A Objectives, Criteria and Method of Evaluation

This appendix details the summarised objectives as they appear in Table 3.2 of the AMETI PT Plan (see below); the evaluation criteria determined for each objective and how each has been assessed using output from the APT and ART models together with other qualitative data.

Table A-1 – Summary Evaluation Criteria

Summarised Objectives Evaluation Criteria	Units	Stakeholder Objective	
		AMETI/ ACC/ MCC	LTMA/ NZTS/ ARTA
1. Sustainable Movement of People, Goods and Services			
Reduction in requirement for roadspace – from decongestion	m^2, $	1	-
Reduction in private vehicle fleet – from car trips diverted	no., $	1	-
Reduction in CO_2 emissions from VKT and decongestion	tonne, $	1	40
Reduction in fossil fuel consumption/improved energy efficiency.	litres, $	1	23
2. Connectivity between Communities and Businesses			
PT journey time, % of trips by PT to key employment areas	mins, %	2,11	19, 26, 36
PT journey time, % of trips by PT to education and hospitals	mins, %	3	19, 26, 36
3. Promotion of Economic Development/Reduces Congestion			
Decongestion benefits	$	3	20
PT journey time, % of trips to key retail centres	mins, %	3	20
4. Providing for Auckland's Growth Needs/Supports the RGS			
PT journey time, % of trips to employment growth areas	mins, %	4	18, 26, 36
PT journey time, % of trips to retail growth centres	mins, %	4	18, 26, 36
5. Efficiency			
Increases user benefits	$	-	37
6. Improves Journey Time Reliability			
% of passenger transport Trips, PKM by rail	%	-	21
7. Improves PT Interchange Quality and Facilities			
Numbers of transfers and quality of facilities	no.	-	27
8. Reduces Social Disadvantage			
PT journey time, % of trips to key employment nodes from areas with a high index of social deprivation.	mins, %	-	39
9. Safety/Reduce Crash Rates			
Reduction in reported injury crashes based on VKT	no.	12	24
10. Environment			
Reduction in particulate emissions based on VKT and congestion	gm	13	30
Reduction in run-off contaminants based on VKT	gm	13	32
Reduction in noise generation based on VKT and heavy vehicles	dB-km	-	31

As shown, Table A-1 also indicates the units adopted to measure the performance against each criteria.

A.1 Objective 1 - Sustainable Movement of People, Goods and Services

The ability to sustain transport over the long term implies a preference for renewable over depletable resources, re-use and recycling of resources, and the avoidance of damaging impacts that threaten future continuity of transport activity. The criteria selected are the requirement for road space, the number of private vehicles in use, fossil fuel consumption and greenhouse gas emissions. Each is quantified using modelling outputs and a value is also estimated.

A1.1 Road Space

Space is one of the scarcest resources in the urban environment. Transport systems that are economical in the use of space allow higher corridor density of passenger trips while making minimum demands on space for other urban uses. Transport systems that support dense passenger flows in relation to their space requirement also allow urban intensification and reduce the tendency to urban sprawl[1]. Transport solutions that create new space through undergrounding (or elevated structures), are another way of alleviating space scarcity, but are less affordable.

Increasing public transport's mode share contributes towards increased flow density and lessens the demand for additional road-building, provided public transport is well-used (achieves sufficiently high load factors) and is sufficiently direct (so that savings are not offset by indirect routing)[2].

The extent to which each PT option creates additional corridor peak passenger capacity, taking account of future corridor traffic growth is a way of assessing the contribution to this aspect of sustainability.

The method of assessment is to use the number of peak car trips diverted to public transport, together with journey times and peak travel speeds to estimate the reduction in peak space requirement on the road network in square metres; the dollar value of this reduction is assessed from land value and pavement construction cost.

A1.2 Private Vehicle Fleet

Other resources used in transport include **vehicles** and consumables, mainly fuel. Increased PT use will reduce the size of the private vehicle fleet over time, particularly households' second or third cars. The number or percentage of person-trips transferred to public transport (excluding park-and-ride), are an indicator of this aspect of sustainability.

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[1] Auckland's regional growth objectives include intensification around main transport routes for this reason

[2] These features also contribute to financial viability

Measurement is again from the number of peak car trips diverted to public transport, assuming that a proportion of these trips will result in a reduction in household vehicle ownership in the medium term and a corresponding resource cost saving.

