out in Section 3.2 of this report, stormwater wetlands have been identified as part of the concept design as the preferred stormwater management device. Six wetlands are proposed as follows:

- Corner of Weymouth Road and Selwyn Road;
- Adjacent to Tadmore Park and Gallaher Park;
- Corner of Alfriston Road and Scotts Road;
- Alfriston Park;
- East of Porchester Road, north of the Papakura Stream; and
- East of Porchester Road, south of the Papakura Stream.

The size and location of each of these wetlands was identified based on the process set out in Section 3.2 of this report.

It is noted for completeness that raingardens were considered for the Weymouth-Alfriston Road corridor. These were not preferred on the basis that:

- Raingardens would not provide the necessary stormwater functions required for the corridor (see Section 3.2); and
- The additional road widening required to accommodate raingardens in this corridor context would increase rather than reduce the property requirements compared with the preferred wetlands.

5.5.3 Route protection requirements of the preferred option (NoRs 3 / 4)

The sections of the Takaanini FTN which utilise Weymouth Road, Alfriston Road, and Porchester Road generally require continuous road widening and additional land take to provide for the necessary form and function of the transport upgrades as defined in Section 5.5.1 above (i.e. along Weymouth Road and Alfriston Road between Selwyn Road and Magic Way; and along Porchester Road between Alfriston Road and Walters Road). These requirements are proposed to be packaged in two NoRs as follows:

- The Weymouth and Alfriston Road extents are proposed to be packaged within the NoR referred to as **NoR 3**; and
- The Porchester Road extent is proposed to be packaged within the NoR referred to as **NoR 4**.

The remainder of the preferred option to the south of Airfield Road can largely be accommodated within the existing road reserve, with third-party land requirements limited to isolated requirements for intersections along the route listed in Section 5.3.2 above.

Route protection is only required for the parts of the preferred option requiring third-party land, and the remainder of the transport upgrades comprising the preferred option are assumed to be either permitted activities or readily consentable.

In assessing the strategic merit of proceeding with route protection for NoR 3, a qualitative assessment considering the range of factors set out in Table 3-3 was carried out. This assessment noted the following:

- The Weymouth and Alfriston Road upgrades were assessed as providing high transport benefits, in particular provision for bus lanes in both directions which will enable significant improvements in the performance of public transport, and upgraded active mode facilities which will increase the safety and attractiveness of walking and cycling;
- The Weymouth and Alfriston Road corridor is a strategically significant east-west route and has no equivalent parallel route. Accordingly, there is a high reliance on the route today, and it will need to accommodate continued increases in transport demands resulting from planned growth. The proposed upgrades will ensure that the road is appropriately future proofed to efficiently serve the demands associated with planned growth;
- While the scale of property requirements and associated costs associated with route protection were assessed as significant (noting that over 400 properties are directly affected), the above noted benefits were considered to justify these effects and costs;
- While these parts of the Takaanini FTN traverse mostly urbanised areas in Manurewa, there remains a route protection benefit to be derived from future-proofing transport upgrades to provide for the urban intensification enabled by the AUP:OP; and
- Route protection presents an opportunity to provide for integration of bridge upgrades with other interdependent projects – e.g. integration of Weymouth Road bridge upgrade with future four-tracking of the NIMT.

The same assessment was undertaken for NoR 4, and noted that:

- The Porchester Road upgrade was assessed as providing high transport benefits, in particular upgraded active mode facilities which will increase the safety and attractiveness of walking and cycling;
- The scale of property requirements and associated costs associated with route protection are moderate relative to the benefits of the project given that the majority of the corridor widening is proposed to be undertaken on the eastern side of Porchester Road which is not urbanised; and
- Clear opportunity to achieve route protection given that the eastern side of the Porchester Road corridor is not urbanised.

For completeness, it is noted that the potential third-party land requirement for an approximately 7km extent at the southern end of the Takaanini FTN (sections 8 and 9 as documented in this report) is **not proposed** to be route protected as part of the current application, and in effect is deferred to future designation processes. As part of this strategic merits assessment, it was considered that the relative cost-benefit assessment of these areas did not favour route protection at this time given the projected time scale for future urban growth in this area.

