



REPORT:

Planning and Design of Public Spaces to Support Ageing Well

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RESEARCH TEAM

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EXECUTIVE SUMMARY

The proposed project aimed at bringing together existing research strengths at The University of Adelaide in built environment and design; social sciences (geography and population); health (geriatric and gerontology); and computer science (mobile wireless sensing technologies). This is a first step toward a long-term goal to establish a new interdisciplinary research group in ageing well, focused on assisting older people to remain independent for longer, with quality of life and preferably in their preferred environment.

The specific research was a pilot study to develop and test an interdisciplinary methodology to investigate whether the planning and design of public spaces in Adelaide are appropriate and friendly for older people. Specific methods and research tools have been developed and tested in two types of public spaces, i.e. hospitals (The Queen Elizabeth Hospital) and shopping centres (Marion and Arndale Shopping Centres, Adelaide Central Market) involving 17 participants recruited from the hospital and 45 people recruited at the shopping centres. These methods and tools include:

1. Built environment audit (observation, measurement, recording and visualization of data)
2. Walking observation of research participants at a hospital (observation and recording of physiological measures such as heart beat, skin conductance (to indicate stress level), acceleration (to indicate walking ability/speed) using a 'smart' wristband, and recording of physical activities (e.g. walking, resting, sitting) of the participants)
3. Questionnaire survey and semi-structured interviews with research participants following the walking observations
4. Semi-structured interviews with older people at shopping centres/market
5. A smart phone application (App) to record and visualize the data from the walking observation
6. A tablet application (App) for the built environment audit

Evaluations of the above methods and tools are discussed in this report. Key findings including both the positive and negative outcomes of the investigations of the age-friendliness of the above case study buildings are also reported. These findings highlight aspects of the built environment that need to be addressed in any future development of public spaces to ensure that they will support active participations of older people.

This pilot study is expected to lead to the following activities:

- Submission of ARC Linkage (with Office for the Ageing, SA Health, Renewal SA, LGAs (e.g. Unley, Adelaide, Holdfast Bay)) to investigate whether, and how far, our public spaces have been planned and designed to be all-age inclusive and the improvements that need to be made.
- Submission of ARC Linkage to investigate the value of green space and its impact on health and wellbeing of older people (could also be extended to focus on general public)
- Comparative study of frailty, wellbeing and the built environment in low, medium and high density cities for older people in Adelaide, Nagoya and Hong Kong (with Professor Prof Kuzuya from Nagoya University and Professor Jean Woo from Chinese University Hong Kong).

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1. INTRODUCTION

Recent statistics and population projections show that the proportion of people aged 65 years and above (often termed as 'older people') in Australia is steadily increasing. In 2012, older people made up around 14% of the total Australian population and it is projected that this will increase to 16.5% by 2022 and to 18.8% by 2032 (ABS 2017). Older people, as their younger counterparts, want to continue their participation in community and daily activities. Such participation has been found to contribute to successful ageing (Sugiyama and Thompson 2007) while familiarity with their living environment, area and its facilities were regarded as "important factors contributing to people's day to day lifestyles" (Olsberg and Winters 2005, p79).

There are, however, several factors that can negatively influence older people's physical activities, social interactions and mobility, particularly in public spaces. These include poor signage, confusing spaces, and poor paving and curbs (Phillips et al. 2013, Stahl et al. 2013), lack of convenient facilities (Humpel et al. 2002), ill-maintained road and facilities (Bedimo-Rung et al. 2005), lack of perceived safety (Booth et al. 2000), and high levels of pollution (Singhal and Siddhu 2014).

Standards and guidelines have been developed which recommend these barriers are removed, e.g., Government of South Australia (2012), Sarkissian and Stenberg (2013) and Australian Local Government Association (2006). These guidelines, while comprehensive, require further implementation strategies when applied to a certain development. Studies found that due to conditions such as reduced muscle strength, higher levels of fatigue, reductions in agility and coordination, and increased rigidity in the tendons, many older people still face barriers in public spaces despite them being designed according to guidelines. For example, older people require shorter paths, clearer signage, benches, shade, and low lighting levels (Loukaitou-Sideris et al. 2014, Phillips et al 2013, Cerin and Leslie 2008). Close investigations of the friendliness of our built environment to older people in Australia and how it impacts on their mental and physical health are currently still lacking.

This report presents a pilot study designed to develop and test an interdisciplinary methodology to investigate whether the planning and design of public spaces in Adelaide are appropriate and friendly for older people. A mixed methods research framework enabling the collection and analysis of both quantitative and qualitative data was implemented, supported with literature and theories relevant to the diverse disciplines of architecture and built environment, geography, gerontology, and computer science. Data were collected through observation, questionnaire survey, open ended interviews, built environment audit, and digital/computerised data acquisition and processing. Two types of public buildings that are frequented by older people: hospital and shopping centre/market, have been used as a case study. The study is expected to generate proof of concept that implementation of interdisciplinary approaches is essential in assessing and improving the planning and design of our public spaces. The study will also generate a basis to develop large research grant proposals involving external partners such as, Office of The Ageing, SA Planning and Local Government Authorities.

The report is structured as follows: relevant literature will be first discussed, followed by explanations of the research methods. Finally the results and future studies will be presented. This research was funded by the University of Adelaide's Interdisciplinary Research Funding scheme 2016-2017.

2. LITERATURE REVIEW

Research on age-inclusive public spaces, and in particular the relationship between older people and the built environment, is a relatively recent and emerging field. Much of the existing literature presents reviews of previous work, assessment frameworks or research methodologies, and pilot studies or validation exercises.

A significant amount of studies take a macro-level approach in investigating the different relationships between urban and neighbourhood design, and the health, wellbeing, physical activity and social inclusion of older adults. Relatively few studies investigate specific aspects of the physical environment with which space users come into contact (e.g. foot paths, road crossing, etc.). Existing survey tools and research methods largely reflect the current focus of the field.

2.1. Guidelines and Standards for age-friendly built environment

There have been a number of guidelines and standards developed within and outside Australia that address principles to improve public spaces, neighbourhoods, buildings and constructions to ensure that older people can fully utilize those spaces. At the international level, ten years ago the World Health Organization (WHO) developed a guideline for achieving age-friendly cities (WHO 2007). The WHO defines an age-friendly city as a city that “encourages active ageing by optimizing opportunities for health, participation and security in order to enhance quality of life as people age” (p. 1) where determinants to active ageing include personal, behavioural, social, economic, health and social services, and physical environments. The guideline specifies eight main topic areas that must be addressed to achieve an age-friendly city:

- Public spaces and buildings.
- Transportation
- Housing
- Social participation
- Respect and social inclusion
- Civic participation and employment
- Communication and information, and
- Community support and health services.

(WHO 2007, p. 9)

The outdoor and indoor environments are considered to have major impact on older people's mobility, independence and quality of life in cities, and particularly on their ability to 'age in place' (or to live as long as possible in one's own home). The guideline specifies 11 sub-set areas to be addressed in the topic of 'public spaces and buildings':

- Pleasant and clean environment
- Importance of green spaces
- Somewhere to rest
- Age-friendly pavements
- Safe pedestrian crossings
- Accessibility
- Secure environment
- Walkways and cycle paths
- Age-friendly, barrier-free buildings
- Adequate public toilets, and
- Appreciation of the needs of 'older customers'.

(WHO 2007, pp. 12-17).

Based on the WHO guideline, over 500 cities around the world have developed their specific guidelines, for example, *Placemaking for an aging population: Guidelines for senior-friendly parks* was developed by UCLA

Luskin School of Public Affairs (Loukaitou-Sideris et al 2014). In Australia, the Australian Local Government Association has developed and published *Age-friendly built environment: Opportunities for Local Government* (Australian Local Government Association 2006). Within South Australia, there are three guidelines for age-friendly living and neighbourhood, all of which address the eight determinants for active ageing as described in the WHO's document above. These guidelines are: (1) *Age-friendly Living: Guidelines for Residential Development*, which focuses on the physical environment and communities in new housing projects; (2) *Age-friendly Neighbourhoods: Guidelines and Toolkit for Local Governments*, which focuses on assisting local governments to achieve age-friendly communities; and (3) *Age-friendly South Australia: Guidelines for State Government*, which focuses on age-friendly policies, plans, programs and services (Government of South Australia 2012). In addressing public spaces and buildings for age-friendly living, the Guidelines also relate to *Housing Design Guidelines* by Housing SA (2017); *Liveable Housing Standards* by Department of Families, Housing, Community Services and Indigenous Affairs (FaHCSIA) or now Department of Social Services (Livable Housing Australia 2012); *Australian Standards 1428 – Design for access and mobility* (Standards Australia 2009); and *Building Code of Australia / National Construction Code* (Australian Building Code Board 2016). They also relate to the design principles for *Health Spaces and Places*, a landmark project developed by Australian Local Government Association, the National Heart Foundation of Australia, Planning Institute of Australia and Australian Government Department of Health and Ageing (2013); and *Green Star Communities*, an environmental rating tool developed by Australian Green Building Council (GBCA 2017). In South Australia, councils such as the Cities of Unley, Mitcham and Salisbury have adopted the above three guidelines. Unley Council was the first council in South Australia to be named an age-friendly community by the World Health Organization (in 2013).

There also exists guidelines and tools specific to the environment of health care facilities. In 2006, the National Ageing Research Institute (NARI) developed an audit tool, *Improving the environment for older people in Health Services*, for the Victorian Government Department of Human Services (2006). The document consists of a comprehensive tool to conduct a general audit of all types of inpatient and centre-based health services, audit of rehabilitation services, audit of individual spaces, and night-time audit. The general audit includes aspects such as audit of external areas, parking, entrances and hallways, flooring, furniture, bathroom/toilets, signage, and comfort. While this audit tool was intended for health service facilities, much of the content is also relevant to other types of public spaces and buildings. More recently, the Facility Guidelines Institute developed *Guidelines for Design and Construction of Hospitals and Outpatient Facilities* (FGI 2014). The document provides comprehensive guidelines for various types of hospitals (e.g. general, psychiatric, children's), and ambulatory care facilities (e.g. primary care facilities, outpatient surgical facilities, dental facilities).

While Standards and Guidelines to achieve age-friendly built environment, including public spaces, open spaces, and buildings, are abundant, little evidence exists on their uptake, implementation and effectiveness. We do not know how effective the Standards and Guidelines are in supporting older people to age well so that they can have “full opportunities for health, participation and security”.

The following will look into a number of studies that have been conducted to address the above question.

2.2. Urban design: specific public space, transport, infrastructure

Internationally, there is growing interest in the design of cities to support the ageing population. In both established and developing countries, ageing-in-place is considered ideal as it can often support maintenance of existing social networks, feelings of safety and stability, knowledge of and access to services, which all in turn support the health and wellbeing of older people. While the shapes of our cities take many different forms, from high-density in parts of Asia to lower-density across many suburbs in the USA and Australia, many of the planning and design issues that are becoming apparent with increasingly ageing populations are similar.

Several studies have sought to examine how the built environment of open and public spaces supports or hinders social inclusion of older people. Glass and Balfour (2003) hypothesize that neighbourhood environments affect healthy ageing – they can either impose barriers or facilitate adaptation. An environment that is scarce in opportunities can become unwieldy for older people while an environment rich in services and amenities, with appropriate urban forms or land use patterns, can contribute positively to healthy ageing. In high density Hong Kong, public open spaces present an important opportunity for leisure and “extension of living space” (Yung et al, 2016, p114). Yung and colleagues (2016) argue that while the physical and safety needs of older people in public space have largely been taken care of through the provision of design guidelines, their social needs are not as well considered in the design of these environments. The authors found, from analysis of qualitative data from eight focus groups across two districts in Hong Kong (n= 66), that

the participants value the following characteristics of their public opens space: presence of social and physical activities, community and life facilities and services, social network, as well as a clean and pleasant environment. The authors also recognise and comment on the elders' existing connections with the built environment and established social networks, and how this supports a strong sense of community and belonging. The implicit connection with neighbourhood and broader environment of older people in Hong Kong is also examined by Lum et al (2015) in a survey of low income older people across four different housing estates (n =400). They found that, even when health condition declined to the point where independent living was not ideal, older people within these districts still preferred to age-in-place. This preference was increased threefold when appropriate support was provided within the community (i.e. 'elderly centre' (Lum et al, 2015, p103).

While the use of the built environment by older populations varies across different cultural and geographical contexts, its importance in supporting social inclusion has also been demonstrated in studies from Europe to the US and Canada (Stobl et al, 2016; Hogan et al, 2016; Van de Berg et al, 2015). For example, Strobl et al (2016) found that, along with health, poorly constructed municipal infrastructure presented a major barrier to participation amongst older adults in Germany. The authors conducted eleven focus groups (n= 78) with a diverse range of participants aged from 65 to 92 years old. Specifically, analysis of the qualitative data revealed that safety (i.e. traffic conditions and personal safety), and lack of appropriate and accessible public facilities (e.g. insufficient restroom facilities in public spaces) were some of the main factors relating to the built environment that prevented participation. When asked to prioritise changes that would support their participation in social activities, key themes included ease of access to local shopping and services through well-developed traffic and pedestrian infrastructure and safety (Stobl et al, 2016, p150). In a similar manner, Hogan and colleagues (2016) examined relationships between characteristics of urban design and the 'happiness' of adults (from 25-85 years old) in Berlin, Paris, London, New York and Toronto (n= 5,000). For older adults (n= 685), characteristics of 'performance' (e.g. quality of government services) contributed more to their happiness than characteristics of 'place' (e.g. aesthetics, opportunities experience the city culturally and socially) which are more important to younger adults. This finding likely reflects the increased use of services (e.g. health care facilities, etc.) by older people. While this study did identify board characteristics of cities that contribute to happiness across all age groups of adults, it did not take a specific look at elements of the built environment that support older adults to age-in-place or access services per se. Finally, Van den Berg et al (2015) examined locations that supported social activity of older people in the Netherlands. From analysis of social event dairies kept by 213 older participants over two days, the authors identified four cohorts: those that mostly socialised at home, those that socialised in community centres (including churches), those that socialised in 'third' places (e.g. outdoor public space, shops and other service locations) and those that did not record any social contact. Interestingly, the cohorts that socialised at community centres and 'third' places were more likely to live in low density areas unlike the non-social cohort that were more likely to live in high density urban areas. They were also more likely to be highly mobile (walking, driving, cycling and driving) than the non-social cohort who were less mobile (Van de Berg et al, 2016, p10445).

Several international studies (Oswalk Beiler et al, 2016; Sirchuae et al, 2016) and Australian (Engels & Lui, 2013; Buys et al, 2012) have sought to examine the role of transport networks in the mobility, independence and behaviours of older adults in more detail. Oswalk Beiler and colleagues (2016) developed a research protocol, Age-Restricted Community Connectivity Assessment (ARCCA), and tested it across two urban and rural locations in Pennsylvania, USA. Their methodology, ARCCA, largely consists of mapping transport and walking routes, and assigning classification of connectivity (or potential thereof). From the case study application, the authors concluded that the use of ARCCA can assist in promoting the mobility of older adults by informing planning processes. Note however, that the research protocol does not include any interaction with or survey of older adults themselves. Taking a similar macro-level approach, Srichuae et al (2016) surveyed older adults in three urban areas of Bangkok (n= 292) about public space, urban systems and their independence. They found that accessible transportation services, distribution of public space, urban density and urban development patterns were all important influences on the mobility of the participants. The importance of access to services and facilities within neighbourhoods and surrounding areas was also highlighted in two studies from Australia. Engles and Lui (2013) examined the travel patterns of older adults across three different urban locations in Melbourne, Victoria (n= 300). While some biases existed within the sample frame (weighted toward female, 'younger older adults', one of the three localities and socially active older people), they found that out-of-home travel patterns were very similar across the three locations and, overall, that they desired key services (i.e. supermarket, doctor, chemist, bank and post office) to be located within close proximity to the home (i.e. 0.5 to 3km). The majority of the participants retained their drivers'

licenses and it was noted that the older adults sampled would only use public transport if absolutely necessary. The authors conclude by making recommendations for the further development of planning policies and guidelines. Buys and colleagues (2012) report similar findings among a modest sample of older adults from Queensland (n= 24). They noted that private vehicle transport remained favoured by this cohort, even when suitable public transport alternatives were available. Using evidence from GPS transport-behaviour tracking and qualitative semi-structured interviews, the authors found four key factors influencing this preference: convenience, affordability, availability and health/mobility. Overall, notable themes that arose from these studies were: the need for services to be located within neighbourhoods or at least within adjacent area; that clear and accessible routes to these services were required; that while private vehicle transportation remained favoured, raising wider concerns about older adults' capacity to drive as they aged; and that public transport remained a less viable option, particularly in typical low density suburbs in Australia.

2.3. Neighbourhood: environment, characteristics, design

At a finer grain level, a significant body of work seeks to identify how aspects of neighbourhood contribute to outcomes across independence, social inclusion, social capital, health and physical activity of older residents (Alidoust & Bosman, 2015; Yen et al, 2009).

2.3.1. Perception of neighbourhood

Alidoust & Bosman (2015) conducted a systematic review of studies on neighbourhood characteristics and social health of older adults. While this study focuses on the outcome of social inclusion, it provides useful categories for examination of neighbourhood characteristics. They are safety, density, walkability, accessibility, green spaces, third places (i.e. not home or work/school), streets and soft edges. With a similar focus on neighbourhood characteristics, a study was conducted in three suburbs in metropolitan Perth (Wood et al (2008)) that investigated the associations between social capital and aspects of the built environment, particularly on the walkability as determined by street network design and the mix of land uses. The study was conducted through focus groups, telephone interviews of 113 residents, audit of the neighbourhoods using SPACES (Systematic Pedestrian and Cycling Environmental Scan) audit instrument, and environmental data collection using Geographic Information System (GIS). The study found that the built environment had significant but small effect on social capital and feelings of safety in the neighbourhood, particularly in relation to the number of perceived adequacy of destinations.

In a qualitative study based on semi-structured interviews of 202 participants aged 75-69 years, Mackenzie et al (2015) found that older Australian's who were more strongly identified with, and felt connected to, their neighbourhoods had more positive perceptions of their homes and communities. The authors suggest that this may mean that they would be better able to remain in their home despite increasing disability or frailty. The study underlined the findings by Yen et al (2009) who reviewed the literature on the contribution of neighbourhood environments to the health of older adults. In a similar study based on telephone interviews of 609 residents in Atlanta, Wood et al. (2010) examined the associations between sense of community, neighbourhood characteristics and walking. The authors found associations between sense of community and leisurely walking, home ownership, seeing neighbours and the presence of interesting sites. However, interestingly the perceptions of steep hills and mixed used buildings were negatively associated with sense of community despite the fact that there is a health benefit from walking uphill.

2.3.2. Physical activity

A number of studies have been conducted in Australia and overseas to investigate the relationship between physical activity level of adults and older people and the characteristics of the built environment particularly of the open spaces. Based on a large scale study involving more than 1800 adults in Perth, Giles-Corti & Donovan (2003) found that amongst a number of physical environmental independent variables, access to public open space, major traffic, presence of street trees, access to sidewalks and shops were all associated with levels of walking. A further study was conducted also in Perth with more than 1300 adults and involving surveys of over 2000 parks located within the radius of 1.6 km from the participants' homes (Sugiyama et al. 2010). The study found that shorter distance to the most attractive park (identified by the presence of shade, water features, walking paths, irrigated lawn, lighting, and sporting facilities) and higher attractiveness to the closest park were significantly associated with the number of walking activities undertaken by the participants, thus having an attractive park nearby would be conducive to leisure-time walking. On the other hand, larger sized attractive parks were significantly associated with walking a sufficient amount. In other words, a large attractive park in neighbourhoods, though not necessarily nearby to home, may help adults achieve the sufficient amount of time of physical activity.

A similar study was conducted in Adelaide involving more than 1000 adults (including older people) responding to postal surveys to examine the relationship between the presence of greenspace and likelihood of walking (Sugiyama et al. 2013). While the presence of greenspace was found to have association with initiating walking, the authors also found that proximity to green spaces as well as the large areas of green spaces have significant association with a higher likelihood of maintaining recreational walking over time.

Earlier in Great Britain, Sugiyama and Thompson (2007) conducted a study based on a questionnaire survey of more than 500 adults to understand mechanisms through which neighbourhood environments could contribute to health of older people. They found that neighbourhood environments, particularly open spaces lined with paths and trees, provided opportunities to be active and meet with others as well as enjoy nature, all of which contribute to older people's health. Interestingly, however, a study of more than 500 older adults in Oregon, USA, found no associations between walking or not walking and characteristics of the built environment (Nagel et al. 2008). However, amongst those who did walk, the amount of traffic and number of commercial establishments within the area were associated with time spent for walking. Similarly, in a study of nearly 2000 participants in Bogota, Colombia, Gomez et al (2011) found that certain neighbourhood characteristics particularly 'middle park areas', high connectivity, and perception of safety (from traffic) were associated with the amount of walking amongst the elderly population.

A study conducted in Atlanta, USA, based on data from Strategies for Metro Atlanta's Regional Transportation and Air Quality explored the relationship between residential density, street connectivity, land use mix, sociodemographic characteristics of people and likelihood of walking and being overweight (Frank et al 2008). The study found that people were more likely to walk if they lived in neighbourhoods with greater residential density, street connectivity and land use mix. Likewise, Marquet & Miralles-Guasch (2015), based on a CATI survey of 12,000 older people in Barcelona, Spain, investigated the association between neighbourhood vitality and walkability and active ageing. They found that participants residing in walkable neighbourhoods were more active and mobile than their counterparts living in less walkable neighbourhoods. They demonstrated that the built environment had a modifying effect on this relationship, which strengthened as people aged.

2.4. Streets: design, aesthetics, falls risk

While the presence of, and distance to, greenspace, street connectivity, greater residential density and neighbourhood vitality all have positive associations with physical activity (particularly walking) among older adults, the design and aesthetics of these outdoor spaces also play a critical role. The following studies demonstrate the impact of such factors on older adults, particularly in walking or being on the streets.

Ramachandran and D'Souza (2016) investigated the mobility of 75 older adults in Chennai City, India, and found that walking was one of the main forms of mobility, although hazards associated with walking were regularly reported, such as pavements in poor condition or non-existent, difficulty crossing roads, crowded roads and poor condition of roads. They also noted barriers to public transport use, including difficulty in boarding and alighting, not enough seating for older people in public transport and expense of other forms of transport such as rickshaws and taxis.

In a Melbourne study of more than 2000 adults aged 18 to 74 years old, Bentley et al (2010) compared the time spent for walking and features of the local environment, using the SPACES instrument. Features of each street segment were measured, supplemented by Geographic Information System data. They found that paths closer to roads, longer walking tracks, fewer driveways crossing walking tracks, greater number and variety of destinations, as well as having commercial views, are all associated with more walking.

Earlier, a qualitative study based on concept mapping was conducted in Toronto, Canada, to examine neighbourhood characteristics that have associations with mental well-being (O'Campo et al 2009). The study found highly rated items that contribute to good mental well-being are 'green area and natural environment' which include parks, green areas, trees, air quality, street lighting, walkable areas, good lighting, gardens, waterfront, and sidewalks. Moderate rated items include bikes paths and lanes, signage, traffic, and garbage on sidewalks and streets.

The risk of falling is perhaps one of the greatest concerns in providing walkable public spaces for older people. Braga et al (2016) found that fear of falling on sidewalks or while crossing the roads is a universal concern of older people. Experiencing falls often becomes a trigger for older people to remain at home instead of going outside (Lindquist et al (2016). In a walk-along study in the UK of 20 people over the age of 65, Curl et al (2016) identified specific aspects of the built environment that presented fall risk factors. They were change in

level, path condition and smoothness, path material, obstructions, road crossing, street lighting, and weather. The findings were aligned with those by O'Hearn et al (2015), who reviewed hospital admissions and police records, and found that older adults were involved in 21% of pedestrian crash incidents, often occurring while crossing the road around urban shopping precincts.

2.5. Methods and survey instruments

Previous studies to investigate the associations between older people and the built environment, public spaces and neighbourhoods have been conducted based on both qualitative and quantitative methodologies using various methods and using a number of survey instruments. The most common qualitative methods are focus groups and semi-structured interviews (e.g. Yung et al. 2016). Quantitative methods include large scale survey questionnaire (often with more than 2000 respondents), physical surveys or audits of the built environment supported by large scale data collections from existing databases, such as census data, and analysis using Geographical Information System. Survey questionnaires are often used to ask older people about their perceptions on the built environment and neighbourhood but such approach is often criticized on the grounds that reported perceptions can reduce apparent differences because people are often reluctant to admit that they live in a less desirable area (Dunstan et al. 2005). Such approach can also be prone to 'recall error' and 'same-source bias' (e.g. unhappy people are likely to rate their surroundings more negatively (Burton et al. 2011)). Both qualitative and quantitative approaches using both subjective and objective measures are therefore the preferred methodology in assessing the associations between older people and the built environment (e.g. Lord & Luxembourg, 2007; Shoval et al., 2011).

The following sections discuss a number of survey instruments developed or used by other researchers that can be relevant to the present study.

2.5.1. Survey instruments

Ruza et al. (2015) developed an assessment framework, based on the WHO's Guide for Age-Friendly Cities (WHO, 2007), to examine how well communities and the facilities within them meet the needs of older populations. They tested the framework in an urban area of California, USA. While the methodology appears to largely consist of mapping characteristics of the built environment and producing a scorecard weighted based on influences, they conducted focus group sessions with both older adults and senior health care professionals to validate and further illustrate the merit of such an approach.

Lin & Vernez Moudon (2010) present a review of 47 previous 'walking studies' where 18 used subjective measures, 11 used objective measures and the rest used both types of measures. Subjective measures are measures based on survey questions such as "are there any sidewalks in your neighbourhood?", or "are there groceries in your neighbourhood". Objective measures are measures based on actual measurable data, such as the objective measure of sidewalk length along major streets, or the number of groceries, within a certain distance from the respondent home. They found that studies using objectives measures of characteristics of the built environment were a better predictor of physical activity than subjective measures.

Dunstan et al (2005) developed an objective assessment method and proposed a tool, the Residential Environment Assessment Tool (REAT), to survey the built environment. It includes 28 items under the headings: physical incivilities, territorial functioning/personal investment, defensible space, natural environment and other items which were considered important but did not fit directly into any of these dimensions. The tool is used to assess a surveyed area, and a score is given to each of the items being assessed, and a total score calculated. While REAT is not specifically aimed at assessing issues experienced by older people in the built environment, it addresses issues worth assessing and provides suggestions on the items to be assessed in the present study.

Weich et al (2001) developed a survey instrument called Built Environment Site Survey Checklist (BESSC) to evaluate the effects of an urban regeneration programme on the mental health of local residents in north London. It assessed items relating to the house (e.g. form, age, number of stories), immediate outdoor space (e.g. size of gardens, balconies, parking area), surrounding areas (e.g. footpaths, open spaces, evidence of graffiti), and other amenities (nearest bus stops, schools). There was no specific assessment about the age-friendliness of the housing and neighbourhood, but some of the items being assessed were relevant to the present study.

Later Burton et al (2011) developed objective built environment measures specifically to investigate the links with older people's wellbeing and whether the built environment facilitates independence. The tool, Neighbourhood Design Characteristics Checklist (NeDeCC), was based on urban design literature, design

documents and existing measures. It was tested and validated through a study involving 200 older people living in a wide variety of rural-urban environments and different types of housing. The checklist comprises objective measures of the built environment within individual's experience, rather than a predetermined spatial or geographical unit, but only those that can be modified. It covers areas from the front door to the street and wider neighbourhood beyond within 300 meters of radius. This distance was based on an estimate of the average distance older people would be able to walk comfortably within 10 minutes. The checklist assesses aspects that address three categories of wellbeing: (1) functional place-related wellbeing, including amount of independence participants feel they have in life; perceptions of safety from traffic and non-motorised traffic, incidence of falling outside, perceived noise problems, perceived air quality); (2) social place-related wellbeing, including perceived community spirit, extent of social interaction, and perceptions of safety from crime (before and after dark); and (3) emotional place-related wellbeing, including self-rated quality of life, satisfaction with the neighbourhood as a place to live, perceived attractiveness of the neighbourhood, and enjoyment of trips in local neighbourhood.

It is interesting to note that, similar to the findings of other studies, Burton et al found that older people living in more green areas had greater satisfaction with their neighbourhood. Those living in higher density areas tend to feel less safe from non-motorised traffic whereas those in medium density areas tend to feel less safe from motorised traffic, both indicating the importance of adequate street and footpath designs and layouts.

2.5.2. Geographical Information System (GIS) and Goggle Street View

In recent years Geographical Information System (GIS) and Google Street View have been utilised in neighbourhood studies. Purciel et al (2009) present a methodology for using GIS to describe elements of urban design in order to relate back to health. They found good correlations between GIS and observed measures and concluded that valid urban design measures can be constructed from digital sources. Dujardin et al (2014) conducted a study to investigate the influence of the built environment on perceived health of older people in Brussels. The study was based on self-assessed health questionnaire, census data and GIS data of the street networks and green spaces. Similarly, Vine et al (2012) used GIS data, and supported the data collection by using activity diaries and semi-structured in-depth interviews to map the mobility of 12 older adults in Brisbane. Two weeks prior to the interviews, the participants were given a Global Positioning System (GPS) tracking device and paper diary and were asked to carry the GPS everywhere they went and to complete the diary daily. The participants' movements were then mapped onto GIS maps and analysed. Data from each of participants diaries and interviews were then compared and used to interpret the data on the GIS maps. Using such approaches the researchers were able to substantiate the subjective information from the participants (from the diary and interviews) with the objective map data. For example, the participant positive perceptions about their neighbourhood were supported by evidence from the map data showing that they indeed were mobile.

Clarke et al (2010) found that Google Street View can be a useful tool in gathering broader level data for a neighbourhood audit (e.g. recreational facilities, local food environment and general land use) but not a suitable tool for more finely grained observations. Rundle et al (2012) also used Google Street View to audit neighbourhood environment characteristics. Correlation tests between the data generated from field audits and the Street View data demonstrated reasonable agreement for approximately 50% of the items. While the two studies show that Google Street View is a useful tool for neighbourhood audit, they both indicate that further studies, such as field audits are still required when further details of the built environment and its associations to older people are required.

A study conducted in Vancouver, Canada, to assess transportation-related and overall physical activity of 178 older adults (Voss et al 2016) used accelerometers (ActiGraph GT3X+, 1 second epoch) and GPS (QStarz BT-Q1000XT, 1 second epoch) to record the participants' mobility in 7 days. Standardised physical assessments of the participants were performed (including stature and body mass). The participants were also asked to complete questionnaire about the environment, social interaction and general health. Using both devices the study was able to gain in-depth insights into trip characteristics, such as mean distance, speed, duration as well as modes of travel.

2.5.3. Use of accelerometers

While studies reviewed above used GPS to geolocate older people's movements or activity places or recorded the activities using subjective evaluations while the data collected were mapped into GIS, others conducted further studies to record the movements by using accelerometers. In Japan, for example, a study was conducted to evaluate the efficacy of a lifestyle intervention on improving quantity and quality of daily physical

activity (DPA) among 68 older women (Koizumi et al. 2009). The participants wore the accelerometers at waist-level for long periods of time (5 days) without interfering their DPA. Acceleration was sampled every 4 seconds and recorded at two-minute intervals. The level of activity was recorded and downloaded into an Excel spreadsheet. The activity categories were non-ambulatory (0), light (1-3), moderate (4-6) and rigorous (7-9). Earlier Auvinet et al (2001) conducted gait analysis of healthy adults and older people in France used accelerometers worn over the middle of the lower back of the participants. The recorded signals from the movements were transferred into a computer and the data were analysed using MATLAB 5. The walking speeds and distance were recorded and analysed against the participants' age and height, and the results were used to evaluate gait disorders and the possibility of falling among older people.

Chaix et al (2012) developed VERITAS (Visualization and Evaluation of Route Itineraries, Travel Destinations, and Activity Spaces), a web-based interactive mapping application to geolocate individuals' activity places, routes between locations, as well as experienced or perceived neighbourhoods. VERITAS was then used in the CURHA (Contrasted Urban settings for Healthy Aging) project, an international collaboration that developed a platform and research agenda to collect and analyse extensive data on daily mobility, social networks and healthy ageing outcomes of older people living in Montreal, Paris and Luxembourg (Kestens et al 2016). With the use of GPS and accelerometers, the study was able to map the number of activities per month conducted by participants, locations of the activities and distance from home as well as total trip length, and whether the participants depend on cars or were able to walk to the destinations. Based on the data collected the project developed: (1) models to predict walking trips and number of activities that could be conducted by older people in a certain area, (2) typologies of spatial mobility patterns, and (3) indicators for walkability and accessibility.

2.6. Summary

Within Australia and overseas, Standards and Guidelines have been developed to ensure that our built environment is age-friendly and works to facilitate older people as active participants in the community. Significant factors associated with the well-being of older people have been studied, which include the presence and amount of green space around the neighbourhood, neighbourhood density, variety of activities and facilities available, and the quality of the access to these facilities. Most studies found so far have been conducted at the neighbourhood level, using qualitative methods such as – semi-structured interviews, focus groups, activity diaries, as well as quantitative methods such as questionnaire surveys, neighbourhood audits both physical and using Google Street View, mobility recording using Geographical Positioning System (GPS) and accelerometers, as well as mapping using Geographical Information Systems. A

What we found missing are studies of older people's experience, perception, activity and mobility, at the micro-scale level as they navigate spaces within/inside a building and around the immediate areas of the building. Studies using GPS and GIS mapping are useful in a neighbourhood level, but may not be suitable for studies inside a building. While understanding the associations between the built environment and older people at the neighbourhood level is important in the context of facilitating active ageing, we believe it is as important to study such associations at the micro level of building-immediate surrounding and older people.

The next section will discuss the methods developed and tested in this pilot study, followed by presentation of the results.

3. RESEARCH DESIGN

Based on a literature review, particularly of the various methods that have been implemented in previous research, we have developed and tested a number of research methods and tools. A mixed method research design is considered the most appropriate approach to be implemented to interpret and understand the complex issues relating to investigating whether public spaces (in Adelaide) have been planned and designed to be age-friendly. As mentioned, two types of public spaces (buildings and surroundings) that are frequented by older people, i.e. hospital and shopping centres/markets, have been selected as case study to test the methods. The methods are as follows:

3.1. Built Environment Audit

Audits of the built environment outside and inside the case study buildings were conducted to examine whether the planning and design of the spaces (note: only the public areas such as car park, entrance and hallways, and public toilets) meet the Guidelines as discussed in the Literature Review. Two audit forms to assess the external and internal characteristics of the building were developed based on relevant items in the Guidelines (see Appendix 1) and instruments previously design and used by others. An audit checklist such as the one developed by Unley City Council (Unley Age-Friendly Retail Pilot) was also reviewed and relevant items from the checklist were incorporated into the audit form developed in the present study.

