

TECHNICAL REPORT: SCENARIO EVALUATION Attachment 2 – Technical Documents

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September 2011

THE
AUCKLAND
PLAN



Auckland Plan

Scenario Evaluation Workstream

Attachment 2:

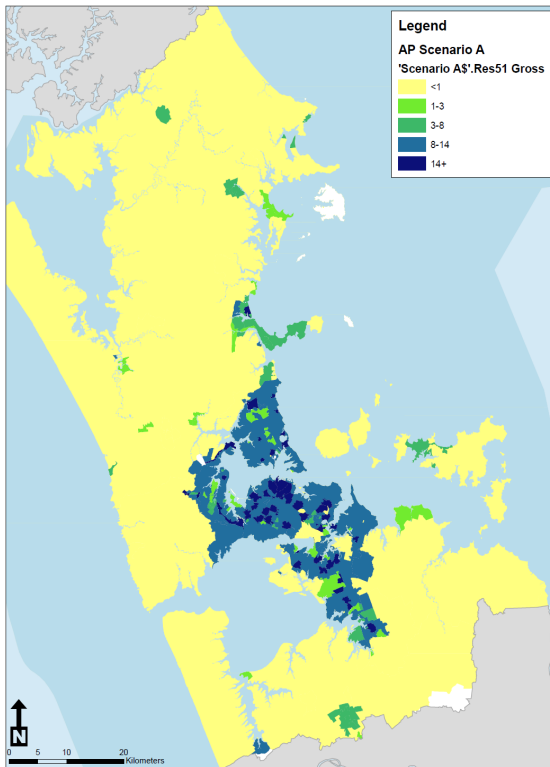
Technical Documents

September 2011

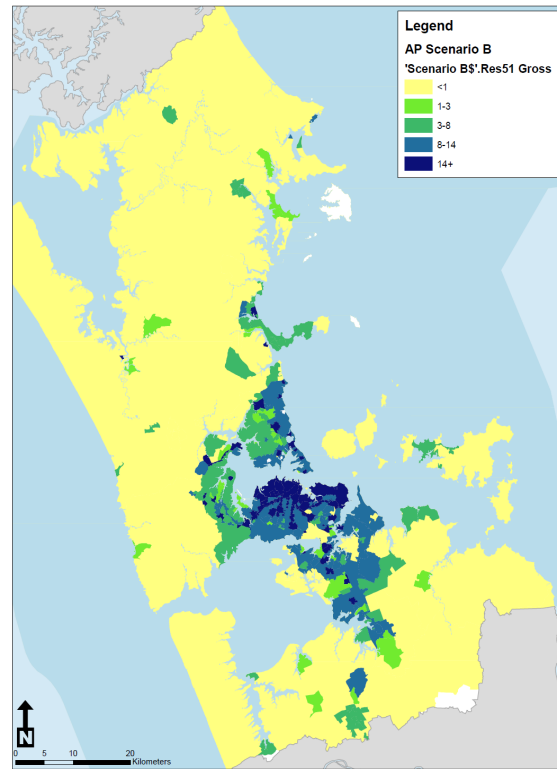
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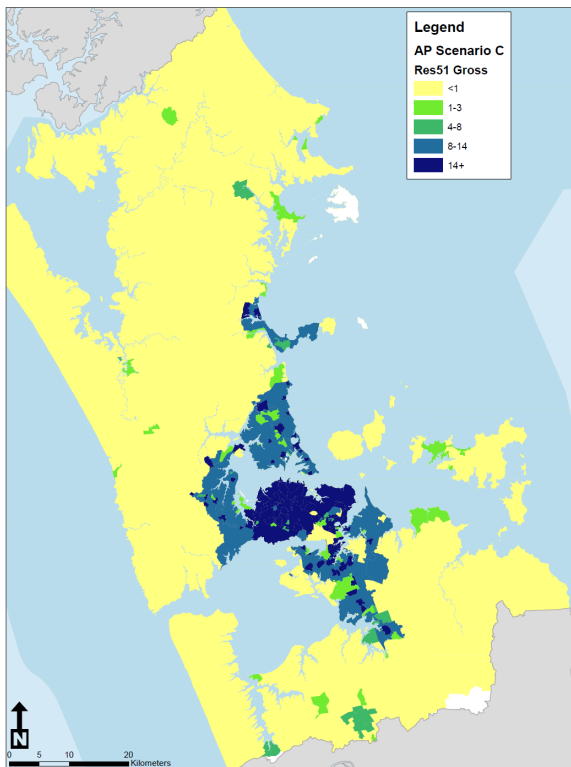
1 Maximum density maps - residential



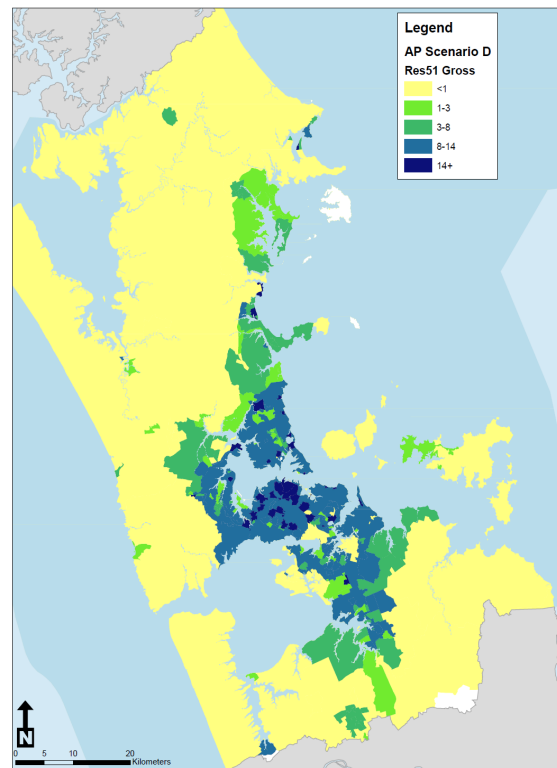
Scenario A - Residential Density
AP Scenarios - Inputs Capacity - Density



