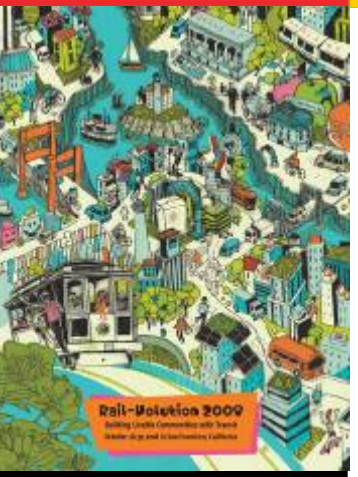


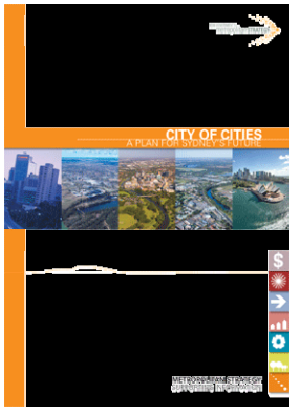
San Francisco
2008

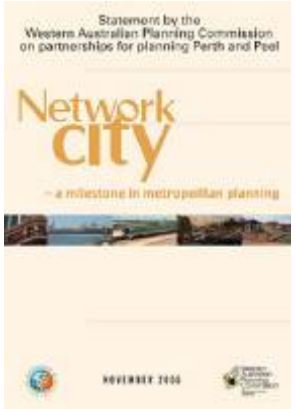
"TOD Trips"
A new sketch planning model for assessing TOD's and Transit Planning

Case studies in best practice from Australia

Dr Mark Bachels
National PlaceMaking Executive
Parsons Brinckerhoff - Australia

Australian Cities - Smart Growth





- All major Australian Cities are pursuing similar growth strategies
  - c. 50:50 ratio of greenfield and urban renewal
  - Connected and mixed use centres
  - Managed growth and urban boundaries
  - TOD principles
  - Improving Transit (rail, tram, bus) – reducing car dependence
- Consistent challenge in concept development and assessment of TODs and corridors

Planning and Assessing TODs and Transit Corridor planning

- Numerous challenges and desires for TODs and transit corridors
  - Understand development potential
  - Understand transit potential
  - Optimize potential land use and transit synergy
- Limited tools for initial concept testing
  - Typically charrette's are used for concept development
  - Quantitative assessment of TOD potential for transit is often very limited (qualitative or "guesstimates")
- Typical transport modelling tends to be:
  - Time consuming (usually months to create/update a model)
  - Complex (multimodal, data hungry)
  - Costly ($100-200k)
  - Inappropriate for sketch planning

What is TOD Trips ?

- An innovative tool for testing integrated land use and transport scenarios
- A single platform for the rapid and detailed appraisal of a range of scenarios
- Built entirely within Excel
- Incorporates GIS features, data sheets and customised programming macros

Key Features

- Fully spatial specification of land use and transport
- Sophisticated user interface for rapid development and testing of scenarios
- Wide range of output capabilities including multi-criteria assessment and benefit-cost analysis

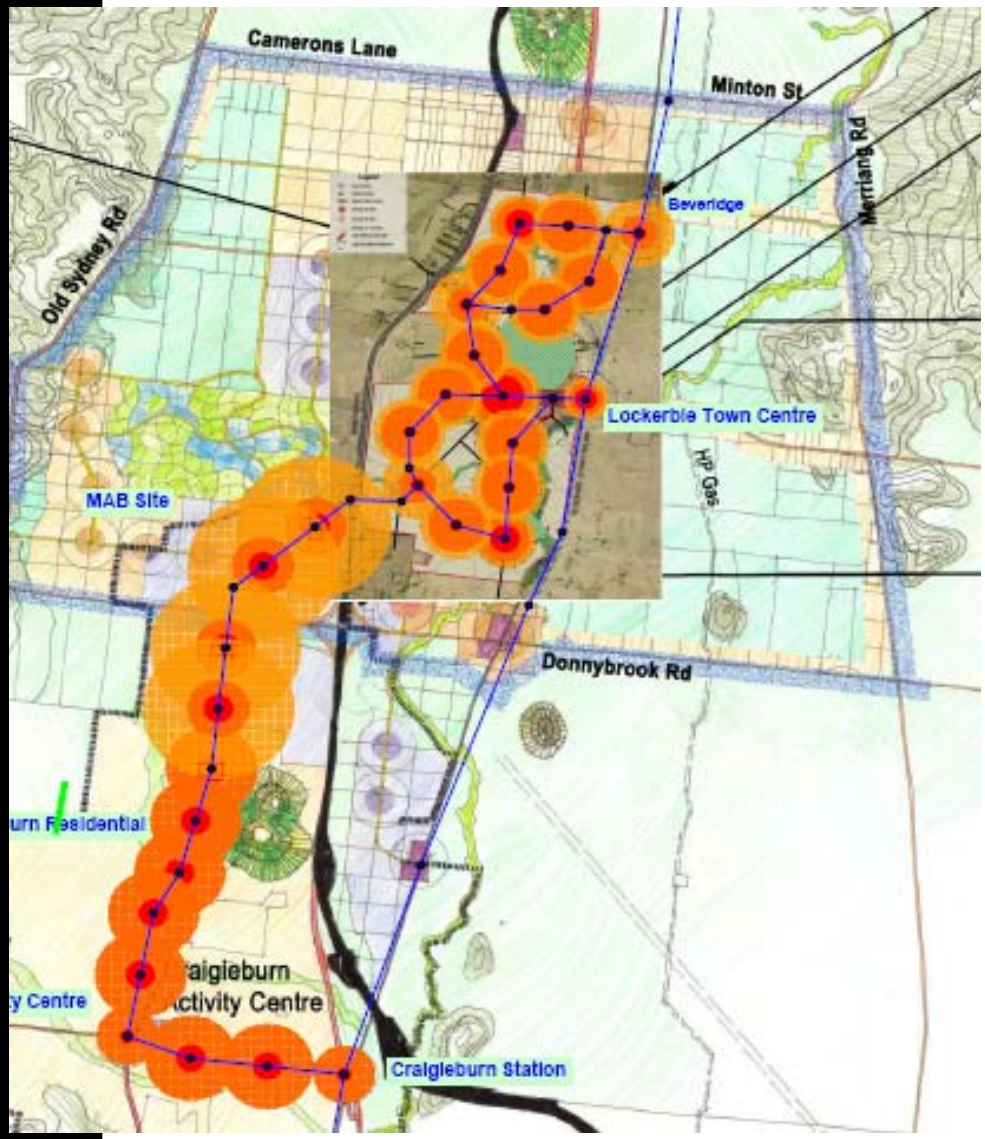
Transport Model Component

- Detailed transit model including trip generation, distribution, mode choice and assignment
- Rapid processing (< 1 minute for 100 zones)
- Separate treatment of access and main modes
- Generalised cost mode choice model

Benefits in use

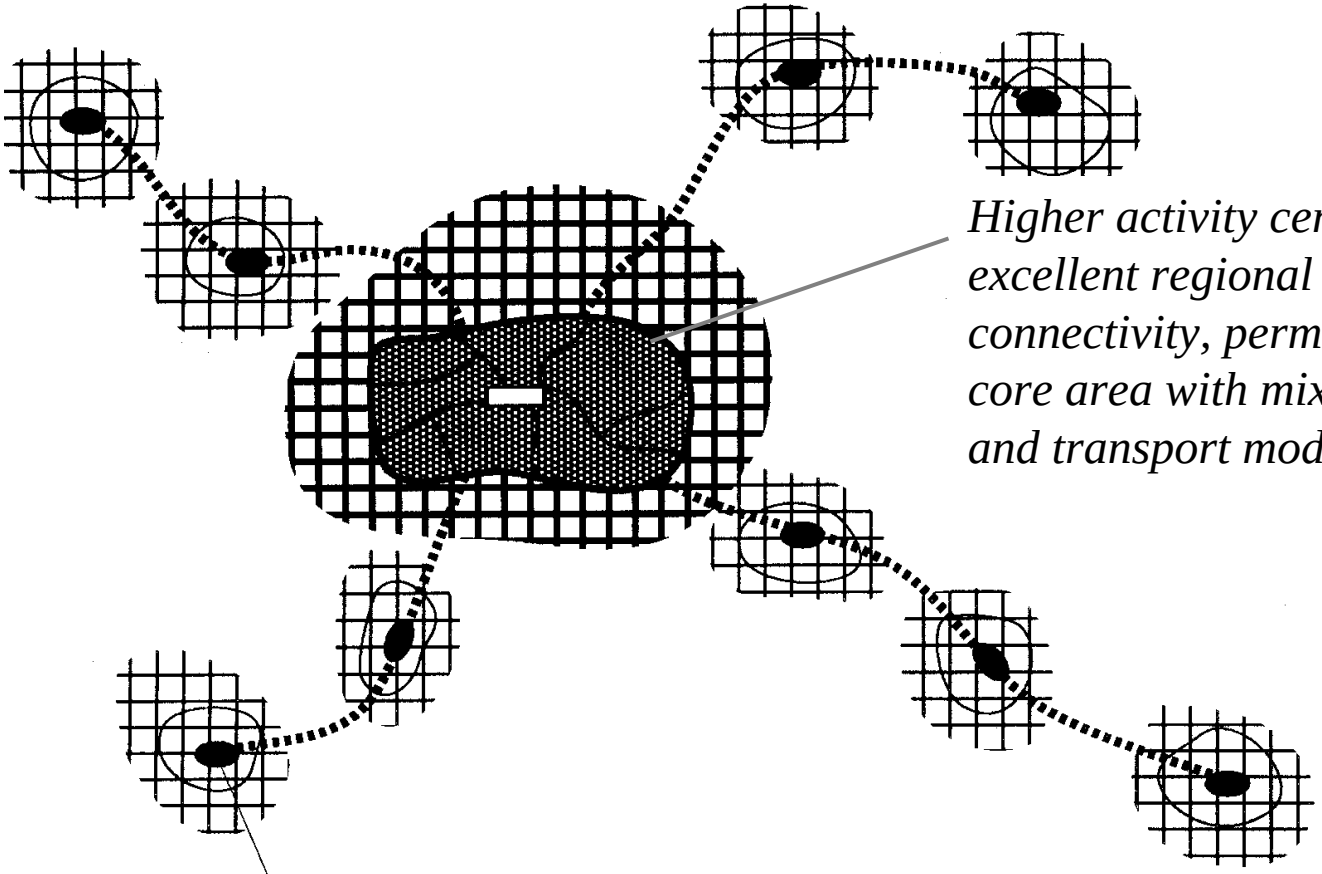
- Rapid development and testing of scenarios (including in a workshop environment)
- Interactive features allow testing of sensitivity to key input parameters
- Incorporates scenario management and multi-criteria assessment
- Useful for:
  - Community engagement and learning
  - Testing density and mix of uses
  - Testing possible transit networks, alignments and types (LRT, BRT, rail, etc).

