CREATING LIVABLE COMMUNITIES: A CASE STUDY OF THE HEARTLAND SITE SOMERSET WEST

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ABSTRACT

Heartland Properties are currently developing 700 ha of land (called the Heartland Site), in the Somerset West area. The site is within the urban edge of Cape Town and is to be developed as a mixed use development comprising residential, commercial, educational and recreational land uses.

The developer and his professional team have committed themselves to a coordinated spatial, urban design and transport planning approach. Using the above approach, a reduction in both the number and length of trips can be achieved. The distribution of land uses can have a major influence on total transport needs, car ownership and use, the availability of alternative ways to travel and the effectiveness and viability of public transport.

Government's Policies are to encourage public transport, walking and cycling over the use of the private car. The paper presents a case study of how the coordinated spatial, urban design and transport planning approach can provide a transport system that will reduce the present excessive dependence on the private car, while providing a more efficient transportation service that supports, rather than impedes the development of a livable community.

1. INTRODUCTION

This paper provides a case study of the Heartland Site in Somerset West, Cape Town. The philosophy of the professional team working on the planning of the site is to facilitate the development of a "work, live and play" environment. Fundamental to the generation of such an environment was the integration of transport and land use planning to ensure the production of development scaled to human needs, with excellent access to public transport and non-motorised transport facilities, while still allowing an appropriate level of car access. International president was considered in the planning and development of the site and from such it became apparent that a reconsideration of the traditional traffic impact assessment model was necessary if the focus of transport planning was to shift from the provision of adequate capacity for cars and instead provide for a range of transport options. Fundamental to this reconsideration was a change in the method of trip generation and modal split.

The paper starts with a review of the international literature, identifying the recent trends in both transport and land use planning and the current move towards integrated transport and land use planning. The South African context is described through a discussion of relevant transport planning and traffic impact assessment policies. From this conceptual and policy basis, the site specifics are considered, with an elucidation of the specific means used to generate the more appropriate trip generation rates and modal split. The paper concludes by considering the infrastructure plan for the site and how it integrates transport and land use planning to achieve the philosophical ends desired by the planning team.

2. LITERATURE REVIEW

2.1 Context

Land use and transport systems are inextricably linked and accordingly if one is to change, the other must respond. Land use planning decisions have a significant impact on transport needs, car ownership and public transport viability (Queensland Department of Transport). Transport technology and planning has a similar impact on land use, influencing the locational demands of businesses and households (Vuchic 2000 and Queensland Department of Transport).

In many respects, both land use planning and transport planning have failed to provide positive urban environments. Increasingly, many cities are faced with serious traffic congestion, declining public transport networks and residential and business environments that are mono-functional and sterile.

Historically, land use planners have attempted to separate different land uses. This thinking has its basis in the unpleasant mixed use areas of cities that grew rapidly during the industrial revolution. The split between residential and industrial areas was originally facilitated by the development of transport technology which allowed people to travel the increased distances necessary to live away from their place of work. This desire to separate different land uses in order to maximise the benefit that each can derive from its location has guided land use planning until fairly recently, particularly within the South African context. In addition to the over separation of land uses, planners have also been responsible for focusing on planning for cars, which has resulted in urban environments which are built at very low densities with large road reserves and are not at a human scale.

Transport planning in many cities has focused primarily on the facilitation of car transport to the detriment of other modes of transport. The result has often been a decline in public transport systems and degradation of the pedestrian environment to the point that non-motorised means of transport are no longer feasible (Autler and Bezer 2002 and Vuchic 2000).

2.2 Reconsideration

Of late, there has been a demand for a change in the style of transport and land use planning resulting from the variety of negative externalities arising from an over dependence on cars. From a transport perspective the major problem is increasing traffic congestion; often exacerbated by a lack of alternative means of transport and a need to travel due the separation of land uses.

As our understanding of the environment has developed, it has become apparent that the reliance on the car, with its internal combustion engine, is not sustainable. This unsustainability has two elements: the first, is the production of greenhouse gases that are a by-product of the combustion of either petrol or diesel; the second, is the finite nature of these fuel reserves and the increasing demands being placed on these reserves as more fuel is demanded by growing economies.