Scenario B - Residential Density
AP Scenarios - Inputs Capacity - Density

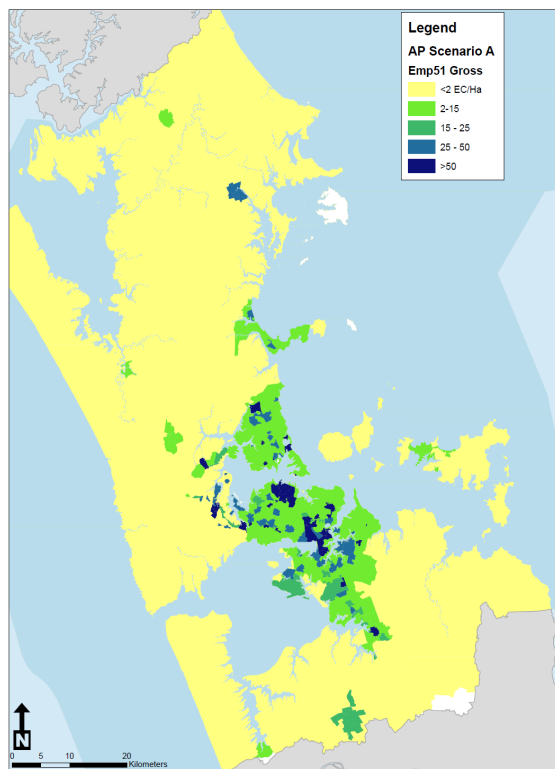


Scenario C - Residential Density
AP Scenarios - Inputs Capacity - Density

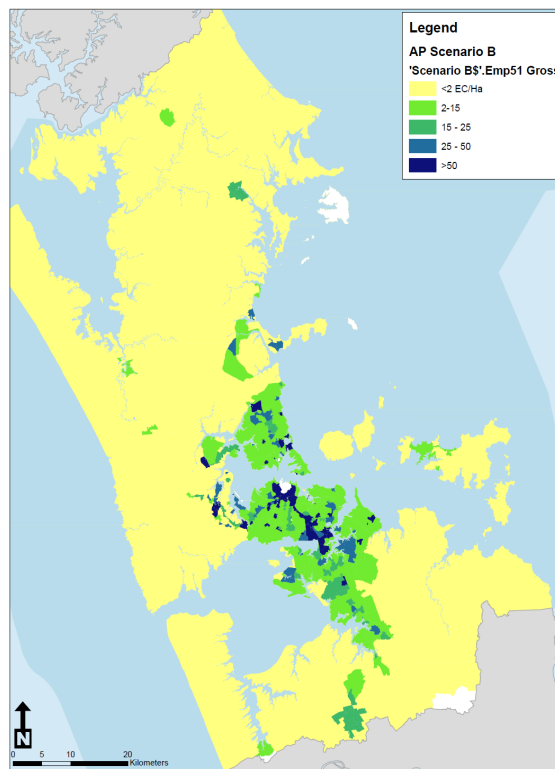


Scenario D - Residential Density
AP Scenarios - Inputs Capacity - Density

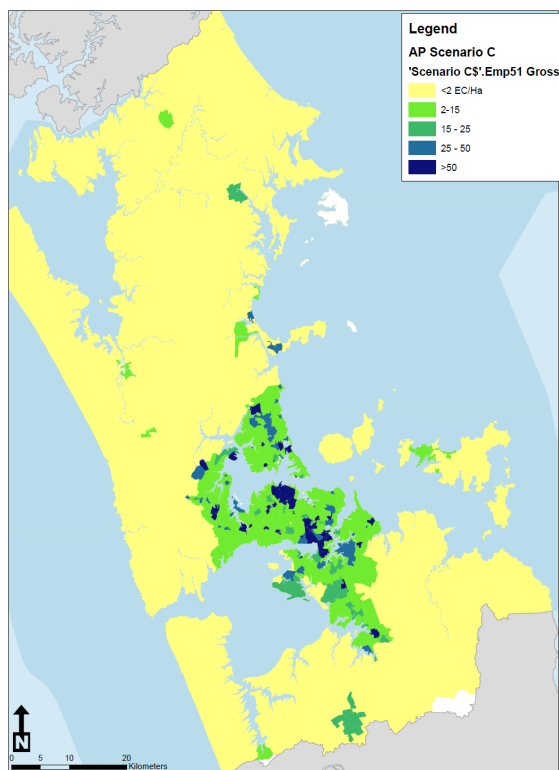
2 Maximum density maps-employment



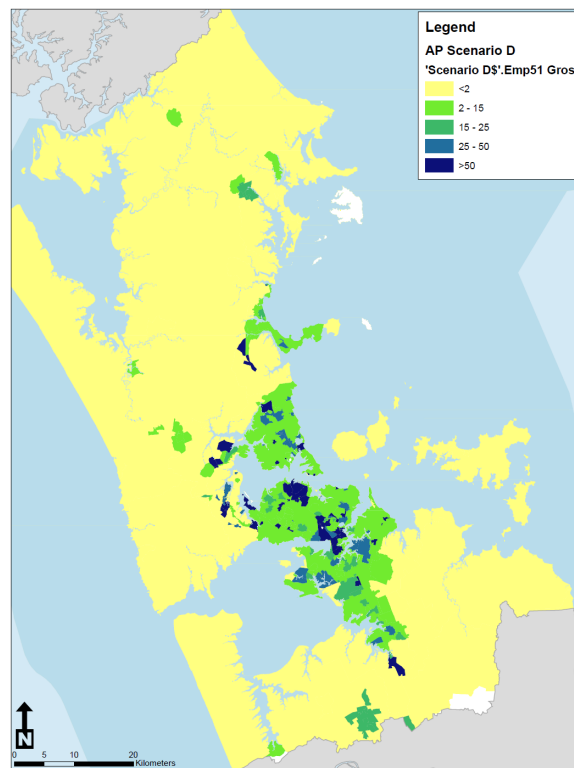
Scenario A - Employment Density
 AP Scenarios - Inputs Capacity - Density



Scenario B - Employment Density
 AP Scenarios - Inputs Capacity - Density



Scenario C - Employment Density
 AP Scenarios - Inputs Capacity - Density



Scenario D - Employment Density
 AP Scenarios - Inputs Capacity - Density

3 Transport approach in each scenario

The following is an outline of the proposed transport policy approach for each Scenario and the main components of the transport programmes for each Scenario.

Scenario A

This scenario is based on the RLTS 2010-2040 (RLTS), which is planned to support the Regional Policy Statement Plan Change 6. It has a fundamental premise of intensive centres which are connected and served by a network of strategic roads, public transport, walking and cycling.

The RLTS provides for improvements across the transport network, with an emphasis on public transport, walking and cycling. It provides a range of policies to support expected growth in a compact urban form, which can be efficiently served by public transport and a network of freight routes, state highways, arterial roads, local roads, walking and cycling routes.

The RLTS recognises that along with the provision of infrastructure, the demand for travel needs to be managed through programmes such as travel planning. However, congestion charging was not included, but the RLTS noted that charging for road use could be considered when realistic, equitable transport options are available.

Main Components

- Integrated transport ticketing and fares by 2012.
- Expanding the rapid transit network (RTN) and quality transit network (QTN) networks by:
 - electrifying the rail network and increasing frequencies by 2015;
 - constructing the city rail link by 2021 and further increasing frequency and capacity;
 - constructing a rail loop to Auckland Airport in the period 2031-2040 with interim public transport and roading improvements;
 - constructing the Avondale-Southdown rail connection in the period 2031-2040;
 - extending the Northern Busway to Albany in the period 2021-2030 and then to Silverdale in the period 2031-2040;
 - developing the Panmure-Botany-Manukau bus connection as a QTN, with upgrading to rapid transit network (RTN) in the period 2021-2030;
 - developing the Henderson-Westgate-Albany bus connection as a QTN.
- Higher frequency of services on the RTN and QTN and improvements to the local connector network (LCN).
- Continuing growth in behaviour change initiatives.
- Expanding the road network by:
 - completing the Western Ring Route by 2015;
 - constructing the Auckland Manukau Eastern Transport Initiative (AMETI) (Panmure elements by 2020, Pakuranga to Botany in the period 2021-2030);
 - improving airport road access in the period 2021-2030.
- Widespread arterial road improvements with a focus on public transport and the regional strategic freight network. Highest priority route improvements include:
 - Albany Highway: Upper Harbour Highway to Wairau Road
 - Wairau Road: Target Road to Tristram Avenue
 - Lincoln Road: Te Pai Place to SH16 Interchange

- Te Atatu Road: Edmonton Road to SH16
- Great North Road: Blockhouse Bay Road to SH16
- Wolverton Street
- Broadway: Khyber Pass Road to Manukau Road
- Khyber Pass Road: Symonds Street to Broadway
- Ellerslie Panmure Highway: Panmure Roundabout to Great South Road
- Great South Road: Church Street to Portage Road
- Pakuranga Road: Panmure Bridge to Ti Rakau Drive
- South Eastern Highway: Waipuna Road to Ti Rakau Drive
- Church Street: Neilson Street to Great South Road
- Neilson Street: SH20 Interchange to Onehunga Mall
- Ti Rakau Drive: Harris Road to Pakuranga Road
- Great South Road: Redoubt Road to Te Irirangi Drive.

A full list of the routes and their functional priorities is contained in Attachment A.

- Walking and cycling infrastructure improvements, including completion of 50 per cent of the regional cycle network by 2016 and 100 per cent by 2026.
- Other important elements include:
 - continued maintenance and renewal of the network
 - safer and more reliable linkages to Northland, Waikato and the Bay of Plenty
 - road safety and rural transport improvements
 - investigation into extending the rail system to the North Shore
 - protection of the route for an additional crossing of the Waitemata Harbour
 - investigation of a potential strategic road connection between East Tamaki and State Highway 20. parking measures in those centres across the region which are planned for growth and good public transport (including setting limits on parking, parking charges, park-and-ride facilities and providing cycle parking in accordance with the Regional Parking Strategy 2009.)

Scenario B

The proposed land use is similar to Plan Change 6 but with a slightly different pattern of intensification. There would be additional growth along coastal areas and ridge lines, on the urban fringes, and in rural settlements.

The broad approach taken in the RLTS would continue to apply with QTN and RTN supporting intensification of centres and along certain corridors. This Scenario supports investment in rail RTN to provide high quality, high capacity services which would reduce the GHG emissions from the transport system. This Scenario also envisages an extended ferry network to support coastal areas where appropriate.

The freight task is similar to Regional Freight Strategy and regional freight routes identified in the RLTS, but with new regional freight routes identified for new expansion areas at the edges of the MUL. For example, Whenuapai Drive will be an important new freight route at NORSGA and connections with and across SH16 and 18.

With higher density, the corridors are better able to support viable QTN or RTN services. Intensification along ridge lines and other corridors needs to ensure liveability. For intensification within 400 metres of a road corridor, pedestrian connectivity to the road corridor is important. For intensification immediately adjacent to a road corridor, the road corridor is designed to ensure

quality of place for those living alongside. The higher density corridors reflect the road space allocation necessary to support this scenario, eg bus lanes, greater walkability in centres, etc.

Public transport services will be extended to new expansion areas at Silverdale, NORSGA, Mill Road area, Papakura (and perhaps a new rail station south of Papakura), and ferries to coastal areas.

Compact urban form is supportive of and offers greater synergies for travel demand management measures as well as walking and cycling infrastructure. This scenario prioritises delivery of components of the cycle network around growth centres and incorporates an expanded TDM programmes and planning (e.g. the regional cycle network and business, education & community travel planning). Investment in transit orientated development (TOD) and walking infrastructure in centres across the region is required to ensure they attract employment.