The external audit included the following:

1. Local amenity: to list available amenities (e.g. mail box, ATM, bus stop/shelter)
2. Current weather conditions: to note the weather conditions at the time of the audit
3. Route characteristics: to note conditions of the routes or paths that may be used by (older) people. These include:
 - a. Type of path (e.g. pavement, various types of paths, disjointed path)
 - b. Slope (e.g. level, slight gradient)
 - c. Path conditions (e.g. smooth, rough)
 - d. Path materials (e.g. paving blocks, cobbles, grass)
 - e. Maintenance of path (e.g. insufficient, reasonable)
 - f. Path usability (e.g. one person wide, two persons wide)
 - g. Permanent/semi-permanent path obstruction (e.g. poles, signs, tables)
 - h. Temporary path obstruction (e.g. litter, leaves)
 - i. Steps and handrails (e.g. present, absent, occasional)
 - j. Benches or seating (e.g. present, absent, occasional)
 - k. Maintenance of seating (e.g. insufficient, reasonable)
 - l. Waste bins along the path (e.g. present, absent, some)
4. Safety and wayfinding:
 - a. Road crossing aids (e.g. zebra crossing, lights)
 - b. Traffic control devices (e.g. roundabouts, speedbumps)
 - c. Speed limit of adjacent roads (to note)
 - d. Bicycle lanes (e.g. shared with pedestrian, separated, absent)
 - e. Social environment (to note)
 - f. Wayfinding and signage (e.g. adequate, inadequate)
 - g. Surveillance (e.g. observation from 75% of the buildings, from 50% of the buildings)
 - h. Street lighting (e.g. paths are well lit, insufficient lighting)
 - i. Type of lighting (e.g. High pressure sodium, metal halide)
5. Aesthetic characters:
 - a. Overall aesthetic impression (to note)
 - b. Litter (e.g. a lot, some, none)
 - c. Dog waste (e.g. a lot, some, none)
 - d. Vandalism (e.g. broken windows, damaged equipment)
 - e. Graffiti (e.g. a lot, some, none)

- f. Open green space (e.g. a lot, some, none)
- g. Maintenance of street in general (e.g. insufficient, reasonable)
- h. Street trees (e.g. a lot, some, none)
- i. Height of street trees (e.g. small, medium, large)
- j. Gardened areas (e.g. a lot, some, none)
- k. Water features (e.g. a lot, some, none).

The internal audit included the following:

1. Local amenity: to list available amenities (e.g. bank, mailbox, bakery)
2. Thermal conditions: to note the thermal conditions at the time of the audit inside the building
3. Route characteristics: to note conditions of the routes or paths that may be used by (older) people inside the building. These include:
 - a. Slope (e.g. level, slight gradient)
 - b. Floor conditions (e.g. smooth, rough)
 - c. Floor materials (e.g. tiles, concrete, carpet)
 - d. Maintenance of flooring (e.g. insufficient, reasonable)
 - e. Path/hall usability (e.g. one person wide, two persons wide)
 - f. Permanent/semi-permanent path obstruction (e.g. poles, signs, tables)
 - g. Steps and handrails (e.g. present, absent, occasional)
 - h. Benches or seating (e.g. present, absent, occasional)
 - i. Maintenance of seating (e.g. insufficient, reasonable)
 - j. Waste bins along the path (e.g. present, absent, some)
4. Safety and wayfinding:
 - a. Social environment (to note)
 - b. Wayfinding and signage (e.g. adequate, inadequate)
 - c. Lighting (e.g. poorly lit, adequately lit, too bright) – record illumination levels
 - d. Glare (e.g. direct, indirect, no glare)
 - e. Noise level (e.g. quiet, mid-range, loud)
5. Aesthetic characters:
 - a. Overall aesthetic impression (e.g. pleasant, neutral, unpleasant)
 - b. Litter (e.g. a lot, some, none)
 - c. Vandalism (e.g. broken windows, damaged equipment)
 - d. Graffiti (e.g. a lot, some, none)

The initial version of the audit form was tested in a pilot audit of Castle Plaza shopping centre. Based on the experience from the audit, several questions were eliminated while more relevant ones were added.

The audit forms are presented in Appendix A.

The paper audit forms were used and tested for the audit of the case study buildings/precincts. Floor plans of the relevant parts of the building were obtained from the building while Google Maps as a proxy for the external spaces/site plan. Relevant notes were added to the site plan and photographs were also taken during the audit.

One digital tablet Application of the audit forms (for outside a building) was developed and tested. The information recorded can then be converted into an Excel spreadsheet (in a CSV format).

Figure 1 below shows a sample screen of the outdoor built environment audit App (to be updated).

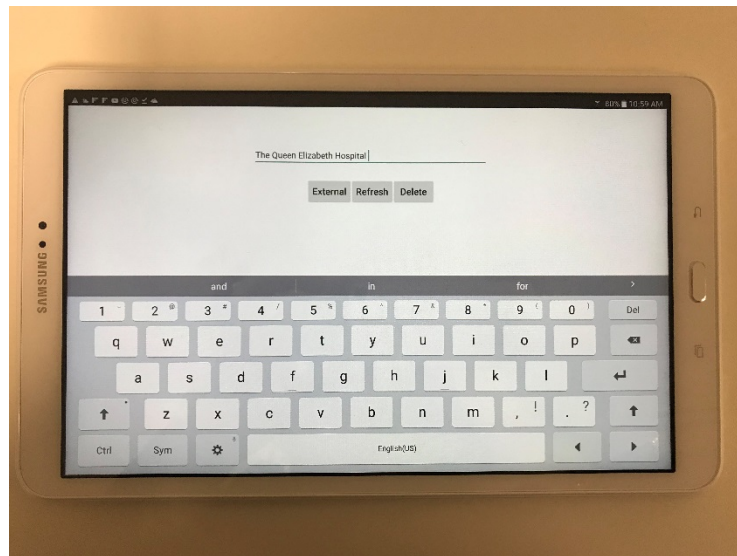


Figure 1. Built environment audit tool

3.2. Walking Observation

While the built environment audit collected 'physical' data of the spaces, external and internal, it is acknowledged that the audit also relies on subjective views of the researcher (who is not necessarily an older adult). For example, the researcher may perceive a space to be too bright or glaring, but older people, particularly those with reduced visual ability, may not perceive the space in the same way. It is therefore critical to also observe and record how older people actually experience and navigate the spaces and to find out whether problems (such as the presence of barriers along a route) identified in the audit by the researcher are also perceived as problems by older people (for example, having to stop or avoid barriers while walking along the route, or on the contrary, not seeing potential obstructions as barriers).

A 'walking observation' is implemented in the present study to observe how older people navigate spaces. During a walking observation, the researcher walks with the participant while taking notes of participants' routes and actions during their walk in that environment. The note includes (1) whether the participant uses assistive devices (such as walking frame, walking stick, wheelchair), (2) a subjective perception of the participant's walking speed, and (3) the number of times and locations where the participant experiences one of the following actions: stop, stop for a rest, sit down, look for or at signage, stop due to an obstruction, trip or have a near fall, take staircases or an elevator, and ask for directions. The researcher also notes the route taken by the participant and marks each relevant position (e.g. when the participant stops, sits) on the floor plan.

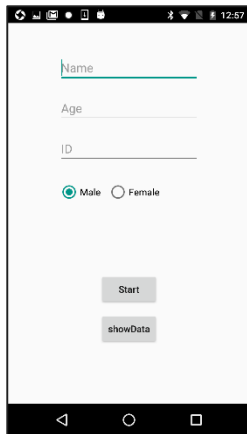
While conducting the walking observation the researcher carried a portable data logger which recorded the air temperature and relative humidity (at 1-second intervals).

Based on the manual note taking above, a digital (smart phone) Application has subsequently been developed to record the participant's movements during the walking observation. The App was developed on an Android-based smart phone system. The sample screens of the Walking Observation App are presented below. With the App, the researcher would press the relevant button (e.g. walking slow, stopping) as the participant moves or stops. The App also recorded the time of day each time the researcher pressed a button on the phone.

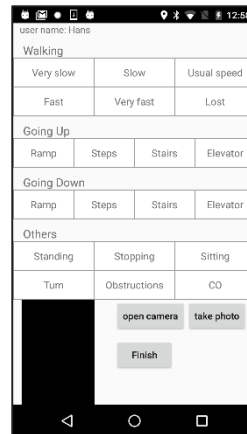
The application also has the ability to take photographs linked to the same timeline of recording of the action. In this pilot study, due to privacy issues, no photographs of participants were taken during the walking observations, and only photographs that included features of the physical environment relating with the walk, (e.g. ramps, seating areas) were recorded. When the location setting of the smart phone is turned on, the coordinates of the location (longitude, latitude and altitude above sea level) at which an activity is recorded, or a photograph is taken, can also be recorded. However, an exact location will not be accurately recorded when the App is used inside a building because the GPS accuracy of any smart phone is reduced when used indoors. Therefore, to record the movement inside a building, the researcher still had to remember the routes taken by the participant and then mark the routes on the floor plan drawing of the building. Subsequently the walking speed of the participant was calculated afterward by measuring the distance of the route (from the beginning

to the end) on the scaled floor plan drawing, and dividing it by the time taken to complete the route as recorded. Therefore, limitations remain in using a smart phone to record participants' movements.

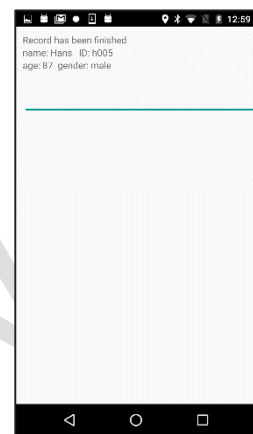
All data recorded can then be downloaded as an Excel csv file.



2a. Opening screen activity



2b. Recording the activity



1c Completing the

Figure 2. Screenshots of Walking Observation App utilized in the walking observations

Before the walking observation was conducted, participants were asked to wear a 'smart' wrist band which measured their blood volume pulse, 3-axis acceleration (walking speed as well as direction in x, y and z axis), skin temperature and skin conductance. A 'smart' wrist band called 'Empatica' was used and tested. The device also records in real-time clock and thus data collected can be merged with data from the Walking Observation App, so that the association between the movement and physiological measures as well as the built environment features, as recorded by the Walking Observation App, can be analysed.

The participant was asked to wear the smart wrist band for 24 hours following the walking observation in order to create baseline data on physiological measures that could be compared to the data collected during the walking observation.

3.3. Survey Questionnaire

A survey questionnaire was developed to include socio demographic questions about age, gender, marital status, residence status, ethnic background, country of birth, occupational status, income, and language spoken at home. The questionnaire included scales validated for use in the older population, in order to capture most domains of the comprehensive geriatric assessment. The following domains were assessed: quality of life assessment named EuroQoL 5D-5L (EuroQoL 1990), social network (Lubben 1988), physical activity levels (Baecke, Burema & Frijters 1982), nutritional status with the Mini-nutritional Assessment-short form (Vellas et al. 1999), a geriatric depression screening (Pocklington et al. 2016), Charlson's Comorbidities Index (Charlson et al. 1987), participant's extent mobility assess by the life-space assessment (Stalvey et al. 1999), basic and instrumental activities of daily living (Katz et al. 1963; Lawton & Brody 1969), a screening for cognitive decline (Jansen et al. 2008), standardized pain questions (Waddell et al. 1993) and a questionnaire evaluating the perceived built environment (Cerin et al. 2008). Frailty status was assessed using two complementary tools the Frail Scale (Lopez, Flicker & Dobson 2012; Satake et al. 2016) and Kihon Checklist (Satake et al. 2016).

The participants could choose to respond to the questionnaire independently or be assisted by the researcher. Participants were encouraged to discuss the questionnaire with their family or significant others (including their general practitioner) if they wished. Where the participants consented, a summary of their responses to health assessments could be provided to their general practitioner. Where participants requested, a summary could also be provided to them.

Descriptive statistics were used to analyse the data from the survey questionnaire (presented in Appendix B).

3.4. Semi-structured Interviews

A semi-structured interview method was implemented to obtain insights from older people of their perceptions about and experience in public spaces. In context with the method, the researcher asked open-ended questions and provided 'prompts' to stimulate the participants' responses. Allowing participants to "tell a story" from their point of view provides much richer information on the topic of investigation.

Semi-structured interviews were conducted with two groups of participants: those who participated in the 'walking observation' and those interviewed in shopping centres/market. The prompts in the interview with the first group encouraged the participants to reflect on the experience during the walking observation as well as on their perceptions of the public spaces in general. The questions included the following:

- Whether participant needed assistance or be accompanied to their destination (either shopping centre or hospital)
- Reasons for taking the particular route on the day of the walking observation
- Frequency of use of the specified public space
- Participant's perceptions and issues when using various spaces related with their mobility such as car park, footpaths, public transportation
- Participant's perceptions when navigating familiar and unfamiliar places, and strategies for wayfinding, as well as issues that might appear in those areas

The objective of conducting the interviews in the public spaces (shopping centres/market) was to gather information about older persons' general perceptions of using public spaces. The prompts in the interview guide included short questions that allowed participants to explain:

- Reasons for their use the public space (i.e. this shopping centre)
- Whether the participant was independent (i.e. come alone) or less independent (i.e. assisted by someone else)
- Whether the participant tended to use the same route to access the venue
- Whether the participants had issues in navigating the spaces
- Their views on the quantity and quality of amenities such as car park, public toilets, paths and seating
- Their experience in general in using public spaces.

Each interview in the shopping centres was intended to be no more than 30 minutes; the interview would not be stopped if the participant did not seem to want to stop expressing their views, as this would provide much richer information. The questions in the semi-structured interviews are presented in Appendix C.

Responses from both waves of semi-structured interviews were then analysed using Qualitative Descriptive Design (QDD) and data analysis approach. QDD is a distinct method of pragmatic practiced based qualitative research (Colorafi & Evans, 2016). It is less restrictive than other forms of qualitative enquiry (in terms of sampling, theoretical framework, subject matter), is low inference and thus appropriate for novice qualitative researchers (Colorafi & Evans, 2016; Sandelowski, 2000).

The researchers' written notes of the interviews (shopping centre) or audio recordings (hospital) were transcribed and key words or phrases identified. The keywords were assigned codes, which were grouped into categories and then categories aggregated into themes. This process was staged, iterative and guided by the expertise of senior qualitative researchers. The description of findings centres on the analysis at category and theme levels supplemented by direct quotations of researchers' notes or participants' responses where appropriate to illustrate particular concerns or issues.

QSR International NVivo was used for coding for the shorter shopping centre interviews and the longer hospital interviews.

3.5. Recruitment

Initially the research targeted three groups of participants: (1) participants who were patients at the Geriatric department of The Queen Elizabeth Hospital, (2) members of the University for the Third Age (UTA), and (3) older people who shop at shopping centres around the Queen Elizabeth Hospital.

After receiving approval from the Human Research Ethics Committees of The Queen Elizabeth Hospital and The University of Adelaide, invitations to participate in the research were distributed at the hospital and UTA Charles Sturt and UTA Port Adelaide. The recruitment through UTA did not, however, result in any participants.

As majority of participants came from The Queen Elizabeth Hospital, the walking observation was conducted there and a built environment audit was conducted in the hospital precinct and buildings. The participants of the walking observation at the hospital were further recruited to participate in the walking observation at their local shopping areas.

Participants for the public space semi-structured interviews were first recruited from Arndale Armada Shopping Centre, located 1.5 km from The Queen Elizabeth Hospital. Then, based on initial conversations with some hospital participants about the places they went shopping, two other shopping precincts were also used as case studies: Westfield Marion and Adelaide Central Market. The latter is not a shopping centre as such, but was considered important as it presents another type of a shopping facility that is frequented by older people in Adelaide. Built environment audits and semi-structured interviews were conducted at these three shopping centres/market with randomly selected, by direct approach, older customers.

3.6. Sequence of the data collection

3.6.1. Walking observation and semi-structured interview

After a participant agreed to participate in the walking observation, the researcher presented the participant with the participant information form, consent form and survey questionnaire. The participant could respond to the questionnaire in their own time and either mail back the survey paper or return in person to the researcher on a later date. The researcher then made an appointment to meet the participant to conduct the walking observation. The researcher turned on the Walking Observation App and the smart wrist band, and placed the latter on the participant's wrist prior to commencing the walking observation. After the participant reached the destination (usually an appointment) and entered the room, the researcher waited and noted the route and any other observations on the map/floor plan. The walking observation was deemed completed at the main exit point from the hospital. After the appointment was completed, the participant walked out of the building followed by the researcher. The participant continued to wear the wrist band. An appointment was made to visit the participant at their home the following day, to go through the survey questionnaire, to conduct a semi-structured (audio-recorded) interview, and to retrieve the smart band.

Each participant was provided with a supermarket gift voucher with the value of \$50.

3.6.2. Semi-structured interview in the shopping centres

For the semi structured interviews in the shopping centres, at least two researchers conducted the interviews. The researchers established a table in a prominent area of the shopping centre (assigned by the shopping centre management) and signage/posters about the study were displayed around the table. The researchers waited for customers to approach them or verbally invited customers who were walking nearby to participate in the interviews. Customers needed to be aged 65 years or over to be interviewed. Customers who agreed to participate were provided a verbal consent and interviewed on the spot. As a token of appreciation, each participant was provided with a \$5.00 worth of coffee voucher to be used at a local coffee shop. After the interview, they were invited to participate in a walking observation either at the same shopping centre and/or at The Queen Elizabeth Hospital, if they were patients in that hospital.

4. RESULTS

The methods that have been discussed in the previous section were implemented/tested in four case study buildings (The Queen Elizabeth Hospital and three shopping centres: Arndale Armada Shopping Centre, Westfield Marion Shopping Centre and Adelaide Central Market). Note, however, that the Built Environment Audit App was still being developed at the time the audits were conducted therefore the audits were conducted using conventional equipment (e.g. paper, pen, camera). Likewise, the Walking Observation App was being developed at the time the first ten walking observations were conducted thus the note taking during the observation was done manually by the researcher using paper and pen.

4.1. Built Environment Audit

The following sections summarise the main findings from the built environment audits (see Appendix A for full results tables).

4.1.1. The Queen Elizabeth Hospital (TQEH)

TQEH is located in Woodville, approximately 6kms north-west from Adelaide's CBD and provides emergency, inpatient and outpatient services. It has been progressively added to since its original opening almost seven decades ago. It is primarily serviced by Woodville Road and has provision for access via private car, public transport and taxis. Building floor and site plans were obtained from the hospital and used as guideline/map for the audit. The audits were conducted using the paper version of the audit forms (see Appendix 1), on the 16th March and the 21st March 2017.

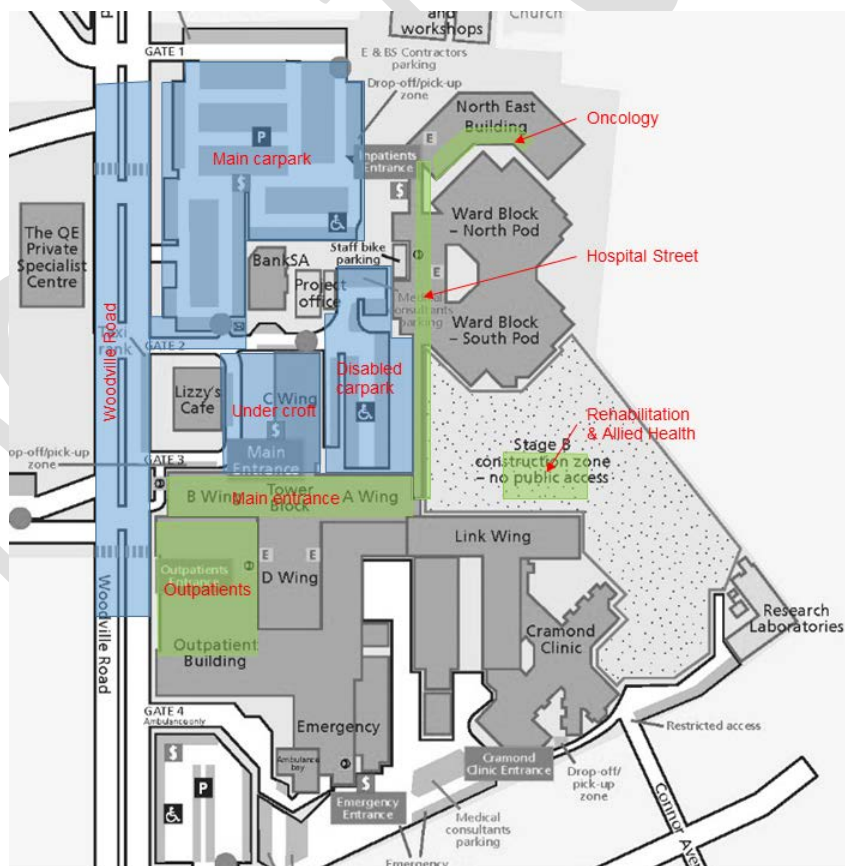


Figure 3. The Queen Elizabeth Hospital external and internal audit areas (map adapted from SA Health, The Government of South Australia)

External

Two main carpark service TQEH: the main carpark accessible via Cedar Avenue (from Woodville Road), and the 'emergency' carpark (named because of its proximity to the emergency department). The audits focused on the main carpark and surrounding areas to the north of the precinct. Overall, the external impression of the hospital is a mixture of architectural styles, erroneous master planning/site layout and little hierarchy indicative of main entry points. Thus, visitors largely rely on their past experience to successfully navigate from the carparks to the entrances via the series of disconnected foot paths. Car parking is free for the first two hours with modest fees charged after that, up to a maximum of \$13AUD for a full day (10 hours or more). At the time of both of the audits, the carparks were very full with many visitors having to wait for a carpark. There are no clearly delineated 'drop-off' areas for patients.

Main carpark:

- o There was little shade in the carpark. Some trees were along the perimeter only. The carpark was very hot on the second visit;
- o 4 disabled carparks are available in this area;
- o Route characteristics:
 - Poor signage for vehicular access to carpark from Woodville Road;
 - Carpark was very busy on both visits, many visitors looking for carparks;
 - Many pedestrians crossing vehicular entry point to carpark (no allowances for pedestrians) – could present risk;
 - No path through carpark e.g., no delineation of pedestrian route (zebra crossing);
 - Path around carpark to entrances – not always clearly marked;
 - Various types of outside surfaces e.g. paving, concrete, asphalt and various levels – route heterogeneous;
 - Some areas of concrete paving have moved and are raised at the edges presenting trip risk;
 - Most paths are suitable for two people to walk abreast;
 - Slight gradient/ramp up to main entrance of hospital, handrails not in useful position i.e. do not continue to the entry point;
 - Gradients as the path crosses access roads (e.g. to disabled parking area) – no handrails;
 - Some path obstructions near main entrance e.g. café signboard;
 - Seating only available at main entrance in undercroft area at main entrance;
 - Seating (and area generally) is poorly maintained e.g. timber seating is weathered, varnish peeling off;
 - No seating is provided at the entrance to the North-east building (observed older person waiting in the sun while waiting for accompanying person to use the pay machine);
- o Safety and wayfinding:
 - Poor signage to guide visitors from carpark to main entrance (outpatient wing);
 - Signage is generally for drivers (e.g. traffic control), not pedestrians;
- o Aesthetic characteristics:
 - Overall, aesthetically the area has various design styles, provide little built form at human scale and is poorly maintained; and
 - Area near the North-east building entrance is newer, better maintained, one predominant design style.

Disabled carpark (between C Wing and corridor to North-east building):

- o Area more sheltered than main carpark – predominantly from C Wing building and two storey corridor;
- o 22 disabled carparks are available in this area;
- o Route characteristics:
 - Paths only provided around the edges of the carpark, consistent with the other hospital carparks;
 - Very poor surface – asphalt is cracked and raised, lots of leaf litter from tall eucalypts;
 - Fewer users than main carpark;
- o Safety and wayfinding:
 - Poor passive surveillance; and
 - Signage provided outside of the entrances to the corridor but not directly inside (observed older person walk in, then look for signage).

Undercroft area at main entrance/adjacent paths:

- o Some areas in the undercroft and surrounding paths act as a wind tunnel;
- o Route characteristics:
 - Mixture of surfaces, many level changes in undercroft – often not clearly marked, no handrails, very hard corners if someone did fall;
 - Quite busy with visitors or hospital staff, mostly either alone or in pairs;
 - Adjacent access road busy with drop-off/pick-up (both private and taxis) – one way road (observed older person drive wrong way down road); and
 - Undercroft area is quite dated, dark and not well maintained.

Woodville road:

- o Route characteristics:
 - Foot path has very steep gradient (toward road), particularly at the taxi rank;
 - Paved with small red-pavers, reasonable condition;
 - No seating provided (even at taxi rank), however observed some people sitting on low wall adjacent hospital carpark;
 - Footpath generally suitable for two people to walk abreast;
 - Adjacent road (Woodville) was very busy (60km/hr). There was a bus stop in front of the hospital and two sets of pedestrian crossings within close proximity of hospital – one near the carpark, the other near the bus stop;
 - No cyclists observed; and
- o Safety and wayfinding:
 - Good passive surveillance from road users.



Figure 4. Main carpark (from left to right): perimeter footpath, access road crossing – no handrails, access road crossing-handrails



Figure 5. Main carpark & Woodville Road (from left to right): uneven and sloped paving adjacent access road, sloped footpath at taxi rank on Woodville Road, lack of pedestrian demarcation at vehicular entrance to carpark



Figure 6. Undercroft at main entrance (from left to right): gradient/surface change at main entrance, surface and level change, limited seating



Figure 7. Obstruction in the middle of a footpath (left); no dedicated footpath to carpark (centre); no ramp to a building (right)

Internal

The hospital incorporates over ten distinct buildings. The audits focused on the main entrance of the General Building, the public areas of the Outpatients Building, Hospital Street that connects the General Building to the North East Building, and limited areas in the Rehabilitation & Allied Health and North East Buildings. The General and Outpatients Buildings are older, and while relatively well maintained, appear worn. The Hospital Street, and Rehabilitation & Allied Health and North East Buildings are newer which is reflected in their design and physical condition. During the audits, the internal areas were reasonably busy with visitors, patients and hospital staff.

Main entrance/A Wing:

- o Strong wind tunnel effect at main entrance at the time of the audit;
- o Warm, humid breeze when transitioning from A Wing to corridor to North-east building;
- o Route characteristics:
 - Handrails at entry only, do not continue in corridors;
 - Floors generally laminate tiles, carpet in some waiting areas;
 - Some seating provided but mostly located in waiting areas of specific areas, not along the corridors;
 - No waste bins immediately visible (few in waiting areas);
 - Quite busy at time of visit, generally would be difficult to walk two abreast;
 - Corridors are generally used by both outpatients/visitors and staff with inpatients (in beds);
 - Some lighting not working in corridors – quite dark;
 - Lighting reflects off of the shiny laminate tiles;
 - Noise level is generally okay (quiet through to mid-range/loud when lots of different users);
- o Safety and Wayfinding:
 - Lots of signage but little hierarchy to the information presented so directional signage overwhelmed.
- o Aesthetic characteristics:
 - Interior is relatively dated and worn.

Outpatients:

- o Route characteristics:
 - Same flooring as main entrance and adjoining corridors;
 - Hallways become very small upon entry to Outpatients, only main hallways sufficient for two people but secondary hallways only wide enough for one;
 - Lots of equipment in secondary hallways presenting obstructions;
 - Seating provided in the waiting areas
 - Quite busy in this area, more staff than patients;
- o Wayfinding:
 - Very poor signage e.g. for outpatient waiting area, toilets;
- o Aesthetic characteristics:
 - Again, dated interiors, restricted room, over-full with furniture and equipment.

Corridor from A Wing to North-east building (Hospital Street):

- o Noticeably warmer than Tower block/Outpatients (direct sun);
- o Route characteristics:
 - Flooring mixture of tiles and laminate;
 - Handrails available through length of corridor – discontinuous through south/north Ward Block;
 - Limited seating – fabric chairs stained but not broken (approximately 5-8 seats with ~30m until other seating toward the North-east building and ~40m or more until other seating toward A Wing);
 - Reasonably busy but wide enough to accommodate – approximately four-five abreast;
 - Noise level is higher than Tower Block or Outpatients (conversation, TV, doors, wheelchairs, beds);
- o Signage:
 - Clear signage and less informal signage/information;
- o Aesthetic characteristics:
 - Corridor is naturally lit by direct solar penetration as well as artificial lighting – some direct glare from the sun; and
 - Overall, more pleasant aesthetic character than older part of hospital.

Rehabilitation/Physio (new area – marked as ‘under construction’ on the map):

- o Route characteristics:
 - Flooring mixture of carpet (at entrance) and polish concrete (quite slippery);
 - Wide corridor servicing Rehabilitation and Physio area, two external entrances (one to internal courtyard, one to rear of hospital);
 - Seating available outside of lifts and toilets;
 - Not very busy, more of a thoroughfare;
 - Artificial lighting seems to be a little dim in comparison to natural light (contrast);
 - Slight glare on polished from south facing doors;
 - Noise level is quiet however there was intermittent loud beeping; and
 - Observed older person in wheelchair having difficulty opening the door to disabled toilet (needed assistance).
- o Aesthetic characteristics:
 - Overall the area was cool, quiet, well presented and maintained.

Oncology – North-east building:

- o Cool in the hallways.
- o Route characteristics:
 - Tiles in front of the lifts and laminate in the hallways and waiting room;
 - No obstructions through the hallways;
 - Handrails provided along the hallways on the external wall, not continuous;
 - Seating only provided in the waiting areas;
 - Quiet area, not as many patients or visitors in this area;
 - Lifts were crowded at times as they were also used to transfer patients on stretcher beds. No seats in lifts.
- o Signage:
 - Informal signage provided in a couple of areas hinting that formal signage may not be sufficient
- o Aesthetic characteristics:
 - Water bubbler provided at entrance of waiting room;
 - No glare at time of visits but may be on sunny day (large areas of glazing); and
 - Overall, pleasant aesthetic character.



Figure 8. Main entrance/Wing A (from left to right)



Figure 9. Outpatients (from left to right)



Figure 10. Corridor from Wing A to North-east building (from left to right)



Figure 11. Oncology – North-east building (from left to right)



Figure 12. North-east building (from left to right)

4.1.2. Arndale Armada shopping centre

Arndale Armada shopping centre is a suburban shopping precinct located approximately 8.5 km north-west of Adelaide CBD. It is bounded by three main roads: Hanson Road to the west, Torrens Road to the south-west and Regency Road to the south. The Centre has bus transit links to the CBD and surrounding suburbs, and is serviced by free open air car parking. Facilities within the Centre include two main supermarkets, low-cost department stores, numerous fashion clothing outlets, banking, post office, and café and dining facilities. Movie cinemas and a fast food outlet are located in close proximity to the main shopping mall.

The Built Environment Audit was conducted in one session in the afternoon of the 30th March 2017. The weather was predominantly fine but blustery, the temperature remained around 19°C during the visit (based on BOM observations at the Kent Town weather station accessed using *Weatherzone* app for IOS).

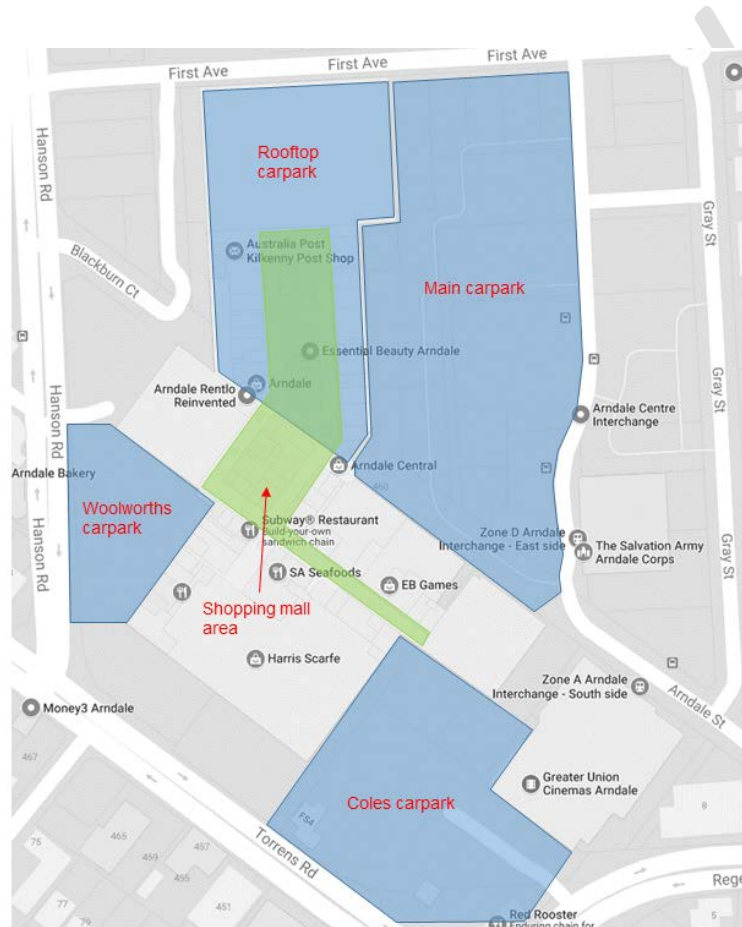


Figure 13. Map of Arndale shopping centre (adapted from Google Maps)

External

Externally, the shopping centre is bounded on all sides by car parks. The car parks are serviced from 4-5 entrances from the surrounding main roads. There are multiple entrances to the shopping centre: one to the south primarily servicing the Coles supermarket, one to the east servicing the shops located within the middle proportion of the centre, one to the west, and two to the northern end of the centre servicing Big W and surrounding shops. Finally, there is an entrance from the rooftop carpark also servicing the northern end of the centre. The rooftop carpark is accessible via a ramp off of the west carpark (referred to below as the Main carpark). The various car parks and entrances appeared to have developed progressively as they are in varying states of repair. Generally, the southern carpark is in the poorest condition, while the eastern carpark is in the best condition being the newest area of development at the centre.