PB TOD and Corridor Assessment Tool



- Scenarios for mixed uses (density, jobs, etc), mode share, transit networks
- Greenfield or urban renewal applications
- Transit corridor studies
- TOD site studies
- Quick and facile
- Integrates land use and transport/transit modelling

Tests Connectivity – Local and Regional

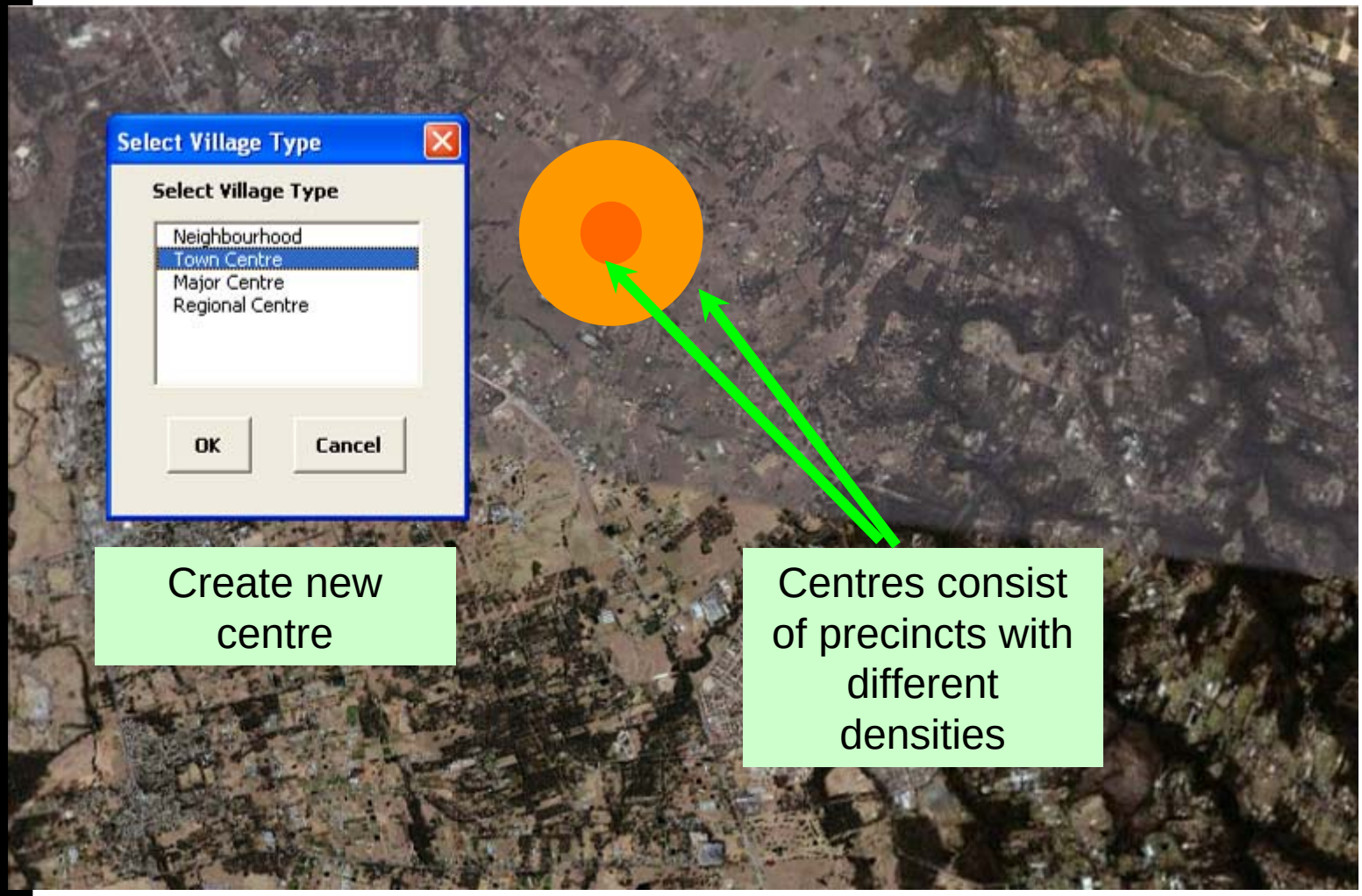


Higher activity centre, excellent regional connectivity, permeable core area with mix of uses and transport modes

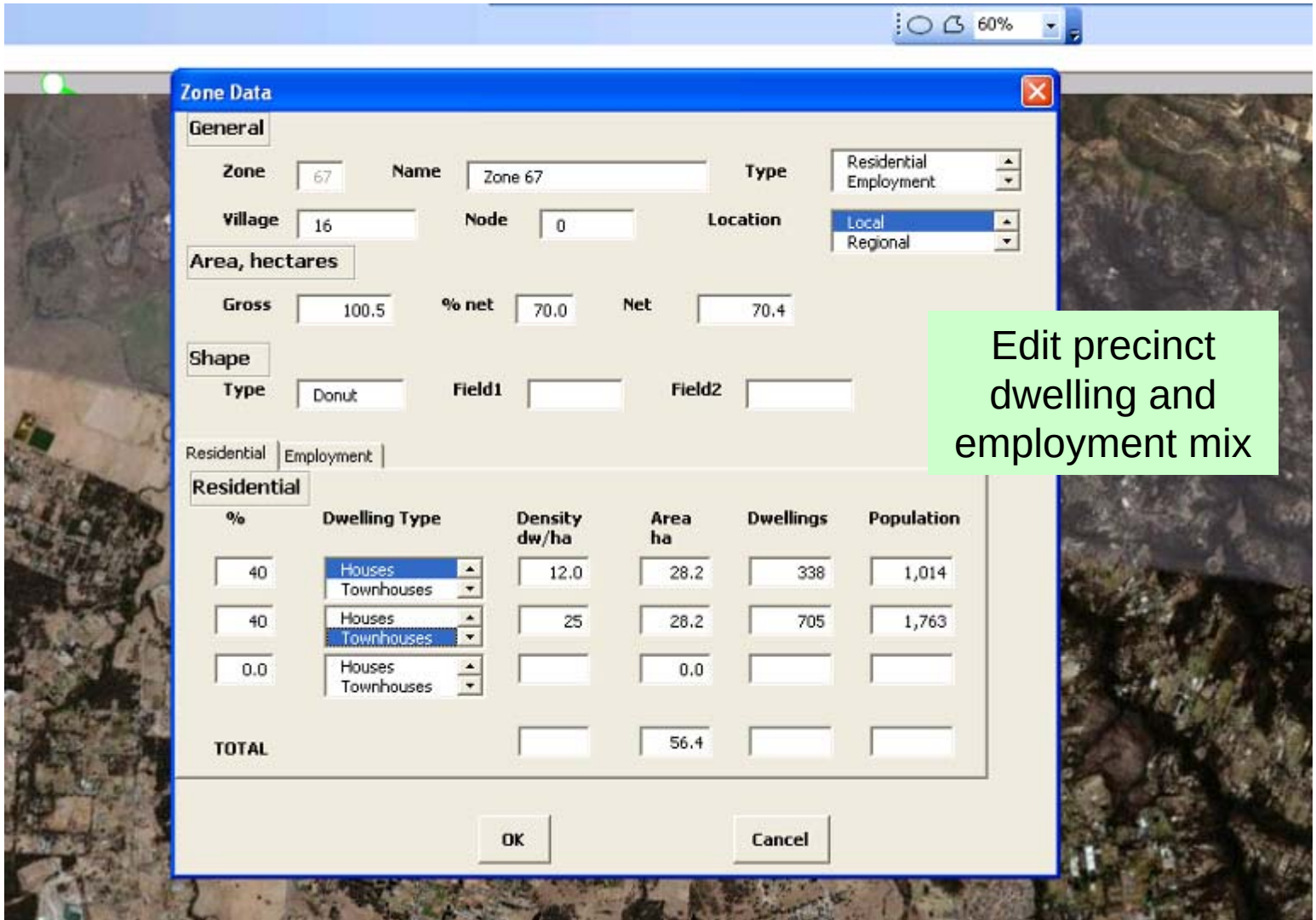
Mixed use, excellent permeability, connected to other centres via public transport and roads