Main Components

All components identified for Scenario A **plus**:

- Expanding the rapid transit network (RTN) and quality transit network (QTN) networks by:
 - Expanding rail RTN to North Shore (light rail)
 - Extending ferry network to support coastal areas (Waitemata Harbour, North Shore and eastern suburbs)
 - Extending rail services to Drury (2031)
 - Extending cross-town bus services and frequencies on Isthmus (connecting growth centres)
 - Extending busway along SH16 Westgate to Waterview (2031)
 - Extending busway along SH18 Westgate to Constellation (2031)
 - Extending busway Botany to Flat Bush to Manukau (2031)
 - Extending Northern Busway - Onewa to CBD (Dedicated lane both directions on existing bridge) (2026)
- Higher frequency and capacity rail and bus services on the RTN and bus services on the QTN with an extension of services to new expansion areas, and ferries to coastal areas
- Expanding the strategic road network by:
 - Widening SH1 from Manukau to Papakura (2016)
 - Constructing the Puhoi-Warkworth Motorway (2019)
 - New regional freight routes for new expansion areas at the edges of the MUL
 - Upgrading SH16 Kumeu (4lane arterial standard Brigham Ck to Waimakau) (2026)
 - 6 laning SH1 Constellation Rd to Orewa
 - Construction of South West Corridor to East Tamaki (2041)
- Expanded TDM programmes, and planning and investment in transit orientated development (TOD) and walking infrastructure in centres across the region.

Scenario C

With a compact urban form but dispersed growth in centres, along corridors and infill throughout the urban area, this Scenario is a Los Angeles style urban form with strong growth everywhere with limited intensive centres. The transport system needs to provide for a greater distribution of movement of goods and services. With lower density centres, it is less feasible to expand the RTN.

The key challenge will be getting people from home to work because of the dispersed area within a compact urban form. To minimise the need for interchanges, this Scenario requires a public transport system that has a bus focus, rather than light rail on corridors. There is a greater reliance on the bus network, with buses providing higher frequency feeder and cross town services.

Supporting road networks will play a larger role in distributing traffic as arterials become congested. Extensive arterial roading improvements will be required, with some collector roads being converted to to majors, majors to 4 lanes + busways etc and the provision of more through-links. Roads in infill areas will need to be upgraded to provide for higher levels of traffic due to more local employment, residents and truck movements.

The freight task is similar to Regional Freight Strategy and regional freight routes identified in the RLTS. As greater infill in residential areas will require more truck movements in those residential areas to supermarkets, freight routes will need to be provided in those areas. An additional Waitemata Harbour Crossing will be required to enable greater freight distribution in the North.

Penlink will be needed to support development of the Whangaparaoa Peninsula and bus services to/from the north will need to be provided to reflect this new development.

Compact urban form is supportive of and offers greater synergies for travel demand management measures as well as walking and cycling infrastructure. TDM programmes will be expanded for this scenario.

Main Components

All components identified for Scenario A **plus**:

- Expanding the rapid transit network (RTN) and quality transit network (QTN) networks by:
 - Extending Northern Busway - Onewa to CBD (Dedicated lane both directions on existing bridge) (2026)
 - Auckland International Airport (AIA) busway and interchange northern link (Onehunga, Mangere to airport) (2026)
 - AIA busway and interchange eastern link (Puhinui to airport) (2026)
 - Busway along SH20 Onehunga to Waterview tunnel (2026)
 - Extending busway Botany to Flat Bush to Manukau (2031)
 - Extending rail services to Drury (2031)
 - Higher frequency bus services on the RTN and QTN and improvements to the local connector network (LCN) with higher frequency feeder and cross town services.
- Expanding the road network by:
 - Widening SH1 from Manukau to Papakura (2016)

- Constructing the Puhoi-Warkworth Motorway (2019)
 - Constructing an additional Waitemata Harbour Crossing (2026)
 - Constructing South West Corridor to East Tamaki (2041)
 - Extensive upgrading of the arterial roading network and the provision of more through-links
 - Increasing the capacity of the arterial roading network servicing the new urban areas to the north (Silverdale and Okura) and south (Karakā)
 - Upgrading of roads in infill areas to provide for higher levels of traffic due to more local employment, residents and truck movements.
 - Construction of Penlink and expansion of bus services to/from the north
- Expanding the TDM programmes

Scenario D

A less intensive dispersed land use requires a transport system that provides for longer distances for travel to employment and distribution of goods and services. Buses will be important for new expansion areas with an extension of the busway to the north supported by more park and ride facilities serving the new expansion areas.

The ferry network and services will be extended to support coastal areas where appropriate.

The freight task is similar to Regional Freight Strategy with regional freight routes identified in the RLTS, but new regional freight routes for new expansion areas at the edges of the MUL and beyond the MUL. For example, Whenuapai Drive will be an important new freight route at NORSGA and connections with and across SH16 and 18 need to be considered. In relation to the new industrial areas around Drury, the extent to which this freight hub is road based and rail based needs to be considered. There is a strong need for an AWHC because of additional growth in the north.

Development in proposed expansion areas in the south west would require new road connections in those areas and a bridge from Weymouth to Karakā.

There is a stronger case for public transport services to new expansion areas at Silverdale, NORSGA, Mill Road area, Whitford, Papakura (and a new rail station south of Papakura), and ferries to coastal areas.

The Expansive scenario is not as supportive of travel demand management and not so conducive to active travel. There is no need to expand TDM programmes and planning (e.g. the regional cycle network) for this scenario.

Main Components

All components identified for Scenario A **plus**:

- Expanding the rapid transit network (RTN) and quality transit network (QTN) networks by:
 - Extending Northern Busway - Onewa to CBD (Dedicated lane both directions on existing bridge) (2026)
 - Extending busway along SH16 Westgate to Waterview (2031)
 - Extending busway along SH18 Westgate to Constellation (2031)

- Extending busway Botany to Flat Bush to Manukau (2031)
- Expanding the road network by:
 - SH1 widening from Manukau to Papakura (2016)
 - Constructing the Puhoi-Wellsford Motorway (2019)
 - SH1 6 laning Constellation Rd to Orewa (2019)
 - Additional Waitemata Harbour Crossing (2026)
 - Upgrading SH16 Kumeu (4lane arterial standard Brigham Ck to Waimakau) (2026)
 - Construction of South West Corridor to East Tamaki (2041)
 - New road connections to proposed expansion areas in the south west
 - Bridge connection from Weymouth to Karaka
- Reduced TDM programmes

APPENDIX – Regional Arterial Road Improvement Priorities

The table highlights roads (or segments of roads, or corridors) that have multiple deficiencies across more than one function.

Road	General traffic	Passenger transport	Cycling	Freight	Safety	Place function?
Balmoral Road: St Lukes Road to Dominion Road			2		1	
Balmoral Road: Dominion Road to Manukau Road	1		2		2	
Broadway: Khyber Pass Road to Manukau Road	1	2	1		1	✓
Church Street: Neilson Street Great South Road	1	2	2	2		
Customs Street East: Customs Street West to Anzac Avenue	2	1	1		2	✓
Customs Street West: Fanshawe Street to Britomart Place	2	2	1			
Dominion Road: SH20 to Mt Albert Road		1	2		2	
Dominion Road: Mt Albert Road to Balmoral Road		2	2		2	
Dominion Road: Balmoral Road to New North Road	2	2	2		2	✓
Ellerslie-Panmure Highway: Great South Road to Lunn Avenue	1	1	2			
Ellerslie-Panmure Highway: Lunn Avenue to Panmure Roundabout	2	1	2		1	
Gillies Avenue: Khyber Pass Road to Owens Road	2	1				✓

Road	General traffic	Passenger transport	Cycling	Freight	Safety	Place function?
Great North Road: Ash Street to Blockhouse Bay Road		2	1		2	
Great North Road: Blockhouse Bay Road to SH16	1	1	1		1	
Great South Road: Ellerslie-Panmure Highway to Church Street		2	2	2		
Great South Road: Church Street to Portage Road	1	1	2	2	2	
Great South Road: Atkinson Avenue to TLA Boundary (Tamaki River)	2	2	2	2	2	
Karangahape Road: Pitt Street to Great North Road	2	1			2	✓
Khyber Pass Road: Symonds Street to Broadway	2	1	1		2	✓
Kohimarama Road: Kepa Road to St Heliers Bay Road	2	1				
Lagoon Drive: Panmure Roundabout to TLA Boundary (Tamaki River)	2	1				
Lower Albert Street/Albert Street: Quay Street to Wellesley Street	2	1			2	✓
Maioro Street: New Windsor Road to Sh20 Interchange	1	1				
Manukau Road: Greenlane to Mt Albert Road	2	1	1			
Manukau Road: Broadway to Greenlane	2	2	1		2	✓
Mayoral Drive: Wellesley Street to Cook Street		1	2			