- *Coles carpark (south, Torrens Road):*
 - o Conditions on the day were very windy – no protection from wind, sun or rain provided (few trees);
 - o Route characteristics:
 - Construction works in carpark near road blocked only direct path through carpark;

- Shopping trolleys left along path next to centre reduced useable width of path;
 - Benches were poorly maintained and unclean.
 - o Safety and wayfinding:
 - No prominent signage to entrance, however entrance location was relatively intuitive;
 - What looked like a second/alternate entrance to Coles was closed and covered in advertising;
 - Poor (no) passive surveillance (or surveillance by customers) from inside the shopping centre, as all windows facing the carpark were covered over or they were entirely blank walls;
 - Disabled permit parks (6 out of 240 car park spaces) available; and
 - Taxi rank located close to entrance;
 - Anti-social behaviour occurring at entrance (benches for taxi rank) – occurring 2/3 times walked past the area. A security guard was present but did not approach patrons; and
 - Lighting on car park noted.
 - o Aesthetic characters:
 - No notable architectural features; and
 - Generally, the area around the perimeter of the centre was poorly maintained and needed cleaning.
- *Woolworths carpark (south west corner, Hanson Road):*
 - o Route characteristics:
 - Raised/cracked asphalt in carpark (tree roots – large eucalyptus adjacent main road);
 - Pedestrian crossing on south west corner ended on a curb (instead of continued to a sidewalk); and
 - No path through the carpark, only at perimeter of centre.
 - o Safety and wayfinding:
 - Glass feature façade used to designate entrance to main shopping centre;
 - Passive surveillance available – perimeter shops with external access/view through glazing;
 - Disabled permit parking and taxi rank provided at entrance (5 out of 120 car park spaces);
 - Several people smoking very close to the entrance; and
 - Noted temporary flood light in-place (no permanent lighting in carpark proper – just along main road i.e. street lighting).
 - o Aesthetic characteristics:
 - The plants in the garden bed of road dividers had died – the area was used to leave trolleys instead.
 - Large area of pooling water in carpark – poor/no drainage.
 - Minimal shades on the carpark.
- *Main carpark (east, Gray street):*
 - o Route characteristics:
 - Appears to be recently built, tactile paving, pedestrian crossings, smooth surfaces on road and footpath;
 - Only 2 out of 300 car park spaces were for disabled permit parking. This was less than the requirement by the National Construction Code (NCC / Building Code of Australia) which specifies 1 disabled car parking space for every 50 car parking spaces in Class 6 building (retail buildings).
 - No taxi rank available;
 - Direct path with tactile paving from Centre entrance to bus transit stops on Andale Shopping Centre Access Road;
 - Usable width of this path reduced by trolleys not returned to trolley-bays; and
 - No seating provided either at the Centre entrance or along the path through carpark to transit stops; and
 - Patrons smoking directly outside of centre entrance.
 - o Safety and wayfinding:
 - Obvious entrance due to large, clear signage and glass façade feature; however,
 - Minimal passive surveillance opportunities from inside to the outside due to almost all solid external walls;
 - o Aesthetic characters:
 - Generally in good condition
 - New plantings.
- *Rooftop carpark:*

- o Route characteristics:
 - No dedicated pathway provided for patrons to access different areas of the carpark from lift/escalator lobby area;
 - Approximately one-third undercover;
 - 8 disabled permit parking spaces out of 200 car park spaces of non-undercover car park; and
 - Some trolleys not returned to trolley-bay.
- o Safety and wayfinding:
 - At the time of the survey very few people using the rooftop carpark;
 - Large signage indicating entrance to shopping mall, entrance also identified by glass roof design feature (these wayfinding opportunities are not viewable from all areas of the rooftop carpark).



Figure 14. Coles carpark (from left to right): provision of disabled permit parking close to entrance, long blank wall with benches servicing the taxi rank, and closed entrance to Coles



Figure 15. Woolworths carpark, view toward external shops and entrance to main shopping centre



Figure 16. Woolworths carpark (from left to right): pooling water & large eucalyptus, trolleys in garden, and view from area where patrons were smoking



Figure 17. Rooftop carpark, view from undercover area near Centre entrance (looking approximately south-east)



Figure 18. Rooftop carpark, view from Centre entrance to undercover area



Figure 19. Main carpark (from left to right): pedestrian crossing from entrance, direct path to transit stops, and view back to entrance of Centre

Internal

The Centre is arranged over one level with a slight slope where the older part (south-west portion including supermarkets) connects with the newer part (northern portion including Big W). The same (or very similar) flooring is used throughout the Centre with carpet at entrance ways to provide an anti-slip surface, and mitigate dirt and water being walked into the building. The Centre was reasonably busy at the time of the audit, however this varied considerably in different parts of the mall: the areas around, and between, the two supermarkets was quite busy as was a concentrated area of cafes and small shops including green-grocer's, butcher and bakery toward the centre of the mall. However, it was generally much quieter around Big W and the access area to the rooftop and main carparks. Throughout the audit active cleaners were observed – particularly around the seating areas.

- **Shopping mall area:**
 - o **Route characteristics:**
 - Walkways inside mall generally suitable for two people to walk abreast, however shop displays, small shops in the centre of the space, café tables and chairs, trollies, and signage reduced the usable width in some places;
 - The areas where various items encroached on the walkway was predominantly concentrated in the older part of the centre between the supermarkets;
 - Regular seating is provided throughout the Centre – in the supermarket areas it was almost always fully occupied, while in the area near Big W there were many unoccupied benches;
 - Benches were generally well maintained (except for some stains and tears in the fabric in places), and arranged in groups of two or four (back-to-back); and
 - Waste bins provided next to every set of benches, however in some places litter was observed around the seating areas.
 - o **Safety and wayfinding:**
 - Prominent signage was not noticeable, however at some entrances, paper maps of the centre were available;
 - The Centre's Information Office was on the first level and not easy to find;
 - The escalators are the traditional stepped type (as opposed to ramps now common in many shopping centres) and are quite tall – looking down from the top was unnerving;
 - Note that a lift was also available.
 - The contrast between outdoor lighting level and indoor lighting level was quite distinct at the entrance to the main carpark (relatively longer corridor with vacant shops) – this created a very dark and then very bright area which was somewhat difficult to navigate. In some places, in combination with the shiny surface of the flooring, this produces considerable indirect glare;

- Similarly, the atrium providing lift and escalator access to the rooftop carpark results in significant internal glare in the surrounding area (near Big W);
- The noise level, generally moderate, varied based on the busy-ness of different areas. Toward the Coles end of the mall a speaker raised the noise level considerably.
- o Aesthetic characteristics:
 - Centre is generally well lit, both through natural light from high level roof windows and artificial level.



Figure 20. Arndale shopping centre (from left to right): roof windows, direct glare from rooftop carpark access atrium, and contrasting light levels at main carpark entrance

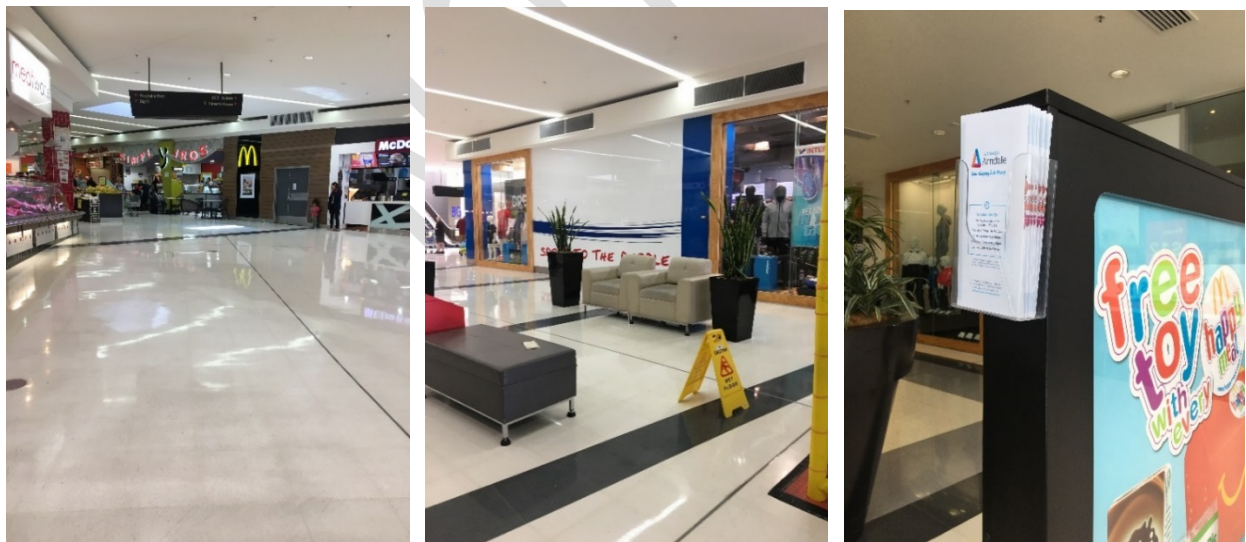


Figure 21. Arndale (from left to right): slightly slope between old and new areas of the Centre, seating provided near the main entrance (children's play equipment to the right out of view), and paper maps of the Centre available

1.1.2. Marion Shopping Centre

Westfield Marion Shopping Centre is the largest shopping complex in Adelaide and located in Oaklands Park, 13 kilometres south of Adelaide CBD. It is predominantly arranged over two floors with a central third floor housing the Event Cinemas and another recreational business. It has more than 340 shops including major department stores and supermarkets as well as other smaller speciality stores and cafes. The two floors are connected by a number of escalators, elevators and electric ramps and the long voids between the two sides of the top floor allow people to have visual connections with the ground floor. Being fully air-conditioned and protected by one roof with skylights makes Marion a popular destination of people of all ages, not only for shopping, socializing but also a place for refuge during hot weather. The shopping centre is also a venue for a number of walking groups; the distance from one end of the building to the furthest end is 400 meters, making it an ideal place for exercising by walking. The long linear layout of shops with major shops at certain nodes (ends and centres) seem to make it easy for people to navigate. A major bus interchange from north, south, east and west of Adelaide is located nearby the western entrance of the shopping centre.

The audit was conducted in the early afternoon of the 18th of April. Weather was warm-hot with full sunshine. The shopping centre was very busy – lunchtime and school holidays. As the building/precinct is quite large, the audit only focused on areas closest to where the interviews with older patrons were conducted (on the western side of the building).



Figure 22. Internal layout of Marion Shopping Centre
(from <https://www.westfield.com.au/marion/centre-info/map#!/marion>)

External

- **Undercover carpark servicing Aldi & surrounding shops:**
 - o Route characteristics:
 - This carpark was undercover with (at least) double height roof level (carpark on top);
 - There was a newer section of carpark with solar panels as the roofs, providing shade to the cars (Figure 24);
 - Surface of carpark was generally smooth and well maintained, more footpaths and zebra crossings were provided closer to the entrance of the centre (in this case, Aldi area);
 - Footpath/pedestrian area widens closer toward entrance;
 - Benches provided at the entrance, none in the carpark proper;
 - The carpark was very busy at the time of the audit with some waiting for parks; and
 - Many families were parking and entering the centre.
 - o Safety and wayfinding:

- Little opportunity for passive surveillance other than that provided by patrons at the carpark and entrance; and
- Entrance can be seen easily from the car park.
- o Aesthetic characteristics:
 - Entrance is well maintained and attractive (themed decorations in same style as internal Aldi decoration).

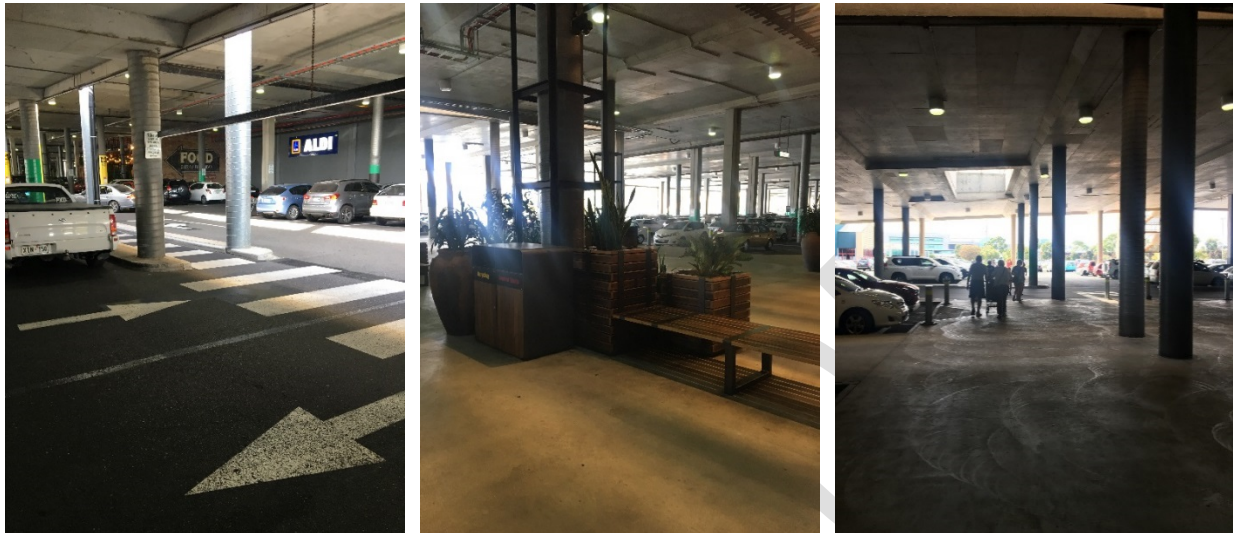


Figure 23. Aldi carpark & entrance (from left to right)



Figure 24. Car park on the roof top

Internal

- *Aldi area, cafes, deli section:*
 - o The temperature in this area felt cooler around the deli and fresh food sections;
 - o The area was very busy during the time of the audit (lunchtime and school holidays);
 - o Route characteristics:
 - Flooring surface was level with large format dark coloured tiles;
 - Walkways run either side of a central area with tables and chairs servicing the surrounding cafes;
 - Tables and chairs are predominantly not built in – the positioning of many reduced the usable width of the walkways;
 - More than two people would have difficulty walking abreast;
 - The noise level was loud to very loud (but no measurement was taken as it was not allowed by the Centre management). Conversation, music, children crying;
 - The Centre offers complementary access to cook books, children's activities in this area; and

- Overall, this area appears to be darker than in the main centre – combination of wall/store colour, dark flooring, and dark tables and chairs.
- o Safety and wayfinding:
 - Signage for shops, public toilets was clear.
- o Aesthetic characteristics:
 - Market style atmosphere/decoration – with busy-ness of the centre, and positioning of tables and chairs and shop displays; and
 - Felt like hub of activity at this end of the centre.
- *Area outside Coles on level 2:*
 - o *Route characteristics:*
 - Floor surfaced with terrazzo tiles, level, shiny, well maintained;
 - Fairly busy, many people with shopping trolleys;
 - Seating provided outside of main supermarkets/shops.
 - Small amount of seating also provided at the intermediate level (carpark access, change travelator);
 - Upper level has atrium roof – this provides bright natural light (may be too bright in some instances?);
 - Some indirect glare, not problematic though; and
 - Noise level fairly loud, although not as loud as the Aldi area (but no measurement was taken)
 - o Safety and wayfinding:
 - The lineal layout of the centre helped in wayfinding;
 - Signage generally just for main supermarkets/shops; and
 - Shop directories (on large screens) were available.
 - o Aesthetic characteristics:
 - Generally this area feels clean and bright.



Figure 25. Aldi area & Area outside Coles on level 2 (from left to right):

4.1.4. Adelaide Central Market

The Central Market is Adelaide's oldest market under one roof, built in 1869. Located adjacent to Victoria Square at the centre of Adelaide CBD, it is considered the hub of food and culture of Adelaide and South Australia. There are more than 80 traders, offering a huge variety of food including fruit, vegetables, meat, poultry, small goods, sea food, cheeses, bread, as well as cafes and eateries. Being part of the Adelaide's "institution", the Central Market is a food shopping destination of people of all ages.

The audit was conducted mid-late morning on the 20th April 2017. The weather was generally cool-mild with intermittent heavy showers.

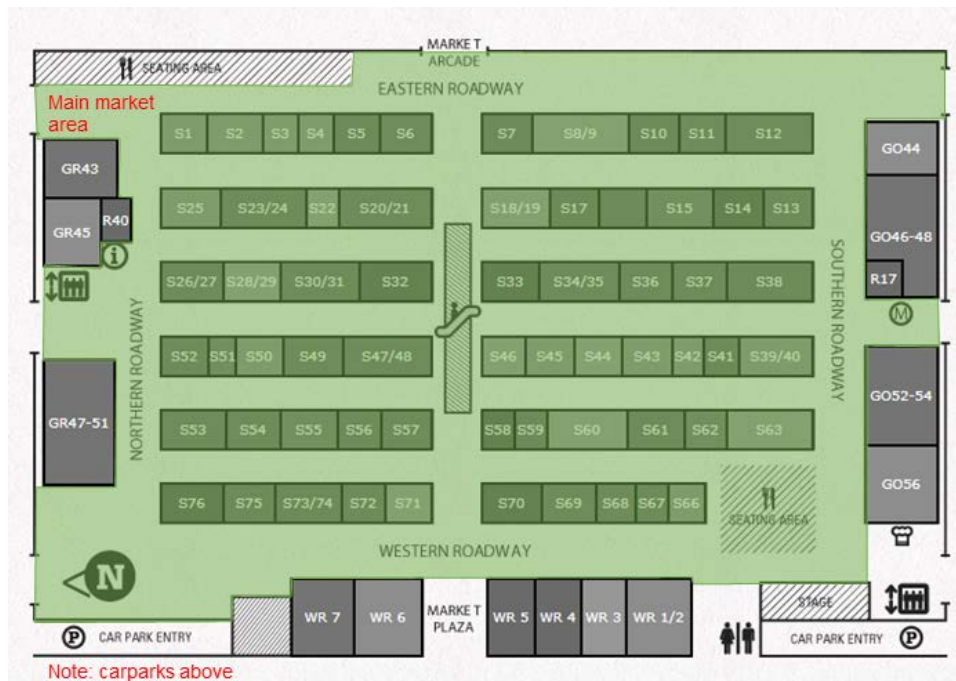


Figure 26. Internal layout of The Central Markets (image adapted from: <http://www.adelaidecentralmarket.com.au/map/>)

External

The markets are arranged over one level with the second and third levels providing car parking that services the Markets as well as surrounding business, restaurant precinct and law courts.

- **Level 1 & 2 carparks:**
 - o **Route Characteristics:**
 - Car parking on both level 1 and 2 above the market proper are undercover and predominately closed along the external boundaries;
 - Primary access to the carparks from the market are via central escalators or via perimeter lifts and stairs;
 - There are some paths around these main access points but no paths through the carparks;
 - Note that these carparks (predominately level 1) also service the nearby law courts
 - Surface is predominantly tarmac with some concrete and paving around the access points;
 - The width of the limited pedestrian areas (extended zebra crossings) generally only accommodates one person;
 - There are no benches or resting areas within the carparks;
 - Some waste bins provided at pay stations; and
 - During the time of the audit there was a steady stream of market shoppers using the central escalators; and
 - The noise level inside the carpark was, at times, very loud due to the heavy rain/thin metal roof.
 - o **Safety and wayfinding:**

- The access areas for the escalators are brightly lit with colourful advertising and artwork;
- Carparks generally feel safe due to presence of market shoppers and maintenance of access points for central escalators;
- Other shoppers are the only form of passive surveillance;
- o Aesthetic characteristics:
 - Areas around the access points/pay stations are well lit, however the car park proper is quite dark (this could also be due to the weather on the day); and

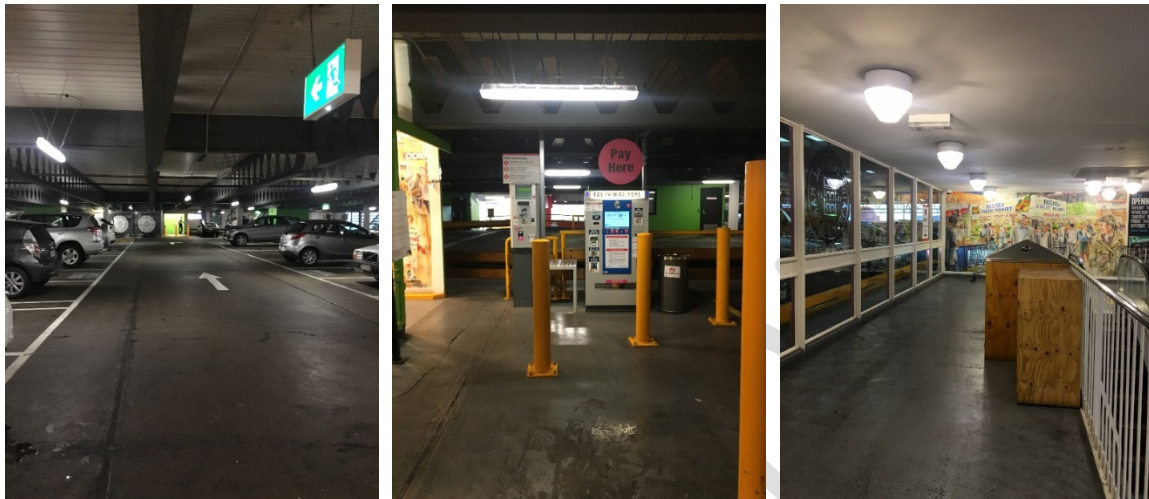


Figure 27. Car park on level 1 (left); car park ticket booth (centre); foyer from car park to the escalator (right)



Figure 28. Car park on level 1

Internal

The audit focused on the main market area where stalls are arranged in aisles running north-south with a central aisle running east-west in the middle. The Market provides a wide range of stalls including fresh fruit and vegetables, bakery products, cheeses, butches and fish mongers, deli products, and a variety of restaurants and cafes. At the time of the audit, many of the stall holders appeared to be setting up for the day and the number of patrons increased significantly toward noon.

- **Main market area:**
 - o Conditions inside of the market generally mild with some breeze around the open entrances and cooler areas near refrigerated shops (e.g. fishmongers);
 - o Route characteristics:
 - Floor surface is generally level with slight gradients where the main market connects with surrounding arcades;
 - The surface is the same level throughout the aisle, however the stalls are all raised by approximately 100-150mm. Some stall holders have created ramps for access into the stalls while others have made no concession – note that many of the edges are inconspicuous and therefore could be a trip hazard for those with poor eyesight or not looking down;
 - Surface is mainly smooth asphalt/tarmac except for the central aisle running east-west which is paved with brick;
 - The aisles are generally wide enough for 2-3 people to walk abreast, however many obstructions reduce the usable width of the aisle;

- Obstructions include: signage/advertising, shop displays, boxes/stall waste, café tables and chairs;
- Most benches or seating areas are associated with cafes – only about 4 park benches are provided in the whole market area (located at the bottom of the central escalators);
- Waste bins are located at market entrances and seating areas;
- At the time of the audit many stall holders were setting up for the day – the market got progressively busier with shoppers toward the middle of the day;
- Lighting levels varied throughout the market: generally the fruit and vegetable stalls were very well lit while cafes and dry goods stalls were somewhat darker – this didn't appear to be particularly problematic however;
- Lighting provided above aisles is very bright (if looked at directly) as it is quite far above the floor level/stalls;
- Noise level is higher in the aisles compared to other circulation spaces
- o Safety and wayfinding:
 - The market had very little general signage apart from indicating directing to toilets and exit.
 - Most of the signage was provided by individual stall holders;
- o Aesthetic characteristics:
 - The market is generally well maintained with floor surfaces free from litter/debris. It also smells of the produce (e.g. spices, vegetables/fruit, bakery, cafes).



Figure 29. Hallways inside the market and some obstructions from the display trolleys



Figure 30. Trolley and uneven surfaces that could become walking hazards for people with walking devices and on wheelchairs

4.1.5. Common Issues

The WHO guideline specifies 11 areas to be addressed in the topic of 'outdoor spaces and buildings' for age-friendly cities (WHO 2007). The following sub-sections discuss the key findings from the four case studies against these 11 areas.

Pleasant and clean environment

In general, all four buildings maintain the cleanliness of their environment; however, as in many other public buildings, there are spots or areas where they are less maintained. These occur in areas that are obviously older than the other parts, areas used for smoking and areas that are less frequented by people or having less passive surveillance. Whether or not the areas can be considered pleasant is relative and only after talking with the participants can a conclusion about pleasantness of the environment be drawn.

Importance of green spaces

In all four case studies there was little green space outside of the buildings. Outside of the buildings was dominated by hard surfaces for car parks with only a few trees and minimal small planting. The only exception is the Queen Elizabeth Hospital, which has internal vegetated courtyards and 'therapeutic gardens' in the newer part of the precinct. Unfortunately, none of the participants used these gardens during the study, hence these were not included in the built environment audit.

Somewhere to rest

In all four buildings, there was limited seating outside of the building. Seating outside of the building was usually provided only at taxi ranks. Inside the hospital, seating was provided only in the waiting areas and there was no or very limited seating along the corridors, as can be seen in Figure 9. In the two shopping centres, seats were provided at every 40-50 meters in walkways; however, during the observation (confirmed by the participants during the interview) most seats were occupied. Some older people were observed using their shopping trolleys as their 'resting device', and this was supported from information provided during the semi-structured interviews.

Age-friendly pavements

The conditions of the pavements outside the four buildings varied. The hospital had the worst conditions of pavements: uneven and with obstructions in the middle of them, as shown in Figures 3-6. The pavements around the shopping centres and market were relatively better.

Safe pedestrian crossings

Overall the pedestrian crossings around and within the precincts of the four case study buildings were safe. They were all marked accordingly; however, a "zebra crossing" crossing at Arndale Shopping Centre ended in the middle of a curb of the car park instead of leading to the foot path.

Accessibility

The most common issues found in all four buildings were: (1) footpaths that were too narrow for people in wheelchairs (due to obstructions, such as trees or poles in the middle of the footpath), and (2) limited number of car parks for the disabled. The other issue related to providing clarity of directions, particularly in the hospital. Signage was not always obvious (poorly located) and clear (small writing). In all three shopping centres/market information desks were not easily found, thus could be a problem if older people were lost or needed assistance.

Secure environment

Overall the four buildings appeared to be secure, except for certain areas with less or no casual surveillance; however, this is a subjective matter and will be discussed later. Security officers were seen at the shopping centres and there were staff, volunteers and nurses in the hospital at the public areas which made the building feel secure. All four buildings as well as the car parks were in general well lit.

Walkways and cycle paths

Around all four buildings there were walkways (footpaths), already discussed above. There were bicycle paths and parking outside the Central Market but no obvious bicycle parking was seen around the other three buildings. The footpaths around all four buildings were used as access from/to public transport (i.e. bus stops and taxi ranks).

Age-friendly, barrier-free buildings

Overall all four buildings provide facilities for older people and those with movement limitations, such as ramps, elevators, seating, and disable toilets. However, not all ramps and stairs are equipped with handrails (such as found in the hospital), and as mentioned, seating in public areas in all four buildings is relatively limited compared to the number of older people who want to use them.

Adequate public toilets

Public toilets were considered adequate (in numbers) by participants in all four buildings, with various levels of cleanliness; however, as these are public buildings such conditions are somewhat expected. It is worth noting that at Marion Shopping Centre new toilet cubicles large enough for a shopping trolley have been provided. Such facility allows older people who use their shopping trolley as a 'walking aid' to use the toilet without fear of falling

Appreciation of the needs of 'older customers'

As mentioned above, there seemed to be some attempts to meet the needs of 'older customers'; however, they were not necessarily adequate. The issues have been raised above: lack of places to rest or sit down, obstructions in access ways, lack of handrails along uneven surfaces, and lack of clarity for direction and information.

4.1.6. Evaluation about the built environment audit tool

The built environment audit tool that has been developed was considered adequate to record the general features of the built environment; however, the researcher still had to write notes about the quality and specific observations that were not necessarily listed on the audit forms. In a way it was difficult to capture everything using the audit forms despite the fact that the contents of the forms were more comprehensive than what other similar audit tools used (for example, the ones developed by Unley City Council and by other researchers).

To obtain a better understanding of the quality of the built environment and how it was used by older people, it was necessary to conduct the audit not only once but a few times during different times of the day and seasons. The use of camera to take still and moving images was also very useful to capture the quality of the built environment. Some factors, such as light and noise levels as well as indoor temperatures, could have been investigated further through objective measurements; however, this was not done in the study as the shopping centre managements seemed to be reluctant for this to be conducted.

The Built Environment Audit App has the potential to be a powerful tool to capture, record and manage large amount of data if such survey is conducted at a number of places because the data can be stored and presented as an Excel spreadsheet which can then be used for further analysis. The use of a smart device (phone or tablet) also allowed the researcher to record the location (through Google Maps or using the GPS capability of the device). However, currently the device can only record the location when used outdoors, thus to conduct the audit inside the building, manual methods and tools, such as direct observation and writing notes on the survey form or on an electronic tablet, are still required.

4.2. Survey Questionnaire

A survey questionnaire (Appendix 2) was developed and tested for its suitability in terms of the participant population and information required. Participants were recruited from The Queen Elizabeth Hospital. They were asked to fill out the questionnaire at home but were also offered an option of the researcher helping them afterwards. Of 16 participants, 6 (37.5%) needed assistance from the researcher mainly due to cognitive problems (previously identified by a family member or physician) and due to a language barrier. No participant reported lack of understanding of the questions, but some execution issues were noted: 5 participants had troubles filling out their heights, and 2 responded in feet instead of centimetres (which was the unit used in the questionnaire); 2 participants left some sections of the questionnaire blank, and referred to the researcher not understanding issues. One participant mentioned s/he did not have time to complete the questionnaire.

4.2.1. Socio-demographic background

The mean of the age of participants was 80.4 (SD = 7.9) and 10 of the participants (62.5%) were female. Majority (75%) had English as the first language. Half of the participants were married and lived either with the partner or other family members and the remaining were either single who either lived alone or in nursing homes. Other socio-demographic information about the participants can be seen in Table 2.

4.2.4. Quality of Life

The European Quality of Life (EQ-5D-5L) (Viney et al. 2011) is a validated questionnaire that assesses 5 domains of participants' current health: mobility, self-care, usual activities, pain or discomfort and anxiety or depression. Each domain is evaluated in a 5-Likert scale from having no problem (1) to having extreme problems or being unable to perform such activities (5). Additionally, it asks participants to rate their current health in a 0 to 100 visual analogue scale (VAS), with 100 being very healthy. In our sample, none of the participants reported extreme problems in any domain. The domains that showed a higher rate of problems were mobility and pain, with participants reporting moderate problems in those two areas. See Figure 31. The mean VAS for this sample was 64.3 (SD 22.2).

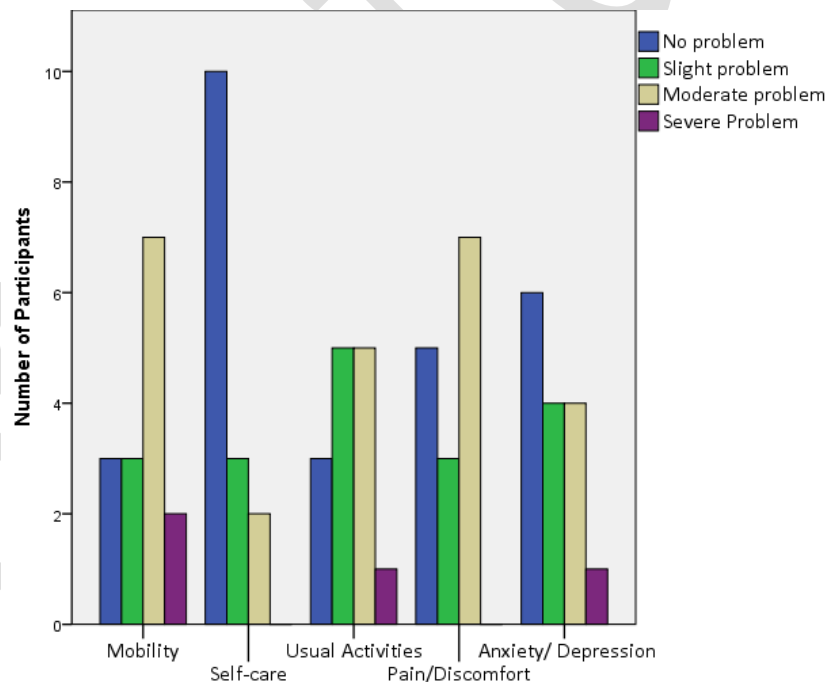


Figure 31. EQ-5D-5L : Quality of life by 5 domains: mobility, self-care, usual activities, pain/discomfort and anxiety/depression

Table 2. Socio-demographic background of participants of the survey questionnaire

Socio-demographic background	Mean (SD)	N (%)
Age	80.36(7.9)	
Gender (Female)		10 (62.5)
Country of Birth		
Australia or New Zealand		7 (43.75)
Europe		6 (37.5)
South East Asia		3 (18.75)
Marital Status		
Married		8 (50.0)
Widowed		6 (37.5)
Separated/divorced		1 (6.25)
Never married		1 (6.25)
Qualification		
Secondary School		5 (31.25)
Certificate/Diploma		4 (25.0)
Bachelor Degree		3 (18.75)
Trade/Apprenticeship		2 (12.5)
Other		2 (12.5)
Residential Status		
Lives Alone		6 (37.5)
Lives with Partner		5 (31.25)
Lives with Family		3 (18.75)
Residential Aged Care/Nursing Home		2 (12.5)
Income		
\$12,000-20,000		3 (18.75)
\$20,001-30,000		6 (37.5)
\$30,001-40,000		3 (18.75)
Prefer not to answer		1 (6.25)
Don't know/Blank		2 (12.5)
Main Source of Income		
Aged Pension		12 (75)
Self-funded Retiree		1 (6.25)
Part-time/Casual Employment		2 (12.5)
Other		1 (6.25)
Home ownership		
Owner (no mortgage)		8 (50)
Owner (with mortgage)		3 (18.75)
Renting		1 (6.25)
Housing trust home		1 (6.25)
Staying with family		2 (12.5)
Other		1 (6.25)

4.2.3. Mobility

Participants' mobility through space and need for assistance were assessed using the questionnaire Life-space assessment (Peel et al. 2005). Questions about the use of transportation were also asked. The life-space assessment tries to identify the distance through which a person would move in the 4 weeks prior to the assessment. The life-space assessment ranges from a person's bedroom to beyond the persons area of residence (town). It also asks the frequency a person would go to a certain area and whether assistance was needed either in the form of equipment (e.g. a walking frame) or personal assistance. The composite score evaluates the maximum space level attained by the individual as well as the frequency and need of equipment or assistance that best correlate with the physical function, mobility and mortality. In a recent longitudinal study (Mackey et al. 2016), a score of 60 or lower correlated with increased mortality in a population of older women. In our sample, only 25% (4) of participants reached scores over 60.

4.2.4. Health Variables

The average number of comorbidity (the simultaneous presence of two chronic diseases or conditions in a person) was 2.75 (the index ranges from 0 to 6). The Charlson's comorbidities index provides a weighted score to 18 prevalent conditions, and its composite score can be a predictor of death from comorbid condition. In our study the Median value was 3, accounting for the fact that scores over 4 had a 1 year mortality of 78% in Charlson et al seminal study (1987). The participants reported using, on average, 5 prescribed medications (SD=3.52) and 1 non prescribed medication.

IQCODE (Jansen et al. 2008; Jorm 1994) is a questionnaire developed as an informant screening tool for cognitive issues. It was further validated as a self-informant tool of participant's perceptions of cognition. Values over 3.3 should prompt further investigation. The mean IQCODE of the study participants was 3.2 (SD 0.57).

