

Transport Costs and Urban Form: Is There a Connection?

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Abstract

Introduction

Planning implies direction and organised action to efficiently achieve that direction. Urban transport and land use planning has developed to ensure an efficient arrangement of urban activities occurs. Good decision-making is predicated on data, information and knowledge relevant to the implications of options being considered. For decisions which seek to achieve sustainability, information is necessary about the economic, environmental and social implications of possible options.

This paper outlines the outcomes of a recent 'best practice' review and interpretation undertaken for the Department of Transport WA and Ministry for Planning by ERM Australia of the relative economic and financial implications of:

- (a) promoting urban development at or beyond the existing urban boundaries (ie fringe or beyond-fringe development) versus promoting development within the existing urban boundary; and
- (b) promoting a low density spread urban form versus promoting increased activity and housing densities.

The survey was undertaken as a first step in a process that would determine for the Perth Metropolitan Region answers to the questions noted above. The aims of the survey were:

- (a) to identify key case studies which might act as a model for the latter stages of this project;
- (b) to identify 'best practice' methodologies and weaknesses found in the available studies;
- (c) to assess the relevance of available case studies to the Perth Metropolitan Region; and
- (d) to recommend how the latter stages of the study might best be carried out.

The findings of this survey provide a useful guide to generating economic and financial information about the implications of certain critical urban planning options.

Background

Perth is likely to continue to be a rapidly growing urban area. Like other new world cities of its size, a primarily concentric pattern of urban growth is evident, from relative higher activity and residential density in inner areas and close to long-established transport infrastructure to lower activity and residential densities in outer, more recently established areas.¹

Concern for the economic and financial implications of fringe and beyond-fringe development has arisen from several factors:

- (a) competition policy suggests that government decision-makers should clarify and make transparent any net financial transfer from the users of one urban type to the users of another urban type or any subsidy for urban development generally as well as by urban development type;
- (b) good government management is based on understanding the implications for public sector finances of promoting or agreeing to one location or style of urban development over other locations or styles; and
- (c) effective social policy requires consideration of the implications of consumer choices on the financial capacity of the consumers to meet their basic needs and to meet the financial obligations their choices have generated.

In Perth, this concern is manifested in several ways:

- (a) Some residents of new beyond-fringe low activity and residential density suburbs for lower income earners are unable to access critical services, because they lack independent transport capacity, and there are few or no local services and public transport services. The high cost of providing public transport services to such suburbs restricts the service level that could be provided and impairs Government's capacity to provide improved public transport services to other areas. Residents of such suburbs will continue to suffer both high personal travel costs and poor access to the goods, services and opportunities normally valued in an urban region.
- (b) The ongoing spread of urban development generates increasing financial costs for infrastructure both to directly serve the newly developing fringe areas, but also to enable the required services to cross the urban area. These infrastructure requirements relate primarily to power, transport, water and sewerage. Reducing the direct costs of urban infrastructure could free funds for infrastructure development in rural areas.
- (c) There is increasing concern about the externalities associated with certain types of urban development. These include loss of biodiversity, and transport-derived

¹ This general pattern of development is to some extent 'lumpy', with higher activity and residential densities also found in older town centres which have become part of the broader urban region and along the suburban passenger rail line, and with lower activity and residential densities in some central areas which were developed in the past 20 – 30 years.

Transport Costs and Urban Form: Is There a Connection?

H Lansdell, R McKellar

externalities, such as Greenhouse gas and regional pollutant emissions, accidents, noise and vibration.

Recent Government urban planning and transport strategies are directed towards achieving urban sustainability. However, it is clear that some of the tools required to direct urban development towards achieving sustainability have not been available.

The Costs of Urban Infrastructure and Services

Public and private investment in urban infrastructure and expenditure on urban services are major elements of government and household budgets. The size of these investments and expenditures is of clear interest to those incurring them, but is seldom transparent even to those directly involved. The relative economic and financial costs of differing urban development or lifestyle options is usually even less available to institutions or individuals. This results in decisions being made about urban development and service provision without full comparative economic and financial data relating to the options under consideration.

This stifles necessary public debate about how best to allocate public funding for urban development and the extent to which certain urban lifestyle choices should receive a public subsidy. It also fetters the capacity of families or individuals to determine the financial implications to themselves of their life style decisions.