Base – structure plan or aerial map

Land uses are graphical

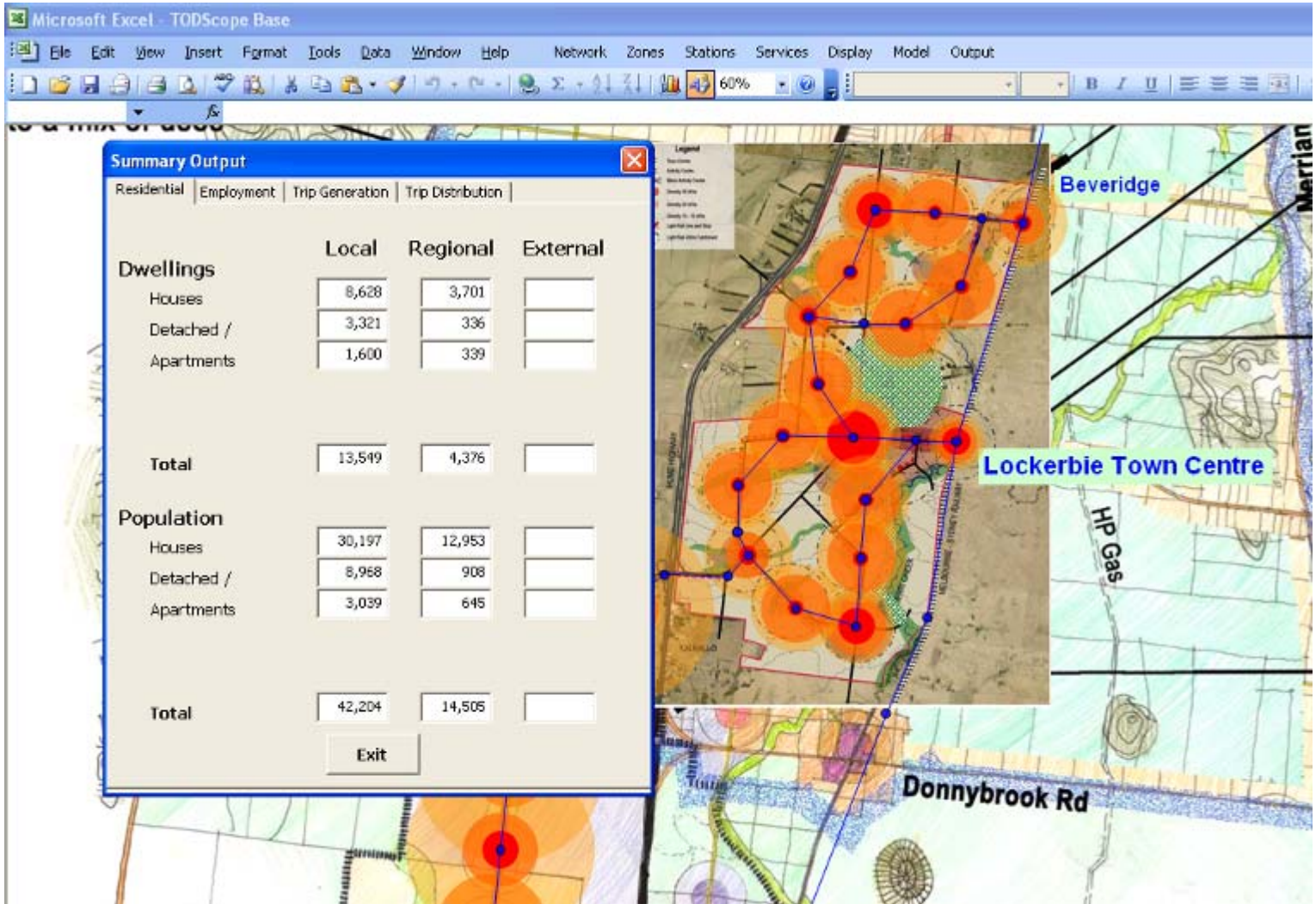


Specify Land Uses



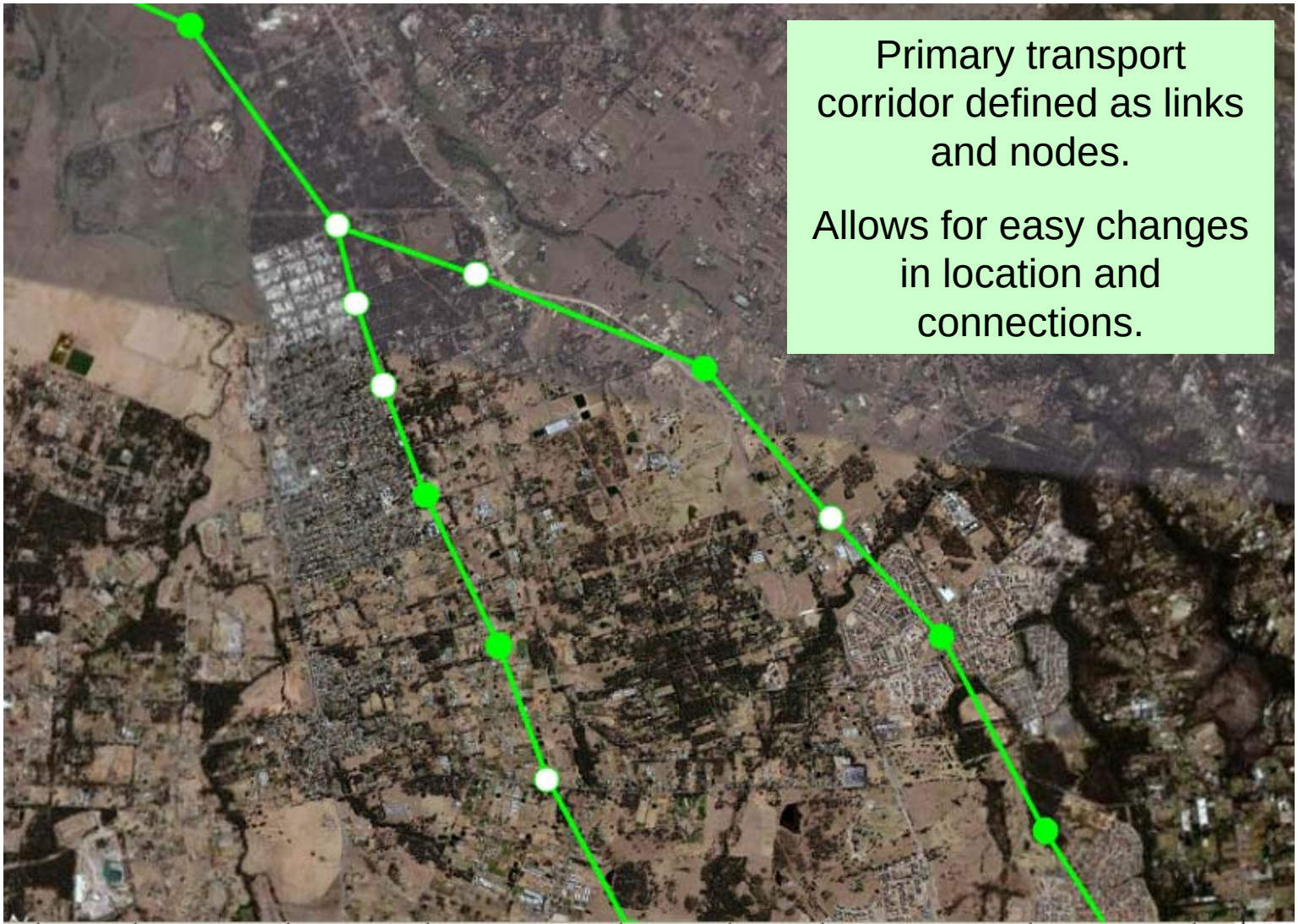
Edit precinct dwelling and employment mix

Test Land Use Yields, Population and Employment



	Local	Regional	External
Dwellings			
Houses	8,628	3,701	
Detached /	3,321	336	
Apartments	1,600	339	
Total	13,549	4,376	
Population			
Houses	30,197	12,953	
Detached /	8,968	908	
Apartments	3,039	645	
Total	42,204	14,505	

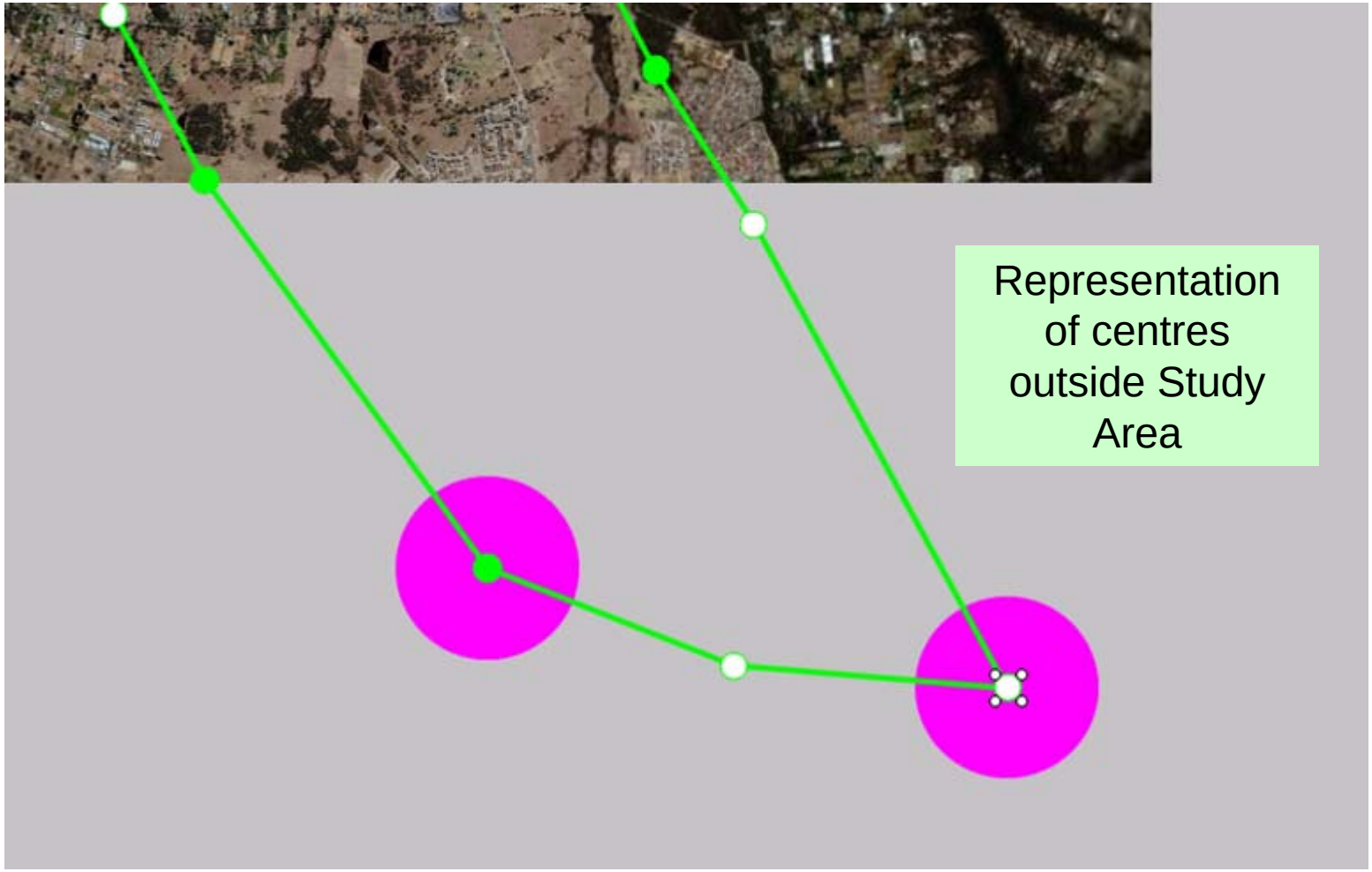
Transport Network – very flexible and facile



Primary transport corridor defined as links and nodes.

Allows for easy changes in location and connections.

External Zones modelled



Typical TOD Info

Data would be mapped for two areas

- "strategic" area (area dependent) and
- specific to site and TOD at 400m and 800m catchments

Land Use

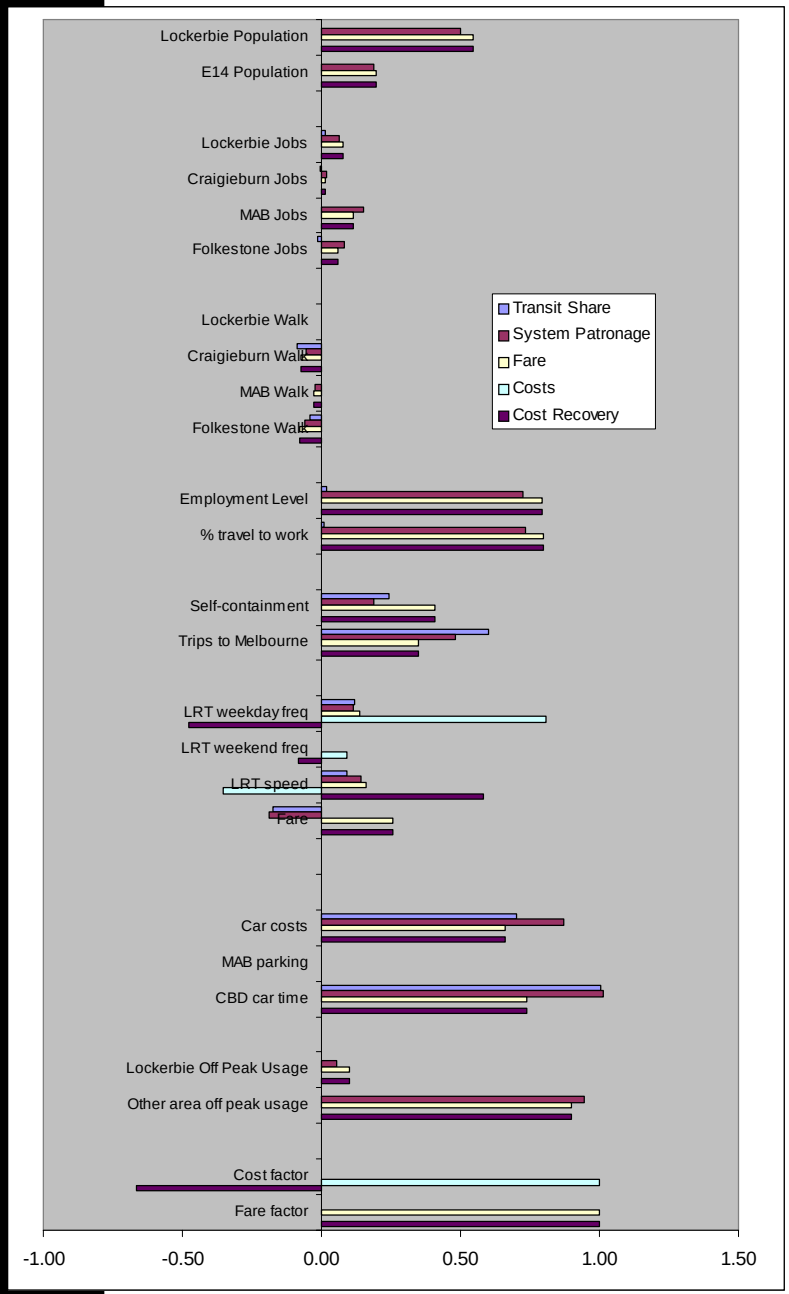
- Residential GFA and/or Density (existing)
- Commercial GFA and/or Density (existing)
- Retail GFA and/or Density (existing)
- Zoning Residential
- Zoning Commercial
- Zoning Retail
- Zoning other uses (eg civic, cultural, etc)
- Allowable building height
- Bonus Density provisions (if any)
- View shed restrictions (zoning)
- Height restrictions covenants (Dept Nat Resources)
- land ownership
- open space overlay
- heritage overlay
- flooding overlay
- vegetation overlay