Table 3. Comorbidities among study participants

Factors	Mean (SD)	N (%)
No of prescribed medications	5.38 (3.52)	
Non prescribed medication	1.00 (1.04)	
Charlson's Index	3.187 (1.83)	
Charlson's Index + Age	6.56 (2.47) (median 8)	
Hearing issue		6 (37.5)
Seeing issue		6 (37.5)
IQCODE	3.2 (0.52)	
Independent for Basic ADL		2 (12.5)
Independent for Instrumental ADL		6 (37.5)
FRAIL Score		
Robust		2 (12.5)
Pre-frail		7 (43.75)
Frail		6 (37.5)
Incomplete		1 (6.25)
Kihon Checklist score		
Robust		4 (25.0)
Frail		12 (75.0)
Geriatric Depression Scale (GDS4) positive screen		3 (18.75)
At risk for social isolation (Lubben's social network)		6 (37.5)
Mini-nutritional assessment	10.75 (1.98)	
At risk of malnutrition		12 (75.0)
No risk		4 (25.0)
Physical Activity Scale		
Work Index (range 1-5)	1.66 (0.8)	
Sports index (range 1-5)	1.50 (1.08)	
Leisure time index (range 1-5)	2.25 (0.71)	

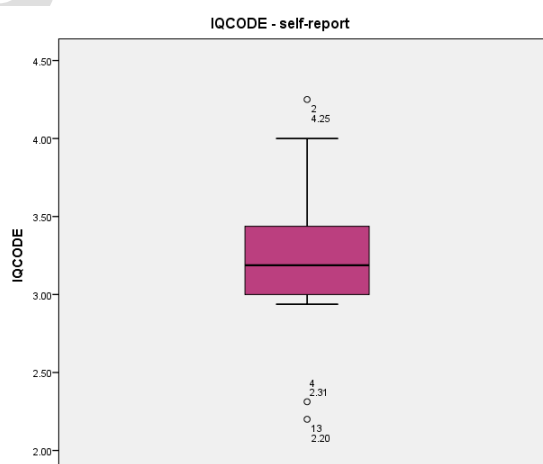


Figure 32. IQCODE results

4.2.5. Frailty Status

Frailty was assessed using two different scores. The FRAIL score (Morley, Malmstrom & Miller 2012) was used to assess 5 main domains: fatigue, resistance, ambulation, illnesses and loss of weight. Using this scale 12.5% of the participants were considered robust, 43.8% pre-frail, and 37.5% frail. Additionally, the Kihon checklist (Satake et al. 2016; Sewo Sampaio et al. 2016) was also used. This checklist was developed by the Japanese Ministry of Health for population screening of frailty and physical functions. It incorporates other domains into the concept of frailty. Using the Kihon checklist, 75% of the participants were considered frail, and 25% robust.

4.2.6. Neighbourhood's Walkability

The participants' perceptions of neighbourhood walkability were assessed using a standardized questionnaire, NEWS (Cerin et al. 2008), with assess multiple domains. The domains investigated include: residential density, land use mix diversity, access to services, street connectivity, and infrastructure for walking, aesthetics and greenery, traffic load, traffic safety and crime.

The results show that the participants' perceived neighbourhood walkability was in the mid-range of each of the domains, as shown in Table 4. The neighbourhood density around the residences of the participants was considered low (mean = 184.93 in a 173-865 range). In other words, while 75% of the participants were considered frail, as shown above, they were aware that their neighbourhoods provided sufficient access to services, had street connectivity, had sufficient infrastructure for walking and greenery, had medium traffic load, traffic safety and somewhat safe from crimes.

Table 4. Neighbourhood Walkability

NEWS	Mean (SD)
Residential Density (range 173-865)	184.93 (67.9)
Land-use Mix Density (range 1-5)	3.9 (2.06)
Access to services (range 1-5)	2.29 (1.15)
Street Connectivity (range 1-5)	2.27(1.36)
Infrastructure for walking (range 1-5)	2.96 (0.96)
Aesthetics and greenery (range 1-5)	2.68 (0.91)
Traffic Load (range 1-5)	2.13 (0.93)
Traffic Safety (range 1-5)	2.26 (1.01)
Crime (range 1-5)	2.01 (1.01)

4.2.7. Evaluation about the survey tool

This survey questionnaire was developed following screening tools used in the geriatric practice, adapted to a self-completed form. Although the tools had been validated to be used in geriatrics or geriatric medicine, their applicability for a non-geriatric study had not been tested.

The study shows that participants sufficiently understand the questions asked, with only minor misinterpretations, although some missing data were found. This might be due to the considerable length of the questionnaire, with over 100 questions, some with longer instructions, and some questions repeated concepts already expressed. A small proportion of participants needed substantial help by the researcher to successfully complete the survey, and this might create a selection bias, preventing the most vulnerable or dependent participants to enter the study. Overall all participants expressed that the questionnaire was acceptable and appealing to participants and no adverse events were found. Participants and researchers had acceptable resources to complete the study in the time given. Ethical aspects were disclosed to each participant about sensitive and private data before the initiation the survey protocol, and no issues arose after completion of the survey.

4.3. Walking Observations

Walking observations were conducted at the Queen Elizabeth Hospital and a small number of shopping centres. The researchers observed all participants who responded to the questionnaire survey. Of the 16 participants, 7 also participated in the walking observation in various shopping centres.

The initial plan was to record the walking activities by the use of a Walking Observation App (see Section 3.2). However, as the tool was still not ready to be used by the time the walking observations at the hospital were conducted, most walking activities were recorded manually by the researcher on the site and floor plan drawings. The routes taken (the start and end points) as well as time required to complete each journey were also noted. Physiological data (blood volume pulse, 3-axis acceleration (walking speed as well as direction in x, y and z axis), skin temperature and skin conductance) of the participants were measured and recorded using a smart wristband, *Empatica*. This will link the physiological information with the recorded information from the Walking Observation App, particularly to identify which aspects of the built environment planning and design have correlations with the physiological information. For example, if the skin conductance increased at a certain point in time, and the Walking Observation App recorded that at the same point in time the participant had to cross the street, then it could be concluded that there was an issue with the street crossing (e.g. no traffic lights were present), which made the participant feel stressful. This highlights the need for a better design of street crossing, which may include installing traffic lights.

4.3.1. At The Queen Elizabeth Hospital

At the Queen Elizabeth Hospital 16 walking observations were conducted from March to June 2017. As mentioned in Section 3.6.1, on the day of the walking observation, the researcher met the participant at an agreed location, which was either the parking lot or hospital entrance. The researcher accompanied the participant from the meeting place to the participant's destination(s), waited while the participant was in the appointment room, and accompanied her or his to the next destination and/or to the end of the visit to the hospital, back to the meeting point.

The walking observation took on average 1 hour and 10 minutes, but ranged from 16 minutes to 2 hours and 40 minutes. During their walk most participants had only one destination (such as an appointment at the Outpatients clinic or the exam area), but some had 3 different destinations.

Using the scaled drawings of the site and floor plans as well as by recording the starting time, the time every time the participant stopped, changed direction, continued their journey, and completed the journey, the total walking distances as well as average walking speeds were calculated. Inside the hospital, participants walked in small distances, on average 269.9 metres. The average walking speed was 0.42m/s, considered to be a slow walking speed in the frailty assessment (a walking speed below the threshold of 0.6 m/s indicates frailty). Table 5 shows the calculated walking speed for all participants.

In this sample 4 participants (25% of the sample) used assistive devices: one participant used a walking stick, 3 used walking frames and they mostly represented the slower walkers.

Actions during their walk were recorded. Out of 16 participants, 15 went in directly to main door when entering the building. On average, participants stopped 4.25 times during their walk, for different reasons, such as looking at signage (3 participants), looking or asking for directions (10 participants), receiving instructions from carer (3 participants), letting other people or cars pass (5 participants) and listening instructions from the researcher (2 participants).

Seven out of 16 participants (43.75%) had appointments other than on the ground floor, and all of them used the lifts to reach to their destination. Participants used varied strategies for wayfinding. Out of 30 wayfinding events, 10 times the participants asked for directions while walking, 8 looked around for directions, 6 looked for signage and 6 needed directions from their carer. During their visits/walks, 8 participants (50%) took a rest by sitting down.

The summary of the walking observations is presented in Table 6.

Table 5. Calculated walking speed of participants at The Queen Elizabeth Hospital

Participant ID	Calculated speed (m/s)	Use of Walking Aid
H001	0.17	walking frame
H004	0.17	no
H007	0.21	walking stick
H011	0.23	no
H014	0.31	no
H016	0.35	no
H005	0.35	walking frame
H008	0.48	no
H002	0.48	no
H018	0.50	no
H012	0.50	no
H010	0.58	no
H019	0.62	no
H020	1.02	no
H013		no
H015		walking frame

Table 6. Walking Observations at The Queen Elizabeth Hospital

Total participants	16		
		Range	%
Average observation time	1h 10 min	16 min – 2h 40 min	
Average walking distance	269.9 m	117 – 697 m	
Average number of destinations	1.2	1 - 3	
Average walking speed	0.42 m/s	(0.17m/s – 1.02 m/s)	
Use of assistive devices	4		25%
Direct use of the door	15		93.75%
Number of stops	4.25	2 – 10	
Use of lifts	7		43.75%
Asked for directions	10		62.5%
Looked around for direction	8		50%
Looked for signage	6		37.5%
Directions from carer	6		37.5%
Resting	8		50%

4.3.2. At Shopping Centres

Participants of the hospital walking observation were invited to take part in a second walking observation at their preferred shopping centres. Out of 16 participants, 7 agreed to participate in walking observation at shopping centres. Of these 7 participants, 5 (71.4%) were considered frail, 1(14.28%) were pre-frail and 1 (14.28%) robust, thus comparatively there was a higher proportion of frail participants who participated in the walking observation in the shopping centres compared to study at the hospital (in the overall group, 37.5% were frail and 46.6% pre-frail).

There was no restriction to the shopping destination. Out of 7 participants, 3 (42.85%) went to West Lakes Westfield Shopping Centre, and the remaining 4 (0.57%) went to local smaller shopping centres in their neighbourhoods, all located in the western suburbs of Adelaide. The procedure for the walking observation is the same as the one at the hospital.

Participants took on average 48 minutes on their walking trip, and ranging from 14 minutes to 1 hour and 27 minutes. There was only one participant requiring an assistive device (walking frame) while walking (14.28%).

Actions taken during their walk, including the distance and duration were recorded. Out of 7 participants, all went directly to main door when entering the building. Only one participant needed to reach upper floors, and used the lifts to do so.

On average, participants stopped 26.1 times during their walk, for different reasons but mainly in relation to their shopping. Out of 7 participants, 4 (57.1%) looked for signage during the walk, 1 (14.28%) asked for directions and 1 required directions from the carer (14.28%). Only one participant (14.28%) rested during their walk. The smaller percentage of participants asking for direction in the shopping centres compared to that in the hospital may be due to two factors: (1) they had visited the shopping centres quite frequently, or (2) they were in a more relaxed mode for not having to reach a destination at a certain time for an appointment. However, this issue needs to be further investigated.

The summary of the walking observation in the shopping centres is presented below.

Table 7. Walking Observations at Shopping Centres

Total participants	7		
		Range	%
Average observation time	48 min	14min – 1h 27min	
Use of assistive devices	1		14.28%
Direct use of the door	7		100%
Number of stops	26.1	5 - 67	
Use of lifts	1		14.28%
Asked for directions	1		14.28%
Looked around for direction	0		
Looked for signage	4		57.1%
Directions from carer	1		14.28%
Resting	1		14.28%

4.3.3. Summary of findings

Even though they were long time visitors of the hospital, most participants still needed some wayfinding strategies such as looking or asking for directions, looking for signage, and constantly asking directions from their carer. Although only 4 participants used walking devices, the walking speed of more than half of the participants is considered very slow, which could be related to the substantial need of assistance for wayfinding.

Participants in the walking observations at the shopping centres were also long time users of the shopping areas. While they did stop significantly more often during their shopping trips this was not part of their wayfinding strategies but more related to their shopping experience.

The percentage of participants needing to rest to rest during the walk in the hospital was much higher than in the shopping centres.

4.3.4. Evaluation about the survey tools

As outlined in the beginning of this section (4.3), two methods were used to collect the information from the walking observation. Initially a paper-based method was used for 16 walking observations in the hospital while the smart phone App was being developed. Subsequently the App was used in the 7 walking observation in the shopping centres, supplemented with printed maps. For this reason, different issues in each method were identified.

For the paper-based tool, a number of variables were recorded, as outlined in section 3.2 Walking Observation. The researcher would document (note) the journey on the floor plans and marked the point for each action taken by the participant while recording the time of its occurrence at the same time. This involved a lot of note taking, while doing observation at the same time. Although the researcher was able to record very detailed information, it does require a highly multi-tasking skill from the researcher.

The main purpose of the App was to (1) record participant's actions in real-time and (2) synchronize the real-time acquired data from the smart wristband (*Empatica*) which records the participant's physiological variables (blood volume pulse, 3-axis acceleration (walking speed as well as direction in x, y and z axis), skin temperature and skin conductance), in order to (3) link the participant's interactions with the built environment (such as stopping, resting, looking for signage, turning around, using elevators or steps) with the physiological variables. It was evident that the App permitted the researcher to focus more on participants' actions than on the recording activity itself, which occurred during the manual recording of the walking observations in the hospital. However, there are also some pitfalls of the App. The positive and negative aspects of the App are pointed below.

Positive aspects

The App enables a higher proportion of participants' actions being recorded during the walking observation compared to the manual recording method. This App was particularly useful during the shopping centre observations, where a higher number of actions were taken by the participants.

Negative aspects

- Currently the App cannot record details of the participant actions, such as the reasons for resting or for slowing down pace (e.g. being unsure where to go, or being tired) because there was no way for the researcher to write notes on the App.
- Although being an essential tool to allow the connection between variables (actions vs physiological variables), the App cannot record the location inside the building where the actions took place, requiring the researcher to keep using a printed map to record the trajectories and places where the actions occurred. This was still a complicated process for the researcher, having to handle and write on the printed map and operate the App on the smartphone simultaneously.
- At times, the smartphone lost connection with the wristband *Empatica*, requiring the researcher to stop to fix the problem, and this interfered the participant's experience during the walk.

4.4. Semi-structured Interviews

The qualitative data from the semi-structured interviews were analysed in three groups, 1) semi-structured interviews with the participants from the hospital walking observations; 2) semi-structured interviews with the participants from the hospital walking observations who also participated in walking observations at their regular shopping centres; and 3) an unrelated group of older patrons of three shopping precincts in Adelaide. The semi-structured interviews with the first two groups were audio recorded and thus analysis was of fully transcribed interview data, while the findings for the third group were drawn from analysis of the researchers' notes of the semi-structured interviews. Two researchers undertook the analysis in NVivo, meeting periodically to compare coding methods and development of themes. One researcher analysed the data from groups one and two, while a second analysed the data for group three.

Over a period involving iterative analysis of the three sets of data, five consistent themes were derived from the interviews. They are:

1. Assistance
2. Environment
3. Facilities
4. Transportation
5. Individual experiences

Assistance - The "Assistance" theme is defined by all means of help including physical items, such as mobility aids or signage, as well as personally being accompanied or assisted and more general strategies for wayfinding.

Environment - The "Environment" theme includes physical aspects of the indoor and outdoor environment specific to the public spaces (i.e. hospital and shopping centre), for example noise, lighting, temperature and maintenance/cleanliness.

Facilities - The "Facilities" category includes macro attributes of the public space such as convenience and organization of the spaces, as well as specific individual attributes such as toilets or seating.

Transportation - The "Transportation" theme covers all aspects involved in the participants' journey to the specific public spaces, for example, car parking, public transport and driving.

Individual experiences - The "Individual Experiences" theme includes participants' individual preferences or behaviours when navigating a public space, social aspects of their use of public space, as well as their habits and routines.

From these five themes (or "parent" codes), the semi-structured interview data was coded into "child" codes or sub themes. These child codes of sub themes were different across the three datasets, but are however indicative of similar underlying issues relevant to the appropriateness of the built environment to support older persons active engagement and use of public spaces.

The following three sections present the results of the thematic analysis of the semi-structured interviews. The audit trails for each theme in all three semi-structured interviews are presented in Appendix 6.

4.4.1. With participants of walking observation - hospital

The 16 participants enrolled in the walking observation at the hospital were interviewed at their home the day after the observation. Participants were asked about the route they had taken, their choice for transportation, aspects of the hospital building itself and strategies used when navigating the space. A description of the main findings from the thematic analysis of the interview notes, arranged by themes, is presented below.

4.4.1.1. Assistance

Within this theme four sub themes have been identified: (1) Assistance by others, (2) Transport assistance, (3) Signage, and (4) Wayfinding.

Assistance by others

More than half of the participants (9) stated going alone for appointments at the hospital, while the rest went with family members.

Transport assistance

Most participants stated that they needed assistance from others for transportation, often being driven by family members to the hospital. One participant used a transportation service specific for older people.

Signage

Participants had mixed responses relating to signage at the hospital. The positive comments were related to having enough signage, while the negative comments referred to the signage not well positioned, either being too far or needing bigger lettering.

Wayfinding

Participants' perceptions about wayfinding in the hospital were mostly negative, with participants reporting episodes of getting lost and difficulties in finding specific locations. The main strategy to find their way was by directly asking another person for directions. The Reception desk and volunteers placed at the main entrance were the most positive aspects mentioned for wayfinding.

4.4.1.2. Environment

The theme of *Environment* included physical environmental aspects inside and outside a specific public space. They are: (1) lighting, (2) temperature and weather, (3) noise and (4) other design issues. Issues relating to this *Environment* theme were mentioned 24 times during the interviews.

Lighting

Overall lighting inside the hospital was considered adequate by the participants. Some participants however stated that the corridors at the Outpatients area to be dull and dark. Some also mentioned issues in the car park at night.

Temperature and weather

Overall inside temperature were considered comfortable by the participants. A number of participants mentioned that some areas inside the hospital to be cold but without being specific as to which areas.

Noise

Participants stated that there were no issues with noise inside the hospital. Only a few reported some specific issues with noise at specific wards or at emergency department.

Other design issues

Despite the fact that no serious negative issues were mentioned about temperature and noise inside the hospital, the overall design was considered negatively by participants. Participants stated specific issues with narrow aisles, having to go through lots of steps, areas with difficult access, and an overall sense that the hospital was in need for redesign.

4.4.1.3. Facilities

Within this theme, three sub themes were identified: (1) management, (2) seating and resting areas and (3) toilets.

Management Issues

Participants often stated some issues with long waiting times and privacy at hospital.

Seating and resting areas

Seating is very important to the participants. They stated that there were not enough seats in the waiting areas. They also expressed concerns with long corridors with no seating available.

Toilets

Toilet facilities were considered well maintained, however some participants stated that they were in need of upgrade particularly in terms of accessibility.

4.4.1.4. Transportation

The sub themes identified include (1) parking issues, (2) public transportation use, (3) driving and traffic, and (4) taxi.

Parking issues

Most participants used cars as their main choice for transportation, either as drivers or passengers. For those who drove, parking was the most problematic issue and there were a number of problems associated with parking: (1) finding a spot to park the car, (2) using the pay machine, (3) walking on uneven surface of the car park, (4) insufficient lighting at night, and (5) feelings of unsafety walking from/to the car park. Due to the difficulty in finding car parking, participants looked for either alternative parking options or alternative transportation mode to get to the hospital. On the positive side, the size of a car park spot was considered adequate, and the car park for disabled people was also considered adequate and sufficient in number.

Public transportation use

Participants who use public transportation stated that buses to the Queen Elizabeth Hospital were frequent. The bus stops were close to the hospital and accessible. Seating at the bus stops were provided and shaded from direct sun. However, on the negative side, the participants experienced accessibility issues to and from the bus itself, reporting episodes of injuries when getting on and off the bus. Some participants mentioned that the bus stops were far from their homes.

Driving and Traffic

Participants who drove the hospital tend to avoid driving on congested streets. They used side streets to get to or return from the hospital.

Taxi

Participants stated that riding a taxi was a convenient option for transportation to and from the hospital due to close proximity to and convenience of a taxi rank.

4.4.1.5. Individual experiences

Within this theme six sub themes were identified: (1) being Independent, (2) frequency of use, (3) mobility issues, (4) relationship with staff, (5) routes, and (6) use of technology.

Being independent

Participants often stated the importance of being independent and able to move around. Participants stated trying to “do as much as they can by themselves” (participant H015), and often trying to not be a burden to family members. Regaining and maintaining one's driver's licence was also recognized as a way of keeping their independence (participant H016).

Frequency of use

The majority of the participants stated as being long time patients at the hospital. On average the participants had been going to the Queen Elizabeth for the last 11 years and most visited at least once every 3 months, while some had weekly visits. Only one participant was on the second visit to the hospital.

Health issues

Participants often referred to issues with their intrinsic capacity that often hindered their mobility through the spaces. These included difficulties to step up and down to or from a bus due to knee problems. As a result they used alternative strategies such as riding a train (as the train and station platform are on the same level), riding a mobility scooter, taking a taxi, or being driven by their spouse. Another participant who has mobility issues tried to avoid going to public toilets by not taking their medication before going to a public space.

Relationship with staff

Participants showed the importance of the presence of staff and volunteers at the hospital. Staff and volunteers were usually referred to as “helpful” and “pleasant”, and played an important role in the participant satisfaction with the hospital service.

Routes

Participants often chose the most direct or shortest route to get to their destination. It was often related to a familiarity with the routes in the hospital as they had established a routine when going to the hospital.

Use of technology

Technology was a specific prompt included in our interview. Majority of the participants stated that they were not used to using technology to navigate through spaces. They perceived it as “possibly helpful” when navigating a new place but also seemed to be reluctant to use it.

4.4.2. With participants of walking observation – shopping centre

Of the initial 16 participants from the hospital walking observation, 7 participants accepted to repeat their participation in a walking observation at a shopping centre that they often went to. For the other 9 people who did participate in the walking observation in shopping centres, the most reason being the time already spent in the project, and having accessibility as well as scheduling issues (they were taken by family members to go to most places).

4.4.2.1. Assistance

Similar to the above, there were 4 sub themes identified under *Assistance*: (1) Assistance by others, (2) Transport assistance, (3) Signage, and (4) Wayfinding.

Assistance by others

In this sample only one participant mentioned to be needing assistance by another person when doing their shopping.

Transport assistance

Out of 7 participants, 2 stated that they required assistance for transportation to and from the shopping centres.

Signage

Participants mentioned that signage would be a useful wayfinding, but interestingly they seldom used it when it was present.

Wayfinding

Participants stated few episodes of getting lost at shopping centres. The common strategies would be asking someone for directions, or trying to find the correct place by themselves.

4.4.2.2. Environment

As above four sub themes were identified under the theme *Environment*: (1) lighting, (2) temperature and weather, (3) noise and (4) other design issues.

Lighting

Participants overall stated that there was no issue with lighting; it was considered comfortable and sufficient.

Temperature and weather

Overall participants stated that the temperature inside the shopping areas was comfortable, although some participants had minor issues in certain specific shops. All participants stated that they would go to the same shopping centres independently of the weather, suggesting familiarity was important in decision making about shopping.

Noise

Noise was a divided topic amongst participants. Four out of 7 participants stated they had no issues with noise, while the remaining stated that there were specific times when noise became an issue.

Other design issues

Only one shopping area had specific issues with the design. These included (1) the disability parking areas were very far from the shopping entrance, (2) lack of accessibility to specific areas, (3) specific facilities being removed from the shopping space, and (4) lack of overall management of the shopping centres.

4.4.2.3. Facilities

Within the theme *Facilities*, three sub themes were identified: (1) seating and resting areas and (2) toilets, and (3) shopping environment.

Seating

Participants stated that the seating at the shopping centres they went to was comfortable and sufficient in number, particularly in the recently upgraded shopping areas.

Toilet

Toilets were considered clean, sufficient and have been lately upgraded. Some however mentioned that some toilets were large distances from the shopping centres.

Shopping environment

The shops were overall considered to be pleasant, enjoyable and accessible.

4.4.2.4. Transportation

The underlining sub themes in the *Transportation* theme are (1) public transportation, (2) parking, and (3) paths.

Public transportation

Public transportation was seldom used by the participants to go shopping. They considered buses to be difficult to access (due to the different level of the ground and bus step, as mentioned above). They also lived too far away from bus stops. No one mentioned using a council run transport service for shopping.

Parking

Parking at shopping centres was a topic discussed by all participants. Most participants said they found parking spots quite easily, and considered maintenance and surface of car parks to be adequate. Some negative issues were brought up with the use of pay machine and electronic gates to exit, as they found them difficult to use. The disability car parks were mentioned as being larger than normal car park spots and usually vacant, but one particular shop was considered to be more difficult to access from the disabled car park.

Participants often expressed specific preferences when choosing a car park. Shaded areas, convenient entrances to the shops and areas where parking was free were considered important.

Paths

One participant, using walking frame and scooter, was particularly concerned about footpaths when driving his scooter to access the shopping centre.

4.4.2.5. Individual experiences

The sub themes in this theme included: (1) Family influences, (2) helpful staff, (3) health and mobility issues, (4) route, (5) safety issues, and (6) frequent user.

Family influences

Participants commented on often receiving advice from family members, relating to considerations about safety when walking through shopping areas and the use of assistive devices.

Helpful staff

Staff at the shopping centres was considered by participants as helpful when directing them to navigate the spaces.

Health and mobility issues

Participants reported on some health related issues that impacted their mobility. These included knee problems, hearing impairments, using walking frames, and swollen ankles. Often the environmental aspects were perceived as barriers to their mobility or use of public spaces, such as the different level between the ground of a bus stop and the step into a bus, lack of hand rails, and loud background noise. To overcome the problems the participants applied different strategies. These included: (1) riding a train instead of a bus, (2) not wearing hearing aids, (3) avoiding cramped stores when using walking frames, (4) asking a spouse to help (due to lack of hand rails to go up or down the steps), (5) riding a mobility scooter, and (6) not taking the fluid tablets before going to shops to prevent having to access toilets.

Route

Participants stated choosing the shortest and familiar routes to get to shops. They tend to follow the same routine when they went shopping.

Safety Issues

Two participants stated concerns with their personal safety and fear of crime when shopping, although not frequently. These concerns prompted them to be more watchful when doing regular shopping.

Frequent users

Participants were frequent users of the chosen shopping areas, usually coming weekly, for many years.

4.4.3. With older customers at shopping centres

The interviews at the three shopping centres involved a total of 48 participants. Three participants were under 65 years old, but the researchers only found out about their age after having conversations with them (despite the fact that this was explained in the beginning of the interviews and the flyers posted around the desk clearly said that the participants must be 65 years old or older). However, as their inputs were valuable to the study, they are included in the analysis below.

During the interviews, the participants made both positive and negative observations of the shopping precincts. Overall, while there was some consistency in the topics discussed (for example access to disabled car parking spaces were often mentioned), specific issues were varied and distinct across the three precincts. Many of the participants visited shopping precincts more than once a week and had been doing so for many years – in many cases it represented an important part of the participants' daily or weekly routines.

A total of 12 interviews were completed with older people at Armada Arndale on the 30th March, 2017. The mean age of the participants was 75 years old and gender was equally represented (see Table 5). Most of the participants frequented Arndale by themselves, while just under half were accompanied by their spouse or children. The participants used a range of transport options to access Arndale, however driving was still the primary method. Approximately a quarter of participants used public transport, a similar proportion relied on taxis while the rest either walked or used community bus services.

A total of 16 interviews were completed with older people at Westfield Marion on the 18th of April and 8th of May, 2017. The mean age of the participants was 70 years old and 13 of participants were female. As with Arndale, most of the participants regularly frequented Marion by themselves, while just over a third were accompanied by their spouse and a fifth accompanied by their children. Similarly, while the participants used a range of transport options to access Marion, driving was still the primary method. Approximately a third of participants used public transport, and a small proportion used taxis, walked or used community bus services.

A total of 20 interviews were completed with older people at the Adelaide Central Market on the 20th and 25th of April, 2017. The mean age of the participants was 74 years old and slightly more than half (13) were female. Just under half of the participants frequented the Markets by themselves, roughly a third were accompanied by their spouse or visited with a friend. Again, driving was still the primary method used to go to the Market, while approximately a third of participants used public transport, and a small proportion used taxis, walked or used community bus services.

A description of the main findings from the thematic analysis of the interview notes, arranged by themes, is presented below.

Table 5. Summary statistics for select characteristics of the shopping centre interview participants

	Arndale		Marion		Central market	
Age (years)						
Mean (SD)	74.6 (10.1)		70.1 (8.9)		73.9 (9.1)	
Min	61		55		61	
Max	90		88		99	
N	12		16		20	
Missing	0		0		1	
Gender (count)						
Male	6	50%	3	19%	8	38%
Female	6	50%	13	81%	13	62%
Missing	0		0		0	
Accompaniment (count - multiple answer)						
Alone	6	55%	11	69%	9	45%
Spouse	2	18%	6	38%	6	30%
Children/sibling	2	18%	3	19%	1	5%
Friend	1	9%	1	6%	5	25%
Carer	0	0%	0	0%	1	5%
Missing	1		0		1	
Mode of transport (count - multiple answer)						
Walks	2	17%	2	13%	2	10%
Drives	6	50%	8	50%	11	55%
Public transit	3	25%	6	38%	7	35%
Council/community bus	2	17%	1	6%	1	5%
Taxi	3	25%	1	6%	1	5%
Missing	0		0		1	
Times visiting (years)						
Mean (SD)	17.6 (19.1)		31.5 (11.2)		28.5 (17.3)	
Min	2		16		4	
Max	53		49		57	
N	7		16		14	
Missing	5		0		7	

4.4.3.1. Assistance

Approximately 15% of all of the interviewees' responses were coded under the *Assistance* theme. Generally, by their very presence in the shopping areas, these participants were reasonably independent and mobile, and therefore not expressing too many concerns that can be categorised by this theme. Of the concerns or topics discussed, five sub themes could be drawn, they are: 1) Assistance by others; 2) Getting lost; 3) Mobility; 4) Signage and 5) Wayfinding.

Assistance from others

Some participants reported being unable or unwilling to drive themselves to the shopping areas, instead relying on family or friends. Interestingly, others reported providing this service to family members (i.e. taking their children or friends to the shops). Many participants commented positively on the assistance provided through a service desk at the shopping centres, however in one case, when the service desk moved and changed its function participants expressed concerns including not knowing its location and difficulty in accessing the services. A few participants noted that they find the stall holders or shop keepers very helpful in providing direction or information.

Getting lost

Very few participants reported getting lost in the shopping areas despite their size (e.g. Marion or the Central Market). Those that did get lost did not appear to be distressed by their experience, rather, they looked for some recognisable features of the shopping area to reorientate themselves. Many participants noted that they never got lost because they had been going to the shopping centres or Market for many years, although one person did comment that they found it harder when things in the shopping area were moved around.

Mobility

Generally, the interviewees had good mobility; only four made comments about how they moved around the shopping centres or Market. Two participants commented that they used a shopping trolley for support while walking around or shopping, while one said that she did not need assistance from another person because she had a walker. The same participant, who lived in an aged-care centre, mentioned that the centre only brought to the shopping centre residents who had good mobility and were not able to bring residents in wheelchairs. No further explanation was offered; however, this could be due to staffing or transportation to the shops rather than the built environment of the public space per se.

Signage

Overwhelmingly, participants reported not using signage in the shopping centres or commented that it was adequate. The concerns raised in the interviews generally referred to very specific instances such as during renovations and for specific services (e.g. toilets, bus timetables, shop listings and street signage). Of the signs themselves, several participants commented that they could be illuminated, brighter and bigger but these comments were in the minority. The participants seemed to make these suggestions based on the perceived needs of others, not their own needs.

Wayfinding

Comments coded to wayfinding were quite varied. Many respondents reported that they simply relied on past experiences to find their way around, while others mentioned particular features (e.g. the lifts) from which they could orient themselves. Some participants said that a paper map would be very useful but others said that they would not use a map. In Adelaide Central Market, they were available at the main entries although hard to find. Almost all of the participants said that they would not use an App to find their way around (e.g. a map on their phone).

Several commented that they parked their cars in the same place so that they would remember where they parked. One suggested that numbered parks would be useful.

4.4.3.2. Environment

Approximately 15% of references were coded under the theme *Environment*. Comments were generally positive but concerns were mentioned to specific instances (e.g. perception of lighting in Marion shopping centre or congested aisles in the Central Market). The child codes or sub themes are 1) Crowded and busy; 2) Lighting; 3) Maintenance; 4) Noise; 5) Temperature and weather; and 6) Ambience.

Crowded and busy

While only nine references were made about this sub theme, they demonstrate an important potential limiting factor in the ability of older people to use public spaces. Several participants noted that they chose to time their visits to the shopping areas when they were likely to be less busy. They raised concerns about temporary obstructions caused by the high volume of customers, such as trolleys taking up too much room and semi-permanent obstructions from shop displays or table and chairs encroaching into walkways. Both issues exacerbated when the shopping centre or Market became busy. One said that clear, wide walkways are necessary.

Lighting

Most of the comments regarding lighting were positive, for example, that the shopping area was well lit and even on an overcast day the inside was “nice and bright”. The negative comments on lighting were associated with the area in front of the Aldi supermarket at Marion Shopping centre. Participants appeared to favour brightly lit areas with lighter internal surfaces (whereas in this area the surfaces appeared to be dark even though the horizontal illumination level itself was similar to the other areas. Refer to section 4.1.3).

Maintenance

Very few concerns were raised about maintenance at the shopping areas. The concerns were mostly confined to the external appearance of the building or carpark (e.g. “shopping centre looks daggy” and “the

carpark is a bit dirty). One participant noted that a particular internal floor surface in Arndale was very slippery but several others noted that the footpaths outside of the centres were well maintained.

Noise

Responses were varied to queries about noise. Many participants did not comment on it, however amongst those that did, generally in Arndale and Marion it was negatively perceived, while in the Adelaide Central Market there was more 'forgiveness'. That is, participants interviewed at the Market appeared to perceive it as a necessary (and generally positive) feature of a market. An exception to this was that one participant said that some stall holders could be "too loud and too aggressive". In the other two shopping areas particular concerns were raised regarding the use of PA (public address) systems, loud music and children.

Temperature and weather

Most participants reported that they visit the shopping centres regardless of weather, however some said that they came either more or less often in hot or cold weather. One participant said that she came "to use their air-conditioner instead of [hers]" in hot weather, while another said that she visited less in cold weather because of mobility issues. One participant did note problems with the air-conditioning system at Arndale during hot weather. Some also said that they went to other public spaces during hot weather (e.g. the beach). Several participants commented on their preference for shade outdoors (e.g. in the car park or walking to the centre) during hot weather.

Ambience

This code was dominated by references from the Adelaide Central Market interviews. Many of these participants commented on the atmosphere, ambience or vibe of the Market. Aspects such as smell, aesthetic quality of the stalls and liveliness were all highlighted as positive experiences during visits to the Market.

4.4.3.3. Facilities

Approximately 15% of references were coded to the theme *Facilities*. Issues raised within this theme were quite varied but generally reflected either why the participants chose to visit the particular shopping centre or specific facilities within it. The sub themes include: 1) Location; 2) Seating; 3) Services and shops; and 4) Toilets.

Location

Several participants commented that they used their particular shopping area because it was close to either home or work. These comments were predominantly raised in relation to the Marion and Arndale shopping centres, with only one participant living close to Adelaide Central Market.

Seating

The number of positive and negative comments on seating were roughly equal. Some thought that there were adequate seating areas and knew where they were, while others thought that there were too few and often already occupied. Specific issues included: seats being too soft, too low and without armrests (at Marion) making it difficult to get up, benches getting moved around or removed (at Arndale) and not enough general seating without having to go to a particular café (at the Central Market).