Road	General traffic	Passenger transport	Cycling	Freight	Safety	Place function?
Mount Albert Road: Dominion Road to Pah Road	2		1			
Mount Smart Road: Royal Oak Roundabout to Mays Road	2		1			
Mt Wellington Highway: Ellerslie-Panmure Highway to Waipuna Road	2	2		2		✓
Mt Wellington Highway: Waipuna Road to SH1 Interchange	2	2		2	2	
Neilson Street: SH20 Interchange Onehunga Mall	2	1		1		✓
Pah Road: Mt Albert Road to SH20 Interchange	2	1	2			
Princes Street: Atkinson Avenue to SH1 Interchange			1		2	
South Eastern Highway: Carbine Road to Waipuna Road	1			1		
St Johns Road: Kohimarama Road to College Road		2	1			
St Johns Road: College Road to Greenlane	2	1	2			
Tiverton Road/New Windsor Road: Wolverton Road to Maioro Street	1	1				
Wolverton Street: TLA boundary to Blockhouse Bay Road	1	1			2	
Karaka Road (SH22): SH1 to Glenbrook	2				1	
Cavendish Drive: SH1 Interchange to SH20 Interchange		2	1			✓

Road	General traffic	Passenger transport	Cycling	Freight	Safety	Place function?
East Tamaki Drive: Preston Road to SH1		2	1	2	2	✓
East Tamaki Drive: SH1 to Great South Road		2	1		2	
Great South Road: TLA boundary to Shirley Road			1	2	1	
Great South Road: Shirley Road to Tui Road		2	1			✓
Great South Road: Tui Road to Te Irirangi Drive		2	1			
Great South Road: Te Irirangi Drive to Redoubt Road	2	2	1	2	2	
Great South Road: Browns Road to Alfriston Road	2	2	2			
Massey Road: TLA boundary to SH20 Interchange	2	2			2	
Pakuranga Drive: TLA boundary to Ti Rakau Drive	1	2	2		2	
Pakuranga Drive: Ti Rakau Drive to Glenmore Road	2	2	2		2	✓
Pakuranga Drive: Glenmore Road to Fortunes Road		2	2		2	
Pakuranga Drive: Fortunes Road to Bucklands Beach Road		2	2		2	✓
South Eastern Highway/Pakuranga Motorway: Waipuna Road to Ti Rakau Drive	1			1	2	

Road	General traffic	Passenger transport	Cycling	Freight	Safety	Place function?
Springs Road/East Tamaki Road: Smales Road to Preston Road	2				1	
Ti Rakau Drive: Pakuranga Road to Pakuranga Motorway	1	1	2	1		✓
Ti Rakau Drive: Pakuranga Motorway to Gossamer Drive	2	1	2	2		
Ti Rakau Drive: Gossamer Drive to Harris Road	1	1	2	2		
SH17: Oteha Valley Road to SH1 Greville Interchange	2	1	1			✓
Albany Highway: Oteha Valley Road to Upper Harbour Highway	1	1				
Albany Highway: Upper Harbour Highway to Glenfield Road	1	1		2		
Albany Highway: Oteha Valley Road to Upper Harbour Highway	1	1				
Anzac Street: Fred Thomas Drive to Auburn Street	2	1	1		2	
East Coast Road: Constellation Drive to Forrest Hill Road	1		1		2	
Glenfield Road: Bentley Avenue to Downing Street		1	1			✓
Lake Road: Esmonde Road to Calliope Road	1	2			2	✓
Oteha Valley Road: SH1 to North Cross Intersection	2	1				
Tristram Avenue: Forrest Hill to Wairau Road	2	2		2	2	

Road	General traffic	Passenger transport	Cycling	Freight	Safety	Place function?
Wairau Road: Target Road to Tristram Avenue	1	2		2	2	
Wairau Road: Forest Hill Road to Northcote Road	1			2	2	✓
SH1 Hibiscus Coast Highway: SH1 Silverdale to Whangaparaoa	1	2	1			✓
Whangaparaoa Road Red Beach Road to Vipond Road	2		1			
Great North Road: Te Atatu Road to Clark Street		2	2		1	✓
Lincoln Road: Te Pai Place to SH16	1	2	2	1	1	
Rata Street: Great North Road to Ash Street		2	1			
Te Atatu Road: Edmonton Road to SH16	1		2	2	2	

4 Detailed list of transport projects

Year	Lead Agency	Total Cost	Source	Activity Type	Area	Project	A	B	C	D
2006						2006 ART3 validated network				
2011	NZTA-HNO		Completed	New Infra SH	north	Alpurt B2 extension	1	1	1	1
2011	NZTA-HNO		Completed	New Infra SH	central	CMJ2 (2006 changes)	1	1	1	1
2011	NZTA-HNO		Completed	New Infra SH	west	SH18 Greenhithe section	1	1	1	1
2011	NZTA-HNO		Completed	New Infra SH	north	SH1/Esmonde I/C	1	1	1	1
2011	NZTA-HNO		Completed	New Infra SH	east	SH1/East Tamaki I/C	1	1	1	1
2011	NZTA-HNO		Completed	New Infra SH	south	SH1 Papakura IC improvements	1	1	1	1
2011	NZTA-HNO		Completed	New Infra SH	central	SH20 Mt Roskil section	1	1	1	1
2011	NZTA-HNO		Completed	New Infra SH	south	SH20 Manukau Harbour crossing	1	1	1	1
2011	NZTA-HNO		Completed	New Infra SH	north	SH1 Onewa I/C upgrade	1	1	1	1
2011	NZTA-HNO		Completed	New Infra SH	south	SH20 Manukau section	1	1	1	1
2011	NZTA-HNO	\$9	RLTP/LTP Online	New Infra SH	west	SH18 Hobsonville section (Deviation)	1	1	1	1
2011	NZTA-HNO		Completed	New Infra SH	north	Northern Busway Stage 1 Constellation to Esmonde	1	1	1	1
2011	AT		Completed	PT Infra	central	CTC bus lanes	1	1	1	1
2011	NZTA-HNO		Completed	New Infra SH	north	SH1 widening Northcote to Sunnynook Rd 4L,3L(NB)	1	1	1	1
2011	KIWIRAIL/AT		Completed	Rail line	central	Onehunga Rail Branch line	1	1	1	1
2011	AT		-	PT Serv	all	2006 PT services used as a base for the region with exceptions as below. - North Shore services were those from the 2016 PTNP rather than the 2006 services - QTN services to/from AIA brought forwards to 2011 (QS780, QS777, QC50, QS760, QS750, QS730)	1	1	1	1
2011	AT	\$0	Completed in 2011	PT Infra - rail	central	Parnell Rail Station, Panmure moved, Tamaki deleted	1	1	1	1
2011	KIWIRAIL/AT	\$52	Under construction-ATP	Rail line	south	Manukau Rail Spur	1	1	1	1
2011	AT			PT Serv - rail	west	Western rail line increased to 10 minute frequencies	1	1	1	1
2011	NZTA-HNO	\$3	Under construction - NLTP09/LTPOnline	New Infra SH	west	SH16 Brigham Creek Extension	1	1	1	1
2011	NZTA-HNO	\$39	Under construction - NLTP09/LTPOnline	New Infra SH	central	SH1 Newmarket Viaduct & Newmarket Viaduct to Greenlane Aux	1	1	1	1
2011	AT	\$26	Unit Rate 13km*\$2m/km	New Infra SH - pt	west	Bus lanes along SH18 Westgate to Albany	1	1	1	1

Year	Lead Agency	Total Cost	Source	Activity Type	Area	Project	A	B	C	D
2011	KIWIRAIL/AT	\$0	Under construction - Interchange facility (ARTA and MCC) only - RLTP09	PT Infra - rail	south	Manukau Rail Spur - Station & interchange facility	1	1	1	1
2015	KIWIRAIL/AT	\$500	Under construction	PT Infra - rail	all	Electrification of rail network	1	1	1	1
2016	AT	\$10	ARTA (Nik Voster 16.7.09)	PT Infra - rail	all	Rail station renewals (Required to service 10 minute frequencies)	1	1	1	1
2016	AT	\$29	RLTP	PT Infra - rail	all	Rail Station upgrades (Non-DART)	1	1	2	3
2016	NZTA-HNO	\$608	NLTP'09 Construction phase (\$548.6m) not in NLTP	New Infra SH	west	Western Ring Route - SH16 widening St Lukes to Te Atatu 8L	1	1	1	1
2016	NZTA-HNO	\$18	NLTP09	New Infra SH	west	SH16 Te Atatu junction Improvements and widening to Lincoln Rd	1	1	1	1
2016	NZTA-HNO	\$55	HNO – LTP Online	New Infra SH	west	SH16 Lincoln Rd interchange upgrade	1	1	1	1
2016	NZTA-HNO	\$126	NLTP09	New Infra SH	central	SH1 Victoria Park Tunnel	1	1	1	1
2016	NZTA-HNO	\$59	HNO – LTP Online + Proman	New Infra SH	south	SH20 A Kirkbride IC and George Bolt Memorial Drive M'way upgrade	1	1	1	1
2016	AT	\$835	AMETI Investigation - Sheila Smart (AT) - 28/12/10	New Infra Local Rds	east	AMETI Package1-4 (Merton Rd to Mt Wellington Hwy link/Lagoon dr busway/RTN to Te Rakau Dr/Gosemer Dr Flyover)	1	1	1	1
2016	NZTA-HNO	\$0	100% developer funded	New Infra SH	south	SH1 Wainui IC	1	1	1	1
2016	AT	\$11	LTP online 09	New Infra Local Rds	central	Tiverton Wolverton St Upgrade (widening)	1	1	1	1
2016	NZTA-HNO	\$1,001	NLTP'09	New Infra SH	central	SH20 Waterview section - Surface & Driven Tunnel	1	1	1	1
2016	AT	\$70	Not in RTP but has been included in ATP expenditure estimate	PT Infra	all	Integrated Ticketing and Fares	1	1	1	1
2016	AT	\$100	MCC 2009	New Infra Local Rds	south	Mill Rd Corridor1 (Manukau to Papakura)	1	1	3	1
2016	AT	\$0	Paid for by developer	New Infra Local Rds	west	Westgate/Massey North including link to trig Rd	1	1	1	1