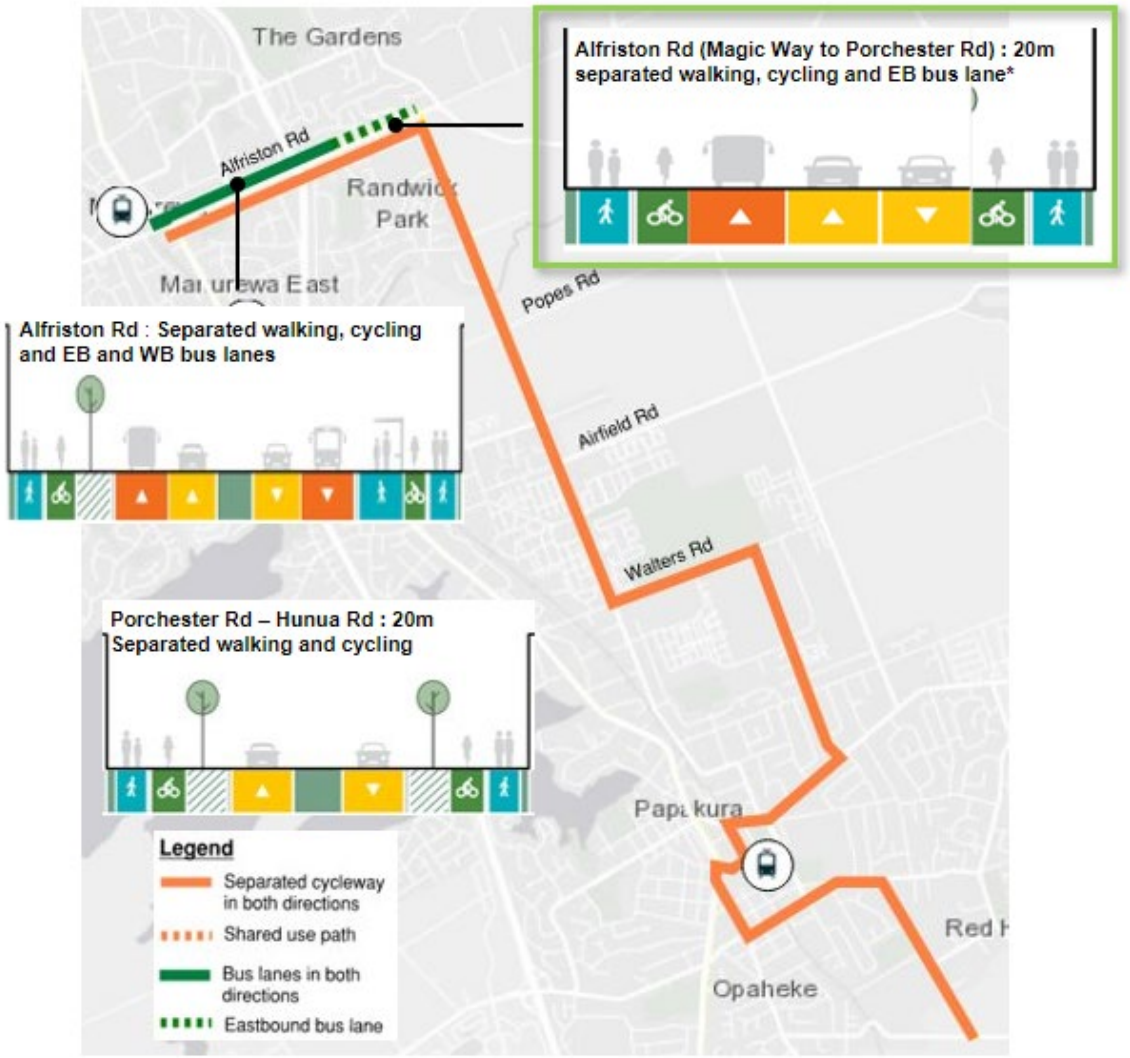

Figure 5-12: Takaanini FTN preferred option

6 Key Connections

6.1 Gap analysis and confirmation of optioneering scope

As noted in Section 2.3, each of the adjoining **Key Connections** originates from options identified as part of the ISTN through the IBC process; and have fallen into the scope of the South FTN DBC as a result of circumstances summarised in the gap analysis (see Section 2.3).

These are outlined in Table 6-1 below.

Table 6-1: Origins of the complementary corridors and why they are in Project scope

Corridor	IBC option	Reasons for inclusion in Project scope
Popes Road	Formed part of option EW9B which comprised east-west connections in the Takaanini area (see Figure 2-4).	• The decision to discount the Rangi Road Viaduct as part of the Takaanini FTN meant that option EW9B (and indeed option MT4L) was not possible in the form envisaged in the IBC. However, this decision only applied to the Rangi Road Viaduct, not to the wider east-west corridor including Popes Road. • Popes Road still likely has strategic significance as a future east-west connection between the north-south route formed by the Takaanini FTN and the future Mill Road corridor (and indeed further west via the TLC crossings).
Great South Road (Drury)	Formed the southernmost part of options MT4K and MT4L (SH1 FTN options), forming the connection between the SH1 Drury Interchange and Drury Central Station (see Figure 2-2).	• As noted in Section 2.3, options MT4K and MT4L have not been taken forward into a DBC by Te Tupu Ngātahi, meaning that the upgrade of this section of Great South Road has not been provided for. • The designation/consenting and funding of the Drury Central Station and Waihoehoe Road urbanisation through NZUP have left this section of Great South Road requiring corresponding planning for urbanisation to ensure that the projects form a cohesive whole.