- Household Building Stock Age
- No. of Blocks/Ha ("Permeability")
- Population (and density)
- No. Dwellings
- Employment/jobs (and Density)
- Household Income

Typical TOD Info

Transport

- Traffic volumes on key surrounding streets (arterials, sub-arterials, etc.) peak period and total daily volumes
- Car Ownership rates
- Public Transport Routes bus and rail (existing and planned/committed)
- Public Transport Frequency (existing and planned/committed)
- Parking provisions (numbers on-street and off-street)
- Parking policies (time period policies and rate of development (maximum/min))
- Current mode split
- Public transport fares
- Identified rail or bus station sites
- Identified interchange sites (bus and/or rail)
- Park and ride (existing and planned)



Model Outputs

Outputs/parameters:

Pop'n, job and mixed use density

Transit types (LRT, bus, rail)

Mode split

Walkability/permeability

Transit trips, frequency and costs

Parking effects/policies

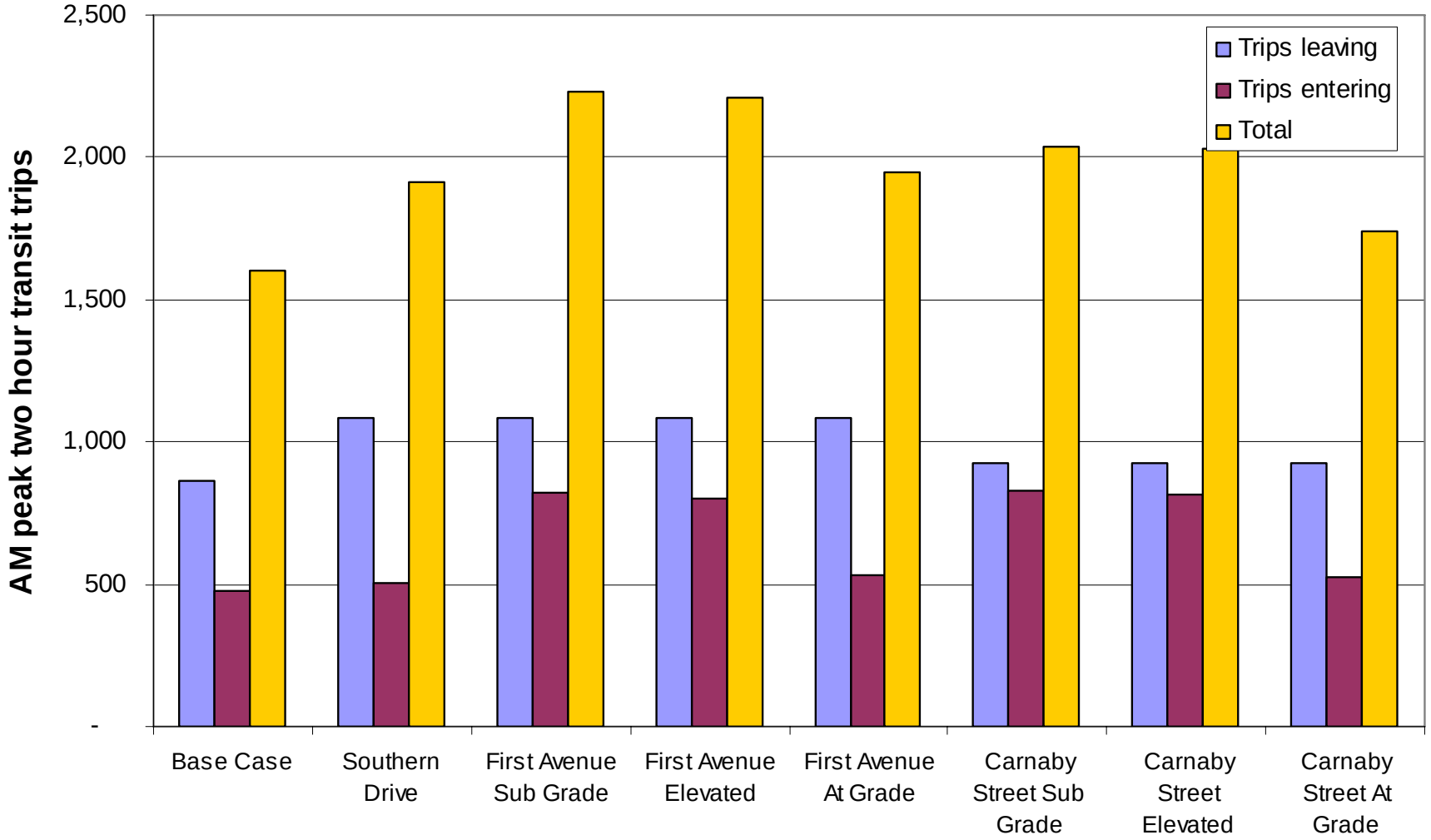
Scenario tests

Model output – typical summary tables

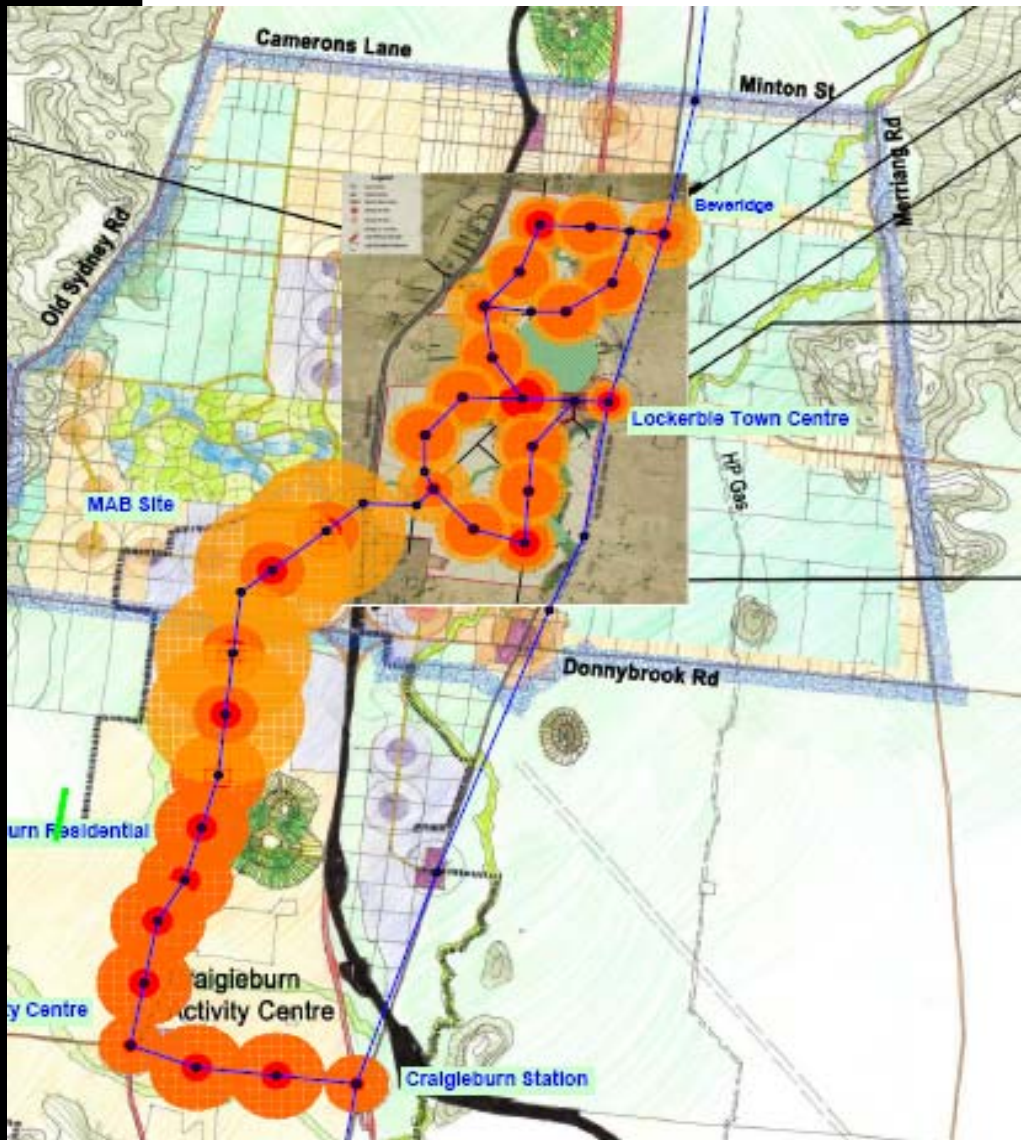
SUMMARY OUTPUT

Output	Current Scenario	Base	Last	Current	Target
Total dwellings	19,468	17,339	28,629	19,468	24,000
Total GFA	500,191	440,748	538,049	500,191	500,000
Total population	56,337	54,000	82,875	56,337	70,000
Total employment	20,883	18,054	22,145	20,883	
Average dwellings per ha	7.4	8.6	10.9	7.4	11.0
Total AM peak transit trips	5,278	5,200	6,134	5,278	
Total annual transit trips, million	4.3	4.2	5.0	4.3	
Transit mode share	22.6%	17.0%	22.9%	22.6%	24.0%
Annual VKT, million	176	270	201	176	200
System operating costs, $ mill p.a.	38.9	34.2	38.9	38.9	
System fare revenue, $ mill p.a.	10.7	11.4	12.4	10.7	
System cost recovery, %	27%	30%	32%	27%	35%
Annual travel time savings, $	8.6		9.9	8.6	
Additional operating costs, $ mill p.a.	7.8		7.8	7.8	
Additional capital costs, $ mill p.a.	6.8		6.8	6.8	
Benefit Cost Ratio	0.59		0.68	0.59	1.20