Transport Costs and Urban Form: Is There a Connection?

H Lansdell, R McKellar

The Scope of the Review

There has been active interest in urban costs in Western developed nations for the past 50 years or more. However, to ensure that the information gained would be of most direct relevance to Perth, the review was limited to reports relating to urban areas in Australia, Canada and the USA. In addition, only studies completed since 1980 were included, unless there was a specific and strong reason to do so. A total of 22 available reports was reviewed.

The review considered available reports which investigated and reported on:

- (a) the direct costs of providing roads, water, sewerage, power and telecommunications, public transport, private transport and housing;
- (b) the indirect costs of providing education, health and emergency services, and municipal services (rubbish collection and street cleaning); and
- (c) the external costs of road accidents, air pollution, noise and travel time.

The focus of the review was to report on:

- (a) substantive findings that might be relevant to the Perth Metropolitan Region;
- (b) the effectiveness of analytical methodologies; and
- (c) further research.

The Findings

Issues considered by the studies:

Most available research reports were limited to direct costs incurred by Government. Few investigations were found to have considered indirect or external costs, and virtually none quantified costs incurred by the private sector, whether businesses or households.

Transport Costs and Urban Form: Is There a Connection?

H Lansdell, R McKellar

Many of the studies were not applicable beyond the specific locations they addressed. In most instances this resulted from the nature of the matter being investigated, such as a comparison of the costs of development in a particular inner urban area versus a particular area on the urban fringe. In these instances, a direct comparison of infrastructure costs is inevitably complicated by the potential existence of spare capacity in one or more of the areas being investigated. While these research findings may be useful for decisions at a particular time concerned with a specific place, they cannot be readily generalised or used for strategic purposes.

Other studies could not be applied beyond the location to which they related because they did not transparently communicate the data or methodology used or even the explicit assumptions applied. Australian studies tended to be historical assessments of particular situations or summaries of national data, while some North American studies were developed for strategic planning purposes.

In a similar manner, many comparisons of service costs were affected by potential economies or diseconomies of scale which were not explicitly addressed.

Research into indirect costs, which are primarily concerned with emergency and social services, revealed difficulties in distinguishing between costs related to location or urban form and costs associated with social factors. For instance, assessing the relative health costs of differing urban development options needs to go beyond considering the costs of establishing and operating hospitals and private clinics in a specific location, to considering both the health and morbidity implications attributable to urban form and location and the resultant costs incurred by Government, the private sector and individuals.

Costing some apparent implications of urban location and form was complicated by the nature of human activities and service provision in urban regions and the interaction between an urban area and its hinterland. For instance, it is necessary to determine the transport activities associated with urban location and form and within the greater state and regional context, as opposed to transport activities that happen to occur in differing parts of a region, to determine the relevant applicable costs.

Few studies compared the external costs associated with differing urban forms. However, two studies demonstrated that this very difficult area can be addressed, using methods such as property value comparisons, willingness to pay, human capital, and cost estimates per pollutant emitted.

Research Methodologies

The review revealed the use of a wide range of research and analytical methodologies, in response to the range of research questions being addressed.

- *Direct costs:*

Where the research question related to a particular location or locations, it was usual to use data specific to those locations. Such data was generally detailed and expressed between relatively tight boundaries. However, indicative costs, such as average road

Transport Costs and Urban Form: Is There a Connection?

H Lansdell, R McKellar

construction costs, were used where location specific data was either not available or not relevant. Many of the specific and average cost figures used in analyses were obtained from public sector infrastructure agencies; the increasing trends towards private sector involvement in infrastructure provision and commercial confidential arrangements could impair the availability of pertinent data. **Appendices A through C** illustrate the direct costs in relation to urban form.

- *Indirect costs:*

Indirect costs relate to public sector services. Costs were normally estimated from reports of infrastructure development and service provision costs accessed from departmental annual reports or strategic plans. **Appendices D and E** illustrate the indirect costs associated with urban form.

- *External costs*

Estimates of external costs were generated through analytical approaches such as foregone income and productivity, property damage and values, travel times, health care costs, willingness to pay, human capital, and cost estimates per pollutant emitted. **Appendix F** illustrates the external costs associated with urban form.

Transport Costs and Urban Form: Is There a Connection?