Concerns have developed within the urban planning profession regarding the quality and liveability of many modern urban environments. The claim is made that many of the newer environments are mono-functional and sterile and fail to meet the needs of people who work and live in them. Of particular concern are the effects of urban sprawl, which results in loss of valuable farm and environmental land, increasing travel times, decline in transit ridership, increasing crime levels, decline of CBD areas and a host of other social ills (Litman 2005).

These concerns have lead to a reconsideration of the traditional separation of land uses and resulted in the ideas of new urbanism which is focused on the development of mixed use urban environments focused on encouraging transit ridership and non-motorised transport. The primary cause of sprawl and its negative externalities is the low density of many new developments. The need to accommodate cars in large numbers exacerbates the problem of low density as further land is required for road reserve and parking. Low densities reduce the population in an area, impacting on the viability of public transport and commercial and retail activity. The result is the development of big box retail centres, to which people have to drive, and the decline of public transport networks as high frequency services are not economically viable with low population thresholds. The result is that people are forced to drive more often and further, thereby exacerbating traffic congestion and fuel consumption with its attendant problems (Belzer and Autler 2002).

Apparent from the foregoing is the need for better transport systems that offer a range of transport options without maximising any one. To complement these transport networks there is a need for better human environments that minimise the distances that people are required to travel in order to access the goods and services, social networks and recreational opportunities that are necessary for ever day life. Additionally, these new environments should facilitate the development of all modes of transport, particularly non motorised modes of transport that have a limited environmental impact (Vuchic 2000 and Queensland Department of Transport).

2.3 Integrated Transport and Land Use Planning

In order to achieve this end, there is a need for integrated planning that considers both transport and land use together in order to develop urban environments which support a range of transport options and at the same time meet the needs of the people who use them. Such planning is necessary if truly sustainable cities are to be developed (Vuchic 2000).

Transport planning needs to consider solutions to transport problems in an integrated and systemic manner. The basis for this needs to be the integration of different modes of transport and the acceptance that there is not one form of transport that should be dominant, but rather a range of options should be offered. Of particular importance is the need to ensure that car dominance in transport planning no longer prevails and, instead, means are found to make public transport more efficient and convenient and non-motorised forms of transport are planned for and the use of such is encouraged (Vuchic 2000).

In order to produce the types of urban environments that support public transport and non-motorised transport usage, three factors must be improved: density, mix of land use and pedestrian friendliness. Higher density environments are able to support a range of retail, commercial and transport services. The result is that people live closer to the retailers and service providers that they need to access on a regular basis and can often do so using non-motorised means of transport. Higher density results in more people using an area, which equates to more potential transit users. Increased demand for transit results in more frequent services with attendant increasing efficiency and convenience; thus, encouraging more users. In the United States a general correlation between density and public transport usage has been identified, with a 10% increase in density result in a 5% increase in public transport usage (Millard-Ball and Tamlin 2003).

Mixing of land uses allows people to access all of the goods and services that they require without having to travel long distances. The result is that people are often able to access the retail, commercial and service activities that they use on daily basis using non-motorised transport; hence, reducing the number of vehicle kilometres travelled. Additionally, mixed land use encourages the use of public transport as people do not feel the need to have a car at work as they do not have a sense of being “stranded” when they are able to access all of the goods and services that they require (Transport Research Board 2002).

When mixed land use and higher density are correctly combined, ensuring that commerce, retail and services are located close to public transport routes and terminals, a further incentive for public transport use is found. In such cases public transport users are able to consolidate trips. It becomes possible to drop the children at school or crèche on the way to the transit stop or on the way home it is possible to purchase essential groceries and collect the laundry while walking home. If people are required to use their cars for one leg of their trip it is most likely that they will continue to use the car for the rest of their journey (Transport Research Board 2002).

If the urban environment is not pedestrian friendly then all of the above will have been wasted. In order for public transport facilitation measures to work and for non-motorised means of transport to be used, the pedestrian environment has to be such that people are prepared to walk. If the pedestrian environment discourages walking people will not use public transport as all public transport trips have an element of walking and regardless of how close goods and services are to places of work or residence people will still drive (Transport Research Board 2002, Victoria Department of Transport and Vuchic 2000).