Services and shops

The range and variety of shops as well as the quality and price of products were all cited as reasons that participants visited the shopping centres and Adelaide Central Market. These features were particularly important to those interviewed at the Central Market. Several participants commented on specific services offered by the centres, some positive (e.g. security, free car parking), some neutral (e.g. Adelaide Central Market offers membership but not many knew about this), and some negative (e.g. customers not knowing about scooter hire at Arndale, no shopping baskets at Aldi at Marion).

Toilets

Comments regarding toilet facilities were generally positive with only a few participants raising concerns about cleanliness or design. Of particular importance to several participants was the ability to fit either a walker, wheelchair or trolley into the toilet (at Marion). One participant raised concerns about an automated

toilet at Adelaide Central Market and the problems that he had experienced (such as the door opening when occupied).

4.4.3.4. Transportation

The Transportation theme attracted the most references. The overwhelming issue across all three shopping facilities was car parking, followed by varied, but generally positive, experiences of public transport. The sub themes within Transportation are: 1) Car parking; 2) Driving; 3) Public transport; 4) Taxi; and 5) Walking.

Car parking

This issue was mentioned for nearly 90 times during the interviews. Key issues were: (1) not enough carparks at certain times of the day or year (e.g. school holidays, Christmas), (2) not enough or reduced disabled carparks, (3) available carparks not close to the shopping area entrance or unprotected from weather, and (4) the carparks themselves were too small. Many participants noted that they had to change their behaviour because of difficulty parking, for example, coming at different times of the day or simply finding alternative ways to get to the shopping area (e.g. public transport or walking).

Positive comments however were mentioned and they included (1) the benefit of having a disabled parking permit, (2) the first-hour-free parking at the Market and free parking at Marion and Arndale, and (3) improvements in the pay machines at the Central Markets.

Driving

Only 10 references were covered by this code. Most issues related to driving were specific to car parking as discussed above. Amongst these comments, participants noted problems with traffic access to Hansen Road (Arndale) as well as the difficulty to find safe drop-off spots at Adelaide Central Market.

Public transport

Comments regarding public transport were largely positive. They included (1) frequency and availability of buses, (2) proximity of transit stops to home or the shopping area, (3) helpfulness of the drivers and (4) that it is free for those with a Seniors Card. Most participants used buses with only a few taking trams or trains to the Central Market.

Most participants either used a paper timetable, had memorised the schedule or just turned-up and waited. Only one reported using the Adelaide Metro App. Others said that they would not use the App and clearly demonstrated a preference for the paper timetables. Most did not have any problems getting on or off the bus, train or tram, and overall reported that the transit stops were in good condition with seating and shade. Some negative comments focused on poor behaviour of others, for example, pushy people getting on or off and people smoking at the bus stop.

Taxis

Only 14 comments relating to the use of taxis were mentioned. Taxis appeared to mostly be used in specific circumstances such as when accompanied by spouse (otherwise used the bus), when mobility was particularly poor, or as a way to return home (they used community bus to go to the shopping centre). Generally, taxis and taxi ranks were perceived to be very convenient; however, two participants noted long waits or no taxis after a certain time in the afternoon.

Walking

Quite a few participants either walked to a public transit stop or from home to the shopping centre. Most found the walk to be very easy and for several it was an important way to remain fit and active. Two noted that they did not feel safe walking to the city (to go to the Market) through the southern parklands and instead they preferred to walk adjacent to the main roads. Generally participants reported that footpaths were well maintained and in good condition although there were a few concerns about tree roots damaging the paving. Participants appeared to appreciate shade, opportunities for rest (e.g. benches or seating) and safe pedestrian crossings. A few participants noted difficulty in crossing the road, with one favouring public transport so that she did not have to wait for the pedestrian crossing lights.

4.4.3.5. Individual experiences

Approximately 25% of references were coded to the theme *Individual Experiences*. The topics discussed covered participants' familiarity with the shopping areas, their experiences while visiting, their reasons for visiting as well as some minor comments on how their health shapes their experience. Child codes within this theme are: 1) Health; 2) Length of visit; 3) Routine and habit; 4) Social experience; and 5) Visiting a long-time.

Health

The few comments coded to Health mainly focused on limitations with mobility and walking. For example, one chose different modes of transport (i.e. bus or taxi) based on whether or not her legs and back were sore. Another tried to park as close as possible to the shops that he needed to go to because of sore knees. Another interviewee needed to sit down to rest often because of problems with feet and knees. Two other participants used walking sticks as aids, while, as noted under the Assistance theme, several used trollies or walkers for support.

Length of visit

This code was almost completely dominated by the Adelaide Central Market interviewees. While varied, they reported spending between one and four hours at the Central Market. Many would include a meal or coffee in their visit.

Routine and habit

Over 50 references were coded under Routine and habit. Many participants reported that they visited the shopping centre multiple times per week, on particular days or at particular times. A participant at Marion Shopping Centre commented that her son said when she died he would bring her casket to Marion because she went there nearly every day of the week. Participants interviewed at the Central Market also noted that they regularly went to the same stalls. The participants' routines and habits appeared to be quite important to their wayfinding throughout the spaces, many relying on past experience of the shopping areas to guide them. Only one or two comments expressed a desire to do something different or try something new.

Social experience

The social experiences involved in visiting the shopping areas were very important to many participants, mentioned over 50 times during the interviews. For many the visit fulfilled social needs rather than specific needs to do with shopping or use other services. For some, they used the visit as an opportunity to see existing friends, while for others the visits were an opportunity to make new friends with stall holders, café workers or people on the bus. A notable demonstration of the importance of the social experience was a comment from one participant, "[she] Goes to the market to cheer herself up ... [to] meet people of different nationalities – to cheer her up".

Visiting a long-time

The majority of participants had been visiting the shopping centres or Market for over two to three decades! Quite a few even reported visiting since the time it opened. For example, one participant said "I've come here since it opened in 1964. I'd be lost if this shopping centre wasn't here". Very few had been using the shopping centres for a relatively short-time (e.g. 3-5 years).

4.4.4. Common Issues

Although the participants of the semi structured interviews can be categorised into two groups: those who clearly have health issues (i.e. those recruited from the hospital) and those who possibly have less health issues (i.e. those recruited directly at shopping centres), the research was able to identify the same issues (or themes) and similar concerns within each theme. These issues are perhaps not new; they have been identified in other studies. They are also supposed to have been addressed by the WHO Guidelines for Global Age-friendly Cities (WHO 2007), but the fact that they were still mentioned as issues of concerns by the study participants meant that in practice, these issues were still occurring.

Of the main theme of *Assistance*, most participants required some sort of assistance, particularly to help them reach their destination or to move around within the public spaces, either from **other people** (e.g. family member, shop or hospital staff), or by using **mobility assistive devices** (e.g. walking frames, mobility

scooters). While signage and maps as well as Applications on smart phones are often offered as wayfinding tools, for older participants these seem to be a less preferred option compared to **directly asking people for directions**.

There were less concerns over *Environmental* issues. In all the public spaces the participants referred to the internal temperatures, lighting levels and noise were generally not an issue. Instead, issues were raised over the management and organisation of the space (e.g. crowded hallways, car park too far from the entrance), maintenance (e.g. dirty spaces), and ambience/aesthetics of the space (e.g. older people noticing an area or building that needed to be renovated).

Most concerns about *Facilities* were raised over lack of seating or resting places in the shopping places and hospital the participants went to. When seating was available, they were often not enough (in number) or they were not well designed (e.g. difficult for them to get up). The second concern about Facilities was about the toilets, particularly in terms of their proximity to the main areas they went to, accessibility and available space within the toilet cubicles. The issues were mostly raised by those with mobility assistive devices.

Relating to *Transportation*, two main issues were raised: car parking (for those who drove or were driven), and transport by bus. Several car parking problems include: difficulty in finding car parking spot, reduced number of disability car park spaces in some shopping centres, and difficulty in using the ticket machines. Older participants preferred to park their cars in shady areas and close to the entrance. For those with mobility problems who used public transportation particularly buses, the issue was mostly not about the adequacy of the bus stop itself (location, seating at the bus stop, and maintenance) but about the difficulty to get on and off the bus, due to the different level between the ground and the step of the bus.

4.4.5. Evaluation of the semi-structured interview questions and method

Semi-structured interviews provide richer data and insights that otherwise cannot be obtained by conducting only a questionnaire survey. The interviews allowed research participants to share their experience and voice their concerns, often without being asked.

In this research, the questions were designed to relate to the main aspects of the WHO Guidelines for Age Friendly Cities and the items in the built environment audit. Upon reflection, the questions might have been too structured. For example, the questions relating to the *Environment* theme focused on lighting quality, noise issues, temperature and weather, and neglected other aspects such as the quality of space, the 'feel', and aesthetics. Participants provided more insights when the question was more open ended, such as "why do you like to come to this place?", or "what do you like about this space?" instead of "what do you think about the lighting in this space". Participants experienced the space in a way that was not necessarily the same as anticipated by the researchers, for example, while good lighting and clear signage were thought to be very important, for the participants, wayfinding was achieved by familiarity with the place or by asking people. Noise and crowded spaces were not an issue because the participants valued the social interactions with others more so than being annoyed by noise and crowd. Semi-structured interviews will surely take longer to conduct (as opposed to presenting the participants with questionnaires) but they provide much richer information.

For future studies, it is worth considering audio recording all interviews if the participants provide their consent. In this study, the interviews with participants recruited at shopping centres were not recorded as it was assumed that people would not want to be interviewed had the conversation been recorded. This presented a challenge to the accuracy of the notes from the interviews as the note taking relied on the researchers to remember what was said by the participants during the interviews. Some depth to the information may have been lost or incorrectly interpreted by the researchers.

5. KEY FINDINGS AND CONCLUSIONS

The Australian Local Government Association has developed and published *Age-friendly built environment: Opportunities for Local Government* (Australian Local Government Association 2006), based on the document *Global Age-friendly Cities: A Guide* by the World Health Organization (WHO 2007). The South Australian state government has further developed these into three guidelines for age-friendly living and neighbourhood: (1) Age-friendly Living: Guidelines for Residential Development, (2) Age-friendly Neighbourhoods: Guidelines and Toolkit for Local Governments, and (3) Age-friendly South Australia: Guidelines for State Government (Government of South Australia 2012). All of these guidelines cover the eight areas identified by WHO that need to be addressed for active ageing: public spaces and buildings, transportation, housing, social participation, respect and social inclusion, civic participation and employment, communication and information, and community support and health services. The specific topics under the area of public spaces and buildings are: pleasant and clean environment, importance of green spaces, somewhere to rest, age-friendly pavements, safe pedestrian crossings, accessibility, secure environment, walkways and cycle paths, age-friendly, barrier-free buildings, adequate public toilets, and appreciation of the needs of 'older customers'.

This pilot study aimed to develop and test an **interdisciplinary** methodology to investigate whether the planning and design of public spaces in Adelaide are appropriate and friendly for older people. The WHO Guide mentioned above is used as a reference in analysing the results of the investigation. A mixed methods research framework enabling the collection and analysis of both quantitative and qualitative data has been developed, implemented and evaluated, based on literature reviews and theories relevant to the diverse disciplines of architecture and built environment, geography, gerontology, and computer science, as presented in Chapter 2.

Two types of public spaces were used as case study: a hospital and shopping centres, both for their internal and external spaces. Sixteen participants aged 65 years and over were recruited from the hospital (The Queen Elizabeth Hospital) and forty-eight were recruited from three shopping precincts (Armada Arndale Shopping Centre, Westfield Marion Shopping Centre, and Adelaide Central Market).

The methods and research tools that have been developed in the research are as follows:

1. Data collection framework:
 - a. Built environment audit
 - b. Walking observation
 - c. Survey questionnaire
 - d. Semi-structured interview
2. Data analysis:
 - a. Quantitative analysis (e.g. measuring distance, number of amenities) and qualitative analysis (e.g. perception of space, aesthetics, maintenance quality) of the audit data
 - b. Quantitative analysis (e.g. walking speed, number of stops) of walking observation data
 - c. Quantitative analysis of the questionnaire survey data
 - d. Qualitative analysis of the semi-structured interview data.
3. Data collection tools:
 - a. Built environment audit: on paper and an App on a smart device (digital tablet or smart phone)
 - b. Walking observation App on a smart phone
 - c. Questionnaire: combining questions from various previously developed questionnaire to assess Quality of Life, social network, physical activity levels, nutritional status, geriatric depression, comorbidities, mobility, basic and instrumental activities of daily living, cognitive decline, pain, frailty level, and perception of the built environment.
 - d. Open-ended questions.

In addition, a third-party device, called *Empatica*, was used and tested to collect physiological variables of the research participants for the walking observation. Site and floor plan drawings were obtained from the Queen Elizabeth Hospital while floor plans/maps of the shopping centres/market were obtained from the Internet.

The following summarizes the key findings from the research, both in terms of the methods developed and tested, as well as lessons learned from the field study in which these methods were implemented.

5.1. Key findings

5.1.1. Methods and research tools

All four methods developed and implemented in this research are deemed necessary to assess whether our public spaces meet the aforementioned guideline for age-friendly built environments. With the built environment audit, we can carefully assess whether the actual built environment (in this project, public spaces) has been planned and designed to meet the guideline. The built environment audit can identify existing problems, provide detailed data and thus suggest clear areas for improvement. For example, with the audit we can find out how many spots are available for disabled car park, and not just that disabled car park is provided. It can identify the distance between seating and whether there is enough seating made available for older people, thus **quantifying** the adequacy of the seating provided for older people.

The downside of the built environment audit is, the assessment is based on the researcher's assessment. No matter objective the assessment is, what is identified as a problem during the audit may not be perceived or noticed by older people as a problem. This is where the walking observation (of older people using the public spaces) and semi-structured interviews play an important role. The walking observation allows the researcher to observe how older people use the spaces thus being able to identify whether factors, identified as problems in the built environment audit, are indeed perceived as problems by older people, or impede their activity, mobility and interactions with the spaces and other people.

Data collected from the wearable device (in this research, *Empatica*) have the potential to provide measurable information about the physiological variables of older people (such as blood volume pulse, walking speed, skin temperature and skin conductance) which could indicate what actually happened to the body of the person when doing the walking. For example, if the person stopped to rest, the measured data could indicate perhaps the heart rate before and after the person has sat down, and this could indicate the importance of seating. Or if the person had to cross the street but no safe crossing could be found, the measured data may show that the skin conductance increases, indicating a higher stress level. This in turn could indicate that a safe pedestrian crossing should be built on that spot.

Unfortunately, due to time constraints, data from *Empatica* have not been analysed at the time this report was prepared, thus this aspect of the research is not completed. The research team aims to continue this aspect of the research after completion of the project.

In this research, physiological-related information about the participants have been obtained through the questionnaire survey. Various questionnaires compiled for the survey have been able to predict the participants' levels of quality of Life, social network, physical activity, nutritional status, geriatric depression, comorbidities, mobility, cognition, pain, frailty, and perception of the built environment. The semi-structured interview further informs the investigation as it allows older people to express their views about the public spaces they use, share their concerns and suggestions for improvements, as well as inform the researcher about positive experience they may have. In fact, it is important to note that, even though the physiological conditions of most of the participants of the semi-structured interviews were unknown (only 16 out of 61 total participants of semi-structured interviews had participated in the questionnaire survey), the responses during the interviews still provided very important insights that could not have been obtained from only conducting questionnaire survey and walking observation.

Based on the evaluations of the research methods and tools developed in the study presented in sections 4.1.6, 4.2.7, 4.3.4, and 4.4.5, the following summaries issues that should be addressed in future research if the above methods are to be implemented.

1. Built environment audit and tool:
 - a. The audit needs to be conducted a number of times and at different times of day and seasons.

- b. The tool needs to allow the researcher to add notes to capture issues not anticipated during the development of the tool.
 - c. The tool needs to allow the researcher to capture still and moving images.
 - d. Additional measurements may be required, such as measurement of the illumination level, glare/brightness level, and sound/noise level.
2. Survey questionnaire:
 - a. Repeating questions or questions addressing similar issues need to be eliminated to reduce the burden of the participants in answering the questions.
3. Walking observation and tool:
 - a. Using a digital tool (e.g. App) is much better than a paper-based recording method
 - b. The App should allow the user to upload maps of the spaces, indicate the location of each action taken by the participant on the map in the App, and add additional notes.
 - c. The tool should have a better interaction with the device measuring the physiological variables of the participant.
 - d. Other devices, rather than *Empatica*, should be investigated. These include
4. Semi-structured interview:
 - a. The questions or prompts need to be carefully designed so not to limit what the participants can say.
 - b. The interview should allow the participants to state issues that are not necessarily asked, by adding a question such as "Is there anything else you would want to say about your experience?"
 - c. To increase response reliability the tool should be piloted
 - d. If the participants consent, the interview should be audio-recorded to prevent important information not being recorded or collected by the researcher.
5. Cross-analyses of data:

Due to various factors, including: (1) delay in completing the walking observations and subsequent semi-structured interviews with walking observation participants due to their limited available times, (2) small number of participants of walking observations, and (3) technical problems in developing both the Walking Observation App and Built Environment Audit App, only limited cross-analysis of data collected from the various methods were conducted.

In future research, a larger sample will be required so that relevant cross-analyses could be done. For example, is there any correlation between frailty level (assessed through the questionnaire survey) and older people's perception about public spaces in general and about seating and wayfinding (assessed through semi-structured interview and walking observation)? In this research, only 16 participants whose physiological conditions were known participated in the walking observation and semi-structured interviews, thus making it unreliable to draw conclusions between their physiological variables, their perceptions of, experience and needs in, public spaces.

5.1.2. Initial findings by researchers

Positive outcomes

Section 4.1.5 summarises the findings from the built environment audit. Some of the findings indicate positive outcomes, such as (1) overall pleasant and clean environment (with some exceptions in certain areas), (2) secure environment, (3) safe pedestrian crossing, and (4) adequate public toilets.

Negative outcomes

The most critical and negative findings were (1) lack of available seatings or somewhere to rest in all four case study buildings, (2) obstructions along footpaths or walkways and uneven surfaces, (3) footpaths that were too narrow for wheelchairs, (4) poor signage or information (poorly located and/or poor writing), (5) lack of handrails in ramps and steps, and (6) lack of carpark for disabled people and/or seniors. Lack of surface brightness (area appeared to be dark) was also identified in one of the shopping centres.

The WHO guideline also suggests the importance of green spaces but there were few green areas in all case study buildings, except in the courtyards of the hospital.

5.1.3. *Problems identified by participants*

Five major themes have been identified based on the analysis of the semi-structured interviews. They are (1) assistance, (2) environment, (3) facilities, (4) transportation, and (5) individual experiences. Similarly the findings suggest positive and negative outcomes.

Positive outcomes

On the theme of 'assistance' participants found that staff (in the hospital) and shop keepers/staff (in shopping centres/market) were helpful. As a matter of fact, the participants tend to want to rely more on people (staff or family members) to provide assistance, information or direction, instead of maps, signage or any digital devices. They also used past experiences in using the same public spaces as well as certain features in the public space as the point of reference to orient themselves if they get lost.

On the theme of 'environment' only a very small portion indicated concerns about the quality of light in all four buildings (and that was only in a certain area of Marion shopping centre). Overall the participants were happy with the quality of light, air temperature and sound in the spaces (except for a certain period of time when the shopping centres became very busy and loud, i.e. during school holidays).

The positive aspect around the theme of 'facilities' include well-maintained public toilets in general, and the variety of shops available in all three shopping precincts. Another positive finding worth mentioning, even though it was only mentioned in one shopping centre, was the new design of toilet cubicle which was wide enough to bring in a shopping trolley. This was critical because some participants also the shopping trolleys to provide walking assistance. Participants also noted that it was the lively atmosphere of the shopping centres that attracted and encouraged them to keep returning there.

On the theme 'transportation' the participants noted that the public service system was adequate, including the availability of buses for seniors, adequate bus shelters with seating, as well as taxi ranks (with seating) near the building. Those who walked to the case study buildings/precincts also expressed satisfaction with the maintenance of the footpaths.

Negative outcomes

There are however a number of concerns raised by the participants, and these coincided with the findings from the built environment audit.

On the theme 'assistance', participants in the hospital found that signage was unclear or difficult to find. As mentioned above, they relied on asking people for wayfinding rather than using the signage. On the other hand, participants in shopping centres did not have any wayfinding issue.

In relation to 'facilities', the overwhelming concern was around lack of seating. So though seating was provided, it was not always available when the participants wanted to use it because occupied by others, indicating that there was not enough seating provided for the patrons. The type of seating was also mentioned as an important factor – as older people may have mobility and physical limitations, they need some seating that would allow them to get up easily (some seating was too soft and low, making them 'sink' and unable to get up easily).

On the theme 'transportation', the main concern was about lack of car parking particularly for disabled people or seniors. Some participants commented that there is now a tendency to prioritise people with small children (strollers/prams) thus replacing the disabled car parks with car parks for mothers and babies. Replacing human with parking ticket machines was also a concern for a number of participants. There was also a concern around safety and security in car parks particularly at night time due to lack of adequate lighting.

5.1.4. *Overlapping problems*

Some of the positive and negative findings identified by the researchers overlap with those mentioned or experienced by the participants. Problems identified by the researchers that were not of obvious concerns by the participants include: narrow and obstructions on footpaths, uneven surfaces, lack of green spaces/trees in car parks, lack of maintenance in certain areas, and areas appeared to be dark in a shopping centre. On the other hand, areas of common concerns relate to lack of clear signage in the hospital, lack of adequate seating in all case study buildings, and lack of car parking for disabled people and seniors. Nevertheless, both issues

identified by the researchers and mentioned by the participants, even though they were not all overlapping are necessary to be addressed in future planning and design of public spaces to support ageing well.

5.2. Improvements for future planning and design of public spaces

Key findings above suggest a number of improvements that need to be considered in the planning and design of public spaces. They include the following:

1. Wayfinding strategies:

- While signage is important, the location/position and lettering used for signage must be in such a way that the signs can be seen and read easily by older people.
- Although the use of smart technologies on mobile devices may be inevitable, they should not replace the presence of humans to provide assistance to older people. In public facilities such as shopping centres and hospitals, this means placing real people (e.g. staff, volunteers) to provide assistance or directions instead of simply providing maps or posting information online.
- Access such as hallways must be managed, not only designed, in such a way so that older people with mobility assistive devices (e.g. walking frames, mobility scooters) are able to move around easily.
- Maintaining adequate lighting level is not enough. The surface treatments (colours, texture) for walls, floor, and ceiling affect brightness in the space. Older people prefer spaces with high level of brightness (i.e. light that is reflected to the eyes, as opposed to light that falls on to the surface)

2. Seating, seating, seating:

- Frequent seating must be available to ensure that older people have somewhere to rest.
- The design of the seats itself must allow older people to sit comfortably and able to stand up easily.

3. Toilets:

- Adequate number of accessible toilets must be provided.
- The location of the toilet areas and the size of each cubicle must consider those with mobility assistive devices.

4. Car parking:

- Adequate number of disability car parking must be provided, closer to the main entrance
- If possible, provide shading to the car park and to the walkway from the car park to the destination.
- If the car park cannot be located closer to the entrance or main destination, provide some seating so that older people can rest while walking between the car park and the main destination.
- Provide adequate lighting on car park for night-time usage.

5. Bus stops:

- A new design for bus stops must be investigated to minimize the level between the ground and the step to the bus. Not all buses have the facility to lower the steps, so either ensure that all public buses have this feature, or redesign all bus stops.
- Ensure that seating is provided in all bus stops (and in other waiting areas for public transport, e.g. taxi, train)

6. Public footpaths:

- Ensure that walkways or footpaths have even surfaces to ensure that older people with mobility assistive devices can use them.

5.3. Closing Remarks

The research was expected to generate a proof of concept that implementing interdisciplinary approaches is essential in assessing and improving the planning and design of our public spaces. The research has sufficiently accomplished this goal. Due to time constraints and some technical difficulties, data from the wearable device, *Empatica*, have not been analysed, as well, the Built Environment App has not been fully

tested by the time this report was written. However, these are expected to be conducted as soon as possible.

This pilot study has generated a solid basis from which to develop large research grant proposals involving external partners such as, Office of The Ageing, SA Planning and Local Government Authorities, as initially planned. Work is underway to realize this ultimate goal.

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APPENDICES

DO NOT COPY

Insert building plan

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Built environment audit tool -streets	
- Built Environment Audit/clipboard/pen; - Measuring tape; - Camera; - Handheld anemometer/thermometer/lux metre; and - Map/diagram of area/route.	
Participant ID	Background
Location	
Route	
RN: mark on map/draw diagram.	
Time & date	
Researcher ID	

Local amenity	
S.1 Destinations:	
RN: Tick any that are in proximity to the route.	
1	ATM
2	Letterbox
3	Bus stop
4	Supermarket
5	Bakery
6	Fruit & vegetable shop
7	Buncher
8	Other shops
9	Shopping centre
10	Hair dresser or barber
11	Café
12	Nursing home
13	Pharmacy
14	Community centre
15	Sports facility
S.2 Current weather & thermal conditions:	
RN: Tick all that apply.	
1	Wet
2	Windy
3	Full sunshine
4	Overcast
5	Dusk/evening/low light
6	None applicable
7	Other, please specify
S.3 Localized thermal conditions:	
RN: Briefly describe any notable hot/cold areas along the route e.g. radiant heat from masonry wall, wind tunnel, etc. Mark on map.	

Route characteristics	
S.4 Type of path:	
RN: Tick all that apply. Take picture(s).	
1	Pavement
2	No path
3	Path forms useful & direct route
4	Path is disjointed
S.5 Is this consistent throughout the route?	
RN: if "No" take picture.	
1	Yes
2	No
S.6 Slope:	
RN: take picture.	
1	Mostly level
2	Slight gradient
3	Steep (difficult to walk)
S.7 Path condition and smoothness:	
RN: choose the most applicable; take picture.	
1	Poor (a lot of bumps, cracks, holes, weeds)
2	Moderate (some of the above)
3	Good (very few of the above)
4	Under repair
S.8 Path material:	
RN: Tick all that apply if path is varied; take pictures of all surface types.	
1	Tarmac/black surfacing (e.g. carpark)
2	Paving blocks (small)
3	Paving slabs (large)
4	Textile paving
5	Cobbles
6	Loose gravel
7	Mud/earth/unpaved
8	Grass
9	Other, please specify
S.9 Maintenance of path(s):	
RN: choose most applicable; take picture(s) of notable instances	
1	Insufficient
2	Reasonable
3	Sufficient
4	Not applicable
S.10 Usable width of pavement:	
RN: make note if width varies; measure width of path(s).	
1	Suitable for only 1 person
2	Suitable for 2 people
3	Suitable for more than 2 people

Insert map

S.11 Permanent path obstructions: <i>RN:</i> tick all that apply; take pictures of all obstructions. 1. ☐ Poles 2. ☐ Signs 3. ☐ Tables & chairs 4. ☐ Utilities covers/access hole cover 5. ☐ Overhanging trees 6. ☐ Other, please specify	S.17 Road crossing aids: <i>RN:</i> record details for all road crossing(s); take picture(s) of all road crossing(s). 1. ☐ Median refuge or traffic island 2. ☐ Kerb extensions 3. ☐ Crossing traffic lights 4. ☐ Zebra crossing 5. ☐ None	S.26 Type of street lighting: <i>RN:</i> choose most applicable; take picture(s) of notable instances. 1. ☐ High pressure sodium 2. ☐ Fluorescent 3. ☐ Metal Halide 4. ☐ Other	S.34 Street trees: <i>RN:</i> choose most applicable; take picture(s) of notable instances. 1. ☐ A lot 2. ☐ Some 3. ☐ None
S.12 Temporary path obstructions: <i>RN:</i> tick all that apply; take pictures of all temporary obstructions. 1. ☐ Leaves 2. ☐ Seedpods/tree litter 3. ☐ Sitting water puddles 4. ☐ Dustbins 5. ☐ Litter 6. ☐ Scaffolding/construction hoarding 7. ☐ None 8. ☐ Other, please specify	S.18 Traffic control devices: <i>RN:</i> take picture(s) of all traffic control devices. 1. ☐ Roundabouts 2. ☐ Speed humps or ramps 3. ☐ Chicanes, kerb extensions, lane narrowing 4. ☐ Traffic signals 5. ☐ Paved road sections 6. ☐ None	S.35 Height of street trees: <i>RN:</i> approximate height. 1. ☐ Small (head high) 2. ☐ Medium (between head & ceiling height) 3. ☐ Large (higher than ceiling) 4. ☐ Not applicable	S.36 Gardened areas: <i>RN:</i> choose most applicable; take picture(s) of notable instances. 1. ☐ A lot 2. ☐ Some 3. ☐ None
S.13 Steps & handrails: <i>RN:</i> record details of any/all steps; take picture(s) of all steps(s).	S.19 Speed limit of adjacent road(s): <i>RN:</i> record speed limit(s) of all adjacent road(s).	S.37 Water features: <i>RN:</i> choose most applicable; take picture(s) of notable instances. 1. ☐ A lot 2. ☐ Some 3. ☐ None	S.38 Litter: <i>RN:</i> choose most applicable; take picture(s) of notable instances. 1. ☐ A lot 2. ☐ Some 3. ☐ None
S.14 Benches or seating: <i>RN:</i> briefly describe (i.e. count, approximate distance between) 1. ☐ No benches or seating 2. ☐ Irregular/some benches or seating 3. ☐ Regular benches or seating	S.20 Bicycle lanes 1. ☐ Absent 2. ☐ No separated from car lane 3. ☐ Separated from car lane 4. ☐ Shared with pedestrian path 5. ☐ Not applicable	S.39 Dog waste: <i>RN:</i> choose most applicable. 1. ☐ A lot 2. ☐ Some 3. ☐ None	S.40 Vandalism (broken windows, damaged equipment): <i>RN:</i> choose most applicable; take picture(s) of notable instances. 1. ☐ A lot 2. ☐ Some 3. ☐ None
S.15 Maintenance of benches or seating: <i>RN:</i> choose most applicable; take picture(s) of notable instances. 1. ☐ Insufficient 2. ☐ Reasonable 3. ☐ Sufficient 4. ☐ Not applicable	S.21 Social Environment: <i>RN:</i> briefly describe 'business' (e.g. can the participant walk unobstructed by other users); take pictures.	S.41 Graffiti: <i>RN:</i> choose most applicable; take picture(s) of notable instances. 1. ☐ A lot 2. ☐ Some 3. ☐ None	S.42 Parks & open green space: <i>RN:</i> choose most applicable; take picture(s) of notable instances. 1. ☐ Absent 2. ☐ Present
S.16 Waste bins: <i>RN:</i> choose most applicable. 1. ☐ No waste bins 2. ☐ Irregular/some waste bins 3. ☐ Regular waste bins	S.22 Wayfinding & signage: <i>RN:</i> briefly describe wayfinding & signage; take pictures. 1. ☐ Adequate 2. ☐ Inadequate	S.43 Maintenance of street: <i>RN:</i> choose most applicable; take picture(s) of notable instances. 1. ☐ Insufficient 2. ☐ Reasonable 3. ☐ Sufficient 4. ☐ Not applicable	Notes
S.25 Street lighting: <i>RN:</i> record lux if low light/dusk/dawn. 1. ☐ Street lights present 2. ☐ Path is well lit 3. ☐ Insufficient lighting for pedestrians	S.23 Surveillance: <i>RN:</i> note any specific issues. 1. ☐ Observation from >75% of buildings 2. ☐ Observation from 50-74% of buildings 3. ☐ Observation from <50% of buildings 4. ☐ Not applicable		

Appendix 2 – Survey Questionnaire

DO NOT COPY

Planning and Design of public spaces to support ageing well

Instructions:

Please complete this questionnaire by either circling or ticking the box for the correct response or filling in the blank.

Answer all items as accurately as possible. If you have any questions or need help to fill this form, do not hesitate to contact us (Tel: 08 8222 7676 or email: beatriz.martins@adelaide.edu.au).

All information is strictly confidential.

This section of the survey will ask for some background information about you...

1. Are you: ☐ Female ☐ Male
2. Your date of birth: Day _____ Month _____ - Year _____
3. What is your country of birth? (Please choose by continent region)
- | | |
|---|--|
| ☐ 1 Australia, New Zealand | ☐ 6. North-East Asia (China, Japan, Korea, Hong Kong) |
| ☐ 2 North-West Europe (United Kingdom, France, Germany, Netherlands) | ☐ 7. Southern and Central Asia (India, Pakistan, Bangladesh, Afghanistan) |
| ☐ 3 Southern and Eastern Europe (Italy, Greece, Serbia, Croatia) | ☐ 8 Americas (United States of America, Canada, Mexico, Brazil) |
| ☐ 4 North Africa and Middle East (Egypt, Lebanon, Iran, Turkey) | ☐ 9 Sub-Saharan Africa (South Africa |
| ☐ 5 South-East Asia (Malaysia, Singapore, Thailand, Indonesia, Philippines or Vietnam) | ☐ 10 Other (please specify) _____ |
4. Are you of Aboriginal or Torres Strait Islander origin? (For persons of both Aboriginal and Torres Strait Islander origin, tick both 'Yes' boxes)
- ☐ 1 No
- ☐ 2 Yes, Aboriginal
- ☐ 3 Yes, Torres Strait Islander
5. If you were not born in Australia, what year did you arrive in Australia?
- _____ ☐ Don't Know
6. Is English your primary language?
- ☐ 1 No ☐ 2 Yes
7. What is your highest qualification?
- | | |
|--|---|
| ☐ 1 Bachelor degree or higher | ☐ 5 Primary School |
| ☐ 2 Trade/Apprenticeship | ☐ 6 Other (please specify) _____ |
| ☐ 3 Certificate/Diploma | ☐ 7 Don't know |
| ☐ 4 Secondary School | |

8. What is your marital status?

- ☐ 1 Married or living with a partner
- ☐ 2 Separated/Divorced
- ☐ 3 Widowed
- ☐ 4 Never Married

9. What is your residential status?

- ☐ 1 Lives alone
- ☐ 2 Lives with partner
- ☐ 3 Lives with family (children, siblings)
- ☐ 4 Residential Aged Care/Nursing Home
- ☐ 5 Other: _____ (please specify)

10. What is the approximate annual gross income (including pension) of your household? (That is, for all people in the household before tax is taken out?)

- ☐ 1 Up to \$12,000
- ☐ 2 \$12,001 - \$ 20,000
- ☐ 3 \$20,001 - \$30,000
- ☐ 4 \$30,001 - \$40,000
- ☐ 5 \$40,001 - \$50,000
- ☐ 6 \$50,001 - \$60,000
- ☐ 7 \$60,001 - \$80,000
- ☐ 8 More than \$80,001
- ☐ Prefer not to answer
- ☐ Don't Know

11. What is your main source of income You are able to tick more than one response:

- ☐ 1 Full time Employed
- ☐ 2 Part time/casual employment
- ☐ 3 Self-funded Retiree
- ☐ 4 Aged Pension
- ☐ 5 Overseas Pension
- ☐ 6 Dependant on other people financially
- ☐ 7 Other (please specify) _____

12. Do you own your own home?

- ☐ 1 Owner (No Mortgage)
- ☐ 2 Owner (With Mortgage)
- ☐ 3 Renting
- ☐ 4 Housing trust home
- ☐ 5 Staying with family
- ☐ 6 Other (please specify) _____

This section of the survey will ask for your views about your health today.