Output: Transit Assessments

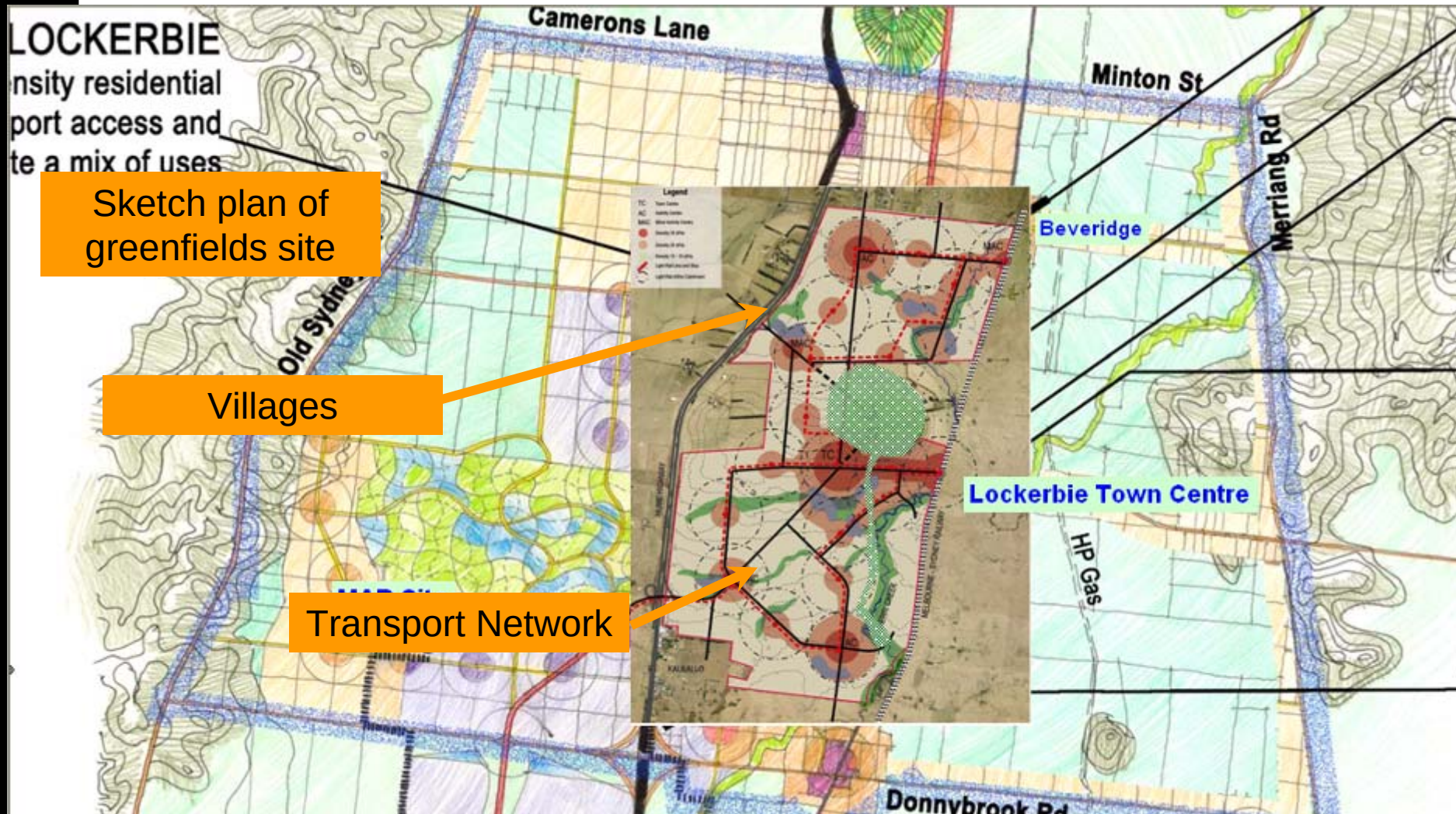


Case #1: Lockerbie greenfield master planning and transit type (Melbourne)

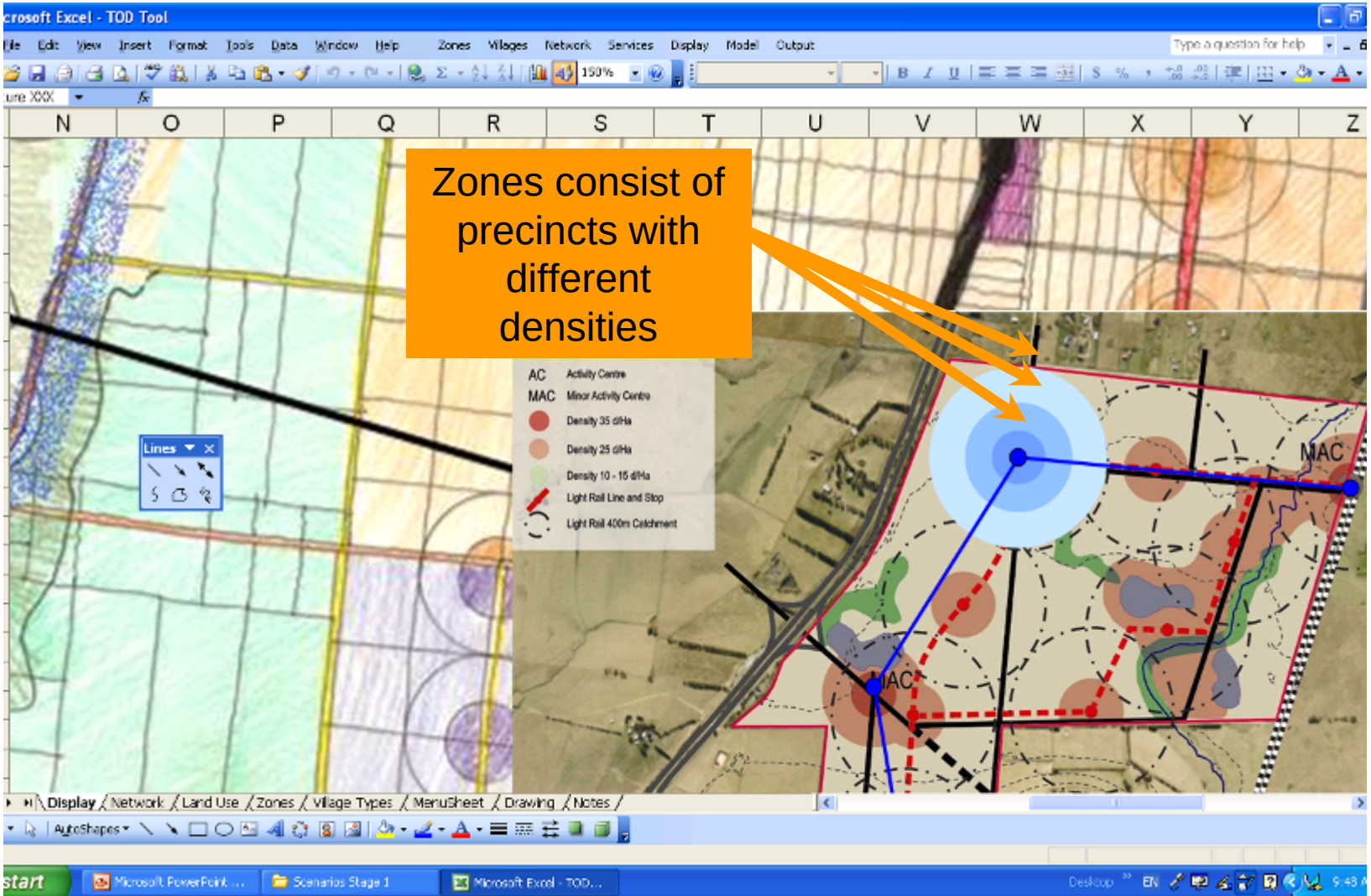


- Large scale greenfield master plan
- Existing rail line
- Desire for new transit to service c. 40,000 new residents and mixed use town centres
- Test of density and transit networks to optimize:
  - transit type (LRT or bus)
  - Transit performance (patronage, cost) and
  - land use yield

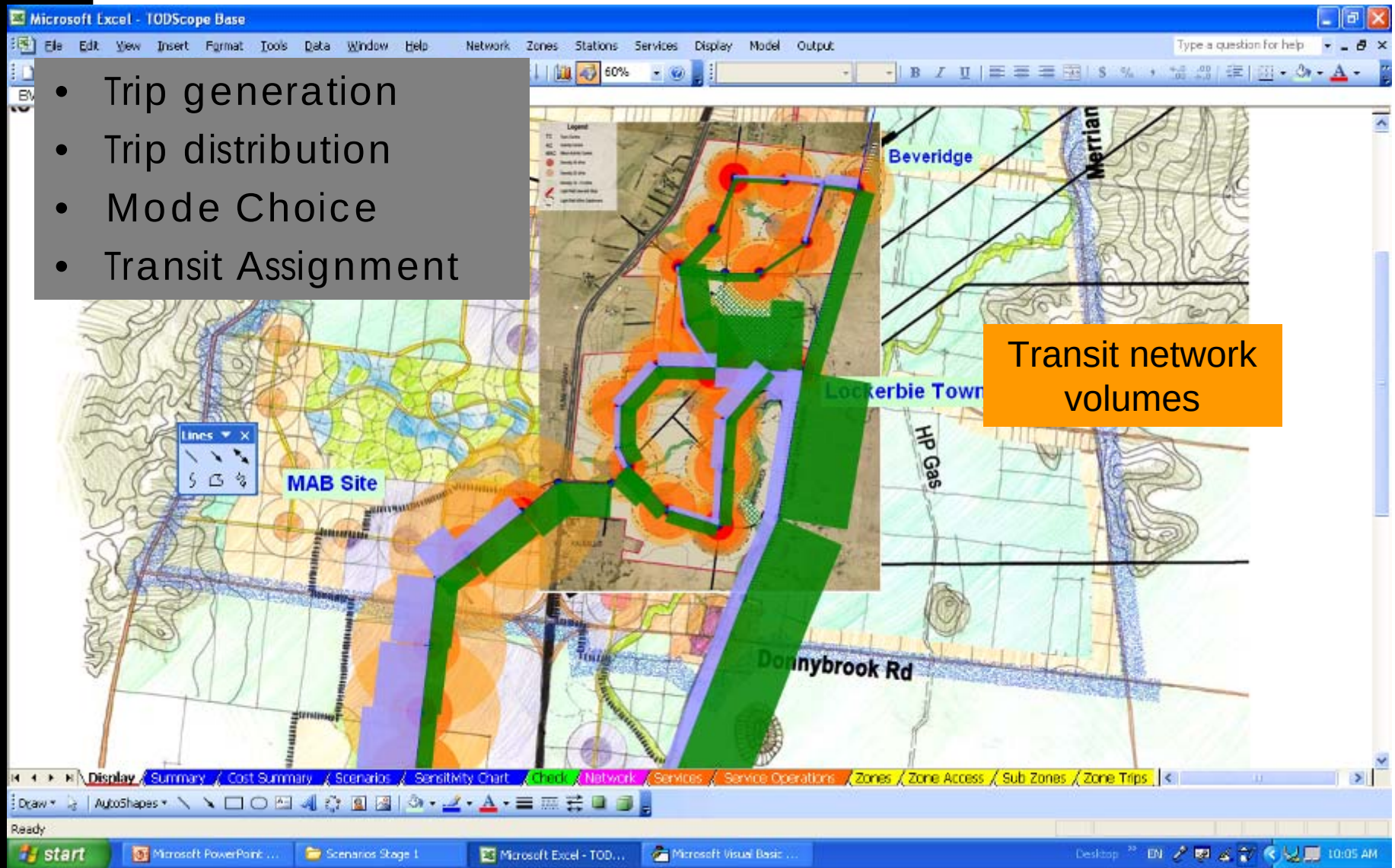
Lockerbie - Starting point



Lockerbie: Defining Land Use Zones



Lockerbie: Transit Outcomes



- Trip generation
- Trip distribution
- Mode Choice
- Transit Assignment

Lockerbie Findings

- Bus base solution was best based on cost
- LRT would generate more patronage but for location was difficult to justify additional cost
- Mix of density enabled either BRT or LRT (with a likely greater theoretical yield for LRT but market location suggested higher densities were doubtful)