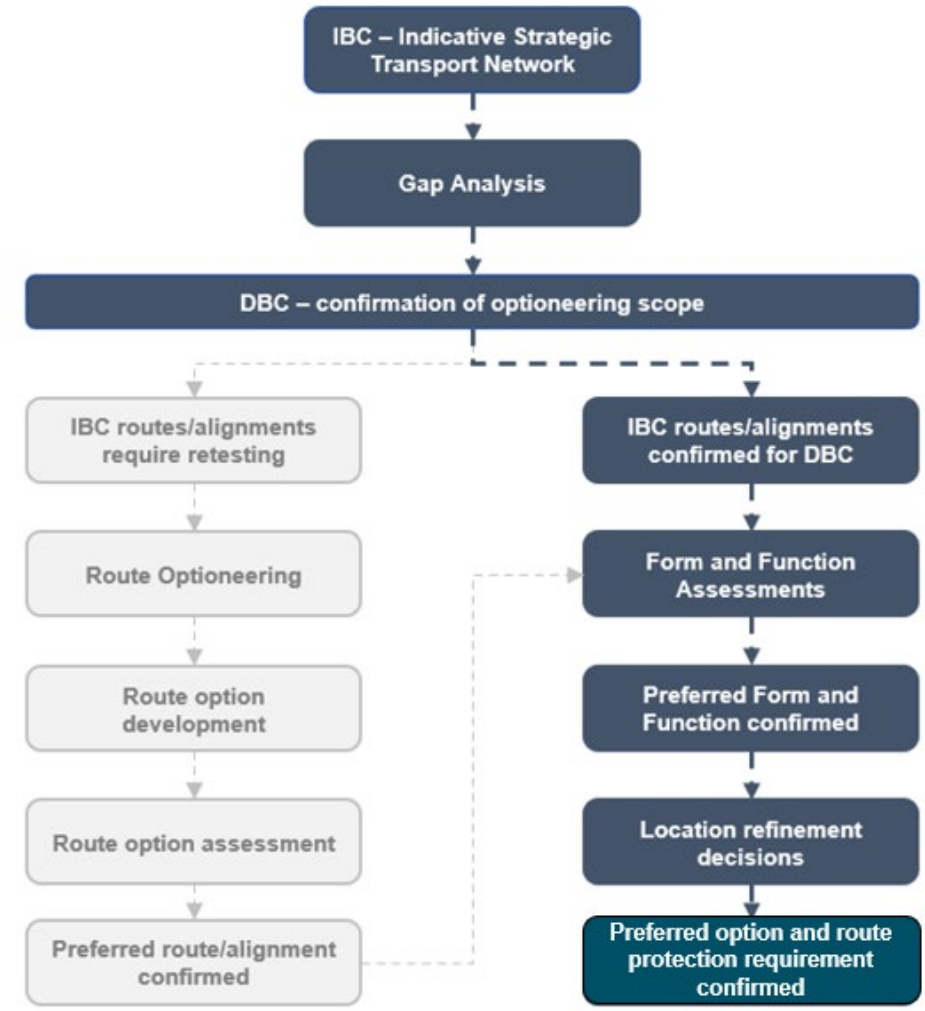

Figure 6-1: Optioneering process adapted for Popes Road and Great South Road (Drury). Note omission of the route optioneering steps.

The methodology outlined in Section 3 requires the implications of new information identified in the gap analysis to be considered with a view towards establishing the necessary scope of further optioneering in the DBC. In making this determination, the following conclusions were reached through the gap analysis on the three complementary corridors:

- The reasoning set out in Table 6-1 for each of the corridors identifies that each of the three corridors remains strategically important in the context of the wider network as it is now planned;
- Legislative and policy direction to enable increased housing supply, updates to AFC growth scenarios, and Private Plan Changes all signal that the areas around the Takaanini FTN Project area will continue to experience urban growth and increased demand on the transport network;
- The types of multi-modal interventions, namely active mode facilities, envisaged along the corridors are entirely consistent with the transport and climate change legislation policy directives outlined in Table 6-1; and
- Both corridors already exist. Given that FTN services are not proposed along these routes, there is no need to consider bus routing implications as was the case for the Takaanini FTN.

For the above reasons, there was not considered to be any reason initially to further retest the routes for Popes Road and Great South Road in Drury. Accordingly, the route optioneering process step was

omitted, and the corridors proceeded directly to form and function assessment and location refinement (see Figure 6-1).

6.1.1 Implications of the draft Future Development Strategy – April 2023

In response to NPS-UD requirements, Auckland Council published a draft FDS in April 2023. The draft FDS proposed changes to the spatial composition of urban growth in Auckland, including removal of the Takaanini FUZ due to natural hazard risks. This area was identified as an area for long-term urbanisation under the Council's FULSS, and remains zoned FUZ in the AUP:OP. Given the timing of the draft FDS, it was not considered during the gap analysis undertaken at the outset of South FTN, and the initial options assessment proceeded on the assumption that the FUZ would remain.

However, the Project Team recognised that the outcome of the final FDS could have a material impact on the option assessment process. While the ultimate zoning outcome is subject to a future plan change process, the draft FDS signalled a clear policy shift for the area. Consequently, the Project Team considered that the required form and function for the eastern end of Popes Road (Popes Road East) would fundamentally change in the event that the removal of the Takaanini FUZ were to be altered via the final FDS. The FDS recommendations are of particular relevance to Popes Road East, because the corridor traverses the Takaanini FUZ, and the need for a road upgrade is premised on the need to provide for future urbanisation. Accordingly, while the initial assessment assessed Popes Road East as a future urban arterial road, it was acknowledged that the required form and function would need to be revisited and change in the event that the proposed removal of the Takaanini FUZ remained part of the FDS. In this event, the Project Team considered it unlikely that Popes Road East traversing the current FUZ would require widening to enable urbanisation. The western section of Popes Road (Popes Road West) would remain in scope given that part of the corridor already traverses live-zoned land. It was noted that this assessment would need to be revisited when the final FDS is released.

At the time at the time of finalising this assessment in October 2023 for a final AT decision, the Council officers' recommendation on the final FDS was released. This required a reassessment of the merits of the inclusion of Popes Road for route protection to be undertaken. This is addressed at Section 6.4 below.

6.2 Form and Function

6.2.1 Corridor Form and Function

As noted in Section 3.1.3.1 of the general methodology, the CFAF process as developed and applied at the Programme-wide level is intended to use land use and transport planning inputs to define functional requirements for the corridor in question, and identify a suitable midblock cross-section from a set of modular concept designs. This approach is taken on the basis that it provides for a suitable level of detail for route protection and design efficiency, whilst allowing for future design changes and flexibility at the time of implementation.

In the case of the adjoining Key Connections for the South FTN, the outputs of the CFAF process were the application of:

- **A two-lane arterial** cross-section for Popes Road incorporating separated walking and cycling facilities (see Figure 6-2). No bus lanes are proposed for this corridor as it is not proposed as FTN bus routes; and
- **A four-lane arterial** cross-section for Great South Road (Drury) incorporating two general traffic lanes per direction, separated active mode facilities in each direction, and space for berms and a median (see Figure 6-3). No bus lanes are proposed for this part of the corridor as it is not proposed as an FTN bus route. However, bus lanes are not precluded.

Figure 6-2: Two-lane arterial as proposed for Popes Road (indicative only).