H Lansdell, R McKellar

Substantive Findings

The survey suggested distinct differences between the costs of inner and fringe urban development.

Estimates of the direct capital costs for the infrastructure required for inner urban development ranged between 20% and 25% lower than the equivalent costs for development on the urban fringe. Lower costs were estimated for road, water, sewerage, telecommunication, electricity, gas, public transport and private transport infrastructure. Many of these costs are attributable to Government at some level. Higher inner urban land costs, which would be paid by the individuals concerned, could overcome this relative community cost advantage for inner urban development.

The review similarly found that studies had consistently reported significant differences for indirect costs, that is the infrastructure costs for social infrastructure, such as schools, hospitals or emergencies services. Once again, the review indicated that fringe and non-contiguous development generally incurred higher indirect infrastructure costs. However, while this result is intuitively obvious, it is also entirely dependent upon spare infrastructure capacity that may be available in inner urban areas. Where, for instance, schools or hospitals in inner areas have no spare capacity or need replacement this advantage will be lost.

Only partial estimates of operating and maintenance costs were found. As a generality, the review indicated that non-contiguous urban developments incurred higher operating and maintenance costs than did contiguous developments.

Estimates of the external costs associated with alternate urban development options suggested inner or contiguous development incurred only 50% of the external costs incurred by non-contiguous development. Moreover, in absolute figures, external costs amounted to more than the total of all public and private sector capital costs, including the average costs for land and building (eg dwelling) construction.

Transport Costs and Urban Form: Is There a Connection?

H Lansdell, R McKellar

Many external costs are shared through the community through insurance and the nature of the impacts, and are not borne only by the individuals making the lifestyle decisions which generate them. This indicates a major imposition of costs on all residents of an urban area when urban fringe or non-contiguous urban development is permitted, and suggests a significant subsidy on the part of residents of inner areas to residents of outer suburbs.

Conclusions

There are several implications of these findings for undertaking economic and financial research to support strategic urban planning:

1. Direct costs can be relatively easily estimated and are an important component of urban costs, but they are only one of several groups of costs that need to be considered.
2. Indirect costs are more difficult to quantify in a manner that allows transparent comparison between differing locations or urban forms, but can be determined by accessing costs associated with social service provision or health or welfare statistics.
3. External costs are very difficult to quantify at the scale required to compare specific urban development scenarios, but are essential to any comprehensive information base for effective decision-making. Order of magnitude strategic information is a realistic option and provides decision-makers with insight into the implications of the options they are considering.
4. While some costs may vary with urban location or form, many direct costs are determined by place-specific factors. Location-specific factors need to be excluded or normalised for strategic planning purposes, or a means of including or excluding them clearly indicated in the report.
5. A study needs to be able differentiate between those costs which are relatively unavoidable and which have location-specific cost implications, such as basic infrastructure and service provision, and others which have location-specific cost implications but which could be reduced, such as urban air pollution, which could be mitigated through improved technologies.
6. There will inevitably be limits to the levels of certainty that a study can achieve on many factors. A simple but effective and clear means of including certainty limits with quantitative information will greatly enhance the utility of information generated by the research.

References

ERM Australia (2000) *Review of the Economic and Financial Costs of Urban Form – Final Draft Report*. Prepared for Department of Transport WA and Ministry for Planning WA.

APPENDIX A

DIRECT COSTS - INITIAL CAPITAL COSTS

Transport Costs and Urban Form: Is There a Connection?

H Lansdell, R McKellar

Road Provision

Items	Contiguous Development with Existing Infrastructure	Non-Contiguous Development with no Existing Infrastructure
Items covered by the cost range	Local road system development.	Local road system development plus major road development.
Confidence in range	Based on 7 cost estimates. Confidence = 3/4 (average/ above average)	Based on 6 cost estimates. Confidence = 3-4 (average/ above average)
Estimate within range most suitable for development	Dependent on the specific subdivision design.	Dependent on capacity of main road system, bridges/structures required and ground/terrain conditions.
Source of further information	For development specific costs seek advice from developers, transport engineering consultancies and/or local governments.	For development specific costs seek advice from Main Roads Department or transport engineering consultancies.