Under each heading, please circle the answer that best describes your health TODAY.

13. . MOBILITY

I have no problems in walking about	I have slight problems in walking about	I have moderate problems in walking about	I have severe problems in walking about	I am unable to walk about
-------------------------------------	---	---	---	---------------------------

14. SELF-CARE

I have no problems with washing or dressing myself	I have slight problems with washing or dressing myself	I have moderate problems with washing or dressing myself	I have severe problems with washing or dressing myself	I am unable to with washing or dressing myself
--	--	--	--	--

15. USUAL ACTIVITIES (e.g. . *work, study, housework, family or leisure activities*)

I have no problems doing my usual activities	I have slight problems doing my usual activities t	I have moderate problems doing my usual activities	I have severe problems doing my usual activities	I am unable doing my usual activities
--	--	--	--	---------------------------------------

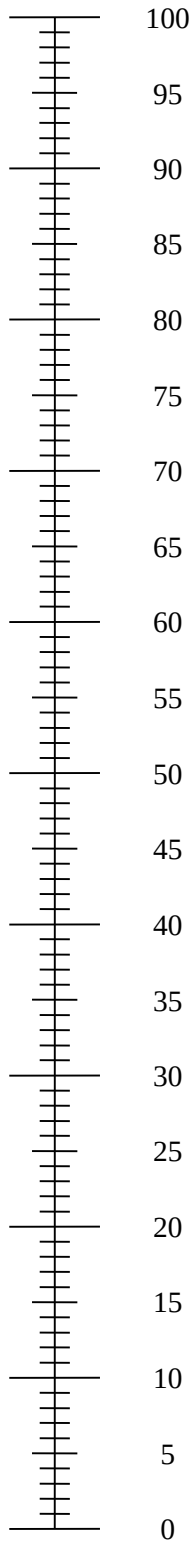
16. PAIN/DISCOMFORT

I have no pain or discomfort	I have slight pain or discomfort	I have moderate pain or discomfort	I have severe pain or discomfort	I have extreme pain or discomfort
------------------------------	----------------------------------	------------------------------------	----------------------------------	-----------------------------------

17. ANXIETY/DEPRESSION

I am not anxious or depressed	I am slightly anxious or depressed	I am moderately anxious or depressed	I am severely anxious or depressed	I am extremely anxious or depressed
-------------------------------	------------------------------------	--------------------------------------	------------------------------------	-------------------------------------

- This scale is numbered from 0 to 100.
- 100 means the best health you can imagine.
- 0 means the worst health you can imagine.
- Mark an X on the scale to indicate how your health is TODAY.
- Now, please write the number you marked on the scale in the box below.



YOUR HEALTH TODAY =

MOBILITY - In this section of the survey, we are interested in places you normally go and how do you get there.

LIFE-SPACE LEVEL		FREQUENCY	INDEPENDENCE
During the past 4 weeks, have you been to...		How Often did you get there?	Did you use aids or equipment? Did you need help from another person?
18. Other rooms of your home besides the room where you sleep?	☐ (0) No ☐ (1) Yes	☐ (1) Less than 1 week ☐ (2) 1-3 times/week ☐ (3) 4-6 times/week ☐ (4) Daily	☐ (1) Personal assistance ☐ (1.5) Equipment only ☐ (2) No Equipment or personal assistance
19. An area immediately outside your home such as your porch, deck or patio, hallway of an apartment building, garage, in your own yard or driveway?	☐ (0) No ☐ (1) Yes	☐ (1) Less than 1 week ☐ (2) 1-3 times/week ☐ (3) 4-6 times/week ☐ (4) Daily	☐ (1) Personal assistance ☐ (1.5) Equipment only ☐ (2) No Equipment or personal assistance
20. Places in your neighbourhood, other than your own yard or apartment building?	☐ (0) No ☐ (1) Yes	☐ (1) Less than 1 week ☐ (2) 1-3 times/week ☐ (3) 4-6 times/week ☐ (4) Daily	☐ (1) Personal assistance ☐ (1.5) Equipment only ☐ (2) No Equipment or personal assistance
21. Places outside your neighbourhood, but within your town?	☐ (0) No ☐ (1) Yes	☐ (1) Less than 1 week ☐ (2) 1-3 times/week ☐ (3) 4-6 times/week ☐ (4) Daily	☐ (1) Personal assistance ☐ (1.5) Equipment only ☐ (2) No Equipment or personal assistance
22. Places outside your town?	☐ (0) No ☐ (1) Yes	☐ (1) Less than 1 week ☐ (2) 1-3 times/week ☐ (3) 4-6 times/week ☐ (4) Daily	☐ (1) Personal assistance ☐ (1.5) Equipment only ☐ (2) No Equipment or personal assistance

23. Do you go out less frequently compared to last year?

☐ 1 No

☐ 2 Yes

24. What is your choice for transportation when doing your usual activities (for example groceries shopping, going to post office, bank etc.) inside your neighbourhood?

☐ 1 Car (as a driver)

☐ 2 Car (as a passenger)

☐ 3 Bicycle

☐ 4 Train or Bus

☐ 5 Walk

☐ 6 Other (please specify)

25. Do you hold a current driver's licence?

☐ 1 No How old were you when you stopped driving? _____

☐ 2 Yes

26. If you still hold a driver's licence, are there any restrictions on your driving?

☐ 1 No

☐ 2 Yes, I am on a restricted licence

☐ 3 Yes, I self-restrict my own driving

Please explain (for example do not drive long distances, at night, etc.)

27. Do you need help for bathing?

☐ 1 No

☐ 2 Yes

28. Do you need help dressing yourself?

☐ 1 No

☐ 2 Yes

29. Do you need help going to the toilet?

☐ 1 No

☐ 2 Yes

30. Do you need help for moving out of bed?

☐ 1 No

☐ 2 Yes

31. Do you have any problems to control your bladder?

☐ 1 No

☐ 2 Yes

32. Do you feed yourself without assistance?

☐ 1 No

☐ 2 Yes

33. Can you use the telephone independently?

☐ 1 No

☐ 2 Yes

34. Can you plan and prepare meals for yourself?

☐ 1 No

☐ 2 Yes

35. Can you do housekeeping work?

☐ 1 No

☐ 2 Yes

36. Can you do your personal laundry?

☐ 1 No

☐ 2 Yes

37. Can you travel independently on public transportation?

☐ 1 No

☐ 2 Yes

38. Can you take your medications independently?

☐ 1 No

☐ 2 Yes

39. Can you manage your own finances?

☐ 1 No

☐ 2 Yes

40. Can you do shopping to buy daily necessities by yourself?

☐ 1 No

☐ 2 Yes

Now we want you to remember what you were like 10 years ago and to compare it with what you are like now. 10 years ago was in 2006.

Below are situations where you have to use your memory or intelligence and we want you to indicate whether this has improved, stayed the same or got worse in that situation over the past 10 years. Note the importance of comparing your present performance with 10 years ago. So if 10 years ago you always forgot where you had left things, and you still does, then this would be considered "Hasn't changed much". Please indicate the changes you have observed by circling the appropriate answer.

Compared with 10 years ago how are you now at:

	1	2	3	4	5
41. Remembering things about family and friends e.g. occupations, birthdays, addresses	Much improved	A bit improved	Not much change	A bit worse	Much worse
42. . Remembering things that have happened recently	Much improved	A bit improved	Not much change	A bit worse	Much worse
43. Recalling conversations a few days later	Much improved	A bit improved	Not much change	A bit worse	Much worse
44. Remembering your address and telephone number	Much improved	A bit improved	Not much change	A bit worse	Much worse
45. Remembering what day and month it is	Much improved	A bit improved	Not much change	A bit worse	Much worse
46. Remembering where things are usually kept	Much improved	A bit improved	Not much change	A bit worse	Much worse
47. . Remembering where to find things which have been put in a different place from usual	Much improved	A bit improved	Not much change	A bit worse	Much worse
48. Knowing how to work familiar machines around the house	Much improved	A bit improved	Not much change	A bit worse	Much worse
49. . Learning to use a new gadget or machine around the house	Much improved	A bit improved	Not much change	A bit worse	Much worse
50. . Learning new things in general	Much improved	A bit improved	Not much change	A bit worse	Much worse
51. Following a story in a book or on TV	Much improved	A bit improved	Not much change	A bit worse	Much worse
52. Making decisions on everyday matters	Much improved	A bit improved	Not much change	A bit worse	Much worse
53. Handling money for shopping	Much improved	A bit improved	Not much change	A bit worse	Much worse

54. Handling financial matters e.g. the pension, dealing with the bank	Much improved	A bit improved	Not much change	A bit worse	Much worse
55. Handling other everyday arithmetic problems e.g. knowing how much food to buy, knowing how long between visits from family or friends	Much improved	A bit improved	Not much change	A bit worse	Much worse
56. Using your intelligence to understand what's going on and to reason things through	Much improved	A bit improved	Not much change	A bit worse	Much worse

In this section of the survey, we are interested on knowing more about details about your health problems.

57. Did your doctor ever tell you have (or had) one of the following (please tick more than one):

- | | |
|--|---|
| ☐ 1 Heart Attack | ☐ 10 Diabetes without complication |
| ☐ 2 Heart Failure of Fluid in the Lungs | ☐ 11 Diabetes with complications |
| ☐ 3 Problems with circulation to your legs or Leg cramping when you walk, that goes away when resting | ☐ 12 Weakness down one side of your body |
| ☐ 4 Stroke or Mini-stroke | ☐ 13 Cancer (without spread) |
| ☐ 5 Dementia or Memory Problems | ☐ 14 Leukaemia |
| ☐ 6 Rheumatoid Arthritis, Sjogren's Disease, Systemic Lupus or Scleroderma | ☐ 15 Lymphoma |
| ☐ 7 Stomach or Duodenal Ulcer | ☐ 16 Moderate to severe Kidney Disease |
| ☐ 8 Mild Liver Disease | ☐ 17 Metastatic Cancer (i.e. cancer that has spread) |
| ☐ 9 Moderate to Severe Liver Disease | ☐ 18 AIDS |
| | ☐ 19 Hypertension |

58. Do you have difficulties seeing?

- ☐ 1 No ☐ 2 Yes

59. Do you have difficulties hearing?

- ☐ 1 No ☐ 2 Yes

60. How many prescribed medications you take daily? _____

61. How many non-prescribed medications do you take in a regular week (off the counter, herbal medicine or alternative medicine)? _____

Here are some of the thing which other patients have told us about their pain. Think about when you feel pain. For each statement please circle any number from 0 to 6 to say how much physical activities such as bending, lifting, walking or driving affect or would affect your pain.

	Completely Disagree			Unsure			Completely Agree
62. My pain is caused by physical activity.(Waddell et al. 1993)	0	1	2	3	4	5	6
63. Physical Activity makes my pain worse.	0	1	2	3	4	5	6
64. I should not do physical activities which might make my pain worse.	0	1	2	3	4	5	6
65. Physical Activity might harm my back.	0	1	2	3	4	5	6
66. I cannot do physical activities which might make my pain worse.	0	1	2	3	4	5	6

67. How much time during the past four weeks did you feel tired?

☐

1 All of the Time

☐

4 A little of the time

☐

2 Most of the time

☐

5 None of the time

☐

3 Some of the time

68. By yourself and not using aids, do you have any difficulty walking up 10 steps without resting?

☐

1 No

☐

2 Yes

69. By yourself and not using aids, do you have any difficulty walking several hundred metres?

☐

1 No

☐

2 Yes

70. Can you normally stand up from a chair without using any aids?

☐

1 No

☐

2 Yes

71. Have you experienced a fall in the past year?

☐

1 No

☐

2 Yes

72. Do you have a fear of falling while walking?

☐

1 No

☐

2 Yes

73. Do you have any difficulties eating tough foods compared to 6 months ago?

☐

1 No

☐

2 Yes

74. Have you ever choked on tea or soup recently?

☐

1 No

☐

2 Yes

75. Do you often experience having a dry mouth?

☐

1 No

☐

2 Yes

76. WEIGHT:

- a. Can you tell your current weight? _____ kg
b. Can you tell your weight a year ago? _____ kg
c. Can you tell your height: _____ cm

77. Are you basically satisfied with your life?

☐ 1 No

☐ 0 Yes

78. Do you feel that your life is empty?

☐ 0 No

☐ 1 Yes

79. Are you afraid that something bad is going to happen to you?

☐ 0 No

☐ 1 Yes

80. Do you feel happy most of the time?

☐ 1 No

☐ 0 Yes

81. Has your food intake declined over the past 3 months?

☐ 0 Severe decrease in food intake

☐ 1 Moderate decrease in food intake

☐ 2 No decrease in food intake

In this section, we want to know about your social network.

Considering the people to whom you are related to by birth, marriage, adoption, etc...

82. How many relatives do you see or hear from at least once a month?

☐ 0 None

☐ 1 One

☐ 2 Two

☐ 3 Three or
Four

☐ 4 Five to
Eight

☐ 5 Nine or
more

83. How many relatives do you feel at ease with that you can talk about private matters?

☐ 0 None

☐ 1 One

☐ 2 Two

☐ 3 Three or
Four

☐ 4 Five to
Eight

☐ 5 Nine or
more

84. How many relatives do you feel close to such that you could call on them for help?

☐ 0 None

☐ 1 One

☐ 2 Two

☐ 3 Three or
Four

☐ 4 Five to
Eight

☐ 5 Nine or
more

Considering all of your friends including those that live in your neighbourhood...

85. How many of your friends do you see or hear from at least once a month?

☐ 0 None

☐ 1 One

☐ 2 Two

☐ 3 Three or
Four

☐ 4 Five -
Eight

☐ 5 Nine or
more

86. How many friends do you feel at ease with that you can talk about private matters?

☐ 0 None

☐ 1 One

☐ 2 Two

☐ 3 Three or
Four

☐ 4 Five -
Eight

☐ 5 Nine or
more

87. How many friends do you feel close to such that you could call on them for help?

☐ 0 None

☐ 1 One

☐ 2 Two

☐ 3 Three or
Four

☐ 4 Five -
Eight

☐ 5 Nine or
more

In this section we are interested on learning how much physical activity you usually do.

88. Do you currently work (includes volunteer work)?

☐ 1 No → (Please go to question 97)

☐ 2 Yes

89. What is your current job?

☐ 1 Clerical work, driving, teaching, housework or medical practice

☐ 3 Factory work, plumbing, carpentry or farming

☐ 5 Construction work, Mining, Professional Sport

90. At work, how often do you sit?

1 ☐

Never

2 ☐

Seldom

3. ☐

Sometimes

4. ☐

Often

5. ☐

Always

91. At work how often do you stand

1 ☐

Never

2 ☐

Seldom

3. ☐

Sometimes

4. ☐

Often

5. ☐

Always

92. At work how often do you walk

1 ☐

Never

2 ☐

Seldom

3. ☐

Sometimes

4. ☐

Often

5. ☐

Always

93. At work how often do you lift heavy loads

1 ☐

Never

2 ☐

Seldom

3. ☐

Sometimes

4. ☐

Often

5. ☐

Always

94. After working how often are you tired?

1 ☐

Never

2 ☐

Seldom

3. ☐

Sometimes

4. ☐

Often

5. ☐

Always

95. At work how often do you sweat?

1 ☐

Never

2 ☐

Seldom

3. ☐

Sometimes

4. ☐

Often

5. ☐

Always

96. In comparison of others of my own age I think my work is physically:

1 ☐

Much
heavier

2 ☐

Heavier

3 ☐ As

Heavy

4 ☐

Lighter

5 ☐

Much
Lighter

97. Do you play sports or exercise regularly (including walking)?

☐ 1 No

☐ 2 Yes

98. Which sport do you play more frequently?

99. How many hours a week do you play the sport mentioned in question 98?

1 ☐ <1 hour

2 ☐ 1-2hours

3 ☐ 2-3hours

4 ☐ 3-4 hours

5 ☐ > 4 hours

100. How many months a year do you play the sport mentioned in question 98?

1 ☐ <1 hour

2 ☐ 1-2hours

3 ☐ 2-3hours

4 ☐ 3-4 hours

5 ☐ > 4 hours

101. In comparison with others of your age, you think your physical activity during leisure time is:	5 ☐ Much more	4 ☐ More	3. ☐ the same	2. ☐ Less	1 ☐ Much less
102. During leisure time how often do you sweat?	1 ☐ Never	2 ☐ Seldom	3. ☐ Sometimes	4. ☐ Often	5. ☐ Always
103. During leisure time do you play sports?	1 ☐ Never	2 ☐ Seldom	3. ☐ Sometimes	4. ☐ Often	5. ☐ Always
104. During leisure time how often do you watch television?	1 ☐ Never	2 ☐ Seldom	3. ☐ Sometimes	4. ☐ Often	5. ☐ Always
105. During leisure time how often do you walk	1 ☐ Never	2 ☐ Seldom	3. ☐ Sometimes	4. ☐ Often	5. ☐ Always
106. During leisure time how often do you cycle	1 ☐ Never	2 ☐ Seldom	3. ☐ Sometimes	4. ☐ Often	5. ☐ Always

107. How many minutes do you walk and/or cycle per day to and from work/school/shopping

1 ☐ <5 minutes 2 ☐ 5-15 minutes 3 ☐ 15-30minutes 4 ☐ 30-45minutes 5 ☐ > 45minutes

In this section we would like to find out more information about the way that you perceive or think about your neighborhood. Please answer the following questions about your neighborhood and yourself.



A. Types of residences in your neighbourhood

Please circle the answer that best applies to you and your neighborhood.

108. Are there many detached single-family residences in your local area?

1	2	3	4	5
None	A few	Some	Most	All

109. Are there many townhouses in your local area?

1	2	3	4	5
None	A few	Some	Most	All

110. Are there many apartments or flats of 1-3 stories in your local area?

1	2	3	4	5
None	A few	Some	Most	All

111. Are there many apartments or flats of 4-6 stories in your local area?

1	2	3	4	5
None	A few	Some	Most	All

112. Are there many apartments or flats bigger than 7-12 stories in your local area?

1	2	3	4	5
None	A few	Some	Most	All

113. Are there many apartments or flats more than 13 stories in your local area?

1	2	3	4	5
None	A few	Some	Most	All



B. Shops, facilities, and other things in your neighborhood

About how long would it take to get from your home to the nearest businesses or facilities listed below if you walked to them? Please put only one check mark (v) for each business or facility.

	1-5 min	6-10 min	11-20 min	20-30 min	30+ min	Don't know
example: petrol station	1. ____	2. ____	3. ____	4. <u>v</u>	5. ____	8. ____
1. local shops	1. ____	2. ____	3. ____	4. ____	5. ____	8. ____
2. supermarket	1. ____	2. ____	3. ____	4. ____	5. ____	8. ____
3. hardware store	1. ____	2. ____	3. ____	4. ____	5. ____	8. ____
4. green groceries	1. ____	2. ____	3. ____	4. ____	5. ____	8. ____
5. laundry/dry cleaners	1. ____	2. ____	3. ____	4. ____	5. ____	8. ____
6. clothing store	1. ____	2. ____	3. ____	4. ____	5. ____	8. ____
7. post office	1. ____	2. ____	3. ____	4. ____	5. ____	8. ____
8. library	1. ____	2. ____	3. ____	4. ____	5. ____	8. ____
9. primary school	1. ____	2. ____	3. ____	4. ____	5. ____	8. ____
10. other school	1. ____	2. ____	3. ____	4. ____	5. ____	8. ____
10. book store	1. ____	2. ____	3. ____	4. ____	5. ____	8. ____
11. cafe	1. ____	2. ____	3. ____	4. ____	5. ____	8. ____
12. video outlet	1. ____	2. ____	3. ____	4. ____	5. ____	8. ____
13. pharmacy	1. ____	2. ____	3. ____	4. ____	5. ____	8. ____
14. bus or trains stop	1. ____	2. ____	3. ____	4. ____	5. ____	8. ____
15. park	1. ____	2. ____	3. ____	4. ____	5. ____	8. ____
16. nature reserve	1. ____	2. ____	3. ____	4. ____	5. ____	8. ____
17. fitness or recreation center	1. ____	2. ____	3. ____	4. ____	5. ____	8. ____
18. sports field	1. ____	2. ____	3. ____	4. ____	5. ____	8. ____
19. beach	1. ____	2. ____	3. ____	4. ____	5. ____	8. ____
20. river	1. ____	2. ____	3. ____	4. ____	5. ____	8. ____
21. dentist /doctor	1. ____	2. ____	3. ____	4. ____	5. ____	8. ____
22. petrol station	1. ____	2. ____	3. ____	4. ____	5. ____	8. ____
23. auto services eg. car repair	1. ____	2. ____	3. ____	4. ____	5. ____	8. ____
24. appliance stores	1. ____	2. ____	3. ____	4. ____	5. ____	8. ____
25. your own job (if you work)	1. ____	2. ____	3. ____	4. ____	5. ____	8. ____



C. Access to services

Please circle the answer that best applies to you and your neighborhood. Both local and within walking distance mean within a 10-15 minute walk from your home.

1. Stores are within easy walking distance of my home.

1	2	3	4
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree

2. I can do most of my day to day shopping in my local area.

1	2	3	4
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree

3. Car parking is difficult in local shopping areas.

1	2	3	4
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree

4. There are many places to go within easy walking distance of my home.

1	2	3	4
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree

5. It is easy to walk to a transit stop (bus, train) from my home.

1	2	3	4
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree

6. The streets in my neighborhood are hilly, making my neighborhood difficult to walk in.

1	2	3	4
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree

7. There are major barriers to walking in my local area that make it hard to get from place to place (for example, freeways, railway lines, rivers).

1	2	3	4
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree



D. Streets in my neighbourhood

Please circle the answer that best applies to you and your neighborhood.

8. The streets in my local area do not have many, or any, cul-de-sacs (dead end streets).

1	2	3	4
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree

9. There are walkways in my local area that connect cul-de-sacs to streets, pathways or other cul-de-sacs

1	2	3	4
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree

10. There are many four-way intersections in my local area.

1	2	3	4
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree

11. The distance between intersections in my neighborhood is usually short (100 meters or less).

1	2	3	4
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree

12. There are many alternative routes for getting from place to place in my neighborhood. (I don't have to go the same way every time.)

1	2	3	4
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree



E. Places for walking and cycling

Please circle the answer that best applies to you and your local area. Both local and within walking distance mean within 10-15 minute walk from your home.

13. There are footpaths on most of the streets in my local area.

1	2	3	4
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree

14. The footpaths in my local area are well maintained (even, not broken or cracked).

1	2	3	4
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree

15. There is a park or nature reserve in my local area that is easily accessible.

1	2	3	4
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree

16. The footpaths are separated from the road/traffic in my neighborhood by parked cars.

1	2	3	4
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree

17. There are bicycle or walking paths in or near my local area that are easily accessible.

1	2	3	4
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree

18. There is a grass/dirt strip that separates the streets from the footpaths in my neighborhood.

1	2	3	4
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree



F. Neighbourhood surroundings

Please circle the answer that best applies to you and your neighborhood.

19. There is a lot of greenery around my local area (trees, bushes, household gardens).

1	2	3	4
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree

20. There is a tree cover or canopy along footpaths in my local area.

1	2	3	4
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree

21. My local area is generally free from litter, rubbish or graffiti.

1	2	3	4
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree

22. There are many interesting things to look at while walking in my neighborhood.

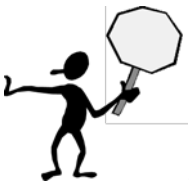
1	2	3	4
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree

23. There are pleasant natural features in my local area (for example, nature reserves, beach, river, lakes).

1	2	3	4
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree

24. There are attractive buildings and homes in my neighborhood.

1	2	3	4
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree



G. Traffic in your neighbourhood

Please circle the answer that best applies to you and your neighborhood.

25. There is so much traffic along most nearby streets that it makes it difficult or unpleasant to walk in my neighborhood.

1	2	3	4
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree

26. I live on or near a main arterial road or busy thoroughway for motor vehicles.

1	2	3	4
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree

27. The speed of traffic on the street I live is usually slow (40 km/h or less).

1	2	3	4
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree

28. There are many traffic slowing devices in my local area (such as speed humps, roundabouts, traffic islands).

1	2	3	4
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree

29. Busy streets in my local area have footpaths and traffic signals to help walkers cross.

1	2	3	4
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree

30. When walking in my local area there are a lot of exhaust fumes (such as from cars, buses).

1	2	3	4
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree

31. Most drivers exceed the posted speed limits while driving in my neighborhood.

1	2	3	4
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree

H. Neighbourhood Safety

32. My neighborhood streets are well lit at night.

1	2	3	4
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree

33. Walkers and bikers on the streets in my neighborhood can be easily seen by people in their homes.

1	2	3	4
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree

34. There is a high crime rate in my neighborhood.

1	2	3	4
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree

35. The crime rate in my neighbourhood makes it unsafe to go on walks during the day.

1	2	3	4
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree

36. The crime rate in my neighbourhood makes it unsafe to go on walks at night.

1	2	3	4
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree

37. I would feel safe walking home from a bus or train stop at night.

1	2	3	4
Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree

In this section of the survey we would like to ask questions about where do you are currently living. This information is very important to understand how walkable your neighbourhood is and if there are any differences inside your own neighbourhood.

38. Where is your current place of residence?

Unit/Street n.o _____

Street: _____

Suburb: _____

State: _____

Postcode: _____

39. How long have you lived at your current address?

Years _____ Months _____

The Adelaide Study of Frailty and Built Environment is a project divided in 2 phases. We are hoping to understand how the built environment can affect your health and maybe promote healthy ageing through improvements in local neighbourhoods. We wish to tell the communities involved in this project by letting them know of our findings and also invite participants to the clinical phase of the study.

If you are interested and would like to be involved, please tick the boxes below and provide us with your mailing address, a contact phone number and the best time for us to call you.

Name: _____

Mailing Address: _____

Phone Number: _____

Best time to reach me: _____

☐ Yes, I would like interested in further participation in this project.

☐ Yes, I would like to receive regular updates about this project.

Thank you for taking the time to complete this survey, we appreciate your efforts.

Please Post this survey back using the self-addressed, postage paid envelope provided.

Appendix 3 - Semi Structured Interview Questions

DO NOT COPY

SEMI STRUCTURED INTERVIEW - Planning and Design of Public Spaces to Support Aging Well

Name: _____ Age: _____

Address: _____ Postal Code: _____

Telephone: _____ Email: _____

We would like to know about your experience in public spaces in general, such as on the road on the way to the hospital or shopping centre, and at the hospital and shopping centre grounds, and particularly about your experience today/yesterday from your house to (the hospital, or shopping centre), and back to the house.

(Tick the one that applies):

- ☐ House – Shopping Centre -House
☐ House- Hospital - House

1. Do you usually come alone or with:

- ☐ Son/Daughter ☐ Friend ☐ Grandson/granddaughter
☐ Other family member ☐ Other _____

2. Do you always go through the same route as you did today/yesterday?

If yes: Could you tell us why you always go through that route?

Prompt:

- Is it because it's the shortest? On the bus route? Shady? Quite? More people?

If not: Why not?

3. Before you went to the (hospital or shopping centre) today/yesterday, how often or how many times have you been going there?

4. If the person drove to the premise:

Could you tell us what you think about car parking at (the hospital or shopping area)?

Prompts:

- Is it easy to find car park?
- What do you think about the distance from the car park to the building? (e.g. far, close)
- If you could choose where you park, would you choose it based on the distance of that parking spot to the building, or whether or not it is shaded, or other reasons?
- Do you have a parking permit?

- What do you think about the size of car park spot? Is it easy to park your car?
- What do you think about the surface of the car park?
- If you have to use a pay machine, is it easy to find the location of the pay machine and is it easy to use it?
- If you go in the evening, what do you think about the lighting on the car park and outside the building?

5. If the person walked to the premise:

Could you tell us about your journey from your house, to the car park area of the building, and into the building?

Prompts:

- Is it easy to walk from your house to the destination?
- Could you tell us about the footpaths? (prompts: wide enough? Slippery? Kerbs?)
- Are the footpaths well maintained?
- Are there benches? (if not, does it bother you?)
- Are there shades? Trees? (if not, does it bother you?)
- What do you like seeing during your journey from your house and back? Is there anything interesting (gardens, trees along the paths, buildings, views)?
- Anything that bothers you along the way?
- Are there many cars along the way? Is it easy to cross the road? Is there zebra crossing, or traffic light for pedestrians?
- Do you feel that you were pressured (by a car or a person) to cross the street/walk faster?
- How safe do you feel? (security-related safety)
- Are you concerned about tripping on this route?

6. If the person took a bus or train to the premise:

Tell us about your journey with the bus or train.

Prompts:

- Did you find that it is easy to walk to a transit stop (bus/train)?
- How long does it take you to walk from your house to the (bus stop/train station)? And from the bus stop/train station to (the hospital / shopping centre)?
- How long did you usually wait for the bus/train?
- What do you think about the bus stop (or train station)? Is there any the shade? Is there any seat, if so, how is the seat? Is it clean and tidy (on the seat and around)?
- Do you use App for bus schedule? Do you use the bus time table on the bus stop?
- How easy is it to access or get on to the bus at the bus stop?

7. If the person went to the Hospital:

Tell us about your journey from arriving point to the building.

Prompts:

- Was it easy to find the consultation room? Did you ever get lost in the building?
- Do you really on signs? How easy it is read the signs (how large/small the fonts)?
- How do you navigate? (eg. taking photos, read maps)?
- Do you need help to get to the consultation room?

- Do you find enough resting areas (benches/chairs)?
- Is it easy to find and use the toilet? What do you think about the toilet?
- What do you think about the lighting inside the hospital?
- What do you think about the temperature in the hospital (hot, warm, fine, cool, cold); stuffy, sticky, airy).
- What do you think of the noise in the hospital?
- What do you like and dislike about the hospital?

8. If the person went to the Shopping Centre:

Tell us about your journey from arriving point to the shopping centre building.

Prompts:

- Why do you often shop there? What is it about this shopping centre that makes you go back there often?
- Do you go there during hot weather? During cold weather?
- Is it easy to find the shop you want to go to? Did you ever get lost in the building?
- What do you use to find your way around (signage? visual cues?)
- Do you need help to get to the shop?
- What do you think about the signage and letter (font) size of the signage?
- Do you find there are enough resting areas (benches/chairs)?
- Can you find a toilet easily?
- Do you think that the shopping centre are well lit?
- What do you think of the noise in the shopping centre?

9. Is there anything else you would like to talk about (the hospital building or shopping centre)?

10. Do you use any existing technology to help you navigate public spaces? If yes, what, if no, would you like to use something like touch screens? Other?

Appendix 4 – Notes from Built Environment Audit at The Queen Elizabeth Hospital

App. 4-1. External audit results for the Main carpark

Category	Item	Observations	Comments
Local amenity	Destinations	ATM; Letterbox; Bus stop; Gift shop; Café; Pharmacy	4 disabled carpark are available in this area.
Weather & thermal conditions	Current weather conditions	Windy Full sunshine	
	Localised thermal conditions	-	Very windy in carpark (very hot on second visit) – little protection.
Route characteristics	Type of path	Path is disjointed	No path through carpark e.g., no delineation of pedestrian route (zebra crossing). Path around carpark to entrances – not always clearly marked.
	Slope	Mostly level – Slight gradient	Slight gradient/ramp up to main entrance of hospital, handrails not in useful position i.e. too far from entry point. Gradients as the path crosses access roads (e.g. to disabled parking area) – no handrails.
	Path condition	Moderate	
	Path material	Tarmac Paving blocks Concrete	Various types of outside surfaces e.g. paving, concrete, asphalt and various levels – route heterogeneous.
	Path maintenance	Poor - Reasonable	Some areas of concrete paving have moved and are raised at the edges presenting trip risk.
	Width of path	Suitable for two people	Most paths are suitable for two people to walk abreast.
	Permeant obstructions	Signs	Some path obstructions near main entrance e.g. café signboard.
	Temporary obstructions	None	
	Steps & handrails	-	
	Seating	Irregular	Seating only available at main entrance in undercroft area at main entrance. No seating is provided at the entrance to the North-east building (observed older person waiting in the sun while waiting for accompanying person to use the pay machine).
	Maintenance of seating	Insufficient	Seating (and area generally) is poorly maintained e.g. timber seating is weathered, varnish peeling off.
	Waste bins	Irregular	
Safety & wayfinding	Road crossing aids	Zebra crossing	Many pedestrians crossing vehicular entry point to carpark (no allowances for pedestrians) – could present risk.
	Traffic control devices	NA	
	Speed limit of adjacent road	-	
	Bicycle lanes	NA	
	Wayfinding & signage	Inadequate	Poor signage for vehicular access to carpark from Woodville Road. Poor signage to guide visitors from carpark to main entrance (outpatient wing). Signage is generally for drivers not (e.g. traffic control) not pedestrians.
	Passive surveillance	>75% buildings	
	Social environment		Carpark was very busy on both visits, many visitors looking for carparks
	Street lighting	NA	
Aesthetic characteristics	Overall impression	-	Overall, aesthetically the area has various design styles, provide little built form at human scale and is poorly maintained.