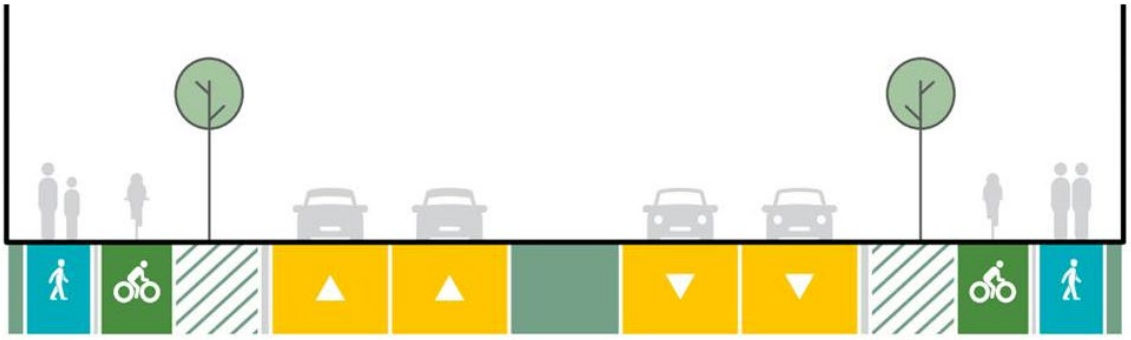

Figure 6-3: Four-lane arterial as proposed for Great South Road (Drury).

6.2.2 Intersection Assessment

As noted in Section 3.1.3.2 of the general methodology, an intersection assessment process is undertaken in parallel to the CFAF to identify the indicative controls required at key intersections, and the resultant footprint implications. Similarly, to the CFAF process, the approach developed and applied across the programme for the intersection assessment is to use land use and transport planning inputs to define functional requirements for the corridor in question, and identify a suitable intersection layout from a set of modular intersection designs.

In the case of the Key Connections, standalone intersection assessment was only undertaken for the intersection of Popes Road and Takanini School Road, where a single-lane roundabout is proposed (see Table 6-2).

All other intersections along the two corridors were either:

- Already addressed as part of intersection assessment for the Great South Road or Takaanini FTN (given that the corridors intersect in some cases);

- Already assessed as part of another Te Tupu Ngātahi project; or
- Anticipated to be assessed as part of a future project scope.

The circumstances pertaining to each intersection along the subject corridors is summarised in Table 6-2, along with key location-specific considerations informing the proposed form (in addition to the above noted considerations).

Table 6-2: Key Connections – intersections

Corridor	Intersection	Key transport planning considerations	Existing form	Proposed form
Popes Road	Popes Road / Takanini School Road	Freight expected to turn into the Takaanini industrial area	Priority (give way)	Single-lane roundabout
	Porchester Road / Popes Road	Key E-W connection to Mill Road/ Takaanini industrial area	Priority (stop)	Dual-lane roundabout (note addressed as part of Takaanini FTN, see Table 4-3).
	Porchester Road / Mill Road	TBC – Assumed to fall within future Mill Road project scope. Existing form is priority (stop).		
Great South Road (Drury)	Great South Road / Waihoehoe Road	Addressed via tie-in to signals proposed as part of the Drury Arterials package and to be implemented through NZUP (see Table 6-1).		
	Great South Road / Firth Street	Need for right-turn bay into Firth Street	Priority (stop)	Signals
	Great South Road / SH1 Interchange	Addressed via tie-in to Waka Kotahi Papakura-to-Drury (Stage 1B1) Project.		

6.3 Location Refinement

As noted in Section 3.1.4 of the general methodology, a process of reconciling expert and technical inputs in a workshop setting applied to decisions on the location of any road widening and realignment (i.e. third-party land requirements) to accommodate the preferred form and function along the preferred routes.

Table 6-3 sets out the key matters identified for each section which have informed the extent and location of third-party land requirements. These generally emphasise where environmental features and identified constraints constitute clear 'differentiators'.

Table 6-3: Key differentiating features/constraints informing application of location refinement

Corridor (as shown in Figure 3-4)	Third-party land requirement?	Key differentiating features/constraints informing application of location refinement principles
Popes Road	Low	• Stormwater conveyance channel on the south side of the road east of Porchester Road to be retained – this is to: (a) avoid the need for extensive piping and/or wider and shallower replacement channels requiring additional land not otherwise required; and (b) avoid choosing an inappropriate conveyance device for the road prior to Auckland Council Healthy Waters

Corridor (as shown in Figure 3-4)	Third-party land requirement?	Key differentiating features/constraints informing application of location refinement principles
		confirming the urbanisation strategy for the wider Papakura Stream catchment. This constraint pushes widening northwards. • Desire to reduce impacts on existing Spark Data Centre site (south side, chainage 300) if practicable given sensitivity of communications infrastructure. • Otherwise – a lack of clear differentiating factors.
Great South Road (Drury)	Moderate	• The need to integrate with adjoining projects – Waihoehoe Road urbanisation to the north, Drury Central Station to the east, and SH1 Papakura-to-Drury (Drury Interchange) to the south. • Desire to avoid/reduce impacts on Hingaia Stream where bridge replacement is required. • Desire to avoid/reduce impacts on Watercare's Waikato No.1 Watermain on the east side of the road. • Approaches to Hingaia Stream bridge need to be raised for flood immunity.

6.4 Final Future Development Strategy implications

At the time at the time of finalising this assessment, the Council officers' recommendation on the final FDS had just been released. The officers' recommendation remains that the Takaanini FUZ should be removed. This affects the continued validity of route protection for the upgrade of Popes Road East.

While noting that the officers' recommendation is yet to be endorsed by the Auckland Council Planning Committee at the time of writing, the Project Team, in consultation with AT, has taken the officers' recommendation as the most recent indication of the likely final FDS position. The implications were considered, and the following conclusions were reached:

- There is no need to revisit any earlier route optioneering assessment because Popes Road was selected largely because it is an existing route. The FDS does not change this; and
- The primary functional requirement for upgrades along Popes Road to the east of Porchester Road was to provide for urbanisation (i.e. corridor widening to enable walking and cycling upgrades). This urbanisation is no longer supported by the most recent policy direction as set out in the FDS reporting and evidence evaluation.