Water and Sewerage

Items	Contiguous Development with Existing Infrastructure	Non-Contiguous Development with no Existing Infrastructure
Items covered by the cost range	Local reticulation and headworks.	Local reticulation headworks plus major infrastructure.
Confidence in range	Based on 4 cost estimates. Confidence = 3/4 (average/ above average)	Based on 12 cost estimates. Confidence = 4 (above average)
Estimate within range most suitable for development	Dependent on specific ground conditions.	Dependent on specific ground conditions, extent of water storage and treatment plants and capacity of main pipelines.
Source of further information	For development specific costs seek advice from developers and/or WaterCorp.	For development specific costs seek advice from WaterCorp and/or engineering consultancies.

Transport Costs and Urban Form: Is There a Connection?

H Lansdell, R McKellar

Telecommunications

Items	Contiguous Development with Existing Infrastructure	Non-Contiguous Development with no Existing Infrastructure
Items covered by the cost range	Local reticulation and connections.	Local reticulation, connections and main infrastructure.
Confidence in range	Based on 2 cost estimates. Confidence = 2 (below average)	Based on 4 cost estimates. Confidence = 3 (average)
Estimate within range most suitable for development	Dependent on ground conditions (for below ground lines) and technology standard required.	Dependent on ground conditions (for below ground lines) and technology standard required.
Source of further information	For development specific costs seek advice from developers and/or Telstra.	For development specific costs seek advice from Telstra and/or other telecommunications providers.

Electricity

Items	Contiguous Development with Existing Infrastructure	Non-Contiguous Development with no Existing Infrastructure
Items covered by the cost range	Local reticulation and connections.	Local reticulation, connections and main infrastructure.
Confidence in range	Based on 5 cost estimates. Confidence = 3/4 (average/ above average)	Based on 4 cost estimates. Confidence = 3 (average)
Estimate within range most suitable for development	Dependent on specific ground conditions.	Dependent on specific ground conditions and additional capacity required.
Source of further information	For development specific costs seek advice from Western Power.	For development specific costs seek advice from Western Power and/or electrical engineering consultancies.

Transport Costs and Urban Form: Is There a Connection?

H Lansdell, R McKellar

Gas

Items	Contiguous Development with Existing Infrastructure	Non-Contiguous Development with no Existing Infrastructure
Items covered by the cost range	Local reticulation and connections.	Local reticulation, connections and main infrastructure.
Confidence in range	Based on 4 cost estimates. Confidence = 3 (average)	Based on 1 cost estimate. Confidence = 1 (low)
Estimate within range most suitable for development	Dependent on specific ground conditions.	Dependent on specific ground conditions and additional capacity required.
Source of further information	For development specific costs seek advice from AlintaGas or engineering consultancies.	For development specific costs seek advice from AlintaGas or engineering consultancies.

Public Transport

Items	Contiguous Development with Existing Infrastructure	Non-Contiguous Development with no Existing Infrastructure
Items covered by the cost range	Changes to timetabled services requiring additional non-fixed assets (eg. buses, trains).	Changes to timetabled services requiring additional non-fixed assets (eg. buses, trains) plus additional fixed assets (eg. rail or bus stations).
Confidence in range	Based on 2 cost estimates. Confidence = 2 (below average)	Based on 5 cost estimate. Confidence = 2/3 (below average/average)
Estimate within range most suitable for development	Dependent on existing capacity and timetables.	Dependent on existing capacity and timetables plus additional fixed assets required.
Source of further information	For development specific costs seek advice from Department of Transport and Transperth.	For development specific costs seek advice from Department of Transport, Transperth and engineering consultancies.

Transport Costs and Urban Form: Is There a Connection?

H Lansdell, R McKellar

Private Transport

Items	Contiguous Development with Existing Infrastructure	Non-Contiguous Development with no Existing Infrastructure
Items covered by the cost range	Car purchase costs (annualised)	Car purchase costs (annualised).
Confidence in range	Based on 1 cost estimate. Confidence = 2 (below average)	Based on 2 cost estimates. Confidence = 2 (below average)
Estimate within range most suitable for development	Dependent on car ownership levels and availability of public transport.	Dependent on car ownership levels and availability of public transport.
Source of further information	For development specific costs seek advice from ABS and motoring organisations.	For development specific costs seek advice from ABS and motoring organisations.