A1.3 Carbon Dioxide Emissions

Greenhouse emissions pose a threat to sustainability, so the role of PT in reducing CO_2 emissions can also be considered as contributing to this objective. The reduction in tonnes of CO2 emissions is estimated directly from fuel consumption, and also expressed as an economic cost using the Government valuation of carbon credits.

A1.4 Energy Efficiency

Fossil fuel is a depletable resource, and one currently under pressure. Reduction in fuel used per person trip is a measure of increased sustainability. Measurement is from the kilometres of travel by car and public transport modes, estimated fuel consumption rates and from decongestion benefits; the result are quantified as litres of fuel saving, and as an economic cost.

Energy efficiency is measured best as the energy use per number of trips completed. For car trips, decongestion can be used as an indicator of the fuel consumption savings, which form part of the decongestion benefits. For the PT modes, VKT coupled with fuel consumptions rates can be used to measure the offsetting increase in fuel use.

A.2 Objective 2 - Connectivity between Communities and Businesses

The connectivity provided by public transport between residential areas and key destinations is measured as the percentage of trips made, and average travel time by, public transport for all peak period trips to key destination zones.

Key destinations are grouped into: employment centres (based on FTEs); regionally significant educational facilities (tertiary institutions), and main hospitals (Auckland City/Starship and Middlemore).

A.3 Objective 3 - Promotion of Economic Development

Two criteria have been selected: the road decongestion effects of public transport, and public transport mode share and travel time to the main retail centres.

Decongestion: A main constraint on economic development is road traffic congestion. Diverting private car trips to public transport frees up roadspace for the movement of goods and service vehicles, reduces wasteful consumption of fuel, improving trip reliability and reducing the size of the commercial vehicle fleet required to service business and industry.

Access to Commercial Centres: the extent to which AMETI public transport options provide a choice of mode and reduce public transport travel times to the main centres of retail and associated commercial activity. The criteria used are again the public transport share of trips to selected destination zones and the average travel time for public transport trips to those zones

Good access to the Auckland CBD is important region-wide, so the four CBD zones are included as key destinations. Major suburban retail centres offering a mix of specialist retail, usually combined with mall-based bulk shopping, multiplex entertainment, restaurants and other personal services that lie in the AMETI direct area of influence (trips route through AMETI corridor) are Newmarket, Highland Park, Botany Town Centre and Meadowlands Shopping Plaza

Other centres lie in the indirect area of influence and are considered in Section 4 criteria.

A.4 Objective 4 - Providing for Auckland's Growth Needs

These criteria are approached in a similar way to objectives 2 and 3, as the public transport mode share and average journey times but are specifically for the proposed growth zones. For the residential areas, the evaluation is for the public transport mode share and average travel time for trips originating in the zone; for the areas of employment and commercial activity it is the public transport share and average travel time for trips to these destination zones.

The new development areas in the AMETI area of influence are:

- Mt Wellington (quarry site)/Glen Innes
- Sylvia Park
- Flat Bush (proposed retail centre)
- Waiouru Peninsular (industrial area)

Areas of anticipated high residential growth are:

- Flat Bush/Ormiston (26,000 increase to 2016)
- Mt Wellington (quarry site)

Areas of Institutional Growth are:

- Auckland University – Tamaki campus

A.5 Objective 5 – Improves Transport Efficiency

The transport efficiency objective is measured from the tangible user benefits are calculated by the public transport model, which comprise savings in travel time to public transport users, savings to other transport users through decongestion and savings in vehicle operating costs. This allows the public transport options to be compared in terms of the total transport user benefits provided in the peak period.

When capital and operating costs are considered, then a cost-effectiveness measure of transport efficiency can also be estimated.

A.6 Objective 6 - Improves Journey Time Reliability

Modes of transport with dedicated right-of-way are less susceptible to journey unreliability that arises from traffic congestion. Rail is least susceptible, then busway, then bus priority-treatments, then buses in the traffic stream. Rail may of course have

other reliability issues depending on equipment and industrial factors. However, as a first order indicator, the proportion of journey or proportion of passenger-kms carried out by rail will be a measure of reliability. The number of interchanges can also be included – fewer interchanges will tend to increase reliability unless there is strict timing of schedules.