On this basis, the proposed upgrade of Popes Road to the east of Porchester Road plus land requirement that had been identified and assessed in the options assessment to date cannot be reasonably justified. Accordingly, the scope extent of the preferred option has been reduced to **remove Popes Road East** beyond the intersection of Popes and Porchester Roads and associated tie-ins. The proposed NoR 4 scope reduction was confirmed by AT prior to lodgement.

The western portion of the Popes Road upgrade is proposed to be retained given that the area is live-zoned. The upgrade is henceforth referred to as **Popes Road West**.

6.5 Preferred option (NoRs 2 and 4)

6.5.1 Summary

Following the application of the above process, preferred options for the Key Connections – Popes Road West and Great South Road (Drury) – were identified. The form and function of the preferred options are shown conceptually at Figure 6-4 and Figure 6-5, and include:

- **Popes Road West** – provision for an urban two-lane cross-section with walking and cycling facilities between Takanini School Road and Porchester Road only, and upgrades of the intersections with Takanini School Road and Porchester Road; and
- **Great South Road (Drury)** – provision for an urban four-lane cross-section with walking and cycling facilities between the SH1 Drury Interchange and Waihoehoe Road, with provision for the upgrade of the Firth Street intersection.

The preferred options for both routes require continuous road widening. The preferred location for widening varies as follows:

- In the case of Popes Road West, the general preference was to widen to the north to minimise impact on the Spark Data Centre (see Table 6-3); and
- In the case of Great South Road (Drury), the differentiating features and constraints along these routes (see Table 5-6) did not identify a clearly preferred side of the road for widening.

Accordingly, widening is proposed on both sides with best endeavors to avoid constraints and properties where practicable.

The proposed alignment and extent are shown in the General Arrangement drawings in Volume 3 of the application.

6.5.2 Design Considerations

The key considerations and assumptions applied in developing the concept design arising from the preferred option are summarised in Section 9 of the AEE.

It is noted for completeness that the approach to stormwater management devices was subject to an assessment of alternatives. Following the process set out in Section 3.2 of this report, the following devices have been identified:

- For Popes Road West, swales within the road corridor have been identified as part of the concept design as an at-source treatment device. Stormwater is then proposed to be conveyed via conveyance channels to the stormwater wetland to the east of Porchester Road / south of the Papakura Stream identified as part of the Takaanini FTN (see Section 5.5 above) and discharged to the Papakura Stream; and
- For Great South Road (Drury), localised raingardens within the road corridor have been identified as the preferred stormwater management device.

6.5.3 Route protection requirements of the preferred option (NoRs 2 and 4)

Both of the Key Connections require continuous road widening / third-party land. Accordingly, the route protection requirements are contiguous along both routes and require additional land take to provide for the necessary form and function of the transport upgrades as defined in Section 6.5.1 above. These requirements are proposed to be packaged in two NoRs as follows:

- The Great South Road (Drury) is proposed to be packaged within the NoR referred to as **NoR 2**; and
- The Popes Road West extent is proposed to be packaged within the NoR referred to as **NoR 4** (along with the Porchester Road upgrade proposed as part of the Takaanini FTN).

In assessing the strategic merit of proceeding with route protection for NoR 2, a qualitative assessment considering the range of factors set out in Table 3-3 was carried out. This assessment noted the following:

- The Great South Road (Drury) upgrade was assessed as providing a high transport benefit, in particular the provision for upgraded active mode facilities which will increase the safety and attractiveness of walking and cycling, and additional traffic lanes which will improve access to SH1;
- Route protection for the Great South Road (Drury) upgrade was identified as an opportunity to achieve an integrated, well-functioning multi-modal outcome which integrates three adjoining interdependent projects – the Drury Train Station, the SH1 Drury Interchange, and the urbanisation of Waihoehoe Road. It was also identified as an opportunity to future-proof for an upgraded bridge over the Hingaia Stream which is located within a known floodplain;
- The Great South Road (Drury) upgrade has partial effects only on 47 directly affected properties, which is a level of impact considered proportional to the transport benefit enabled through route protection; and
- While the Great South Road (Drury) corridor traverses areas of commercial and light industrial peri-urbanisation, there remains a route protection benefit to be derived from future-proofing transport upgrades to provide for the urban intensification enabled by the AUP:OP.

The same assessment was undertaken for NoR 4, and noted that:

- The Popes Road West upgrade was assessed as providing high transport benefits, in particular upgrades to active mode facilities which will increase the safety and attractiveness of walking and cycling, and provision for an urbanised corridor through the live-zoned extent of Popes Road; and
- The scale of property requirements and associated costs associated with route protection are moderate given that much of the area is yet to be urbanised/subdivided, and that all property requirements are partial only.