Case #2: Maroochydore, Queensland

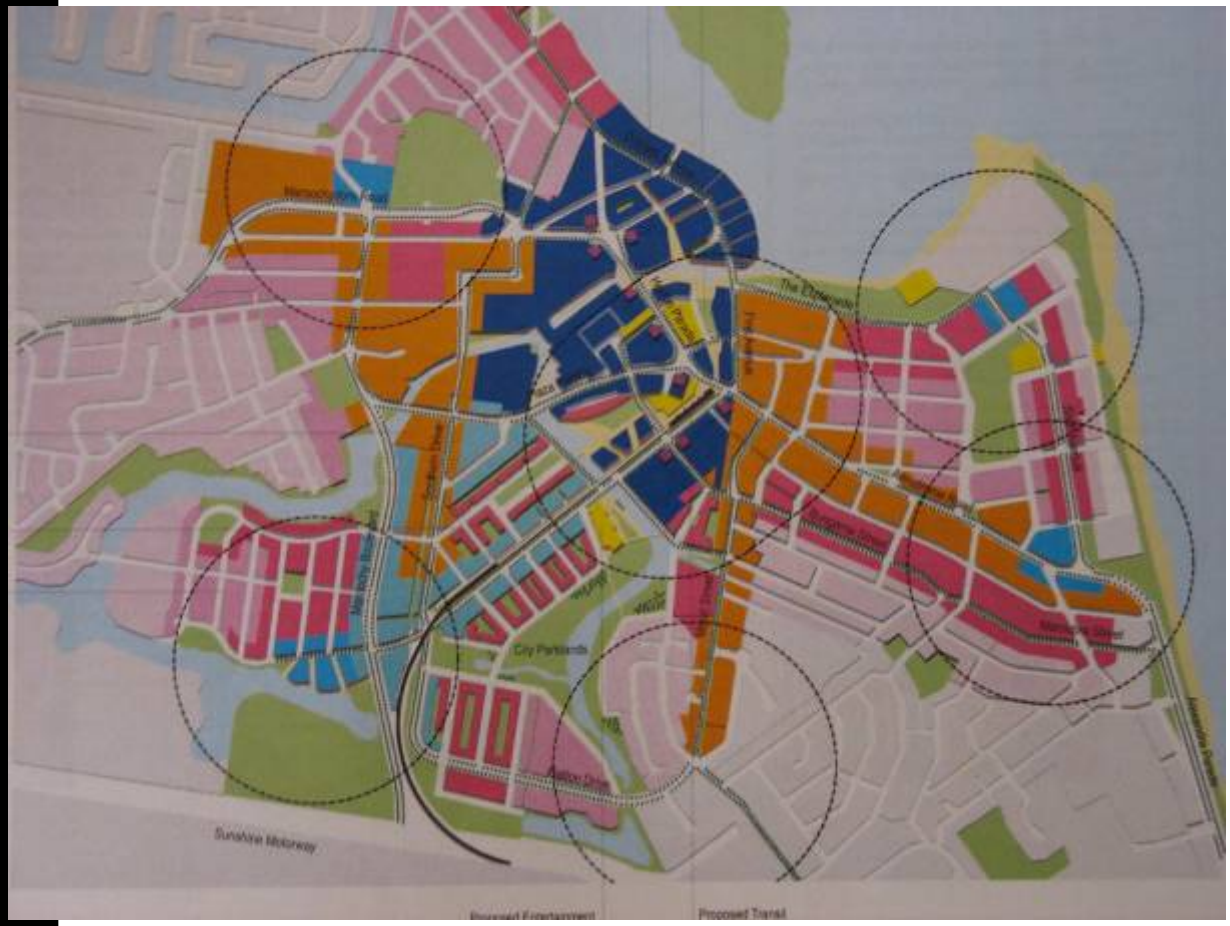
Context:

- *1.5 hours north of Brisbane*
- *One of Australia's fastest growing regions*

1. Develop a City Centre <u>concept plan and TOD</u> in an existing "messy" centre

2. Identify appropriate role, function and location for <u>passenger rail</u> in new city centre

Maroochydore Challenges – Rail Integration



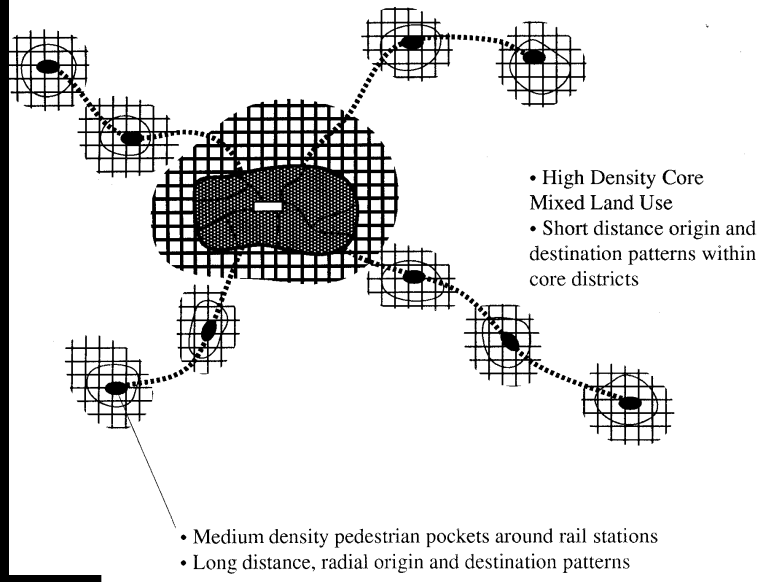
- Assessing rail re-alignment:
  - At grade
  - Elevated
  - Underground
- Maximise benefit to CBD, rail and prospective development of the Golf Course

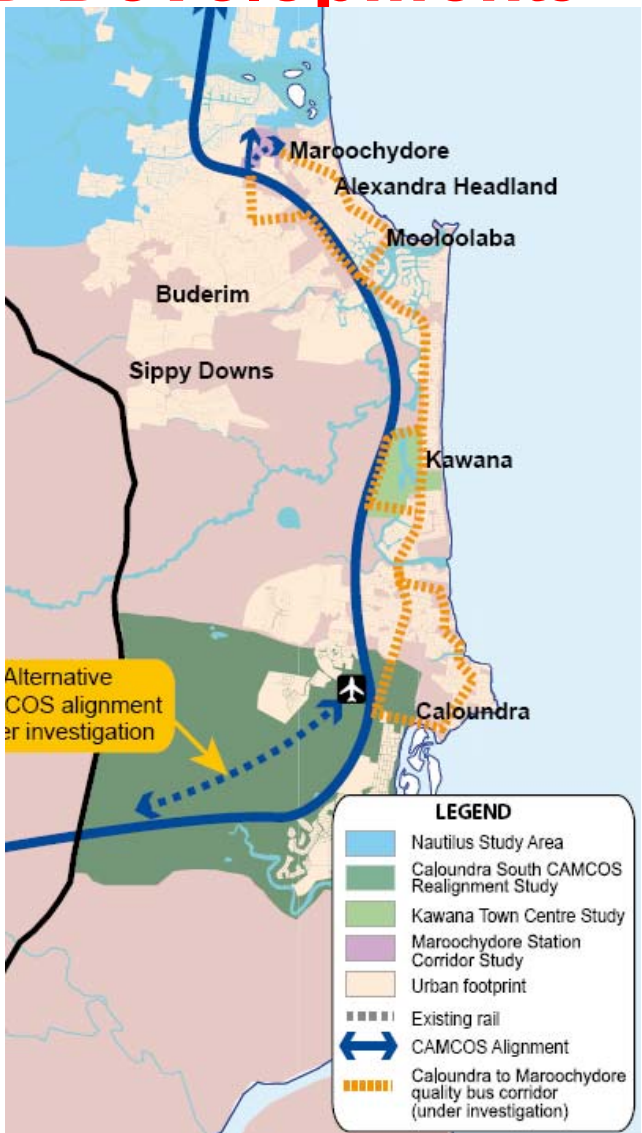
Maroochydore: Drivers and Context

- Population growth (275k now to 450k by 2026)
- Lack of connectivity and major congestion looming
- Chaotic development – disconnected development
- Lack of "city heart"
- Threat other centres out compete (eg Caloundra/ Kawana)
- Major infrastructure planned/committed
  - New multi-modal corridor, major regional hospital,
  - Major new passenger railway – CAMCOS - $3B and 40km spur
- Desire for:
  - Mixed uses, improved civic and public spaces
  - "A real city centre" for the Sunshine Coast
  - Improved public transport and specifically rail connectivity

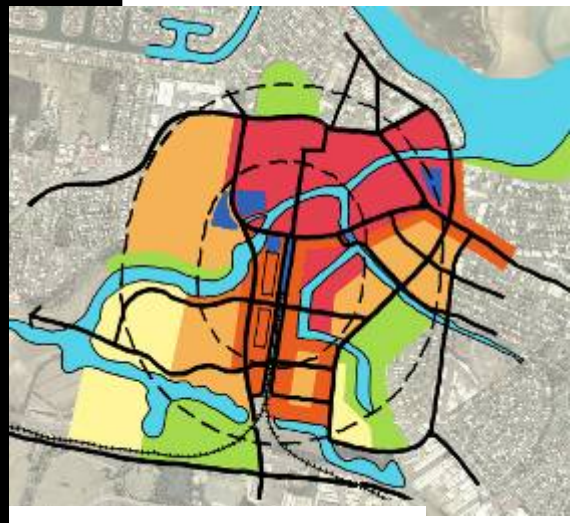
Sunshine Coast
Major Transit and TOD Developments

- Pop'n growth
- New rail line planned
- Green field and urban renewal
- Poor alternative transport
- Requires complementary nodes and corridors