Land Costs

Items	Contiguous Development with Existing Infrastructure	Non-Contiguous Development with no Existing Infrastructure
Items covered by the cost range	Land value only	Land value only
Confidence in range	Based on 17 cost estimates. Confidence = 4/5 (above average/high)	Based on 2 cost estimates. Confidence = 4/5 (above average/high)
Estimate within range most suitable for development	Dependent on location of land and market conditions.	Dependent on location of land and market conditions.
Source of further information	For development specific costs seek advice from UDIA and developers.	For development specific costs seek advice from UDIA and developers.

Transport Costs and Urban Form: Is There a Connection?

H Lansdell, R McKellar

Construction Costs

Items	Contiguous Development with Existing Infrastructure	Non-Contiguous Development with no Existing Infrastructure
Items covered by the cost range	Land preparation and dwelling construction	Land preparation and dwelling construction
Confidence in range	Based on 17 cost estimates. Confidence = 4/5 (above average/high)	Based on 2 cost estimates. Confidence = 4/5 (above average/high)
Estimate within range most suitable for development	Dependent on ground conditions, size and density of dwellings and materials used.	Dependent on ground conditions, size and density of dwellings and materials used.
Source of further information	For development specific costs seek advice from UDIA and developers.	For development specific costs seek advice from UDIA and developers.

Transport Costs and Urban Form: Is There a Connection?

H Lansdell, R McKellar

APPENDIX B

**DIRECT COSTS - OPERATING AND MAINTENANCE
COSTS**

Transport Costs and Urban Form: Is There a Connection?

H Lansdell, R McKellar

Road Provision

Items	Contiguous Development with Existing Infrastructure	Non-Contiguous Development with no Existing Infrastructure
Items covered by the cost range	Existing major roads and new local road system.	New local road system and new major roads.
Confidence in range	Based on 1 cost estimate. Confidence = 1 (low)	Based on 1 cost estimates. Confidence = 1 (low)
Estimate within range most suitable for development	Dependent on traffic volumes and condition of main and local road network.	Dependent on traffic volumes and condition of main and local road network.
Source of further information	For specific costs seek advice from transport engineering consultancies and/or local governments.	For specific costs seek advice from Main Roads Department, local government and/or transport engineering consultancies.

Water and Sewerage

Items	Contiguous Development with Existing Infrastructure	Non-Contiguous Development with no Existing Infrastructure
Items covered by the cost range	Existing major infrastructure and new local reticulation network.	New major infrastructure and new local reticulation network.
Confidence in range	Based on 4 cost estimates. Confidence = 3 (average)	Based on 4 cost estimates. Confidence = 3 (average)
Estimate within range most suitable for development	Dependent on technology used and condition of network.	Dependent on technology used and condition of network.
Source of further information	For specific costs seek advice from developers and/or WaterCorp.	For specific costs seek advice from WaterCorp and/or engineering consultancies.

Transport Costs and Urban Form: Is There a Connection?

H Lansdell, R McKellar

Public Transport

Items	Contiguous Development with Existing Infrastructure	Non-Contiguous Development with no Existing Infrastructure
Items covered by the cost range	Operation of timetabled services and maintenance of transport-specific assets (excluding roads)	Operation of timetabled services and maintenance of transport-specific assets (excluding roads)
Confidence in range	Based on 2 cost estimates. Confidence = 2 (below average)	Based on 2 cost estimate. Confidence = 2 (below average)
Estimate within range most suitable for development	Dependent on age of fixed assets and passenger volumes.	Dependent on age of fixed assets and passenger volumes.
Source of further information	For specific costs seek advice from Department of Transport and Transperth.	For specific costs seek advice from Department of Transport, Transperth and transport consultancies.

Private Transport

Items	Contiguous Development with Existing Infrastructure	Non-Contiguous Development with no Existing Infrastructure
Items covered by the cost range	Costs incurred in operating and maintaining private vehicles.	Costs incurred in operating and maintaining private vehicles.
Confidence in range	Based on 4 cost estimate. Confidence = 3 (average)	Based on 4 cost estimates. Confidence = 3 (average)
Estimate within range most suitable for development	Dependent on car ownership levels, use of public transport and location of trip ends (work, recreation, etc.) relative to dwelling location.	Dependent on car ownership levels, use of public transport and location of trip ends (work, recreation, etc.) relative to dwelling location.
Source of further information	For specific costs seek advice from ABS and motoring organisations.	For specific costs seek advice from ABS and motoring organisations.