A.7 Objective 7 - Improves PT Interchange Quality and Facilities

This addresses APTNP objective of improving access and mobility through improving the connections between parts of the network, in particular through the quality and facilities of transport interchanges. At this level of planning the design of interchanges has not been specifically considered. However, there is an aversion to making interchanges during a trip, so PT mobility and access is improved the more the network provides for direct connections. Measurement of this is available as the average number of boardings per public transport trip.

A.8 Objective 8 – Reduces Social Disadvantage

This addresses ARTA's social responsibility objective of reducing travel times and increasing opportunities for areas with high social deprivation or poor access to transport options.

The evaluation criteria are the mode share by public transport and the average public transport travel time for trips originating in residential zones with a high index of social deprivation as measured by Statistics NZ and the Ministry of Health.

A.9 Objective 9 - Safety

This addresses the Manukau LTCCP objective of safety and the NZTS objective of safety and personal security.

Crash rates are linked to exposure, which is measured in the number of vehicles passing through an intersection or vehicle-kilometres travelled over a road link. Reduction in exposure through reduced vehicle-kms will reduce crashes, all else being equal. In practice there are other complicating factors, but vehicle-kms can be used as a good first order indicator of crash reduction. Using LTNZ data on typical crash rates, the number of injury crashes and social costs are estimated.

A.10 Objective 10 – Improve Environmental Quality

A10.1 Noise

Road traffic noise impact depends on traffic stream characteristics, the surrounding topography and buildings, atmospheric conditions and the location and susceptibility of receptors. Given that the surrounding environment is unchanged, increase or reduction in traffic volumes will reduce noise exposure on links. This will be offset by increases in the number of buses in the traffic stream. Stop-start conditions also increase noise, so improved LOS on the road links will have an effect.

Additional or new rail services will have some associated noise impact which is another offsetting factor.

As a first order indicator, change in VKT for cars, buses and rail may be useful indicators, but the evaluation of noise is more problematic than some other environmental effects.

A10.2 Healthy Water and Air

Traffic impacts on air quality can apply at the corridor level, where travellers, roadside pedestrians and activities are exposed to pollution concentrations from heavy and congested traffic streams, particularly where there is a confinement effect and adverse atmospheric conditions – elevated levels of carbon monoxide are a risk in particular in these circumstances. Pollution impact also applies at a regional airshed level, where emissions such as inhalable particulates and volatile organic compounds have damaging health effects. Reduction in vehicle-kilometres of travel is a first order indicator, although more effective if coupled with the degree of congestion that is being relieved. Decongestion benefits in conjunction with VKT are a possible way of dealing with this.

Run-off from roads is a cause of water pollution, and depends on the material deposition onto the roadway, the trapping of contaminants and final discharge into natural water. As a first order factor, reduction in vehicle-kilometres of travel will be an indicator of effect.

A.11 Cost Aspects

A.11.1 Capital Infrastructure and Service Operating Costs

The QTN and RTN options differ substantially in infrastructure and operational costs. As the RTN networks were developed to future proof the QTN options and not as alternatives to the QTN options, this large cost difference does not impinge directly on the comparison within the QTN options or within the RTN options.

Within the QTN options, the differences are largely confined to costs of service provision rather than infrastructure and the costs used for comparison purposes were the service provision costs net of fare revenue, that is the net public subsidy requirement. Within the RTN options the infrastructure costs vary quite considerably.

It was not practicable nor necessary to develop monetary values for the RTN options and for comparison purposes infrastructure costs within QTN options were allow assigned a "low" value while within RTN options they were assigned a "high", "higher" "highest" value.

A.11.2 User Benefits

The benefit to transport users in dollar values is addressed under the LTMA Efficiency objective. While not included explicitly in the AMETI objectives, user benefits were also evaluated within the AMETI direct area of influence.

A.11.3 Intangible Costs

Road crashes, air quality, noise, water quality and climate change effects are all intangible externality costs. The effects are difficult to measure in some cases, and subject to considerable uncertainty, and the social costs more so.

LTNZ's economic evaluation procedures allow some tentative dollar values to be placed on some of these intangibles, and this may help in deciding what weight to place on them when comparing passenger transport options.