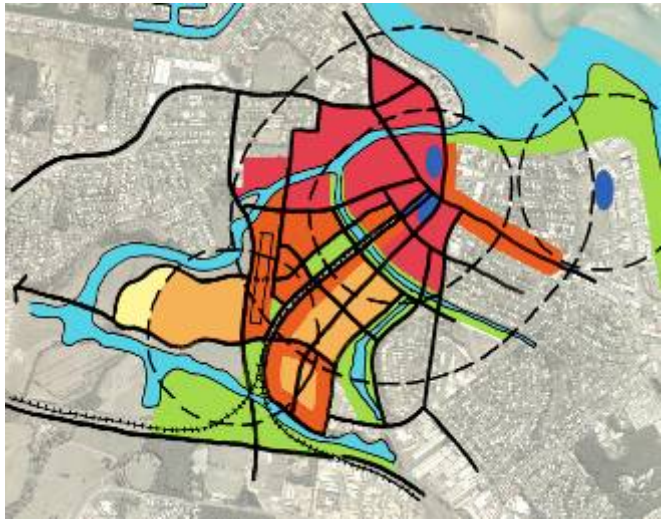


Maroochydore Options Evaluation



Option 2

Option 3



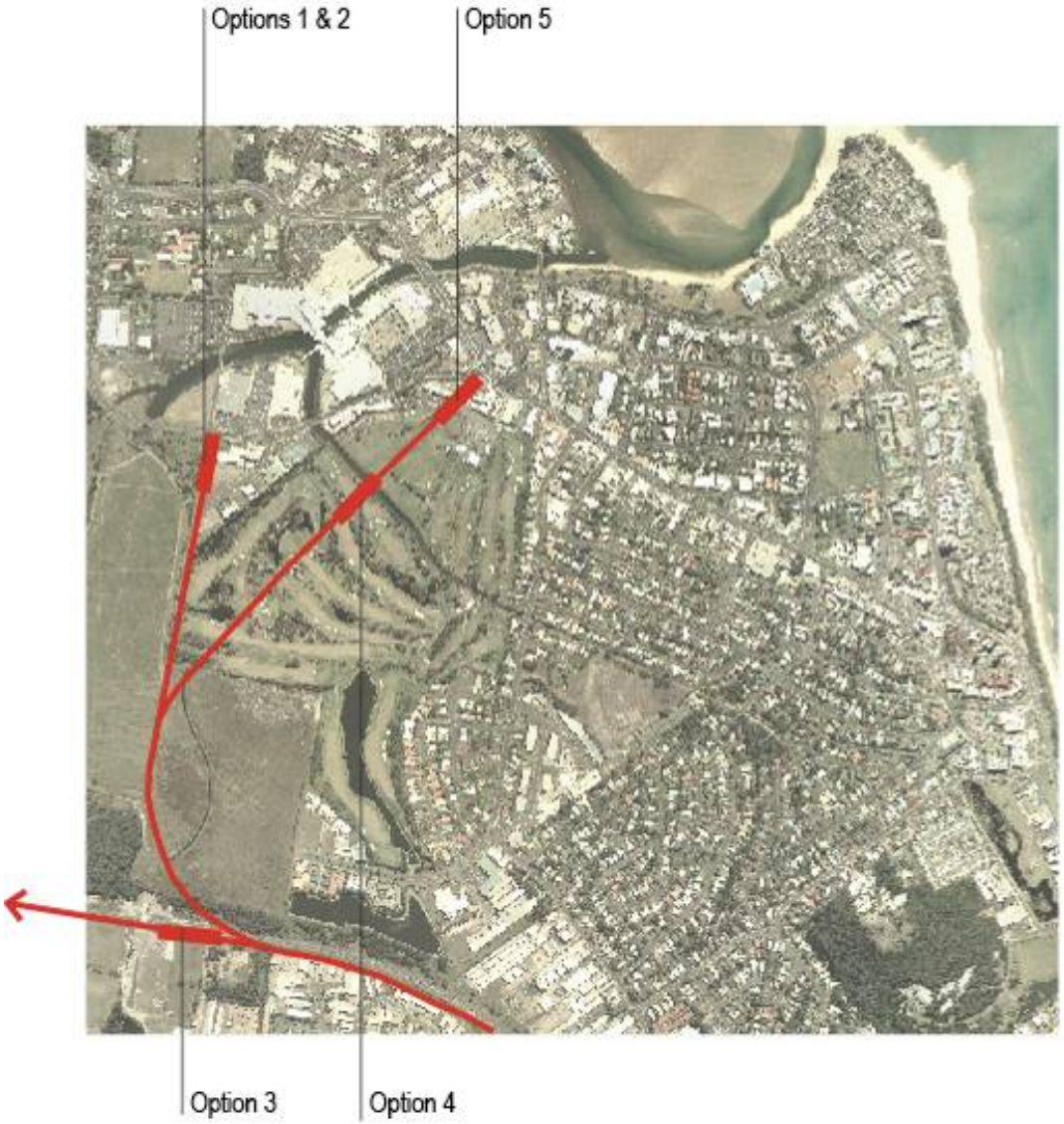
Option 5

Multi-criteria assessment of options:

- Land use
- Transport
- TOD / placemaking
- Environment
- Engineering

Option		Description	Station Location	Primary Catchment	Development Focus	Street Connections	Potential Yield
1							
2							
3							
4							
5							

Concept Plan Rail Options Tested



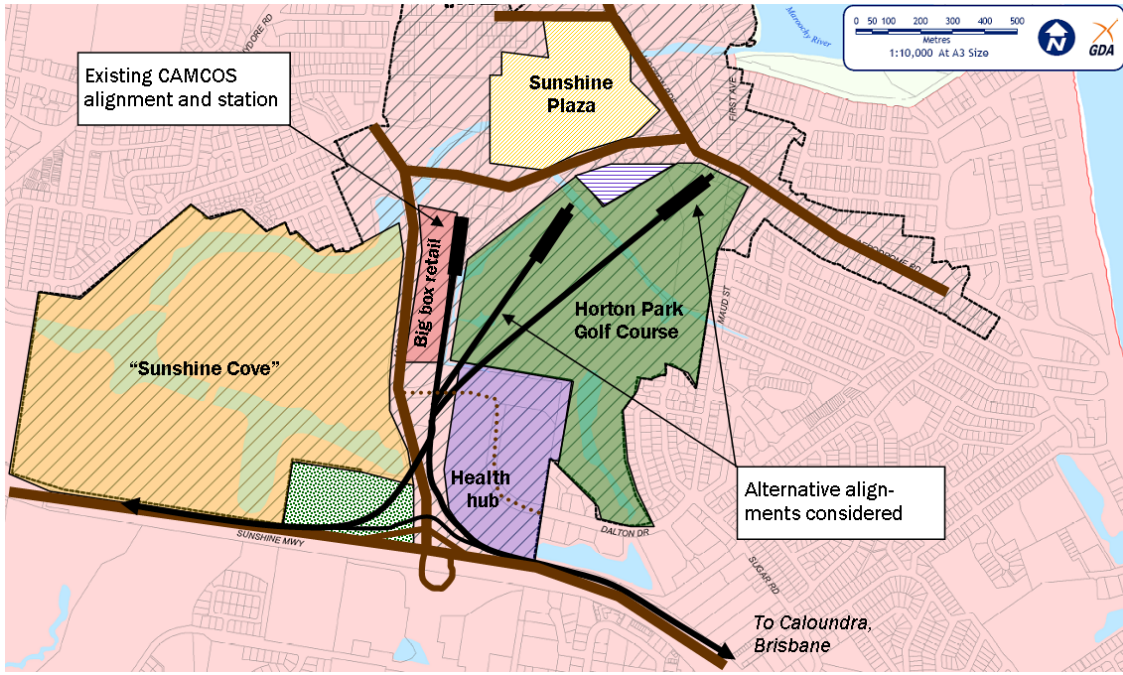
- Option 1 and 2 – current alignment (at grade and elevated)
- Option 3 at motorway
- Option 4 and 5 (at grade, elevated and underground)

- Recommended Option 5 - elevated

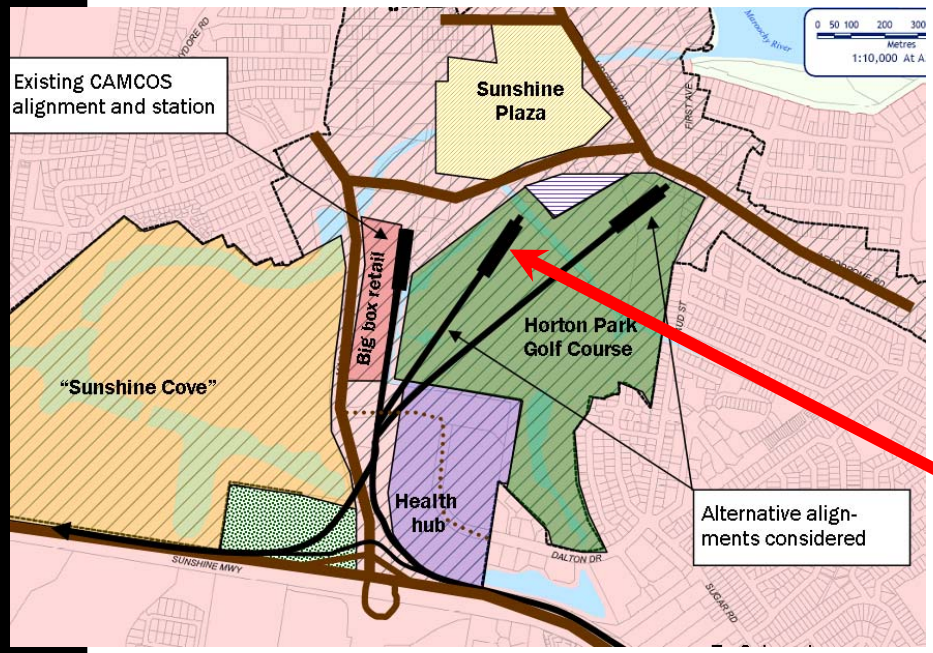
Develop some concept options with stakeholders…. .

Maroochydore Rail Alignment Options

- 7 alignments tested:
  - Existing alignment
    - At grade
  - Alternative 1 - Concept Plan
    - At grade
    - Elevated
    - Underground
  - Alternative 2 – at edge of golf course
    - At grade
    - Elevated
    - Underground