2.4 International Examples

The problems identified above have been a concern for transport and land use planners for a number of decades and attempts have been made throughout the world to provide the solutions outlined above. When combined correctly these solutions have proved to be highly successful in the development of quality urban environments. Below are some examples of interventions and developments which have been highly successful.

Munich in Germany was one of the most congested cities in Europe during the 1950s and 1960s. In the late 1960’s a multimodal transport plan was developed for the city. The plan was comprised of the development of a regional rail system (S-Bahn), an underground rapid transit system (U-Bahn), streets around the city centre were improved and traffic flow in the city centre was impeded and some of the most congested streets pedestrianised. By the early 1970s a 12% shift in modal split in favour of transit occurred for travel into the central area. Since the 1970s car ownership has remained high in Munich but the modal split has continued to change in favour of transit usage (Vuchic 2000).

Melbourne in Australia has been rated as one of the most liveable cities in the world. This is due, in no small part, to the Melbourne Metropolitan Strategy. The strategy set a series of priorities to boost the attractiveness of Melbourne as a place to ‘live, work, invest and do business”. Part of this strategy was an integrated transport plan that ensured that land use and transport planning contributed to produce an urban environment with high levels of accessibility, using a range of modes of transport. Melbourne integrates train, tram, bus and car transport to ensure high levels of public transport access and acceptable levels of car access. Much work has been done on the production of pedestrian areas within central

Melbourne and new layouts for suburban residential areas have been developed that focus on producing mixed use areas that facilitate pedestrian and transit trips (Vuchic 2000).

There is no doubt that integrated transport and land use planning can be effective on a city wide scale but it can also be effective at a smaller area scale, improving the liveability of an area within a city. This can be seen from the effectiveness of a number of new urbanist projects and transit oriented developments.

In Washington and Portland in the United States, transit oriented developments that aggressively promote transit have experienced an average increase in transit ridership of 58%. Not only has ridership increased in these developments but there has also been a change in car ownership patterns in these developments. Only 35% of households in transit oriented developments own two cars as opposed to 55% for the city as a whole (Litman 2006).

Orenco Station transit oriented development on the outskirts of Portland has significantly higher transit usage rates than the rest of the region with 22% of residents regularly using transit as opposed to 5% for the rest of the region (Litman 2006).

A comparison of two neighbourhoods in Chapel Hill, North Carolina in the United States indicates that residents of the new urbanist neighbourhood made 22% fewer car trips and were three times as likely to walk as residents of a similar (in relation to size, location and demographics) neighbourhood (Litman 2006).

There is no doubt that integrated land use and transport planning can result in significant changes in travel patterns, with a shift from car dependence to higher levels of transit ridership and non-motorised transport usage. These changes can affect far reaching improvements in terms of liveability by reducing time spent commuting and increasing accessibility, while improving the quality of the urban environment.

2.5 The South African Context

Currently, within South Africa, and more specifically the Western Cape, a change in travel patterns is taking place. There is an increasing move away from traditional public transport modes such as buses and trains to taxis. The Western Cape has the highest rate of car access in the country with 45% of households having access to cars. Nationally, 60% of households that have access to cars spend nothing on public transport. This indicates that these households us the car exclusively as their means of transport. Clearly, there is a shift to road based transport. The effect of this is increasing congestion in the urban areas (National Household Travel Survey 2003). South Africa has not reached the same point as the United States where more than 90% of households have access to cars and transit usage is as low as 5%. It is still possible to encourage people to return to transit, which they have a history of using.

3. A REVIEW OF SOUTH AFRICAN GOVERNMENT POLICY

It appears that there is something of a disjuncture within government policy between the objectives of government in relation to the promotion of public transport and the requirements for traffic impact assessments. The *Manual for Traffic Impact Assessment* (DoT 1995a) provided by the Department of Transport requires trip generation rates (for car trips) to be produced through the analysis of existing similar developments or the use of the *South African Trip Generation Rates* Booklet. Modal split, is produced by observing existing modal split for similar developments within the area. Essentially, this ensures that the existing situation of car dominant planning is enforced for future developments by ensuring that the current trip generation rates and modal split, with associated low dependence on public transport, is maintained. This has implications for the road network and parking areas that must be developed to meet the future demand. The problem is exacerbated by the demand that the 75th percentile demand be used, further exaggerating the over design of road infrastructure.