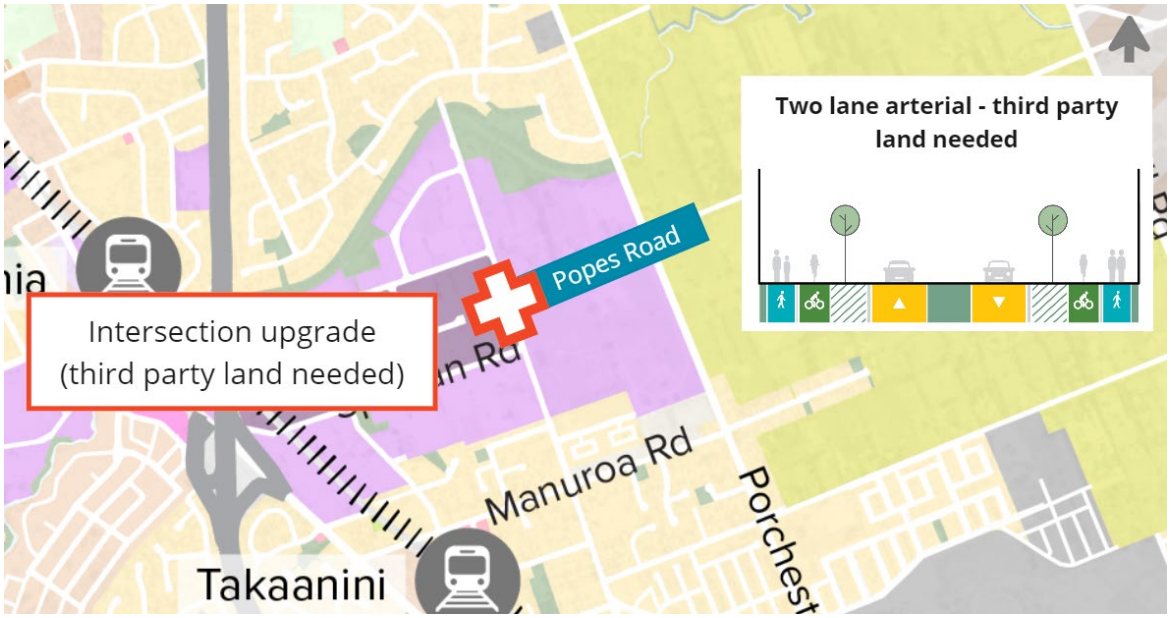

Figure 6-4: Popes Road preferred option

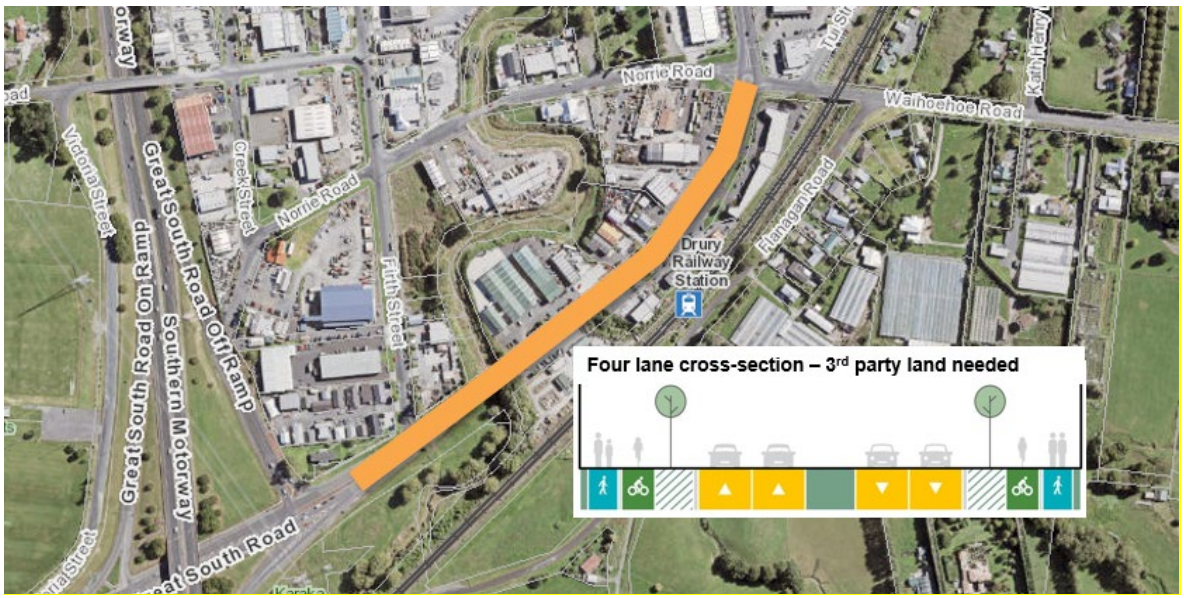

Figure 6-5: Great South Road (Drury) preferred option

7 Consideration of alternative statutory methods

As part of the consideration of alternatives, the alternative statutory methods to enable route protection and future implementation of South FTN have been assessed in accordance with section 171(1)(b) of the RMA. Methods were considered in light of a range of contextual elements including project strategic importance, project urgency/timing, and project complexity risk profile. The methods considered included:

- Designations;
- Resource consents;
- Structure Planning and Plan Changes
- Landowner/developer negotiations; and
- Traditional property acquisition.

The assessed strengths and weaknesses of these statutory methods in the context of the South FTN are summarised in Table 7-1 below.

For clarity, it is reiterated that not all the optioneering documented in this report has resulted in proposed transport upgrades which require additional land take to provide for the proposed transport upgrades. Accordingly, the assessment of alternative statutory methods is relevant only to the parts of the South FTN for which NoRs have been lodged.

Table 7-1: Strengths and weaknesses of statutory methods in the South FTN context

Method	Summary of strengths and weaknesses in the TLC context
Designations	• Prevents development that would prevent/hinder the proposed works within the designation boundaries. • Negates need for land use consents to implement works otherwise authorised by section 9(3) of the RMA – however regional consents need to be applied for separately. • Has interim effect from the time of lodgement. • Can provide for long-term route protection through extended lapse periods. • Can maintain design flexibility – less detail may be provided at lodgement, and further detail to be provided to the territorial authority subsequently at the Outline Plan stage prior to construction. • Provides certainty to affected landowners and the ability to request early buy-out from the requiring authority. • Does not require all land needed for South FTN to be purchased prior to lodgement (unless early buy-out is requested and approved) – property costs can be spread over period between NoR lodgement and the implementation of the work. • Additional areas required for construction can be rolled-back after works are completed. • Requiring authority retains decision making power. • High level of information required to support. • Exposure to contingent liability, and ultimately requires requiring authority to purchase land within footprint under the Public Works Act 1981 (**PWA**) – i.e. designation does not resolve property acquisition aspects of route protection. • Planning 'blight' – affected property owners may be unwilling or unable to maintain or develop properties when designated.
Resource Consents	• Resource consents do not prevent development that would otherwise prevent/hinder the proposed works – not a 'route protection' mechanism. In lieu of a route protection mechanism, all land needed for the project would need to be purchased before lodgement (see 'Traditional Property Acquisition' below). • Land use consents under section 9(3) of the RMA would need to be sought individually and not aggregated in the form of a designation. • Unable to utilise Outline Plan process – less design flexibility than a designation.