Year	Lead Agency	Total Cost	Source	Activity Type	Area	Project	A	B	C	D
2016	NZTA-HNO	\$340	Campaign for Better Transport costing (Option 2) - 20% of NZTA offline solution	New Infra SH	north	SH1 Puhoi-Wellsford safety improvements	1	-	-	-
2016	NZTA-HNO	\$30	NZTA 2011 <\$50m	New Infra SH	central	SH20 Queenstown Road Interchange	-	-	1	2
2016	NZTA-HNO	\$30	NZTA 2011 <\$50m	New Infra SH	central	SH20 Neilson Street Interchange	-	1	1	2
2016	NZTA-HNO	\$16	Unit rate 8km*\$2m/km	New Infra SH - pt	central	AIA bus lanes and bus services along SH20 (Onehunga, Mangere to airport)	1	1	1	1
2016	AT			PT Serv - rail	west	Rail service extension to Kumeu & Waimauku	1	1	2	-
2016	AT			PT Serv	all	PTNP services used across the region.	1	1	1	1
2016	NZTA-HNO	\$450	unit rate 10km*\$100m/km	New Infra SH	south	SH1 widening from Manukau to Papakura	-	2	3	1
2016		\$20	Unit rate 2 terminals @ \$10m/terminal	PT Infra	all	PTNP ferry services (Beach Haven & Hobsonville)	1	1	1	1
2016	NZTA-HNO	60	NZTA	New Infra SH	south	Kirkbride Road Interchange	1	2	1	-
2019	NZTA-HNO	\$680	NZTA 2009. Total outrun cost for Puhoi-Wellsford estimated \$1.7b (2009). Assumed 40% of cost for Puhoi-Warkworth section.	New Infra SH	north	SH 1 Puhoi-Warkworth motorway extension	-	1	1	1
2019	NZTA-HNO	\$900	Unit Rate 20km*\$45m/km	New Infra SH	north	SH1 6 laning Constellation Rd to Orewa	-	-	-	1

Year	Lead Agency	Total Cost	Source	Activity Type	Area	Project	A	B	C	D
2021	NZTA-HNO	\$198	NZTA 2009 NZTA Phasing: Stage 2 - Albany to Redvale, 2030, Stage 3 - Redvale to Silverdale 2030+. Have assumed that designation cost includes property purchase costs of \$52m. Assumed equal costs of stage 2 & 3	New Infra SH - pt	north	Northern Busway Stage 2 Constellation to Albany	1	1	1	1
2021	NZTA-HNO	112.5	Unit Rate 2.5km*\$45m/km	New Infra SH	west	SH16 widening Lincoln to Royal Road 6L	1	1	1	1
2021	AT	\$50	Unit rate 4km*\$13m/km	New Infra Local Rds	south	Redoubt Rd 4-laning SH1-Mill Rd	1	1	1	1
2021	NZTA-HNO	\$203	NLTP'09	New Infra Local Rds	north	Penlink to SH1	1	1	1	3
2021	AT			PT Serv	north	Bus service from Whangaparoa via Penlink to Albany added. 4 services per hour both directions	1	1	1	1
2021	AT			PT Serv	couth	Bus service from Papakura to East Tamaki added via Mill road. 2 services per hour both directions	1	1	1	1
2021	AT	\$20	unit rate 2km*\$10m/km	New Infra Local Rds	north	Glenfield Road Corridor (One lane widening from Bently Avenue to Albany Highway)	1	2	1	1
2021	NZTA-HNO	\$315	Unit rate 7km*\$45m/km	New Infra SH	south	SH1 widening Hill Rd to Hingaia Rd 3L	1	-	-	-
2021	AT	\$582	AMETI Investigation - AT (Sheila Smart) - 28/12/10	New Infra Local Rds	east	AMETI Packages 5&6 (Pakaranga Bridge duplication/Reeves Rd Flyover/SEART upgrade)	1	2	1	1
2021	AT	\$50	Unit rate 4km*\$13m/km	New Infra Local Rds	south	Pukekohe Eastern Corridor by-pass	1	2	-	1
2021	AT			PT Serv	all	Bus service frequencies are all increased proportional to population growth across the region	1	1	1	1
2021	AT			PT Serv	north	Services between Albany and Silverdale shifted to extended Northern Busway	1	1	1	1

Year	Lead Agency	Total Cost	Source	Activity Type	Area	Project	A	B	C	D
2021	AT			PT Serv	west	Bus service from Westgate to Henderson to Rosebank road (via Whau crossing) to Avondale station added. 4 services per hour both directions.	1	1	1	1
2021	AT			PT Serv	south	Bus service from Waiuku to Pukekohe added. 2 services per hour both directions.	-	-	-	-
2021	NZTA-HNO	\$150	Unit rate 1*\$100m	New Infra Local Rds	south	Karaka-Weymouth Link (Bridge)	-	-	-	2
2021	AT	\$60	Unit rate 6km* \$10m/km	New Infra Local Rds	south	Roscommon Road widening	-	-	-	2
2021	KIWIRAIL/AT	\$2,200	AT Business case 2010	Rail line	central	City Centre Rail Link	1	1	2	-
2021	KIWIRAIL/AT	\$140	ARTA unit cost of \$20m/km for 7km	Rail line	central	Onehunga rail duplication & 6 trains per hour.	1	1	2	-
2021	AT			PT Serv - rail	all	Rail changed to 10 minute frequencies (following CBD Loop).	1	1	2	3
2021	AT	\$10	ART model - Unit rate \$5m/rail station	PT Infra - rail	all	New Rail Stations (2020-29)	1	1	2	3
2021	AT	\$10	ART model - Unit rate \$5m/rail station	PT Infra - rail	all	New Rail Stations (2030-39)	1	1	2	3
2021	AT			PT Serv	central	Extension of cross-town bus services and frequencies on Isthmus (connecting growth centres)	-	1	1	-
2021	KIWIRAIL/AT	\$400	ARTA unit cost of \$20m/km for 20km	Rail line	central	Third Rail Line Westfield to Papakura	-	1	2	3
2021	AT	\$1,818	ARTA - RARP'09	New Infra Local Rds	all	RARP Priority 1 (Excluding major regional arterial projects eg AMETI)	1	1	1	1
2021	NZTA-HNO	\$1,020	NZTA 2009. Total outrun cost for Puhoi-Wellsford estimated \$1.7b (2009). Assumed 60% of cost for Warkworth - Wellsford section.	New Infra SH	north	SH1 Warkworth-Wellsford motorway	-	-	3	-

Year	Lead Agency	Total Cost	Source	Activity Type	Area	Project	A	B	C	D
2021	NZTA-HNO	\$1,070	NZTA 2009. Total outrun cost for Puhoi-Wellsford estimated \$1.7b (2009). Assumed 60% of cost for Warkworth - Wellsford section plus \$50m for interchange at Puhoi	New Infra SH	north	SH1 Warkworth-Wellsford motorway	-	2	-	1
2,021	NZTA-HNO	50	NZTA 2011 <\$50m	New Infra SH	central	SH1 SEART/Mt Wellington Southbound Interchange Year 2021	-	-	3	2
2021	NZTA-HNO	\$198	NZTA 2009 NZTA Phasing: Stage 2 - Albany to Redvale, 2030, Stage 3 - Redvale to Silverdale 2030+. Have assumed that designation cost includes property purchase costs of \$52m. Assumed equal costs of stage 2 & 3	New Infra SH - pt	north	Northern Busway Stage 3 Albany to Silverdale (RTN)	1	1	2	1
2021	AT	\$125	Option 4 Opus Report (March 2009)	New Infra Local Rds	west	Whau River crossing	-	-	-	2
2021	NZTA-HNO	\$360	Based on 4km @ \$45m/lane km for additional 2 lanes	New Infra SH	south	SH20 B widening	-	-	-	2
2021	KIWIRAIL/AT	\$560	ARTA (CH)	PT Serv - rail	all	Additional rolling stock(to cater for increased service frequencies down to 5 minutes on main lines and additional services for CBD loop and Airport link north, 2020-2029	1	1	2	-
2026	AT	\$100	One Plan Inventory Database	New Infra Local Rds	south	Mill Rd Corridor2 (Papakura to Drury SH1)	-	-	-	1