On the other extreme, Government policy also calls for an increase in public transport usage and a prioritisation of public transport over private vehicle usage (*National Land Transportation Transition Act* of 2000) with the aim of shifting modal split. The Western Cape, *Moving Ahead: Cape Metropolitan Transport Plan* (Cape Metropolitan Council 19980 has suggested a policy of staged target modal splits and aimed to achieve a modal split of 66:34 (public:private) by 2005. Additionally, *Moving Ahead* calls for a reduction in trip length.

Clearly traffic impact assessment policy is at odds with the governments stated public transport policy. It will be impossible to shift the modal split in favour of public transport if future transport planning is required to cater for private transport demand at the current level. Such planning will produce an environment which is dedicated to providing for private car usage and not for the needs of public and non-motorised transport users. Only when future demand is considered in the light of targeted modal split will transport planners be able to provide for the needs of public transport users.

4. THE HEARTLAND SITE APPROACH

Heartland Properties and the professional team responsible for the planning of the site are committed to the development of a mixed use township which would allow residents to "live, work and play" within its boundaries. This became the philosophy on which much of the decision making regarding the development of the site was based. Transport planning on the site was particularly focused on producing a transport network that accommodated a range of users but encouraged and facilitated non-motorised transport and public transport usage (HHO Africa 2005).

In order to achieve this end, it was necessary to make significant changes to the traditional method of traffic impact assessments (TIA's) in order to correctly present modal split. Traditional TIA's make use of overly generous peak hour vehicular trip generation rates, which provide an estimate of the number of peak hour vehicle trips generated by a development. The future traffic situation modelled using such rates provides no indication of public transport and non-motorised transport demand created by the proposed development. Accordingly, usage of traditional trip generation rates to model future road space demand results in an over supply of road space and parking. This has a particularly detrimental effect on the desire to increase the usage of public transport and non-motorised transport on the site.

4.1 Calculation of the Prevailing Modal Split

In order to present a complete picture of transport demand on the site, it was first necessary to calculate the prevailing mode split that would have been achieved through the use of the standard Department of Transport (DOT) trip generation rates. This was achieved by calculation the trip generation for each land use from first principles by:

- converting each land use to its peak period person generation,
- converting the peak period person trip generation to a peak hour person trip generation

- performing a peak hour person modal split between cars, public transport and walking/cycling
- converting peak hour person car trips to peak hour car trips using a vehicle occupancy

Peak period person generation rates were obtained from a report prepared by HHO Africa (HHO Africa 2001), while the remaining factors were based on prevailing conditions measured at other similar developments in the Cape Town metropolitan area. To date, these prevailing conditions have not been documented collectively and further research into these factors would greatly enhance this approach.

The prevailing modal split calculation for the proposed mix of land uses on the Heartland Site is indicated in Table 1. To assess the prevailing modal split, the predicted peak hour vehicular trip generation based on the Department of Transport trip generation rates, was compared with the peak hour vehicular trip generation produced using the alternative approach indicated above. The modal splits for each land use were adjusted to balance peak hour vehicular trips generated by the alternative methods. Once balanced, the prevailing modal split for each use became evident as well as the number of peak hour public transport and walking/cycling trips. Summing across land uses resulted in an overall prevailing modal split for the proposed mix of land uses for the site.

The prevailing weekday PM peak hour modal split for the Heartland Site, using the standard DOT trip generation rates and for the proposed mix of land uses on the site, was calculated at 33:67 (public:private). The prevailing mode split is vastly different from the 2005 metropolitan target of 66:34 (public:private).