Method	Summary of strengths and weaknesses in the TLC context
	• Notwithstanding the above, resource consents may be required for works within the existing road corridor that do not require third-party land.
Structure Planning / Plan Changes	• Mechanisms within Structure Plans and Plan Change Precincts such as indicative roads and frontage setbacks have historically functioned as alternative route protection measures in lieu of designations. However, these mechanisms provide weaker protection from precluding development than designations, and do not specifically authorise the works – accordingly resource consents would ultimately be needed to authorise works, at which time all land needed for the project would need to be purchased (see 'Traditional Property Acquisition' below). • Road frontage setbacks through Plan Changes have been incorporated into Plan Changes 52 and 58 on Great South Road Ōpāheke (within Section 4 as assessed in this report). However, these types of mechanisms are unlikely to be practical at a Project-wide level given the scale of South FTN and level of land ownership fragmentation. • Some activities required for the works are enabled under the Strategic Transport Corridor Zone and within roads under the E26 Infrastructure provisions of the AUP:OP. However, given that much of the land required for South FTN is subject to other zoning and existing land uses, a Plan Change would be required. This would be less practical than simply lodging a NoR, and would require earlier land purchase (see 'Traditional Property Acquisition' below).
Landowner / Developer Negotiation	• While alternative route protection mechanisms can be negotiated with landowners and developers (as above), ownership within the South FTN project area is fragmented – approximately 450 properties are either partially or fully required for South FTN. Negotiations requiring the concurrent agreement of this number of parties would likely be impractical. • Road frontage setbacks through Plan Changes have been incorporated into Plan Changes 52 and 58 on Great South Road Ōpāheke (within Section 4 as assessed in this report). However, these types of mechanisms are unlikely to be practical at a Project-wide level given the scale of South FTN and level of land ownership fragmentation. • As above – alternative route protection mechanisms provide weaker protection from precluding development than designations, and do not specifically authorise the works. Accordingly, resource consents would ultimately be needed to authorise works, at which time all land needed for the project would need to be purchased (see 'Traditional Property Acquisition' below).
Traditional Property Acquisition	• Not considered appropriate because property is typically purchased closer to construction when more detailed design is available – full property costs incurred immediately for a project that may not be implemented for a long period of time. • Purchasing land ahead of detailed design may result in too much or too little land being acquired with little flexibility between permanent and temporary requirements. • Would need to be accompanied by resource consents to authorise works.

Having considered the relative strengths and weaknesses of the various route protection mechanisms outlined in Table 7-1, designations were identified as the preferred route protection method for South FTN, with AT as the Requiring Authority. Designations were considered the most logical and effective method to protect the route in an evolving environment because they:

- Provide certainty to all parties including the community, affected landowners, and developers;
- Are a well-recognised and understood tool for route protection which links with future land acquisition processes through the PWA;
- Maximises flexibility for future implementation – provides for progression of detailed design and implementation at the appropriate time;
- Negates the need for additional land use consents to implement works otherwise authorised under section 9(3) of the RMA;

- Will continually provide for ongoing future operation and maintenance requirements as well as construction works;
- Reduces future cost risk in cases where route protection and associated land purchase can be undertaken prior to upzoning and / or development which induces a land value increment; and
- Provides protection of the land from development that would prevent / hinder South FTN from the time of lodgement. This is particularly relevant in the Takaanini context which is already experiencing significant intensification.

It is concluded that adequate consideration has been given to alternative statutory methods and that route protection in the form of designations would be progressed for the South FTN.

8 Conclusion

Following the optioneering and refinement process set out above, the final recommended Project that would be taken forward for route protection (i.e., the scope of the AEE) is summarised in Table 8-1. The parts of South FTN requiring route protection are provided for through four NoRs as shown in Figure 8-1.

Te Tupu Ngātahi, on behalf of AT, adopted a systematic approach to considering alternative routes and statutory methods for undertaking the alternatives assessment to the NoRs required to enable the South FTN.

The consideration of alternatives methodology adopted meets the statutory requirements set out in section 171(1)(b) if the RMA.

Table 8-1: Final recommended network

Notice	Corridor	Scope / Description
NoR 1	Great South Road FTN Upgrade	• Road upgrades and transport upgrades providing for the Great South Road FTN route along Great South Road between Manukau and Drury. • NoR comprises eight areas along Great South Road (see Figure 1-2) providing for bus priority measures, walking and cycling facilities, key intersection upgrades, replacement of the existing Otūwairoa / Slippery Creek bridge, and stormwater management devices.
NoR 2	Great South Road Upgrade (Drury section)	• Road upgrades and transport upgrades providing for upgrade of a 520m section of Great South Road in Drury between Waihoehoe Road and the SH1 Drury Interchange. • NoR enables road widening to provide for four lanes, active mode facilities, replacement of the existing Hingaia Stream bridge, and stormwater management devices.
NoR 3	Takaanini FTN – Weymouth Road, Alfriston Road and Great South Road Upgrades	• Road upgrades and transport upgrades providing for the Takaanini FTN route along Weymouth and Alfriston Roads between Selwyn Road and Saralee Drive; and for an adjoining section of the Great South Road FTN route between Halver Road and Myers Road. • NoR enables road widening to accommodate bus priority measures, walking and cycling facilities, key intersection upgrades, replacement of existing bridges along Weymouth Road over the NIMT and Alfriston Road over SH1, and stormwater management devices.
NoR 4	Takaanini FTN – Porchester Road Upgrade and Popes Road Upgrades	• Road upgrades and transport upgrades providing for the Takaanini FTN route along Porchester Road generally between Alfriston Road and Walters Road; and for the urbanisation of Popes Road generally between Takanini School Road and Porchester Road. • NoRs provide for urbanisation of both corridors – two traffic lanes, walking and cycling facilities, key intersection upgrades, and stormwater management devices.