Transport Costs and Urban Form: Is There a Connection?

H Lansdell, R McKellar

APPENDIX C

INITIAL CAPITAL COST - REPLACEMENT COSTS

Transport Costs and Urban Form: Is There a Connection?

H Lansdell, R McKellar

Water and Sewerage

Items	Contiguous Development with Existing Infrastructure	Non-Contiguous Development with no Existing Infrastructure
Items covered by the cost range	Replacement of major infrastructure and local reticulation network.	Replacement of major infrastructure and local reticulation network.
Confidence in range	Based on 4 cost estimates. Confidence = 3 (average)	Based on 4 cost estimates. Confidence = 3 (average)
Estimate within range most suitable for development	Dependent on technology used, choice of discount rate and condition of network.	Dependent on technology used, choice of discount rate and condition of network.
Source of further information	For specific costs seek advice from developers and/or WaterCorp.	For specific costs seek advice from WaterCorp and/or engineering consultancies.

Transport Costs and Urban Form: Is There a Connection?

H Lansdell, R McKellar

APPENDIX D

INDIRECT COSTS - INITIAL CAPITAL COSTS

Transport Costs and Urban Form: Is There a Connection?

H Lansdell, R McKellar

Ambulance

Items	Contiguous Development with Existing Infrastructure	Non-Contiguous Development with no Existing Infrastructure
Items covered by the cost range	Enhanced services requiring marginal additional investment.	Enhanced services requiring substantial additional investment.
Confidence in range	Based on 1 cost estimate. Confidence = 1 (low)	Based on 1 cost estimate. Confidence = 1 (low)
Estimate within range most suitable for development	Dependent on existing level of service capacity.	Dependent on existing level of service capacity.
Source of further information	For specific costs seek advice from emergency services.	For specific costs seek advice from emergency services.

Police

Items	Contiguous Development with Existing Infrastructure	Non-Contiguous Development with no Existing Infrastructure
Items covered by the cost range	Enhanced services requiring marginal additional investment.	Enhanced services requiring substantial additional investment.
Confidence in range	Based on 1 cost estimate. Confidence = 1 (low)	Based on 1 cost estimate. Confidence = 1 (low)
Estimate within range most suitable for development	Dependent on existing level of service capacity.	Dependent on existing level of service capacity.
Source of further information	For specific costs seek advice from emergency services.	For specific costs seek advice from emergency services.

Transport Costs and Urban Form: Is There a Connection?

H Lansdell, R McKellar

Education

Items	Contiguous Development with Existing Infrastructure	Non-Contiguous Development with no Existing Infrastructure
Items covered by the cost range	Enhanced educational services requiring marginal additional investment.	Enhanced educational services requiring substantial additional investment.
Confidence in range	Based on 3 cost estimates. Confidence = 3 (average)	Based on 3 cost estimates. Confidence = 3 (average)
Estimate within range most suitable for development	Dependent on existing level of service capacity.	Dependent on existing level of service capacity.
Source of further information	For specific costs seek advice from the Education Department.	For specific costs seek advice from the Education Department.

Health

Items	Contiguous Development with Existing Infrastructure	Non-Contiguous Development with no Existing Infrastructure
Items covered by the cost range	Enhanced health services requiring marginal additional investment.	Enhanced health services requiring substantial additional investment.
Confidence in range	Based on 3 cost estimates. Confidence = 3 (average)	Based on 3 cost estimates. Confidence = 3 (average)
Estimate within range most suitable for development	Dependent on existing level of service capacity.	Dependent on existing level of service capacity.
Source of further information	For specific costs seek advice from the Health Department.	For specific costs seek advice from the Health Department.

APPENDIX E

**INDIRECT COSTS - OPERATING AND MAINTENANCE
COSTS**

Transport Costs and Urban Form: Is There a Connection?

H Lansdell, R McKellar

Fire

Items	Contiguous Development with Existing Infrastructure	Non-Contiguous Development with no Existing Infrastructure
Items covered by the cost range	Additional service provision.	Additional service provision.
Confidence in range	Based on 1 cost estimate. Confidence = 1 (low)	Based on 1 cost estimate. Confidence = 1 (low)
Estimate within range most suitable for development	Dependent on existing level of service capacity.	Dependent on existing level of service capacity.
Source of further information	For specific costs seek advice from fire service.	For specific costs seek advice from fire services.