TABLE 1: WEEKDAY PM PEAK – CALCULATION OF THE PREVAILING MODAL SPLIT

LAND USE	SIZE	Peak Period Person Movements		% in peak Hour	Peak Hour Move-ments	Car		Car				From Trip Generation Sheet		Bus, Taxi, Rail		Walk, Cycle	
		rate	people	%	people	%	people	occ	cars	cars in	cars out	cars in	cars out	%	people	%	people
Office	369000 m² GLA	20	18450	75%	13838	74%	10240	1.2	8533	1280 15%	7253 85%	1273 7	7214 39	21%	2906	5%	692
Industrial	216250 m² GLA	35	6179	65%	4016	40%	1606	1.2	1339	402 30%	937 70%	389 12	908 29	50%	2008	10%	402
School	10000 pupils	0.6	5500	80%	4400	75%	3300	1.4	2357	1179 50%	1179 50%	1200 -21	1200 -21	15%	660	10%	440
Retail	215000 m² GLA	20	10750	75%	8063	83%	6692	1.2	5577	2788 50%	2788 50%	2784 4	2784 4	12%	968	5%	403
Residential (middle inc)	9720 units	3.5	34020	65%	22113	68%	15037	1.4	10741	8055 75%	2685 25%	8019 36	2673 12	27%	5971	5%	1106
Residential (low income)	2430 units	3.5	8505	65%	5528	31%	1714	1.4	1224	796 65%	428 35%	790 6	425 3	49%	2709	20%	1106
		83404		57957		38589			29770	14500 29770	15271	14455 29659	15204	15221		4148	
						67%								26%		7%	

4.2 Target Modal Splits

Using the above approach, it was possible to do scenario testing. For a desired target modal split, it was possible to assess the implications that the modal shift would have for peak hour vehicle trip generation rates as well as for peak hour public transport patronage. The resultant peak hour vehicular trip generation rates could then be used to plan appropriate road, parking and public transport facilities, all of which would be geared towards achieving the target modal split i.e. appropriate road and parking space provision, so as not to entice excessive car usage and adequate public transport capacity and service to accommodate desired public transport usage.

Tables 2 indicates the effect on peak hour vehicle trip generation rates and vehicle usage when the modal split for the site is changed to align with government targets for modal split (2005 Target of 34% for private transport usage from *Moving Ahead*). Table 2 indicates that a 31% reduction in number of people using car as a transport mode, would be required to achieve these targets. Acknowledging that modal split changes occur over a long period, it was agreed that an interim target modal split would be established for the Heartland Site. Table 3 indicates the effect on peak hour vehicle trip generation rates and vehicle usage when the modal split for the site is changed to the agreed target of 50:50 (public:private).

When the car trip generation rates produced for the lower modal splits are compared to the trip generation rates provided by the Department of Transport (DoT 1995a), the difference becomes apparent. The decrease in the number of cars being planned for, results in a decrease in the size of road and parking facilities for the site. This in turn, assists in the production of a site that is scaled to the human being and encourages the use of non-motorised transport. Additionally, information regarding public transport demand allows both the developers and the public authority to plan and cater for this demand.

TABLE 2: CoCT 2005 TARGET MODAL SPLIT OF 64:36 PUBLIC PRIVATE

LAND USE	SIZE	Peak Period Person Movements		% in peak Hour	Peak Hour Move-ments	Car		Car				Resultant Trip Generation Rates		Bus, Taxi, Rail		Walk, Cycle	
		rate	people	%	people	%	people	occ	cars	cars in	cars out	cars in	cars out	%	people	%	people
Office	369000 m^2 GLA	20	18450	75%	13838	43%	5950	1.2	4958	744	4215	0.20	1.14	47%	6504	10%	1384
										15%	85%	1.34					
Industrial	216250 m^2 GLA	35	6179	65%	4016	9%	361	1.2	301	90	211	0.04	0.10	76%	3052	15%	602
										30%	70%	0.14					
School	10000 pupils	0.55	5500	80%	4400	44%	1936	1.4	1383	691	691	0.07	0.07	41%	1804	15%	660
										50%	50%	0.14					
Retail	215000 m^2 GLA	20	10750	75%	8063	52%	4193	1.2	3494	1747	1747	0.81	0.81	38%	3064	10%	806
										50%	50%	1.63					
Residential	9720 units	3.5	34020	65%	22113	37%	8182	1.4	5844	4383	1461	0.45	0.15	53%	11720	10%	2211
										75%	25%	0.60					
Residential	2430 units	3.5	8505	65%	5528	0%	0	1.4	0	0	0	0.00	0.00	75%	4146	25%	1382
										65%	35%	0.00					
		83404		57957		20622			15980	7656	8325			30290		7046	
										15980							
						36%								52%		12%	

TABLE 3: HEARTLAND SITE TARGET MODAL SPLIT OF 50:50 (PUBLIC:PRIVATE)