Figure 8-1: Recommended Project for route protection (as assessed in the AEE)

Appendix A: MCA Framework

Well being	MCA topic	#	Criteria	Measure
DBC Investment Objectives	DBC Investment Objectives		South FTN Routes	I.O 1 – **Access** – Enable access to economic and social opportunities by providing high quality public transport between Drury and Manukau that integrates with the rail network;
				I.O 2 – **Integration** – Support planned growth by integrating with the existing transport system, land use and the planned public transport network; and
				I.O 3 – **Travel choice and climate change** – Support growth and mode share shift towards low carbon transport modes.
			Key Connections	I.O 1 – **Access** – Improve access to economic and social opportunities by providing and integrated multi-modal corridors;
				I.O 2 – **Integration** – Provide corridor protection to support planned growth and flexibility enable future land use and transport integration;
				I.O 3 – **Travel choice** – Enable transformational mode share in Takaanini by providing a high quality, low carbon transport network; and
				I.O 4 – **Safety** – Provide improvements on the corridors that contributes to a transport network that is free from deaths and serious injuries.
Cultural	Heritage	1a	Heritage	*Extent of effects on:* *Sites and places of valued heritage buildings, trees (with heritage value) and places.* *Sites and places of archaeological value.* *Sites and places of European cultural heritage value* *Sites and places of significance to Manawhenua*
Social	Socio-economic impacts	2a	Land use futures	*To what extent will the option impact on the future development of land (within the corridor, adjacent to it and impacted by it – i.e. consider all 3 scales), in relation to:* *Underlying existing urban structure (block and street pattern)* *Integration with the future landuse scenario (aligning housing delivery with infrastructure delivery)* *Size and shape of potential development parcels to enable appropriate building typologies* *Ability to consolidate residual land* *Access that does not prevent neighbouring development*

Well being	MCA topic	#	Criteria	Measure
		2b	Urban design	*To what extent does the option support a quality urban environment (both current and future planned state)? particularly relating to:* *Context and planned place making considerations* *An inviting, pleasant and high amenity public realm* *Open space integration* *Active interface between public and private realm* *Scale of long term impact on the amenity and character of the surrounding environment.*
		2c	Land requirement	*Scale of public / private land (m^2 / number of properties / special status of impacted property) required to deliver the option.*
		2d	Social cohesion	*Impact on connectivity/accessibility for the existing urban areas including access to:* *Employment* *Other communities or within the same community* *Shops/services/other community and cultural facilities/'attractors'* *Severance of the existing community (including consented)* *Scale of effect on existing community facilities and open space* *Public access to the coast, rivers and lakes*
		2e	Human Health and Wellbeing	*Will the option potentially affect any sensitive land uses nearby or consented (adjacent residential, childcare centres, hospitals, rest homes, marae and schools)? particularly relating to:* *Air Quality* *Contaminated Land* *Noise and Vibration*

Well being	MCA topic	#	Criteria	Measure
Environmental	Natural Environment	3a	Landscape/visual	*Will the option have visual effects?* *Extent of effects on:* *The natural landscape and features such as streams, coastal edges, natural vegetation and underlying topography – acknowledging planned changes to area in light of urban land use/zoning* *Natural character and outstanding natural features/landscapes including geological features (mapped and protected features)*
		3b	Stormwater	*Impact of operational stormwater (both quantity and quality) on the receiving environment, including:* *Potential flooding effects of the option within the catchment* *Extent and consequences of likely mitigation measures*
		3c	Ecology	*Extent of effects on:* *Significant indigenous flora;* *Significant habitats of indigenous fauna;* *Indigenous biodiversity;* *Stream/waterway ecology* *Coastal environment (e.g. CMA)*
		3d	Natural Hazards	*Extent of effect on adverse geology; steep slopes; seismic impacts; other resilience risks (low level infrastructure near coastlines, inundation areas)*
Economic	Transport	4a	Transport system integration	*The extent to which the option achieves the following:* *Integration with wider network and between modes* *Resilience to operational incidents or short term life-line access disruption* *Reduces the need to travel increase access to non-car choices*
		4b	User Safety	*Extent of safety effects on all transport users, including:* *People in public transport* *People walking or cycling* *People in private vehicles*

Well being	MCA topic	#	Criteria	Measure
	Construction impacts	5a	Construction impacts on utilities/infrastructure	*Requirements for relocation/design of existing infrastructure, including* *Consideration of safety impacts* *Risk of continuity of service over construction* *Engagement with utility providers* *Opportunities for integration with other bulk infrastructure*
		5b	Construction Disruption	*Construction impacts on people and businesses regarding:* *Traffic & noise* *Earthworks related effects including dust* *Quality of life and amenity* *Economic impacts on businesses/community/town centres*
	Cost & Construction Risk	6a	Construction costs and risk	*Assessed cost for construction of options including:* *Complexity and risk in construction (including consideration of constructability)* *Complexity in programme* *Cost and complexity of safely undertaking works (including works on contaminated land)*