Education

Items	Contiguous Development with Existing Infrastructure	Non-Contiguous Development with no Existing Infrastructure
Items covered by the cost range	Additional service provision.	Additional service provision.
Confidence in range	Based on 2 cost estimates. Confidence = 1/2 (low/below average)	Based on 2 cost estimates. Confidence = 1/2 (low/below average)
Estimate within range most suitable for development	Dependent on existing level of service capacity.	Dependent on existing level of service capacity.
Source of further information	For specific costs seek advice from the Education Department.	For specific costs seek advice from the Education Department.

Transport Costs and Urban Form: Is There a Connection?

H Lansdell, R McKellar

Health

Items	Contiguous Development with Existing Infrastructure	Non-Contiguous Development with no Existing Infrastructure
Items covered by the cost range	Additional service provision.	Additional service provision.
Confidence in range	Based on 2 cost estimates. Confidence = 1/2 (low/below average)	Based on 2 cost estimates. Confidence = 1/2 (low/below average)
Estimate within range most suitable for development	Dependent on existing level of service capacity.	Dependent on existing level of service capacity.
Source of further information	For specific costs seek advice from the Health Department.	For specific costs seek advice from the Health Department.

APPENDIX F

EXTERNAL COSTS – ANNUAL COSTS

Transport Costs and Urban Form: Is There a Connection?

H Lansdell, R McKellar

Road Accidents

Items	Contiguous Development with Existing Infrastructure	Non-Contiguous Development with no Existing Infrastructure
Items covered by the cost range	Fatalities, injuries and property	Fatalities, injuries and property
Confidence in range	Based on 1 cost estimate. Confidence = 1 (low)	Based on 1 cost estimate. Confidence = 1 (low)
Estimate within range most suitable for development	No range available	No range available
Source of further information	Unknown.	Unknown.

Air Pollution

Items	Contiguous Development with Existing Infrastructure	Non-Contiguous Development with no Existing Infrastructure
Items covered by the cost range	Valuation of emissions from transport.	Valuation of emissions from transport.
Confidence in range	Based on 1 cost estimate. Confidence = 1 (low)	Based on 1 cost estimate. Confidence = 1 (low)
Estimate within range most suitable for development	No range available.	No range available.
Source of further information	Applied research organisations.	Applied research organisations.

Noise Pollution

Items	Contiguous Development with Existing Infrastructure	Non-Contiguous Development with no Existing Infrastructure
Items covered by the cost range	Valuation of noise impacts of transport.	Valuation of noise impacts of transport.
Confidence in range	Based on 1 cost estimate. Confidence = 1 (low)	Based on 1 cost estimate. Confidence = 1 (low)
Estimate within range most suitable for development	No range available.	No range available.
Source of further information	Applied research organisations.	Applied research organisations.

Travel Time

Items	Contiguous Development with Existing Infrastructure	Non-Contiguous Development with no Existing Infrastructure
Items covered by the cost range	Valuation of travel time.	Valuation of travel time.
Confidence in range	Based on 3 cost estimates. Confidence = 2 (below average)	Based on 3 cost estimates. Confidence = 2 (below average)
Estimate within range most suitable for development	Depends on proximity of dwellings to work and non-work destinations, level of congestion and type of mode used for transport.	Depends on proximity of dwellings to work and non-work destinations, level of congestion and type of mode used for transport.
Source of further information	Applied research organisations.	Applied research organisations.

Transport Costs and Urban Form: Is There a Connection?

H Lansdell, R McKellar

Health

Items	Contiguous Development with Existing Infrastructure	Non-Contiguous Development with no Existing Infrastructure
Items covered by the cost range	Additional service provision.	Additional service provision.
Confidence in range	Based on 2 cost estimates. Confidence = 1/2 (low/below average)	Based on 2 cost estimates. Confidence = 1/2 (low/below average)
Estimate within range most suitable for development	Dependent on existing level of service capacity.	Dependent on existing level of service capacity.
Source of further information	For specific costs seek advice from the Health Department.	For specific costs seek advice from the Health Department.