LAND USE	SIZE	Peak Period Person Movements		% in peak Hour	Peak Hour Move-ments	Car		Car				Resultant Trip Generation Rates		Bus, Taxi, Rail		Walk, Cycle	
		rate	people	%	people	%	people	occ	cars	cars in	cars out	cars in	cars out	%	people	%	people
Office	369000 m^2 GLA	20	18450	75%	13838	57%	7887	1.2	6573	986	5587	0.27	1.51	33%	4566	10%	1384
										15%	85%	1.78					
Industrial	216250 m^2 GLA	35	6179	65%	4016	23%	924	1.2	770	231	539	0.11	0.25	62%	2490	15%	602
										30%	70%	0.36					
School	10000 pupils	0.55	5500	80%	4400	58%	2552	1.4	1823	911	911	0.09	0.09	27%	1188	15%	660
										50%	50%	0.18					
Retail	215000 m^2 GLA	20	10750	75%	8063	66%	5321	1.2	4434	2217	2217	1.03	1.03	24%	1935	10%	806
										50%	50%	2.06					
Residential	9720 units	3.5	34020	65%	22113	51%	11278	1.4	8055	6042	2014	0.62	0.21	39%	8624	10%	2211
										75%	25%	0.83					
Residential	2430 units	3.5	8505	65%	5528	14%	774	1.4	553	359	193	0.15	0.08	61%	3372	25%	1382
										65%	35%	0.23					
		83404		57957		28736			22208	10746	11462			22176		7046	
										22208							
						50%								38%		12%	

5. HEARTLAND SITE INFRASTRUCTURE PLAN

The professionals involved in the planning of the site considered the production of a liveable urban environment in which people could “work, live and play” to be essential. Accordingly, transport planning was integrated and integral to the infrastructure plan for the site. The road network provided forms the structure for much of the area and is provided at an appropriate scale due to the targeted modal split used in the trip generation process. Also integral to the planning of the site and the road network was the need for public transport and a positive pedestrian environment. Cognisance was taken of the importance of a positive pedestrian environment in encouraging public transport usage and reducing the number of vehicle trips inside the site. The plan considers the need for a range of road and transport conditions and accordingly provides an activity spine and linking roads which will carry the bulk of the traffic allowing the development of quieter areas in the site. Through the use of appropriate transport facilities, a legibility is developed for the site.

The effect of land use on transport demand and modal split was considered and in keeping with the macro design philosophy an urban design and land use framework was developed which encourages a modal split in favour of public and non-motorised transport. Of particular importance was the development of a mix of land uses, complemented by suitable density that would allow a high level of walkability. Additionally, land uses such as schools, which are fundamental for trip reduction, were included in the land use budget and planning.

The public transport network was designed so that no location would be more than 400m away from a public route (Refer to Figure 1). The resultant network offers nearly 100% coverage of the development at 400m. The local public transport network is planned to be integrated with public transport facilities and networks in the surrounding area. Such integration ensures that the public transport demand stimulated through the integrated land use and transport planning of the Heartland Site positively impacts on public transport usage in the region as a whole.

The public transport, pedestrian and bicycle infrastructure and services that are being considered to service this development include:

- Upgrading to existing public transport interchanges at the nearby railway stations.
- The provision of public transport interchanges that are integrated into the proposed activity / business centres to facilitate the efficient transfer of passengers and minimise walking distances.
- Embayments and shelters at bus / minibus taxi stops along all public transport routes on the site.
- The provision of public transport priority measures along public transport routes.
- The provision of a right of way for a future light rail transit facility along specific alignments/activity spines.
- The provision of feeder services railway stations and the proposed public transport interchanges.
- The provision of a high frequency bus/taxi services along the public transport routes
- An extensive bicycle/pedestrian network within the site and safe linkages to major destinations beyond the site