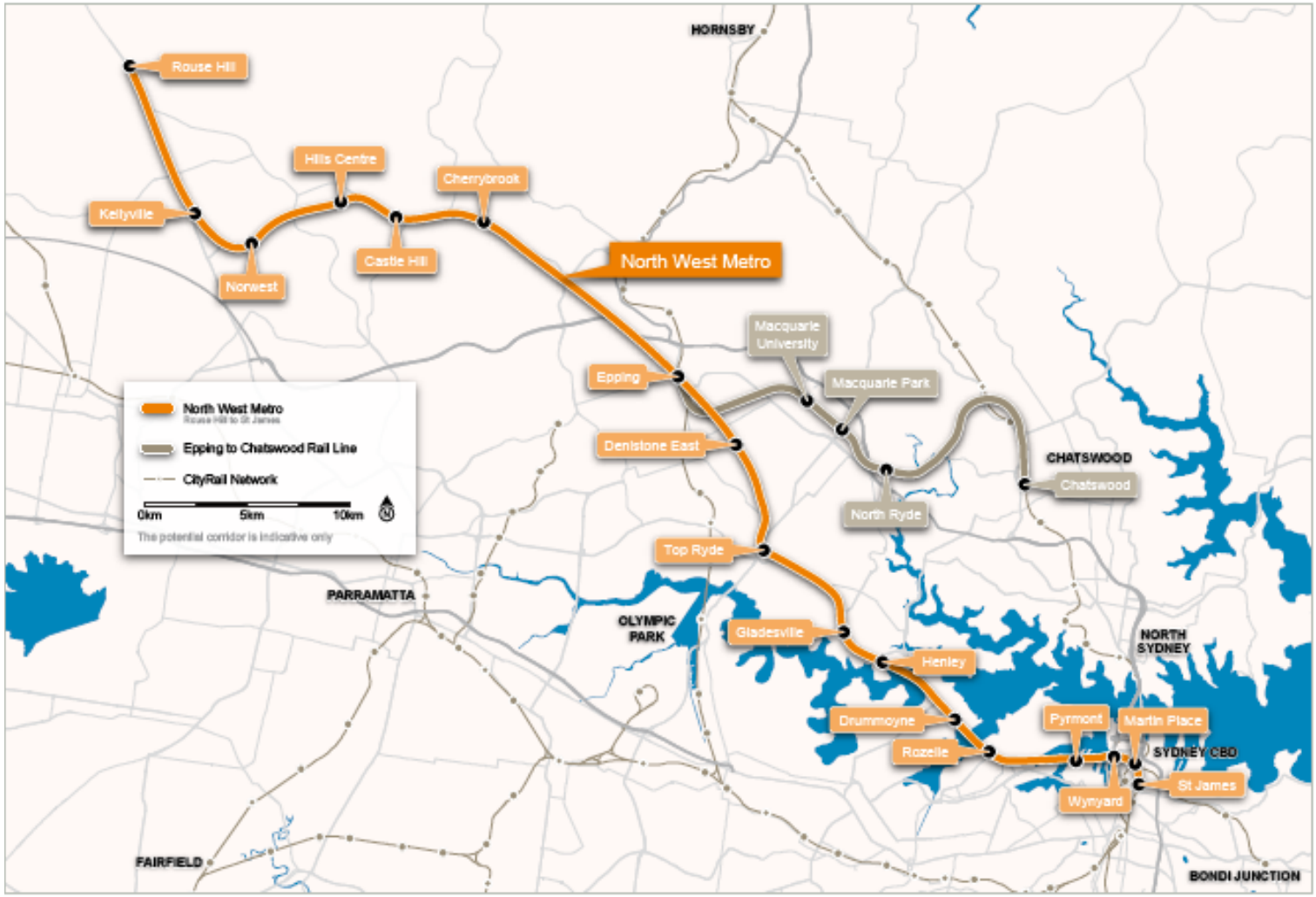


Recommended Rail Alignment

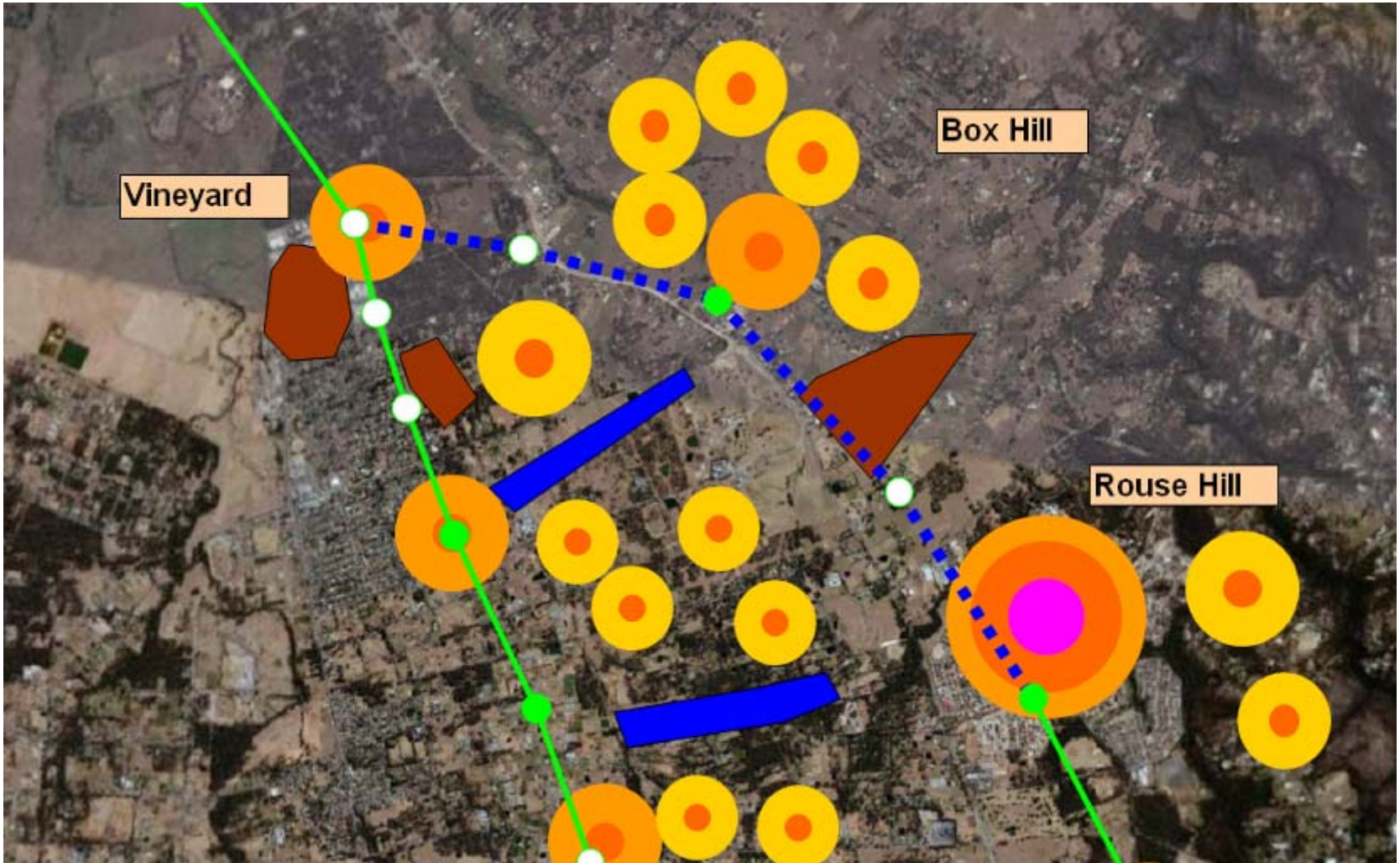


1. At edge of town centre – more flexible development
2. Station mixed use TOD
3. Elevation alignment improves connectivity
4. ***2nd best performance from TOD Trips scenario testing***
5. Enables Golf Course redevelopment
6. No additional water crossing (reducing cost)

Case #3: Sydney Northwest Metro Proposed Route



Sydney NW Metro corridor – TOD Trips Modelling



Sydney – Northwest Metro

- $12 billion proposed 38 km underground metro
- Sydney CBD to outer fringes existing development (Rouse Hill)
- TOD Trips used to evaluate entire corridor potential land uses and transit patronage
  - corridor alignment
  - station locations
  - density

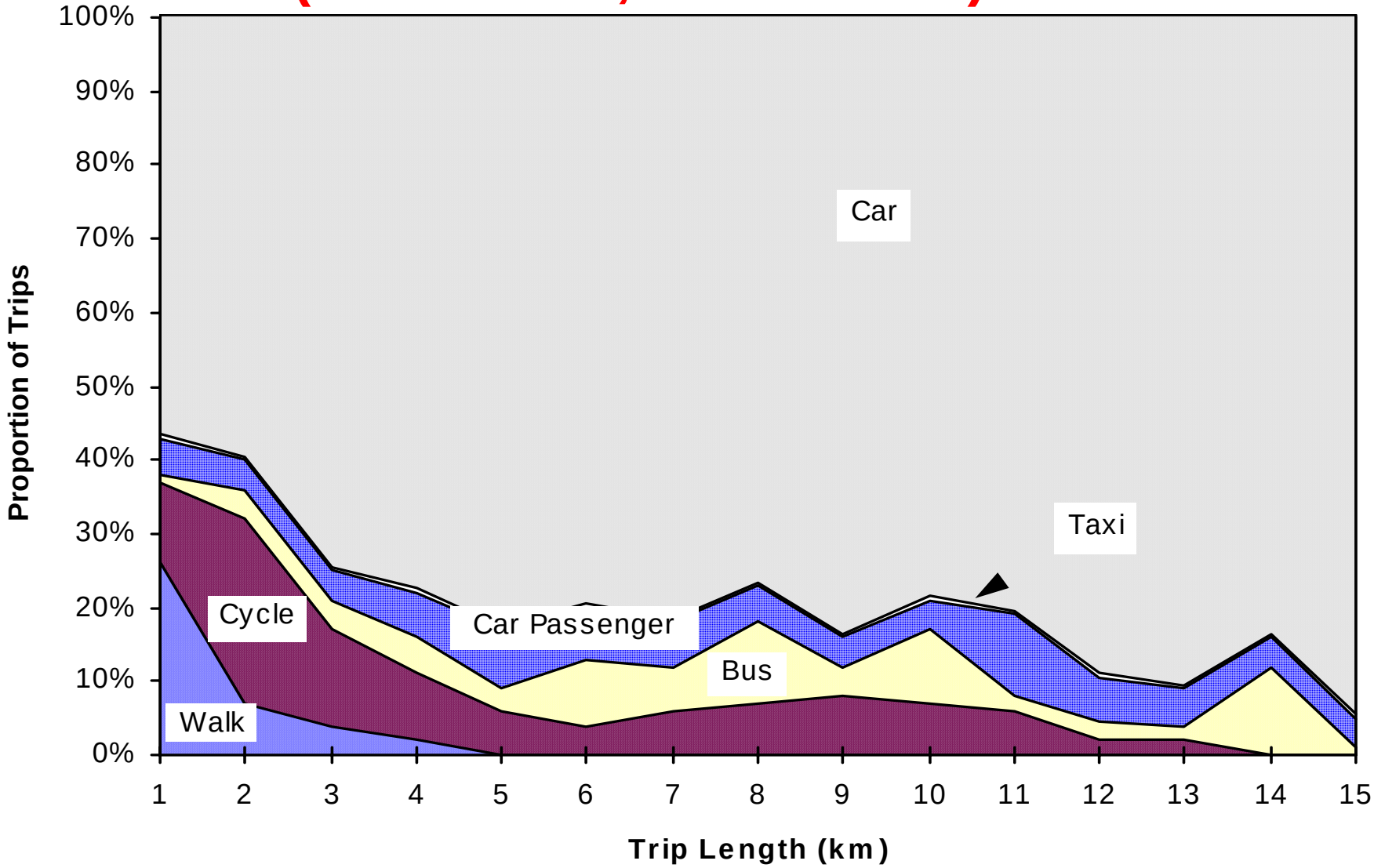
➢ Proposed route is on hold due to change in state leadership and funding concerns (likely proceed with inner city portion)

TOD Trips - Summary

- Highly flexible, requires less time and budget
  - setup 4-6 weeks for model and less than 1 minute to run (typical model takes 8 hours)!
- Greater understanding of interaction between transit networks and master plans
- Quantifies what has often been too difficult:
  - housing mix, retail/commercial mix, transit patronage and transit operating costs, transport energy and CO2 emissions.
- Useful for developing/testing scenarios
- Improves client/team understanding
- Useful for greenfield/urban renewal site and corridor

END

Typical trip length by mode (Christchurch, New Zealand)



Source: 1991 Home Interview Surveys for CTS Model