Year	Lead Agency	Total Cost	Source	Activity Type	Area	Project	A	B	C	D
2026	AT			PT Serv - rail	all	Rail changed to 7.5 minute frequencies rather than 10.	1	1	2	-
2026	NZTA-HNO	\$10	Unit rate 5km*\$2m/km	New Infra SH - pt	north	Northern Busway Stage 4 - Onewa to CBD (Dedicated lane both directions on existing bridge)	-	1	1	1
2026	AT	\$125		New Infra Local Rds	west	Whau River crossing	1	-	2	-
2026	NZTA-HNO	\$100	Unit rate 1km*\$100m/km	New Infra SH	central	SH16 Port Link	1	1	1	1
2026	NZTA-HNO	\$500m	Preliminary NZTA estimate \$400-600m (2010)	New Infra SH	north	SH1-SH18 Motorway to Motorway ramps	1	1	1	1
2026	NZTA-HNO	\$4,650	NZTA, Alternative Harbour Crossing Study, 2010. Average of road tunnel estimate of \$4.0-5.3B. (Road bridge is \$3.0-3.9B.)	New Infra SH	north	Additional WHX (Road tunnel)	-	-	1	1
2026	AT	\$80	Unit rate 8km*\$10m/km	New Infra Local Rds	south	Brookby Road upgrade	-	-	-	1
2026	NZTA-HNO	\$110	Unit rate 11km*\$10M/km	New Infra SH	west	SH16 Kumeu upgrade (4lane arterial standard Brigham Ck to Waimakau)	-	2	-	1
2026	AT	\$240	Unit rate 24km*\$10m/km	New Infra Local Rds	south	Clevedon Road upgrade	-	-	-	2
2026	AT	\$60	Unit rate 6 terminals @ \$10m/terminal	PT Infra	all	Extension of ferry facilities and services linking CBD and coastal centres (Takapuna, Browns Bay, Te Atatu, St Heliers, ...)	-	1	1	-
2026	NZTA-HNO	\$30	NZTA 2011 <\$50m	New Infra SH	central	SH16 St Lukes Interchange (With St Lukes Rd)	-	-	1	1
2026	NZTA-HNO	\$75	NZTA 2011 \$50-100m	New Infra SH	central	SH20 Maioro Street to Hillsborough Road (Additional eastbound lane)	-	-	1	1
2026	NZTA-HNO	\$30	NZTA 2011 <\$50m	New Infra SH	central	SH1 SEART to Ellerslie/Panmure	-	-	1	1
2026	NZTA-HNO	\$30	NZTA 2011 <\$50m	New Infra SH	south	SH1 East Tamaki Interchange	-	-	1	1
2026	NZTA-HNO	\$30	NZTA 2011 <\$50m	New Infra SH	central	SH1 Khyber Pass to Gilles mainline improvements	-	-	1	1
2026	NZTA-HNO	\$75	NZTA 2011 \$50-100m	New Infra SH	south	SH1 Takanini Interchange	-	2	2	1
2026	KIWIRAIL/AT	\$707	Becca - RTC in SW Region Study 2008	Rail line	south	AIA rail link (Stage 1) Northern link (Onehunga, Mangere to airport)	-	1	-	-

Year	Lead Agency	Total Cost	Source	Activity Type	Area	Project	A	B	C	D
2026	NZTA-HNO	\$360	Unit rate 8km*\$45m/km	New Infra SH - pt	south	AIA busway and interchange (Stage 1) Northern link (Onehunga, Mangere to airport)	-	-	1	-
2026	NZTA-HNO	\$270	Unit rate 6km*\$45m/km	New Infra SH - pt	south	AIA busway and interchange (Stage 2) Eastern link (Puhinui to airport)	-	-	1	-
2026	NZTA-HNO	\$360	Unit rate 8km*\$45m/km	New Infra SH - pt	central	Busway along SH20 Onehunga to Waterview tunnel	-	-	1	-
2026	NZTA-HNO	\$16	Unit rate 8km*\$2m/km	New Infra SH - pt	south	AIA bus lane and interchange (Stage 1) Northern link (Onehunga, Mangere to airport)	-	-	-	1
2026	NZTA-HNO	\$12	Unit rate 6km*\$2m/km	New Infra SH - pt	south	AIA buslane and interchange (Stage 2) Eastern link (Puhinui to airport)	-	-	-	1
2026	NZTA-HNO	\$16	Unit rate 8km*\$2m/km	New Infra SH - pt	central	Buslane along SH20 Onehunga to Waterview tunnel (New North rd)	-	-	-	1
2026	AT	\$100	unit rate 10km*\$10m/km	New Infra Local Rds	south	Whitford Rd upgrade	-	-	-	1
2026	AT			PT Serv	west	Henderson-Westgate-Albany bus (QTN)	1	1	1	1
2026	AT			PT Serv - rail	west	Rail service extension to Helensville	1	-	-	-
2026	AT	\$50	Darren's best guess. Based on need for tunnelling under Hobson & Nelson St to accommodate bus movements (NZTA AWHC, 2010)	PT Infra	central	Bus tunnels/dedicated capacity (for NS buses)	-	1	-	-
2026	AT	\$250		PT Infra	central	Bus tunnels (dedicated bus capacity) and Midtown bus terminal /interchange station			1	1
2026	AT	\$150	Unit rate 15km*\$10m/km	New Infra Local Rds	north	Additional peripheral roading for new urban area - Add 1- lanes each way on East Coast Road between Silverdale and Albany				1
2026	AT	\$170	Unit rate 17km*\$10m/km	New Infra Local Rds	south	Additional peripheral roading for new urban area - 2. Add 1-lane each way along Linwood Road from Karaka – SH1 motorway				1
2026	AT	\$280	Unit rate 28km*\$10m/km	New Infra Local Rds	south	Additional peripheral roading for new urban area - 3. Add 1-lane each way along SH22 from Pukekohe- Sh1 motorway				1

Year	Lead Agency	Total Cost	Source	Activity Type	Area	Project	A	B	C	D
2026				PT Serv	south	Additional bus services between Waiuku and Papakura, Hunua and Papakura				1
2026	AT	\$5	Unit rate \$5m	PT Infra - rail	south	New rail station at Drury	-	1	-	1
2026	AT			PT Serv - rail	south	Extension of RTN rail services to Pukekohoe Drury	-	1	-	1
2026	AT	\$141	Unit rate \$7m/km* 18km + \$ 3m/3car EMU's *5	PT Infra - rail	south	Extension of RTN network (electrification) to Pukekohoe and additional rolling stock		1		1
2031	AT			PT Serv - rail	all	Rail changed to 5 minute frequencies rather than 7.5.	1	1	2	-
2031	NZTA-HNO	\$470	unit rate 10km*\$45m/lane km + \$20 for Pukeke Bridge	New Infra SH	south	SH20 A & B widening	1	2	1	-
2031	NZTA-HNO	\$180	unit rate 4km*\$45m/lane km	New Infra SH	south	SH20 Mangere to Puhinui 6 laning	1	2	1	1
2031	KIWIRAIL/AT	\$707	Becca - RTC in SW Region Study 2008	Rail line	south	AIA rail link (Stage 1) Northern link (Onehunga, Mangere to airport)	1	-	-	-
2031	AT			PT Serv	west	Bus service frequency from Kumeu improved. QW1 change to 4 services per hour.	1	1	1	1
2031	AT			PT Serv	west	Bus service frequency on SH18 increased – QW120 and QW130 both changed to 4 services per hour both directions.	1	1	1	1
2031	AT			PT Serv	south	Bus service added from Pukekohe to Manukau CBD via Weymouth. 4 services per hour both directions.	1	1	1	1
2031	AT	\$1,000	ARTA - RARP'09	New Infra Local Rds	all	RARP Priority 2	1	1	1	2
2031	NZTA-HNO	\$65	NZTA 2011 50-80m	New Infra SH	north	SH1 Constellation to Greville Rd 3 lanning northbound	-	1	1	1
2031	NZTA-HNO	\$110	NZTA 2011 75- 150m	New Infra SH	north	SH1 Greville Road Interchange	-	1	1	1
2031	NZTA-HNO	\$30	NZTA 2011 <\$50m	New Infra SH	north	SH18 Greenhithe Road to Albany (Additional 3rd lane eastbound)	-	1	1	1
2031	NZTA-HNO	\$30	NZTA 2011 <\$50m	New Infra SH	west	SH18 Buckley Avneu to Tauhinu Drive (Additional 3rd lane eastbound excluding the bridge)	-	-	1	-
2031	NZTA-HNO	\$75	NZTA 2011 \$50- 100m	New Infra SH	south	SH20 Lambie Drive to Puhinui Road	-	-	1	1
2031	KIWIRAIL/AT	\$471	Beca - RTC in SW Region Study 2008	Rail line	south	Rail: AIA to Manukau (Stage 2) Eastern Link (Puhunui to Airport)	-	1	-	-