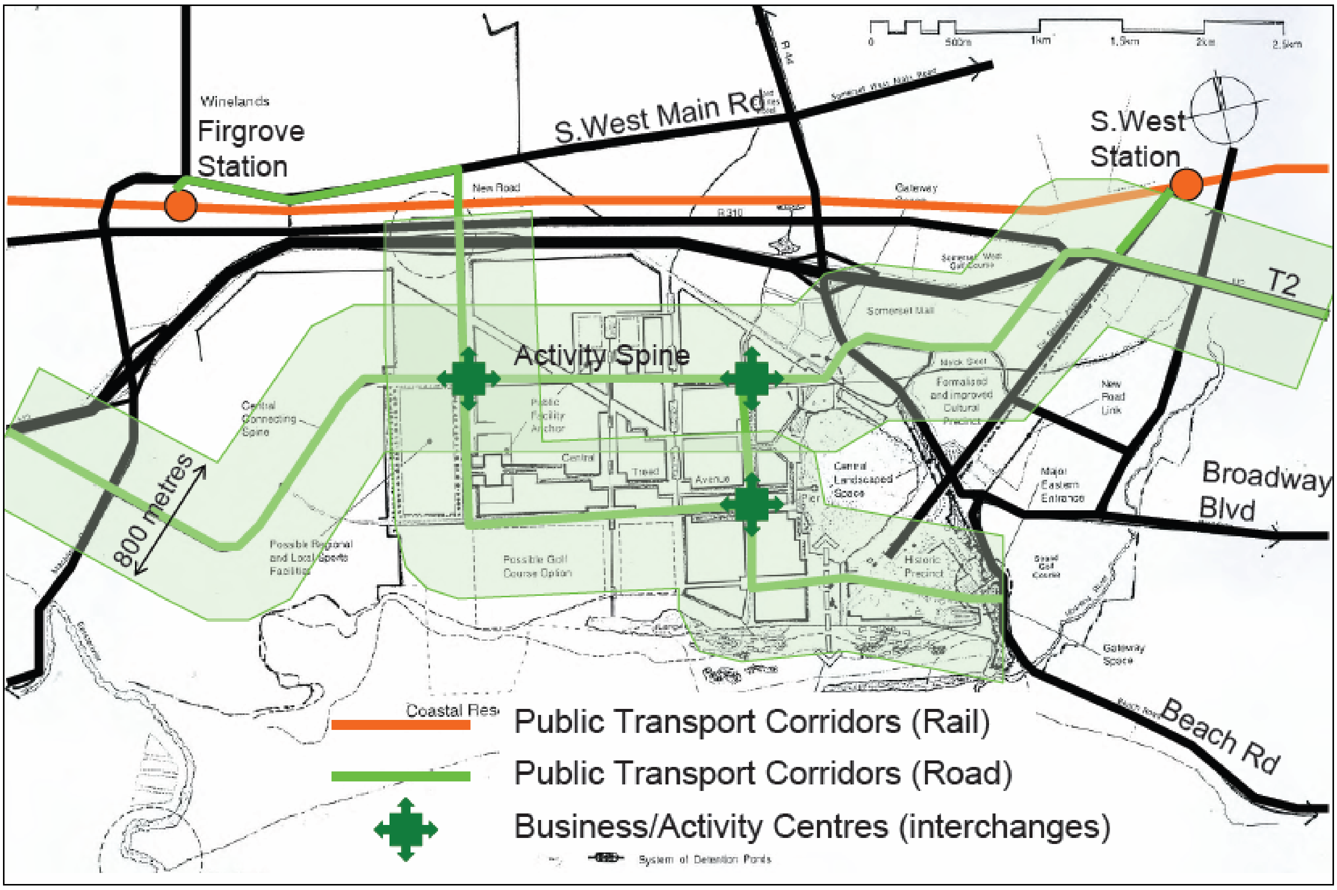

FIGURE 1: LAYOUT OF THE HEARTLAND SITE INDICATING PUBLIC TRANSPORT NETWORK

6. CONCLUSION

The integration of transport and land use planning offers the potential to produce positive environments which are at a human scale while at the same time providing high levels of mobility. Fundamental to this process is the shift in transport planning away from a focus on providing for car users only and instead balancing the needs of all transport users. In order to achieve this end at the Heartland Site, it was necessary to reconsider traditional traffic impact assessment techniques and instead produce a transport impact assessment. Such an assessment allowed the development of a composite understanding of all transport needs and not simply those of car users. With such a composite understanding is was possible to develop an infrastructure plan that can appropriately respond to these needs while producing a high quality urban environment which does not prioritise any single user to the detriment of other users.

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