Year	Lead Agency	Total Cost	Source	Activity Type	Area	Project	A	B	C	D
2031	NZTA-HNO	\$194	unit rate 4km*\$45m/lane km +7km*\$2m/lane km	New Infra SH - pt	west	Buslane along SH16 Westgate to Waterview and busway Henderson to Westgate	-	2	-	2
2031	NZTA-HNO	\$360	unit rate 10km*\$45m/lane km	New Infra SH - pt	west	Busway along SH18 Westgate to Constellation	-	2	-	2
2031	NZTA-HNO	\$22	unit rate 11km*\$2m/lane km	New Infra SH - pt	west	Buslanes & interchange stations along SH16 Westgate to Waterview	-	-	2	-
2031	AT			New Infra Local Rds	all	Additional arterial roads (upgrade of collector roads) to service new urban areas	-	-	1	1
2031	AT			New Infra Local Rds	all	Grade separations at key intersections with rail network	-	1	1	1
2031	AT			New Infra Local Rds	all	Upgrade of arterial roads for bus lanes (Beyond RARP provision)	-	-	1	-
2031	AT	\$405	unit rate 9km*\$10m/km	PT Infra	south	Botany to Flat Bush to Manukau busway extension (RTN)	-	-	1	-
2031	AT	\$124	unit rate 825km*\$150k/km (cf RLTS estimate)	W&C Infra	all	Completion of Regional Cycle Network	1	1	1	1
2032	AT			New Infra Local Rds	central	City centre transport improvements (As defined by City Centre Masterplan)	1	1	1	1
2036	AT			New Infra Local Rds	west	Extension of local roading network (Westgate)	-	1	1	1
2036	AT			PT Serv	west	Extension of local bus services (Westgate)	-	1	1	1
2036	KIWIRAIL/AT	\$602	Becca - RTC in SW Region Study 2008	Rail line	south	Rail: AIA to Manukau (Stage 2) Eastern Link (Puhunui to Airport)	1		-	-
2036	KIWIRAIL/AT	\$1,000	Becca - RTC in SW Region Study 2008	Rail line	central	Avondale to Onehunga/Southdown Rail Line Extension	1	3	-	-
2036	KIWIRAIL/AT	\$210	ARTA (CH)	PT Infra - rail	all	Additional rolling stock(to cater for additional services for Avondale-Southdown link and Airport East Link, 2030- 2039)	1	1	-	-

Year	Lead Agency	Total Cost	Source	Activity Type	Area	Project	A	B	C	D
2036	KIWIRAIL/AT	\$2,650	Rail tunnel across harbour - NZTA AWHC Study 2010 0 - \$1.45B. Light rail on North Shore - unit cost \$80m/km for 15km	Rail line	central	Northshore Rail (East coast alignment, including harbour crossing and link in City Centre)	-	3	-	-
2041	NZTA-HNO	\$500	unit rate 5km*\$100m/km	New Infra SH	central	Sth Western to East Tamaki Corridor Stage4	-	2	1	2
2041	AT	\$90	unit rate 9km*\$10m/km	PT Infra	south	Botany to Flat Bush to Manukau busway extension (RTN)	-	1	-	2
2041	NZTA-HNO	\$180	NZTA 2011 \$100m+	New Infra SH	west	SH16/SH18 Motorway-to-motorway Connections (Westgate/Massey North)	-	-	-	1
2041	KIWIRAIL/AT	\$320	ARTA unit cost of \$20m/km for 16km	Rail line	central	Third rail line on eastern line		1	2	-
2041	NZTA-HNO	\$20	unit rate 2km*\$10m/km	New Infra SH	north	Widening of Albany Highway from Unsworth - Bush roads				1

5 ASP Input Model Assumptions

Count (dwellings and employees) conversion to floor space (m²)

1. Commercial (conversion from employee count)

OFFICE	RETAIL	WAREHOUSE	INDUSTRIAL
15.6	27	68	29.5

2. Residential (conversion from dwelling count)

Attached	Detached
132	132

Employment splits for land use area types

CATEGORY	OFFICE	RETAIL	WAREHOUSE	INDUSTRIAL
CBD	0.626538	0.318116	0.027673	0.027673
Business Area	0.015864	0.015864	0.484136	0.484136
Centre	0.433333	0.433333	0.066667	0.066667
City Fringe	0.556499	0.341843	0.050829	0.050829
Corridor	0.457477	0.340588	0.100967	0.100967
Local Centre	0.146958	0.453042	0.2	0.2
Suburban	0.180649	0.168752	0.3253	0.3253
Rural Town	0.200356	0.501371	0.149106	0.149106
Future Urban Residential	0.45465	0.42035	0.0625	0.0625
Future Urban Business	0.017106	0.017106	0.482894	0.482894
Rural	0.169823	0.103973	0.363102	0.363102

Current available capacity

Released over 29 years from 2007

District Plan Supply

Capacity for Growth 2006 Study numbers used in model include:

1. Residential
 - a. Vacant residential capacity
 - b. Structure plan area capacity
 - c. Business area residential capacity
 - d. Rural residential capacity
2. Employment
 - a. 30% of ([employment potential] minus [employment count])

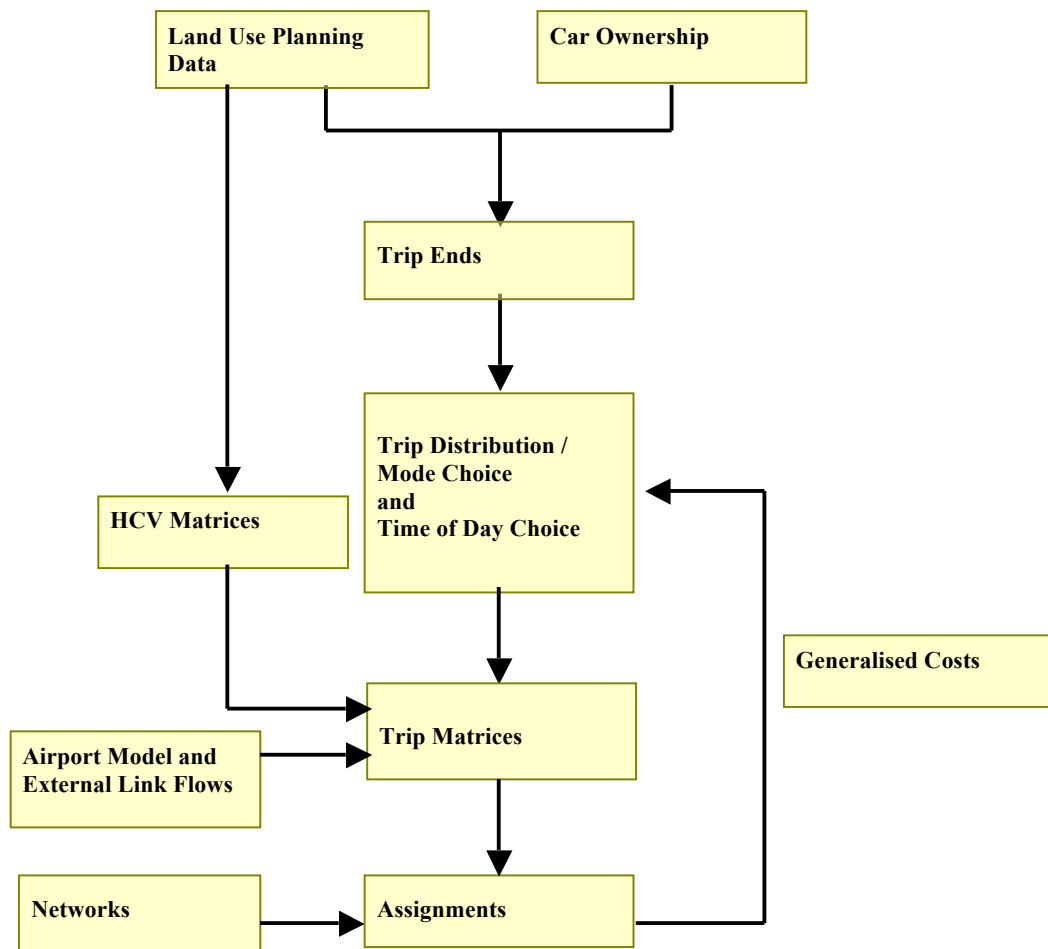
Factoring

If desired maximum developable threshold already exceeds current maximum capacity (capacity being current dwellings or employees PLUS potential), this was 'factored down' or reduced to reflect the lower level

6 ART3 Model Structure and Assumptions

Overall Structure

- ART3 was calibrated using 2006 survey and Census data, and validated using 2006 count and travel time data.
- ART3 Trip Purposes:
 - Home-based work (HBW)
 - Home-based education (HBE)
 - Home-based shopping (HBSH)
 - Home-based other (HBO)
 - Employers business (EB)
 - Non-home-based other (NHBO)
- Modes:
 - Light vehicles (called cars); persons in cars, that is, car driver and car passenger combined, in the demand models, converted into vehicles prior to assignment;
 - Passenger transport; all PT modes combined in the demand models and assignment is used to split PT demands into bus and rail/ferry;
 - Active modes; walk and cycle combined; trip productions only;
 - Medium and heavy vehicles combined (called HCVs);
 - Car and PT modes are referred to as mechanised modes in the demand models.
- Modelled Periods:
 - Trip ends and distribution-mode split are 24-hour models, and
 - 24-hour demands are split into 5 periods by the time-of-day choice model:
 - AM peak: 7 am to 9am
 - Interpeak: 9am to 3pm
 - School peak: 3pm to 4pm
 - PM peak: 4pm to 6pm
 - Offpeak: 6pm to 7am
 - Assignment occurs in three of these periods: AM peak, Interpeak, PM peak.



- An iterative process is carried out with trip matrices used to produce generalised costs which are fed back into the demand models (distribution-mode split and time of day choice) and new trip matrices created. This is repeated until demand-supply convergence is achieved.

Car Ownership Model

- Persons are input into the car ownership model to determine zonal persons by person and household type and car ownership level (0 cars, 1 car, 2 cars, 3+ cars).
- Cross-sectional model to determine zonal allocation:
 - variables: zonal income for each household type
 - no accessibility or density effects
- Temporal model to estimate overall future car ownership levels:
 - variables: GDP/capita (growth at 1.8% p.a.) and saturation level (0.8 cars/person)

Trip End Models

- Employment, households and rolls, and the person data (from car ownership) are used in the trip end models to determine the daily home-based (HB) zonal person trips (excluding HCVs) by purpose.
- Trip rates:

- can vary spatially (rural/urban zones, intensified and mixed-use zones (“RGS” zones))
- are constant over time; ie don’t vary in forecasting
- Trips from home are by mechanised modes (light vehicle, PT) and active modes (walk,cycle); any adjustments due to future changes in proportions working from home associated with TDM non-pricing are made.
- Trips to home are for mechanised modes only.
- Active mode trip rates (and therefore mode shares) can vary spatially (“RGS” zones) and there is a process for estimating increased active mode trips arising from increased car costs (congestion, pricing); additionally they can be increased through the effects of TDM non-pricing measures.
- HBE trip ends are produced for all persons and with persons aged 13-and-under removed and the latter is used further in the model; i.e. HBE persons under 14 years are not included further in the model.
- NHB trip ends are estimated from HB trips ends and are by mode (car, PT).
- Non-home end of HB trips are balanced to match HB ends

Distribution-Mode Split (DMS) and Time of Day (ToD) Choice Models

- The mechanised-mode home-based trip ends and the generalised costs of travel are input into the DMS and ToD choice models.
- DMS-ToD is undertaken separately for each HB purpose resulting in origin-destination (OD) trips by purpose, mode and time of day. Any adjustments due to the effects of future TDM non-pricing are made.
- The NHB Distribution-ToD models are run separately for each purpose (EB and NHBO) and mode (car and PT) to give NHB OD trips by time of day.
- The 2006 observed ToD factors are adjusted in forecasting as the costs of travel in each modelled period change.
- Person trips by car are converted into vehicles using occupancies for each purpose and time of day; these occupancies are fixed and do not change, with changed travel costs for example.

HCVs

- A 24-hour 2006 HCV matrix was developed from counts and survey data
- Count data was used to develop three time period matrices (AM, IP, PM) using global factors; these factors remain constant in forecasting.
- In forecasting, the ratio of future to 2006 synthetic trip ends are applied to the 2006 trip ends, along with a GDP/capita growth of 1.8% p.a. with an elasticity of 0.23.
- HCV trip matrices do vary with the transport network or cost of travel; e.g. road pricing; only the routing of HCVs is affected.

Trip Matrices

- Car and PT matrices for the five periods are calculated, and under-reporting factors for LCVs in EB and cars for other purposes are applied to both persons in cars and cars in all five periods,
- Vehicle trips for the three assigned periods are calculated from: car vehicles, HCVs, vehicle trips external to the region, vehicle trips to/from the airport associated with flights.
- Trips external to the region (i.e. those into the region, out of the region, or through the region):
 - in 2006 were developed from surveys;
 - in forecasting they are factored globally at 3% p.a. in all periods.
- Flight-related vehicle trips to/from the airport:
 - in 2006 were developed from counts of car parks and drop-off/pick-up areas at the domestic and international terminals;
 - the non-airport ends are distributed according to zonal household and employment;
 - in forecasting the 2006 trips are factored by 4.5% p.a. (international) and 3.5% p.a. (domestic) based on AIAL 2006 projections.

Generalised Costs

- Generalised costs are calculated for each mode and period and purpose, which are then input into the DMS-ToD models.
- Each purpose has a different value of time, operating costs, and fares; there are 3 for car (HBW, EB and Other) and 4 for PT (HBW, HBE, EB and Other).
- Vehicle assignments are carried out for the three periods, skimming the costs, etc required.
- PT assignments are carried out for four periods (including OP, in which the IP network is used with headways factored down by 3), and four purposes.
- The vehicle assignments are capacity constrained, in the sense that volume-delay functions are utilised; but the PT assignments are not, i.e. the numbers of passengers on a bus, for example, is not limited in any way. To account for this, it is usual to check for cases where demand exceeds supply and increase frequencies as deemed necessary.
- Car generalised costs include:
 - Time costs,
 - Vehicle operating costs,
 - Parking costs - for HBW (long-term) and Other (short term),
 - Tolls and pricing.
- PT generalised costs include:
 - In-vehicle time,
 - Access and egress time (with a weighting of 2),
 - Waiting time (with a weighting of 2),
 - Fares,

- Transfer penalties (generally 10 minutes, 8 for purpose-built and 5 for high quality stations).

1. Final Assignments

- After demand-supply convergence, final assignments are carried out, prior to which school bus trips are removed from HBE PT trips.

7 ART3 Transport and TDM assumptions

Input	RLTS	Post –RLTS/NZTA/AT	Recommendation for AP
Land Use Inputs (Population ~ 2 million by 2041)			
Zonal land use inputs	Forecasts derived from RGS work but manually adjusted, circa September 2009	Use ASP testrun code 'bh'	As per Scenario
Future 'RGS' zones (where different travel behaviour is expected)	New RGS zones are assumed as used in RLTS, with no new zones in 2016 but 16 new zones in 2026	As use in RLTS	TBA
Policy/Economic Inputs (GDP growth = 1.8% pa)			
Value of Time	No escalation ie 2006 values	Escalated wrt GDP/Capita growth (1.8% pa), with elasticity of 1 on work travel and 0.8 for non-work travel	Escalated wrt GDP/Capita growth (1.8% pa), with elasticity of 1 on work travel and 0.8 for non-work travel (UK DfT - TAG)
Private vehicle operating costs	Significant increases based on predicted fuel price	Lower growth based on forecast fuel price and estimate of improved fuel efficiency	Lower growth based on forecast fuel price and estimate of improved fuel efficiency
Public Transport Fares	No increase over 2006 base model	Increased wrt to GDP/Capita with elasticity of 0.5 (AT=0.5 %pa)	Increased by 0.5% pa as per AT
Integrated ticketing	Assumed faster bus boarding	No change from 2006 bus boarding times on the basis of	Assumed faster bus boarding times than 2006 base – as per

Input	RLTS	Post –RLTS/NZTA/AT	Recommendation for AP
	times than 2006 base	integrated ticketing off-setting the effect of increased number of boarders	RLTS
Integrated fares	Assumed removal of second boarding fare for transferring passengers	Assumed removal of second boarding fare for transferring passengers but with 2c/km increase in all fares to retain same overall revenue and average fare	Assumed removal of second boarding fare for transferring passengers – as per RLTS
CBD Parking Costs	Assumed escalation with implied elasticity to GDP/Capita of 1.67	Escalation wrt GDP/Capita with elasticity of 1.2 for commuter travel and 1.0 for non-commuter travel	Escalation wrt GDP/Capita with elasticity of 1.2 for commuter travel and 1.0 for non-commuter travel
Toll and road pricing	Toll in ALPURT	Toll in ALPURT	Toll in ALPURT
Transport Infrastructure and services			
Rail, Bus and Ferry services	As per PTNP, except with an extra 20% for ferry	As per PTNP except in AMETI area	As per Scenario
Road network	As agreed for each scenario	As agreed separately	As per Scenario
Quality of rail stations	Assumed all upgraded to 'medium' quality by 2026 ¹	Assumed all upgraded to 'medium' quality by 2026 except in AMETI area which remain as per 2006	As per Scenario

¹ Although these changes were not included in previous RLTS forecasts, it is recommended they are included in new forecasts.

Input	RLTS	Post –RLTS/NZTA/AT	Recommendation for AP
HCV Growth	Employment plus GDP multiplier with elasticity of 1	Employment plus GDP multiplier (elasticity of 0.6)	Employment plus GDP multiplier (elasticity of 0.6)
TDM Assumptions			
Working from home	Assumptions for behaviour change asserted in ART3 from increased 'working from home'	15% of RLTS assumptions in Base forecasts, with 70% of RLTS forecasts in Sensitivity Test	TBA
Assumptions for behaviour change from Work Place TDM initiatives	Additional mode change assumptions asserted in ART3		
Assumptions for behaviour change from Education TDM initiatives	Additional mode change assumptions asserted in ART3		
Assumptions for behaviour change from Community TDM initiatives	Additional mode change assumptions asserted in ART3		