			Area near the North-east building entrance is newer, better maintained, one predominant design style.
	Litter	Some	
	Dog waste	None	
	Vandalism	None	
	Graffiti	None	
	Parks & green space	Absent	
	Maintenance of street	Reasonable	
	Street trees	Some	
	Height of street trees	Small – large	
	Gardened areas	Some	
	Water features	None	

App. 4-2. Internal audit results for the Main entrance/A Wing

Category	Item	Observations	Comments
Local amenity	Destinations	ATM; Letterbox; Bus stop; Gift shop; Café; Pharmacy	
Thermal conditions	Localised thermal conditions	-	Strong wind tunnel effect at main entrance at the time of the audit. Warm, humid breeze when transitioning from A Wing to corridor to North-east building.
Route characteristics	Slope	Slight gradient - Mostly level	Slight gradient at entrance doors.
	Floor condition	Good	
	Floor material	Laminate Carpet	Floors generally laminate tiles, carpet in some waiting areas.
	Floor maintenance	Reasonable	
	Width of walkway	Suitable for two or more people	Quite busy at time of audit though, generally would be difficult to walk two abreast. Corridors are generally used by both outpatients/visitors and staff with inpatients (in beds).
	Route obstructions	None	
	Handrails & stairs	-	Handrails at entry only, do not continue in corridors.
	Seating	Irregular	Some seating provided but mostly located in waiting areas of specific areas, not along the corridors.
	Maintenance of seating	Reasonable	
Safety & wayfinding	Waste bins	Irregular	No waste bins immediately visible (few in waiting areas).
	Social environment	-	Busy at time of audit.
	Wayfinding & signage	Inadequate	Lots of signage but little hierarchy to the information presented so directional signage overwhelmed.
	Lighting	Mostly sufficiently lit	Some lighting not working in corridors – quite dark.
	Glare	Indirect	Lighting reflects off of the shiny laminate tiles
Aesthetic characteristics	Noise	Quiet – mid-range	Noise level is generally moderate (quiet through to mid-range/loud when lots of different users)
	Overall impression	-	Interior is relatively dated and worn.
	Litter	None	
	Vandalism	None	
	Graffiti	None	

App. 4-3. Internal audit results for Outpatients

Category	Item	Observations	Comments
Local amenity	Destinations	ATM; Letterbox; Bus stop; Gift shop; Café; Pharmacy	
Thermal conditions	Localised thermal conditions	-	
Route characteristics	Slope	Mostly level	
	Floor condition	Good	
	Floor material	Laminate	Same flooring as main entrance and adjoining corridors.
	Floor maintenance	Sufficient	
	Width of walkway	Suitable for only one person	Hallways become very small upon entry to Outpatients, only main hallways sufficient for two people but secondary hallways only wide enough for one.
	Route obstructions	Some	Lots of equipment in secondary hallways presenting obstructions.
	Handrails & stairs	-	
	Seating	Irregular	Seating provided in the waiting areas.
	Maintenance of seating	Reasonable	
	Waste bins	Irregular	
Safety & wayfinding	Social environment	-	Quite busy in this area, more staff than patients.
	Wayfinding & signage	Inadequate	Very poor signage e.g. for outpatient waiting area, toilets.
	Lighting	Mostly sufficiently lit	
	Glare	Indirect	
	Noise	Mid-range	
Aesthetic characteristics	Overall impression	-	Again, dated interiors, restricted room, over-full with furniture and equipment.
	Litter	None	
	Vandalism	None	
	Graffiti	None	

App. 3-4. Internal audit results for the Corridor from A Wing to North-east building (Hospital Street)

Category	Item	Observations	Comments
Local amenity	Destinations	ATM; Letterbox; Bus stop; Gift shop; Café; Pharmacy	
Thermal conditions	Localised thermal conditions	-	Noticeably warmer than Tower block/Outpatients (direct sun).
Route characteristics	Slope	Mostly level	
	Floor condition	Good	
	Floor material	Tiles Laminate	
	Floor maintenance	Sufficient	
	Width of walkway	Suitable for more than two people	Reasonably busy but wide enough to accommodate – approximately four-five abreast.
	Route obstructions	None	
	Handrails & stairs	-	Handrails available through length of corridor – discontinuous through south/north Ward Block.
	Seating	Irregular	Limited seating (approximately 5-8 seats with ~30m until other seating toward the North-east building and ~40m or more until other seating toward A Wing).

	Maintenance of seating	Insufficient - Reasonable	Fabric chairs stained but not broken.
	Waste bins	Irregular	
Safety & wayfinding	Social environment	-	
	Wayfinding & signage	Adequate	Clear signage and less informal signage/information
	Lighting	Sufficiently lit	Corridor is naturally lit by direct solar penetration as well as artificial lighting – some direct glare from the sun
	Glare	Direct	
	Noise	Mid-range - Loud	Noise level is higher than Tower Block or Outpatients (conversation, TV, doors, wheelchairs, beds)
Aesthetic characteristics	Overall impression	-	Overall, more pleasant aesthetic character than older part of hospital.
	Litter	None	
	Vandalism	None	
	Graffiti	None	

App. 4-4. Internal audit results for the Rehabilitation/Physio (new area – marked as 'under construction' on the map):

Category	Item	Observations	Comments
Local amenity	Destinations	ATM; Letterbox; Bus stop; Gift shop; Café; Pharmacy	
Thermal conditions	Localised thermal conditions	-	Mild to warm day outside, cool inside.
Route characteristics	Slope	Mostly level	
	Floor condition	Good	
	Floor material	Carpet Concrete	Flooring mixture of carpet (at entrance) and polished concrete (quite slippery).
	Floor maintenance	Sufficient	
	Width of walkway	Suitable for more than two people	Wide corridor servicing Rehabilitation and Physio area, two external entrances (one to internal courtyard, one to rear of hospital). Observed older person in wheelchair having difficulty opening the door to disabled toilet (needed assistance).
	Route obstructions	None	Tables, chairs and signs reduce the usable width of the space but there is still plenty of room to walk abreast.
	Handrails & stairs	-	
	Seating	Regular	Seating available outside of lifts and toilets.
	Maintenance of seating	Sufficient	
	Waste bins	None	
Safety & wayfinding	Social environment	-	Not very busy, more a thoroughfare.
	Wayfinding & signage	Inadequate	
	Lighting	Poorly - Sufficiently lit	Artificial lighting seems to be a little dim in comparison to natural light (contrast).
	Glare	Indirect	Slight glare on polished from south facing doors.
	Noise	Quiet	Noise level is quiet however there was intermittent loud beeping.
Aesthetic characteristics	Overall impression	-	Overall the area was cool, quiet, well presented and maintained.
	Litter	None	
	Vandalism	None	
	Graffiti	None	

App. 4-5. Internal audit results for Oncology – North-east building

Category	Item	Observations	Comments
Local amenity	Destinations	ATM; Letterbox; Bus stop; Gift shop; Café; Pharmacy	
Thermal conditions	Localised thermal conditions	-	Cool in the hallways.
Route characteristics	Slope	Mostly level	
	Floor condition	Good	
	Floor material	Tiles Laminate	Tiles in front of the lifts and laminate in the hallways and waiting room.
	Floor maintenance	Sufficient	
	Width of walkway	Suitable for more than two people	
	Route obstructions	None	No obstructions through the hallways.
	Handrails & stairs	-	Handrails provided along the hallways on the external wall, not continuous.
	Seating	Irregular	Seating only provided in the waiting areas.
	Maintenance of seating	Sufficient	
	Waste bins	Irregular	Only in waiting room.
Safety & wayfinding	Social environment	-	Quiet area, not as many patients or visitors in this area.
	Wayfinding & signage	Inadequate	Informal signage provided in a couple of areas hinting that formal signage may not be sufficient.
	Lighting	Poorly - Sufficiently lit	Fairly low light in this area.
	Glare	No glare	No glare at time of visits but may be on sunny day (large areas of glazing).
	Noise	Quiet	Lifts shared with beds which are quite noisy.
Aesthetic characteristics	Overall impression	-	Overall, pleasant aesthetic character. Water bubbler provided at entrance of waiting room.
	Litter	None	
	Vandalism	None	
	Graffiti	None	

Appendix 5 – Manual Records of Walking Observation at The Queen Elizabeth Hospital

DO NOT COPY

Participant ID: H020 (map 01)

Legends

Way In: 

Start Point: 

Stop: 

Start to S1: 26.9 m	S8 to S9: 30.8 m
S1 to S2: 13.5 m	S9 to S10: 74.8 m
S2 to S3: 19.2 m	S10 to S11: 40.7 m
S3 to S4: 32.7 m	S11 to S12: 48.4 m
S4 to S5: 49.6 m	S12 to S13: 18.7 m
S5 to S6: 35.7 m	S14 to end
S6 to S7: 42.6 m	of Way-in: 84.9 m
S7 to S8: 41.8 m	

Way Out: 

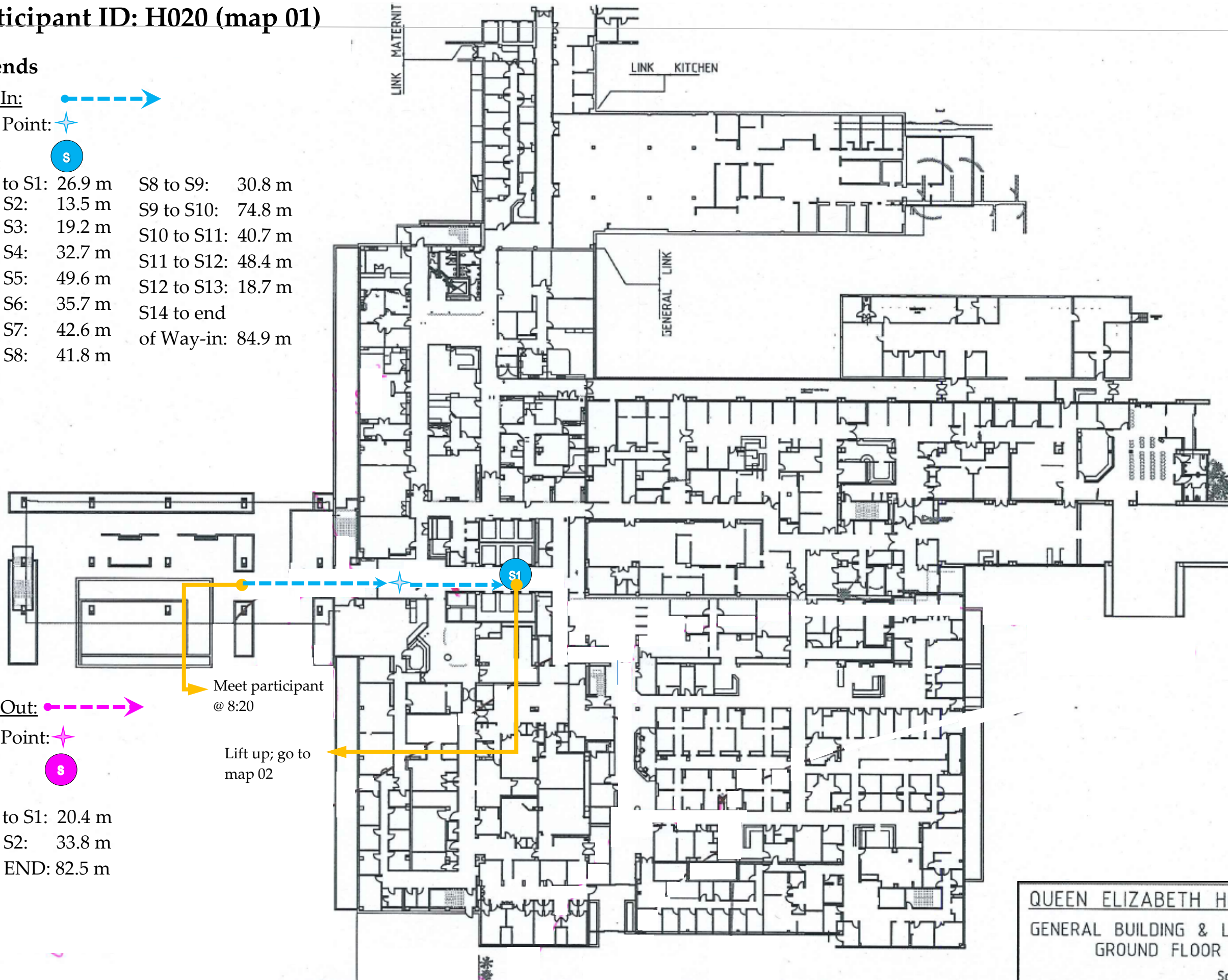
Start Point: 

Stop: 

Start to S1: 20.4 m
S1 to S2: 33.8 m
S2 to END: 82.5 m

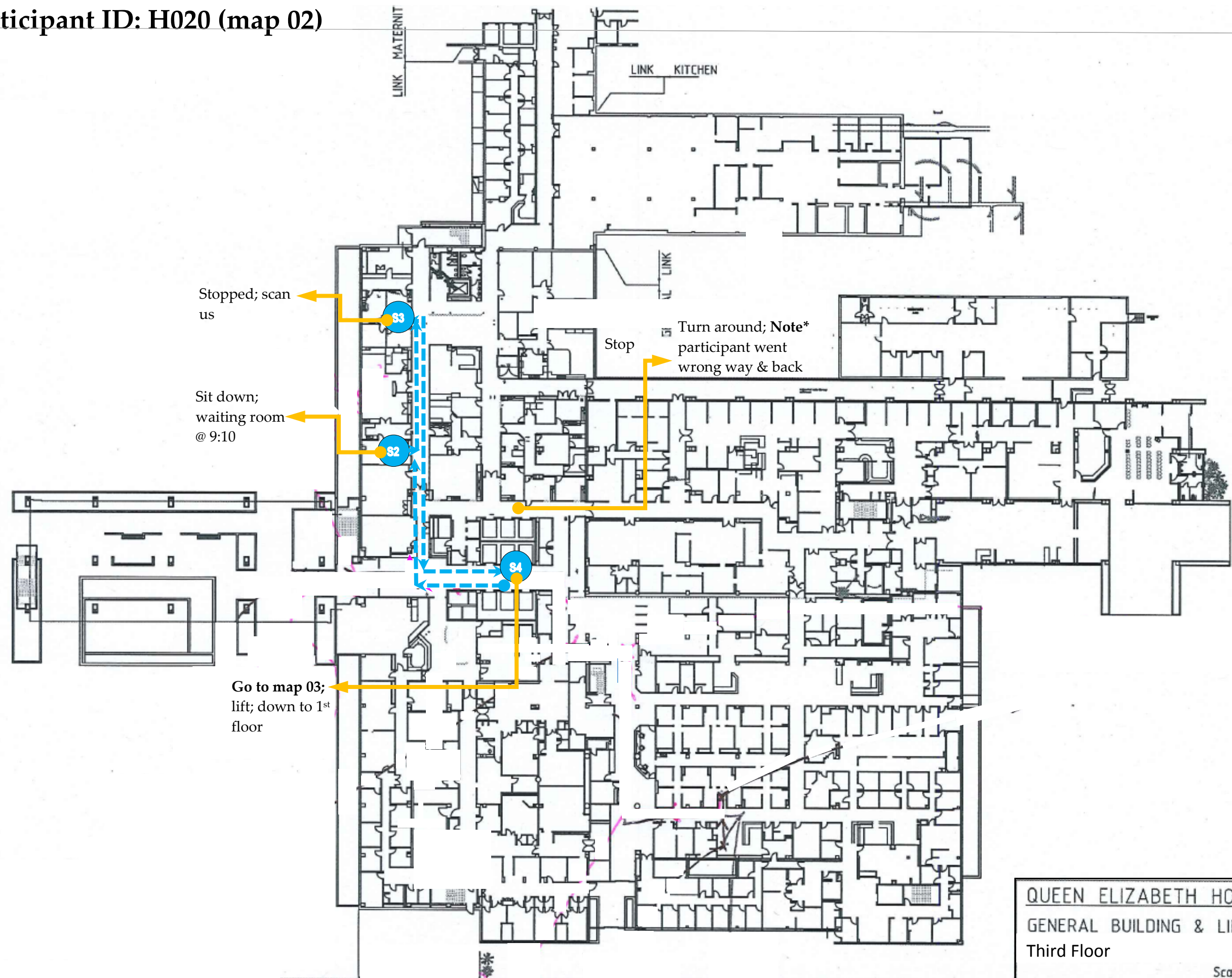
Meet participant
@ 8:20

Lift up; go to
map 02



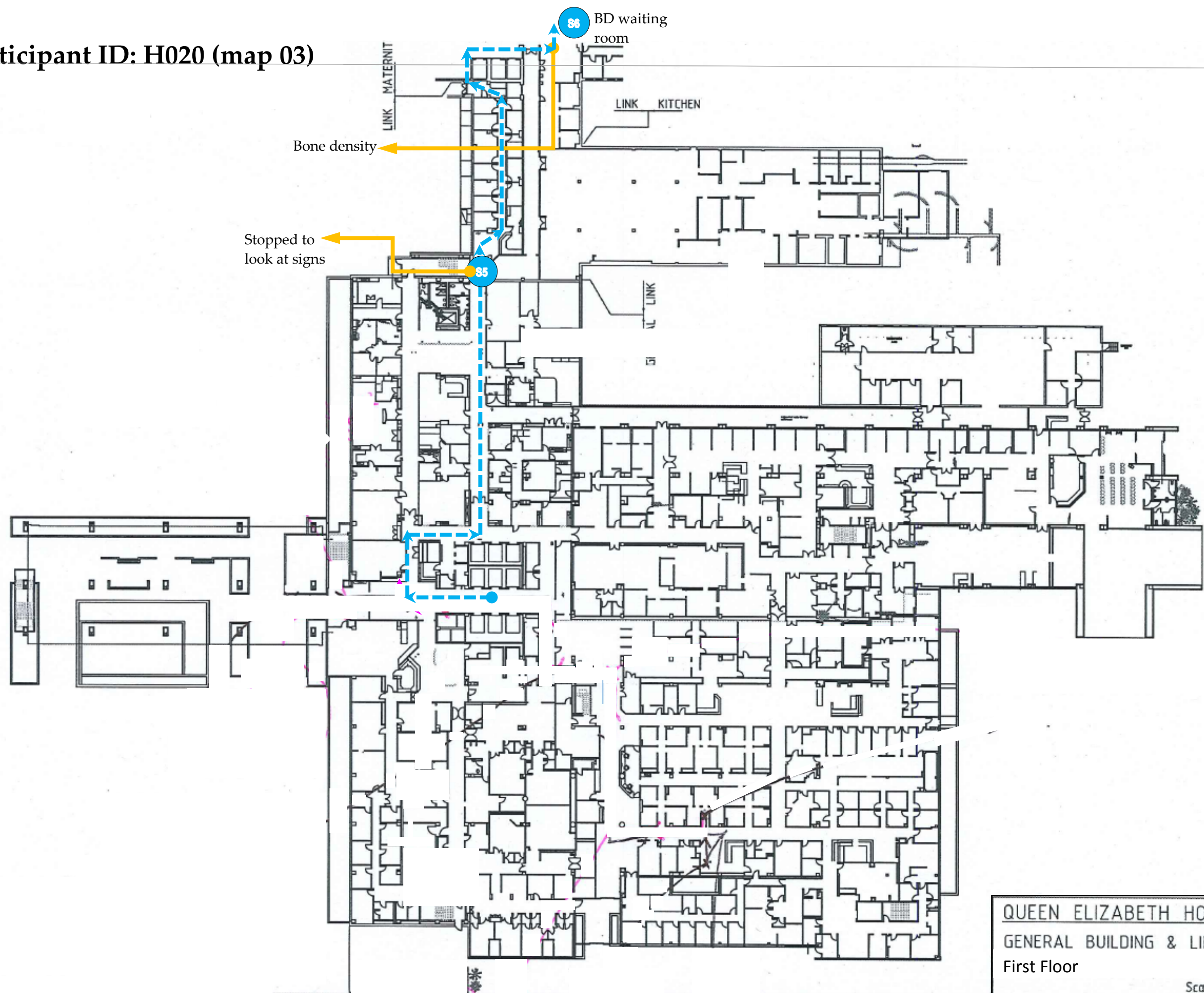
QUEEN ELIZABETH HOSPITAL
GENERAL BUILDING & LINK WING
GROUND FLOOR

Scale NTS

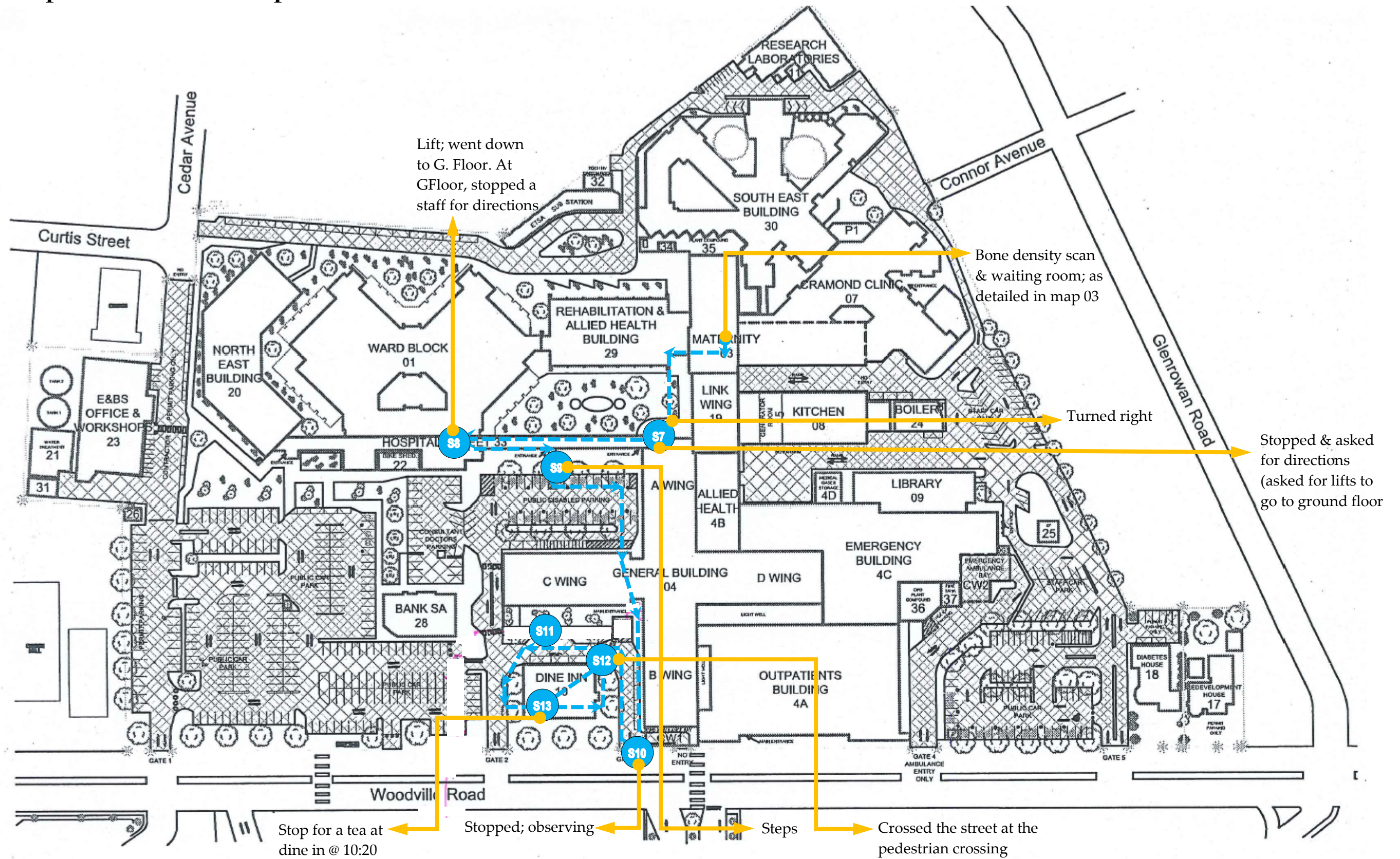


QUEEN ELIZABETH HOSPITAL
GENERAL BUILDING & LINK WING
Third Floor
Scale NTS

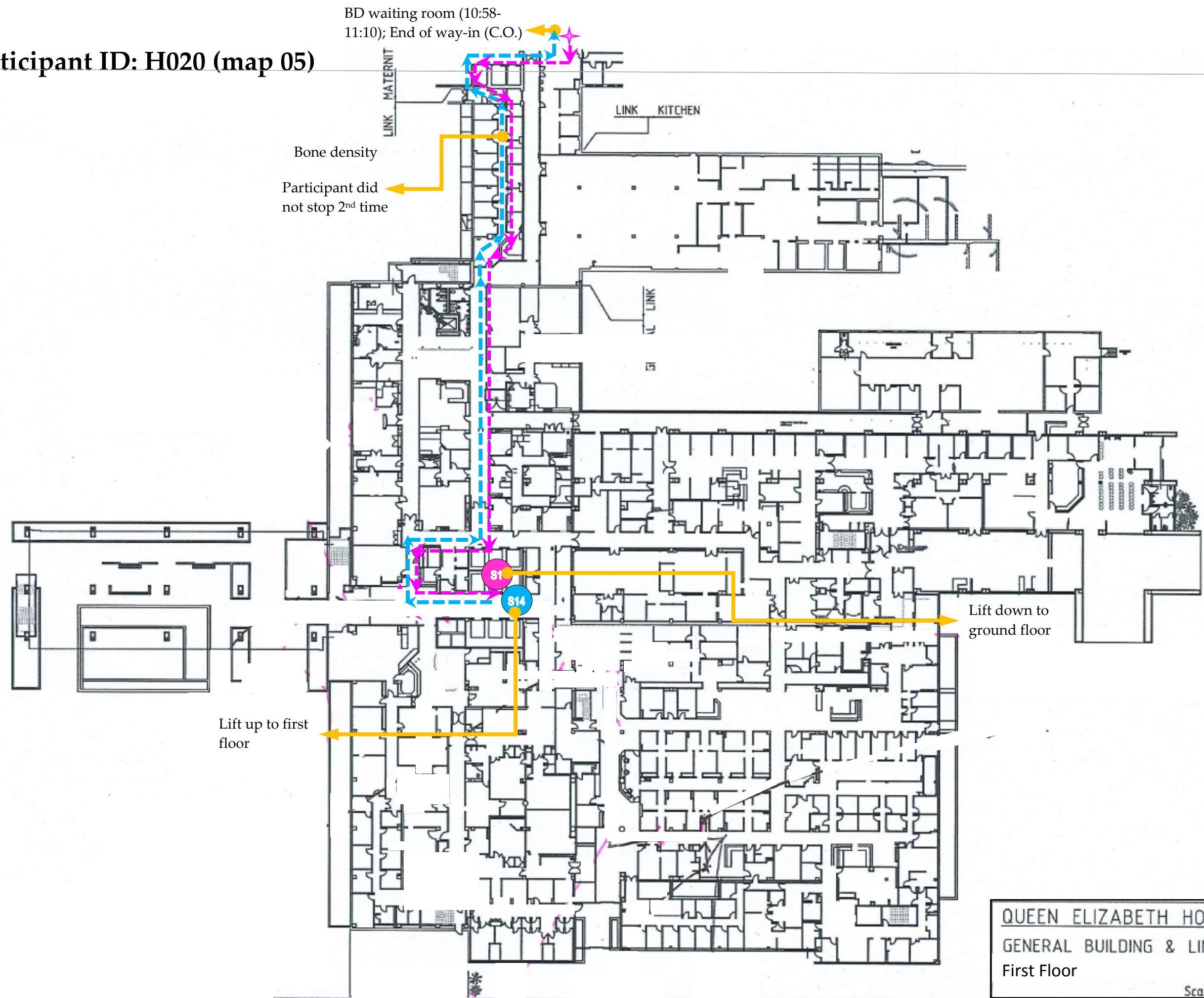
Participant ID: H020 (map 03)



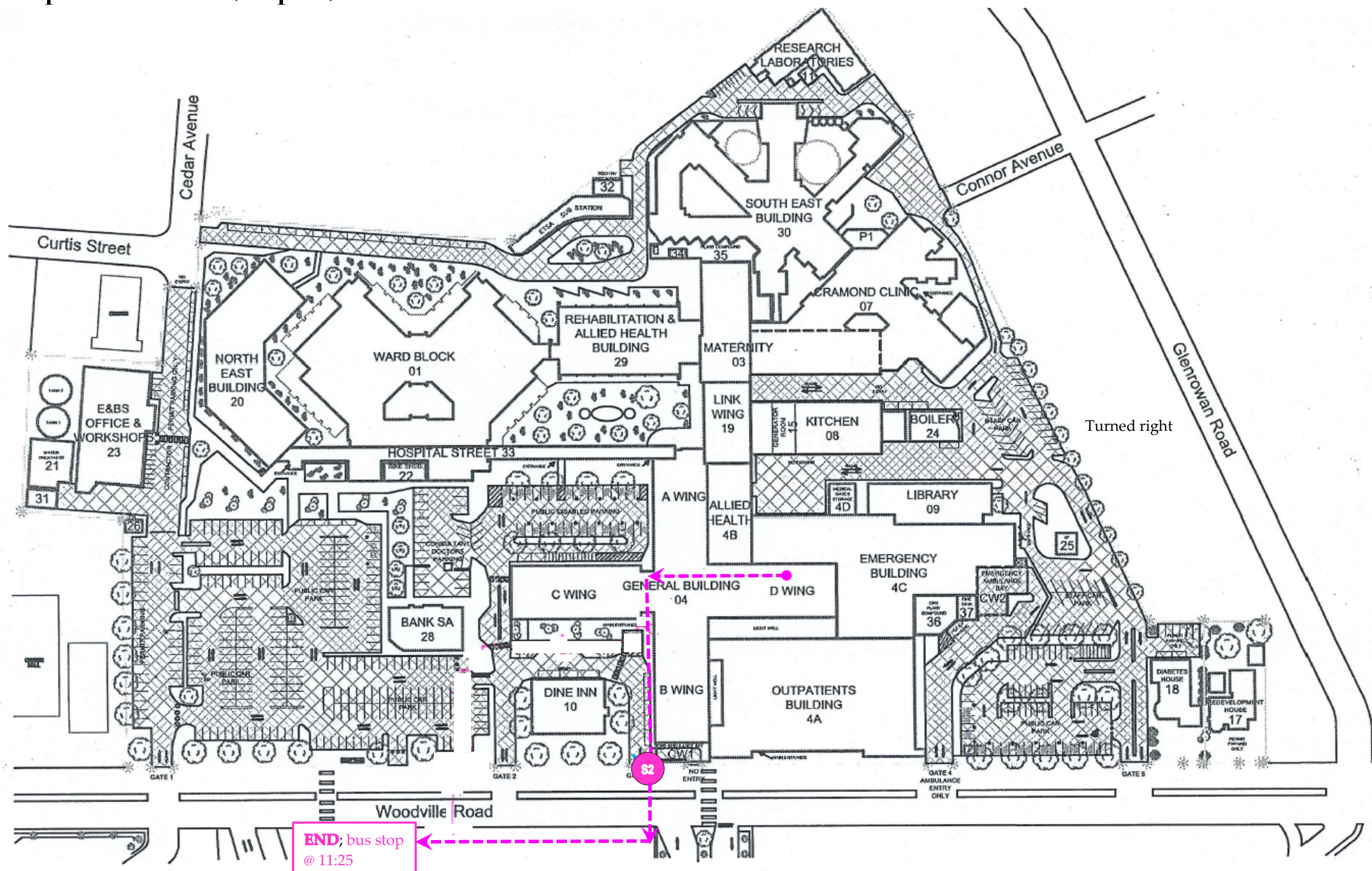
Participant ID: H020 (map 04)



Participant ID: H020 (map 05)



Participant ID: H020 (map 06)



Participant ID: H019 (map 01)

Legends

Way In:

Start Point:

Stop:

Start to S1: 9.6 m

S1 to S2: 23.8 m

S2 to S3: 14.2 m

S3 to S4: 5 m

S4 to S5: 23.1 m

S5 to end of way-in: 14.6 m

Way Out:

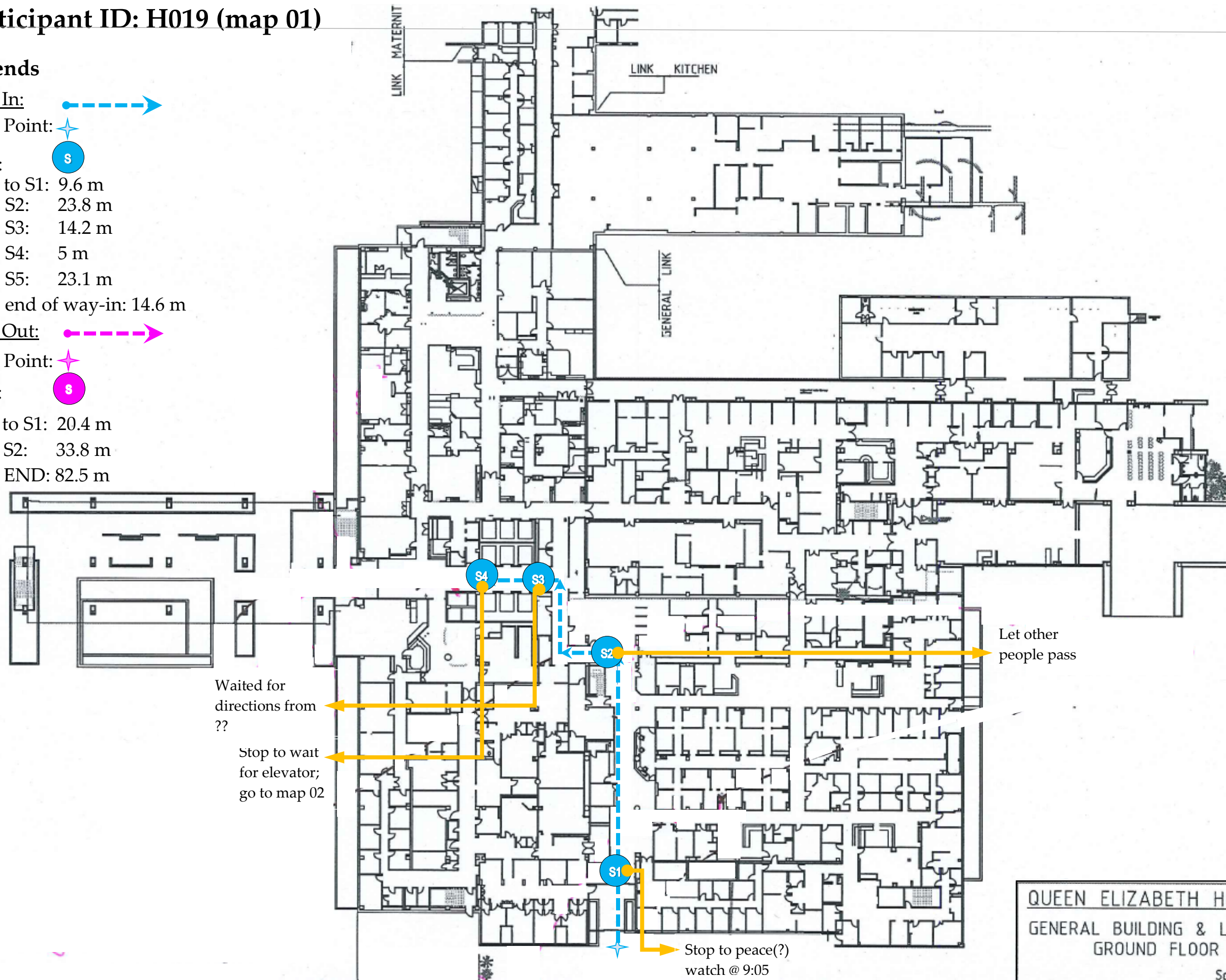
Start Point:

Stop:

Start to S1: 20.4 m

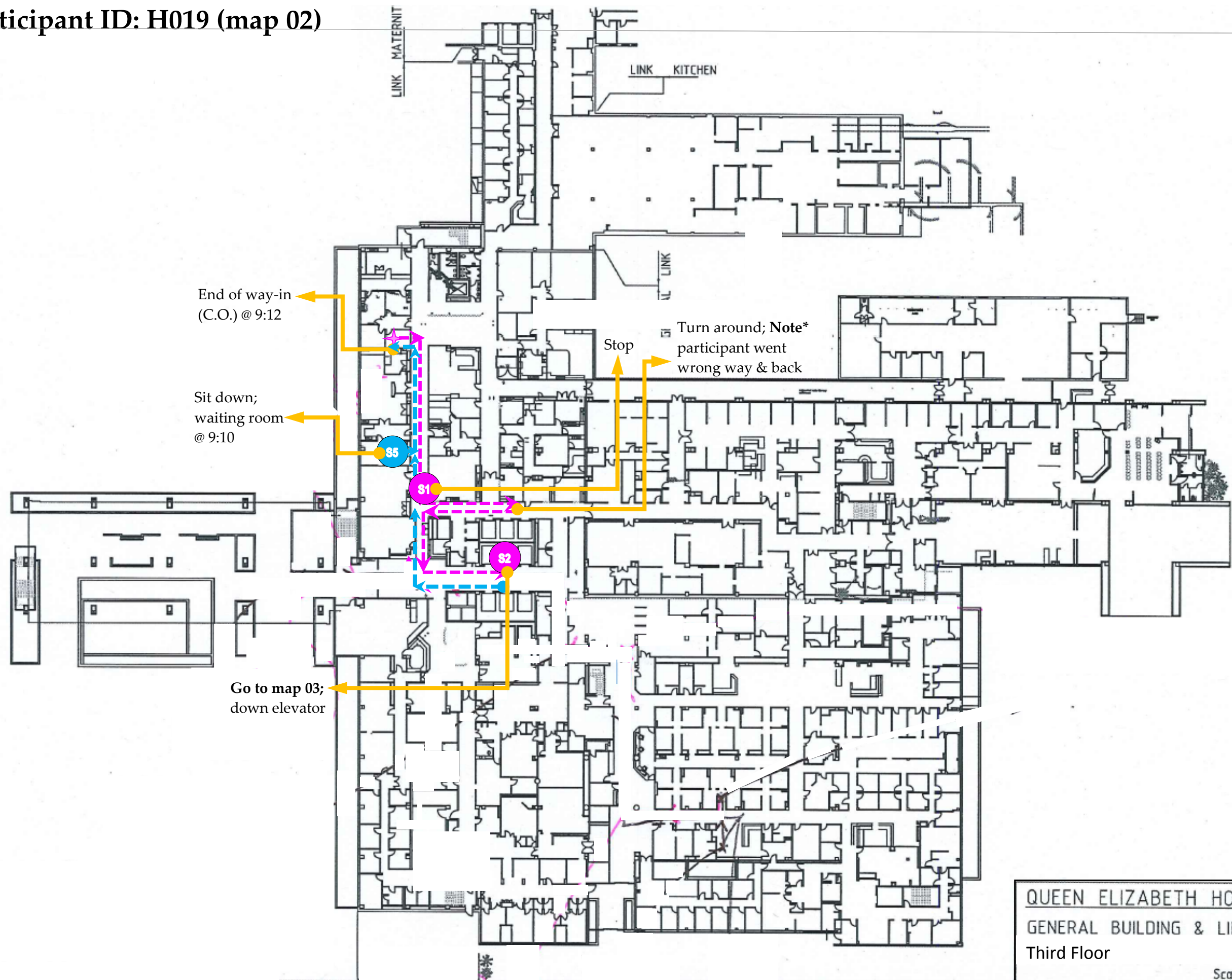
S1 to S2: 33.8 m

S2 to END: 82.5 m



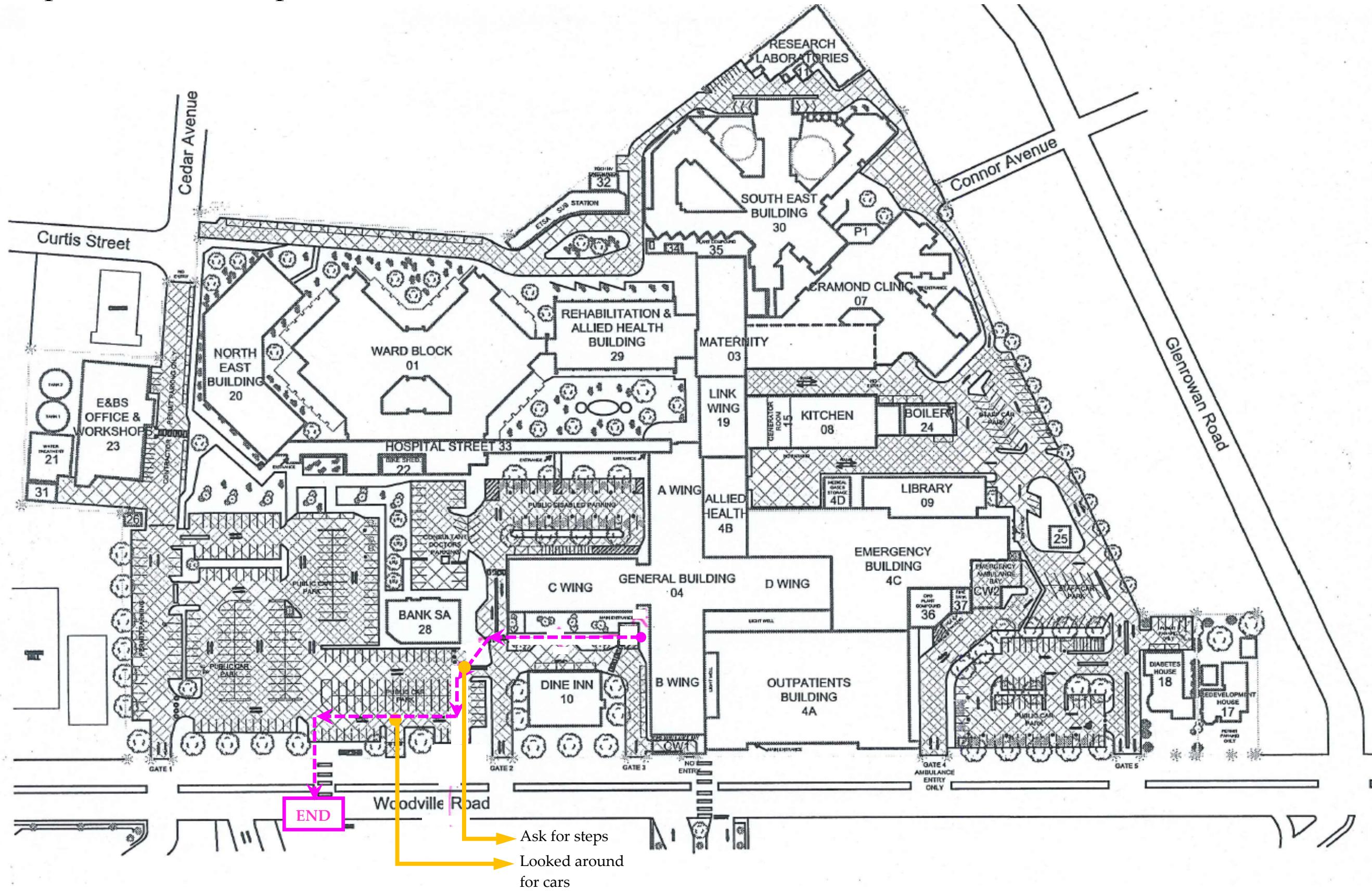
QUEEN ELIZABETH HOSPITAL
GENERAL BUILDING & LINK WING
GROUND FLOOR

Scale NTS



QUEEN ELIZABETH HOSPITAL
GENERAL BUILDING & LINK WING
Third Floor
Scale NTS

Participant ID: H018 (map 03)



Participant ID: H018 (map 01)

Legends

Way In:

Start Point:

Stop:

Start to S1: 11.9 m

S1 to S2: 10 m

S2 to S3: 14.6 m

S3 to S4: 9.2 m

S4 to S5: 10.4 m

S5 to end of way-in: 6.2 m

Way Out:

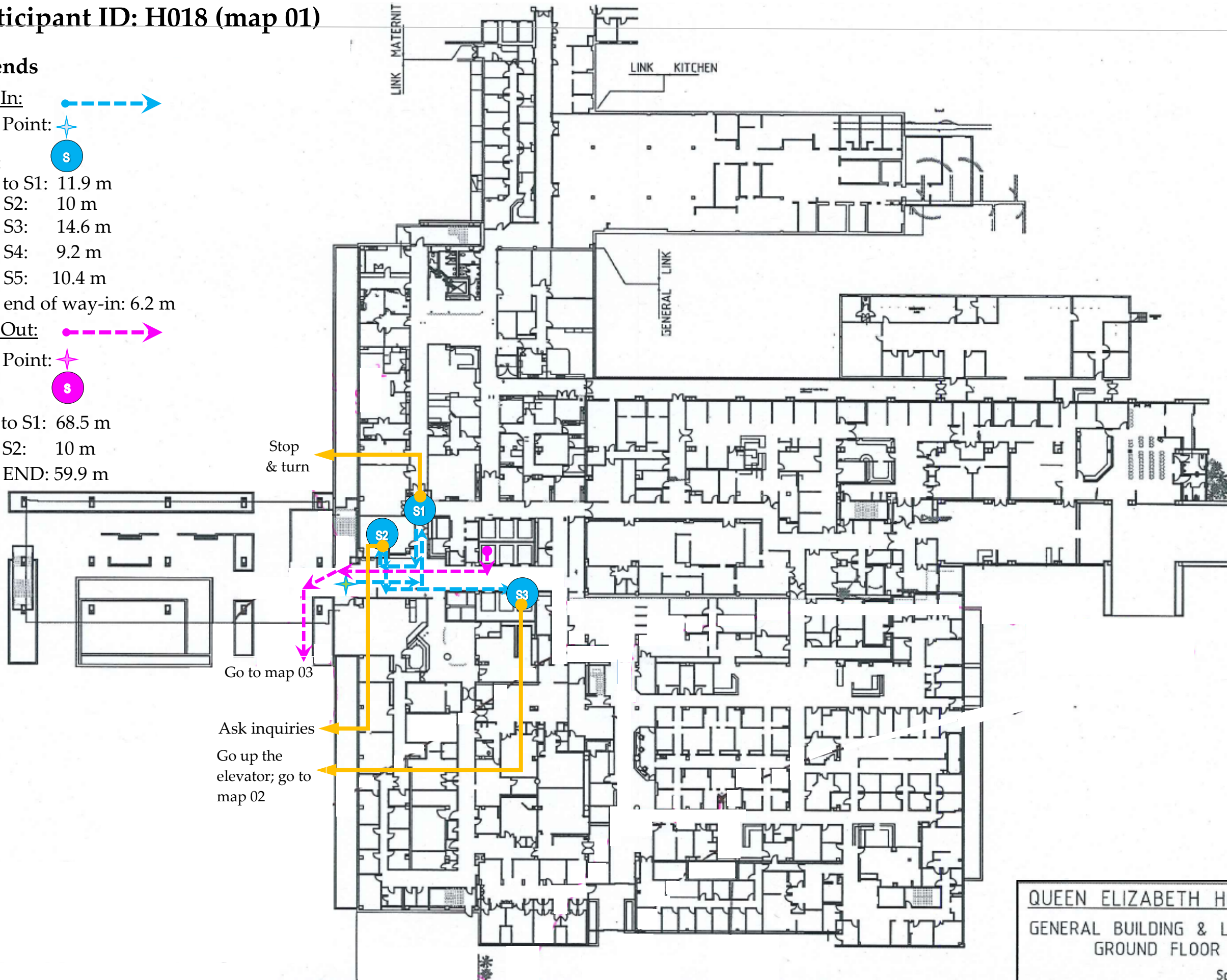
Start Point:

Stop:

Start to S1: 68.5 m

S1 to S2: 10 m

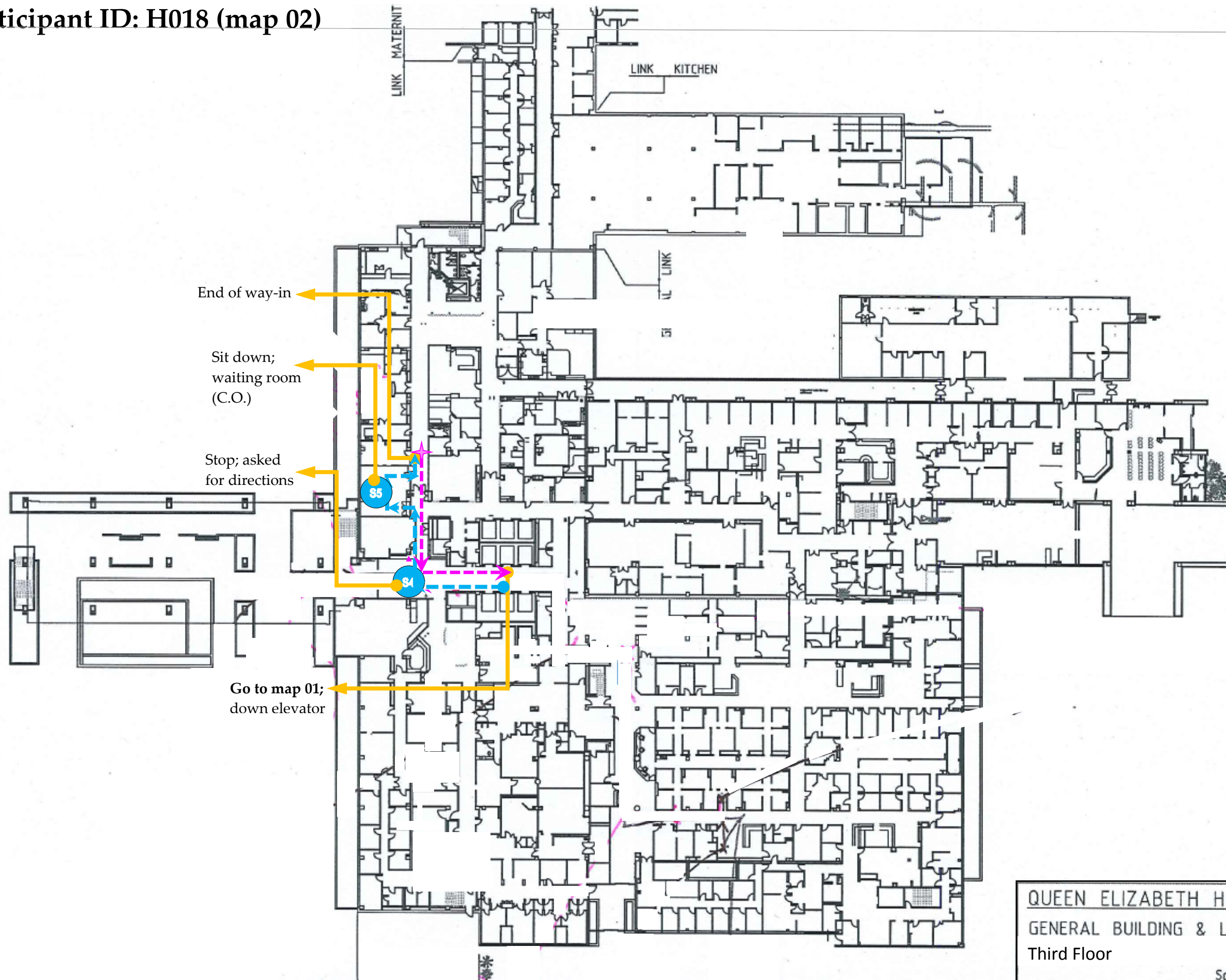
S2 to END: 59.9 m



QUEEN ELIZABETH HOSPITAL
GENERAL BUILDING & LINK WING
GROUND FLOOR

Scale NTS

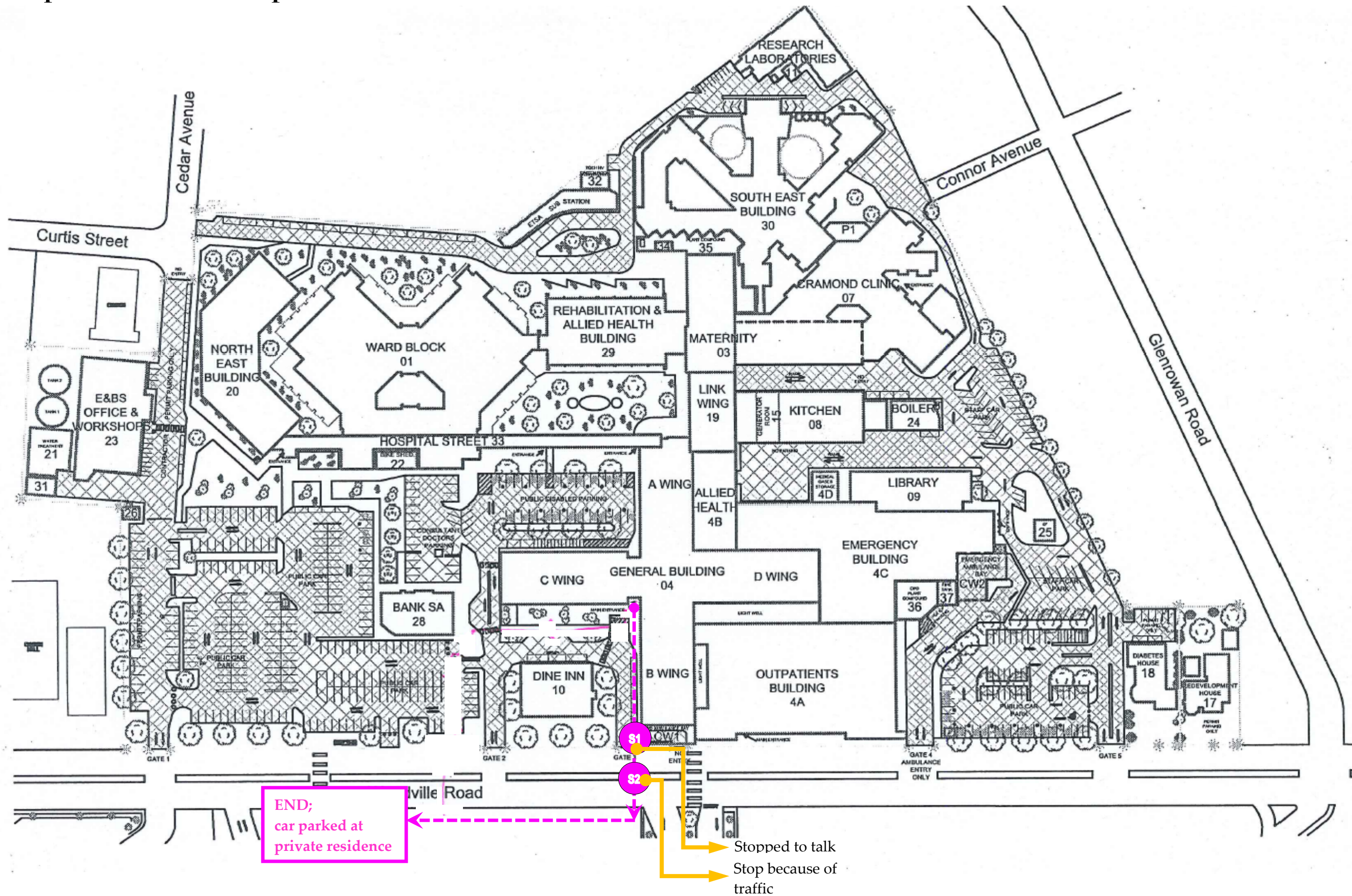
Participant ID: H018 (map 02)



QUEEN ELIZABETH HOSPITAL
GENERAL BUILDING & LINK WING
Third Floor

Scale NTS

Participant ID: H018 (map 03)



Participant ID: H016 (map 01)

Legends:

Way Out: 

Start Point: 

Stop: 

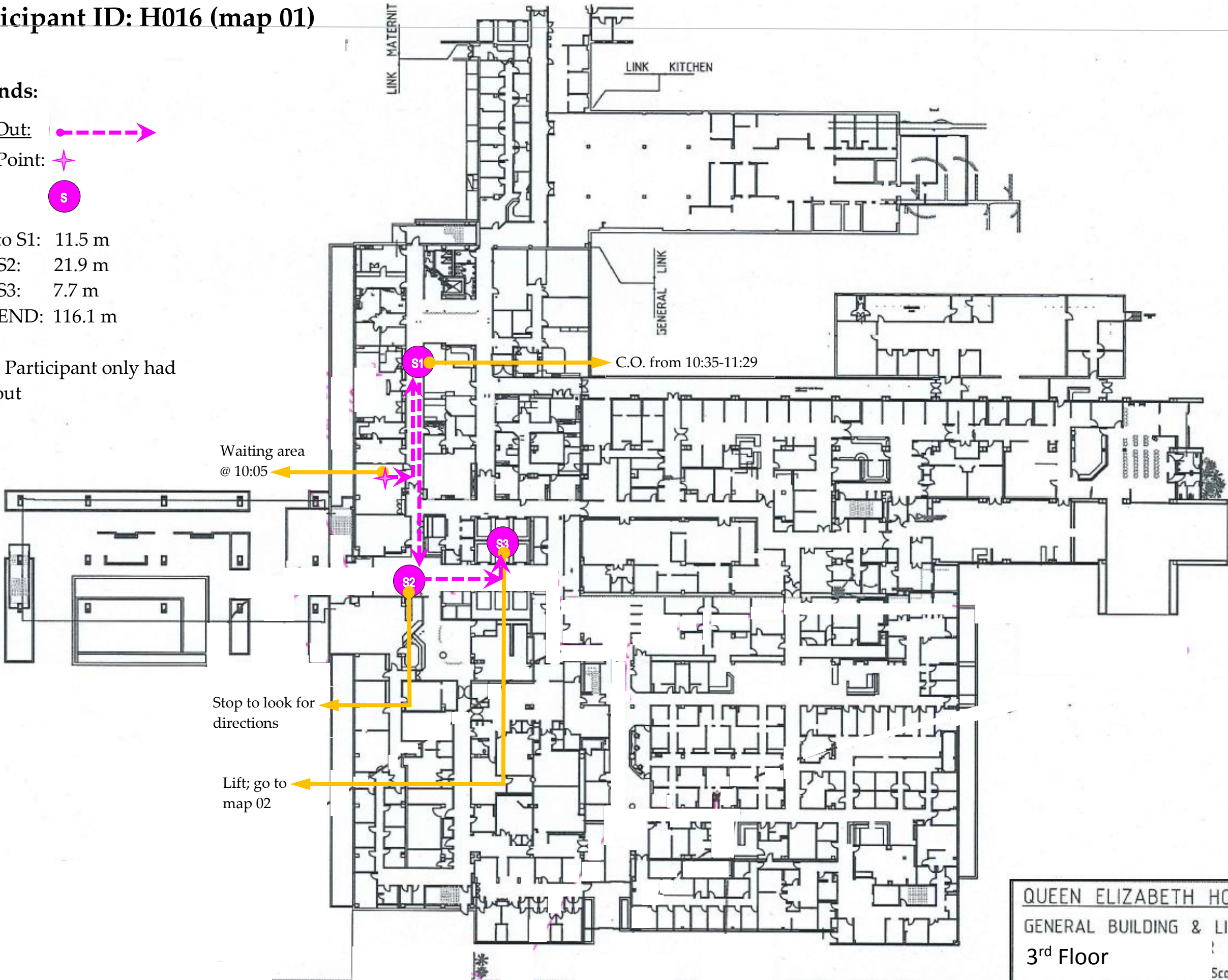
Start to S1: 11.5 m

S1 to S2: 21.9 m

S2 to S3: 7.7 m

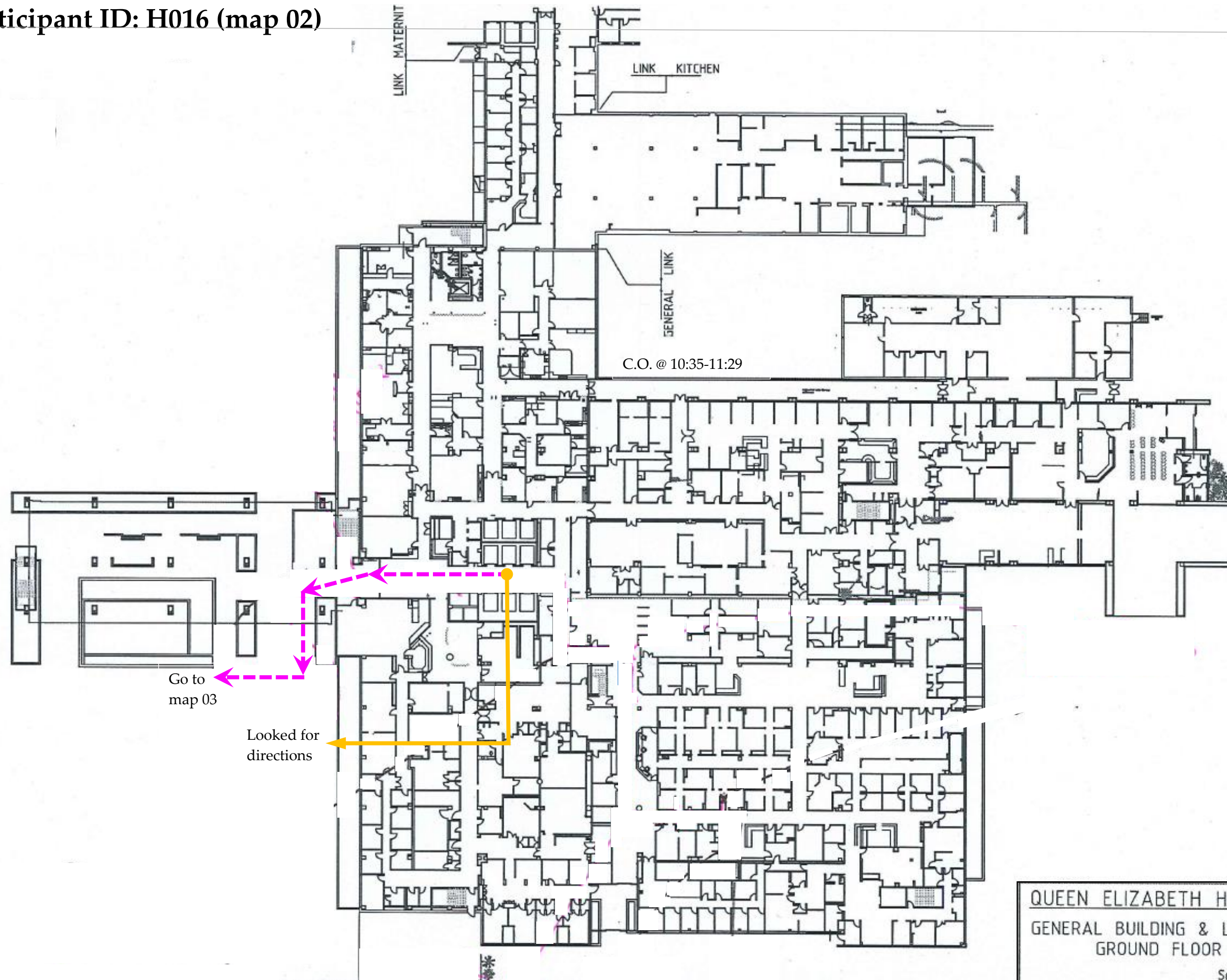
S3 to END: 116.1 m

Note* Participant only had way-out



QUEEN ELIZABETH HOSPITAL
GENERAL BUILDING & LINK WING
3rd Floor
Scale NTS

Participant ID: H016 (map 02)



Participant ID: H014 (map 01)

Legends:

Way In: 

Start Point: 

Stop: 

Start to S1: 35.2 m

S1 to end of way-in: 36.3 m

Way Out: 

Start Point: 

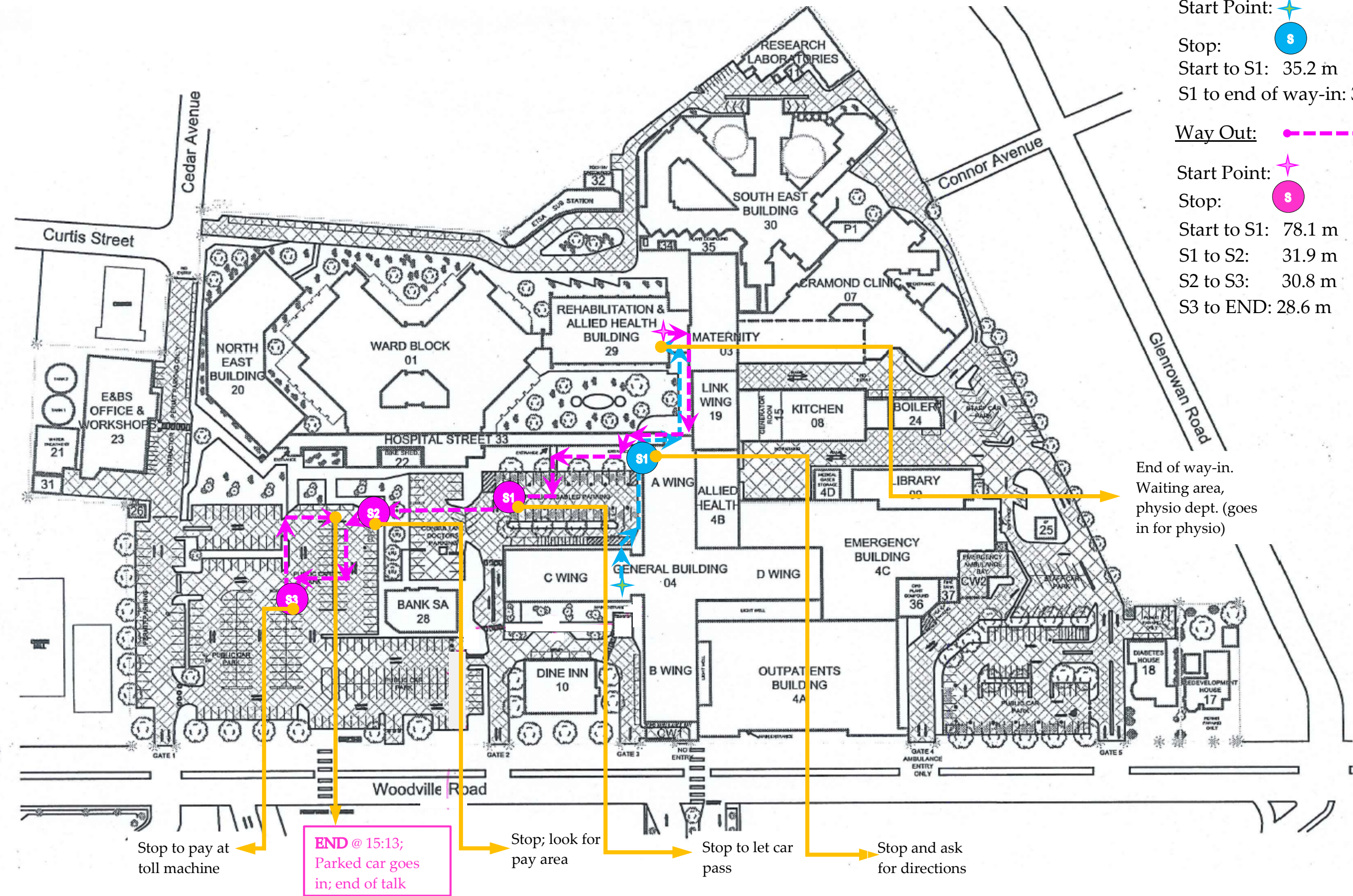
Stop: 

Start to S1: 78.1 m

S1 to S2: 31.9 m

S2 to S3: 30.8 m

S3 to END: 28.6 m

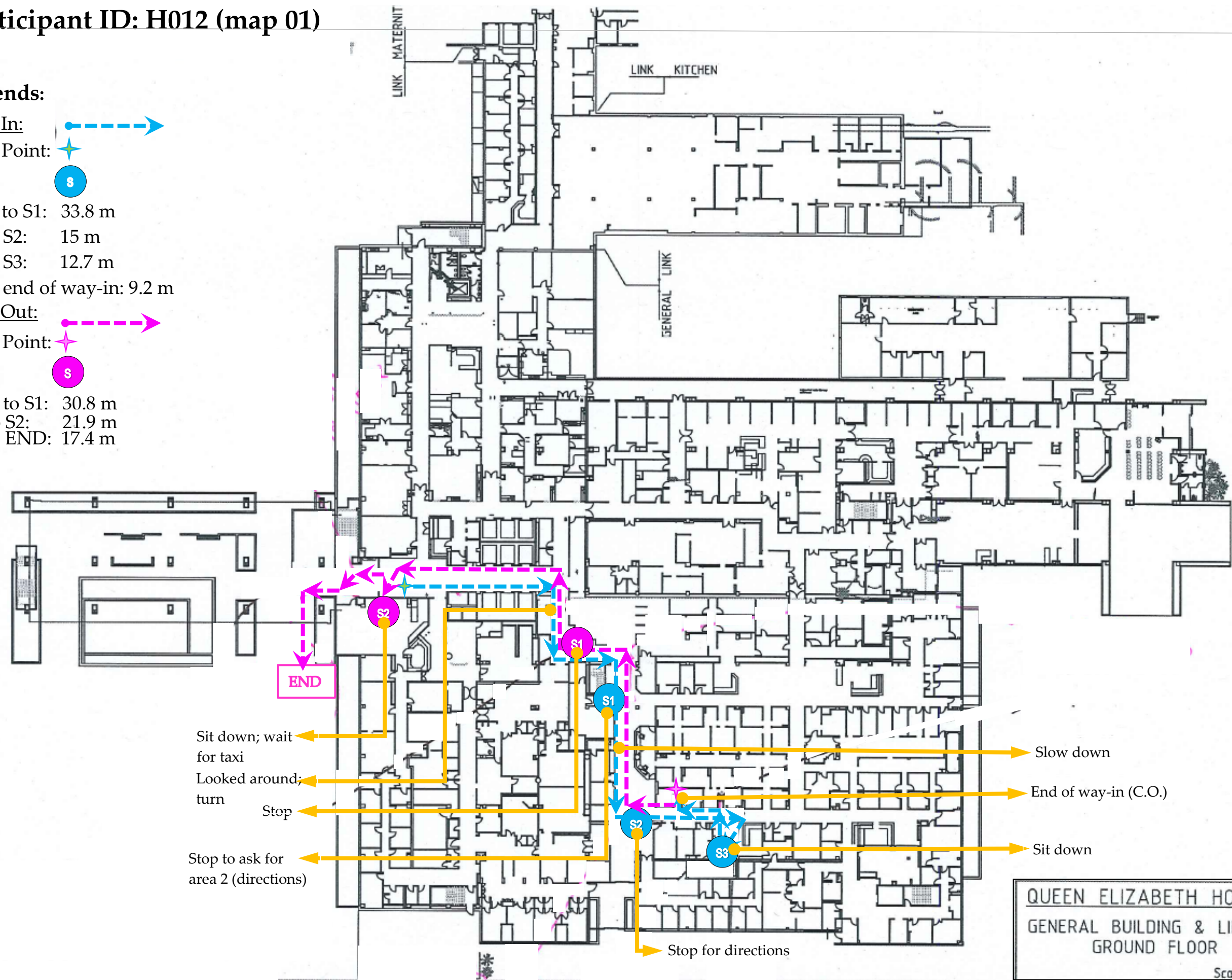


Participant ID: H012 (map 01)



Legends:

- Way In: 
- Start Point: 
- Stop: 
- Start to S1: 33.8 m
- S1 to S2: 15 m
- S2 to S3: 12.7 m
- S3 to end of way-in: 9.2 m
- Way Out: 
- Start Point: 
- Stop: 
- Start to S1: 30.8 m
- S1 to S2: 21.9 m
- S2 to END: 17.4 m



Participant ID: H011 (map 01)

Legends

Way Out: 

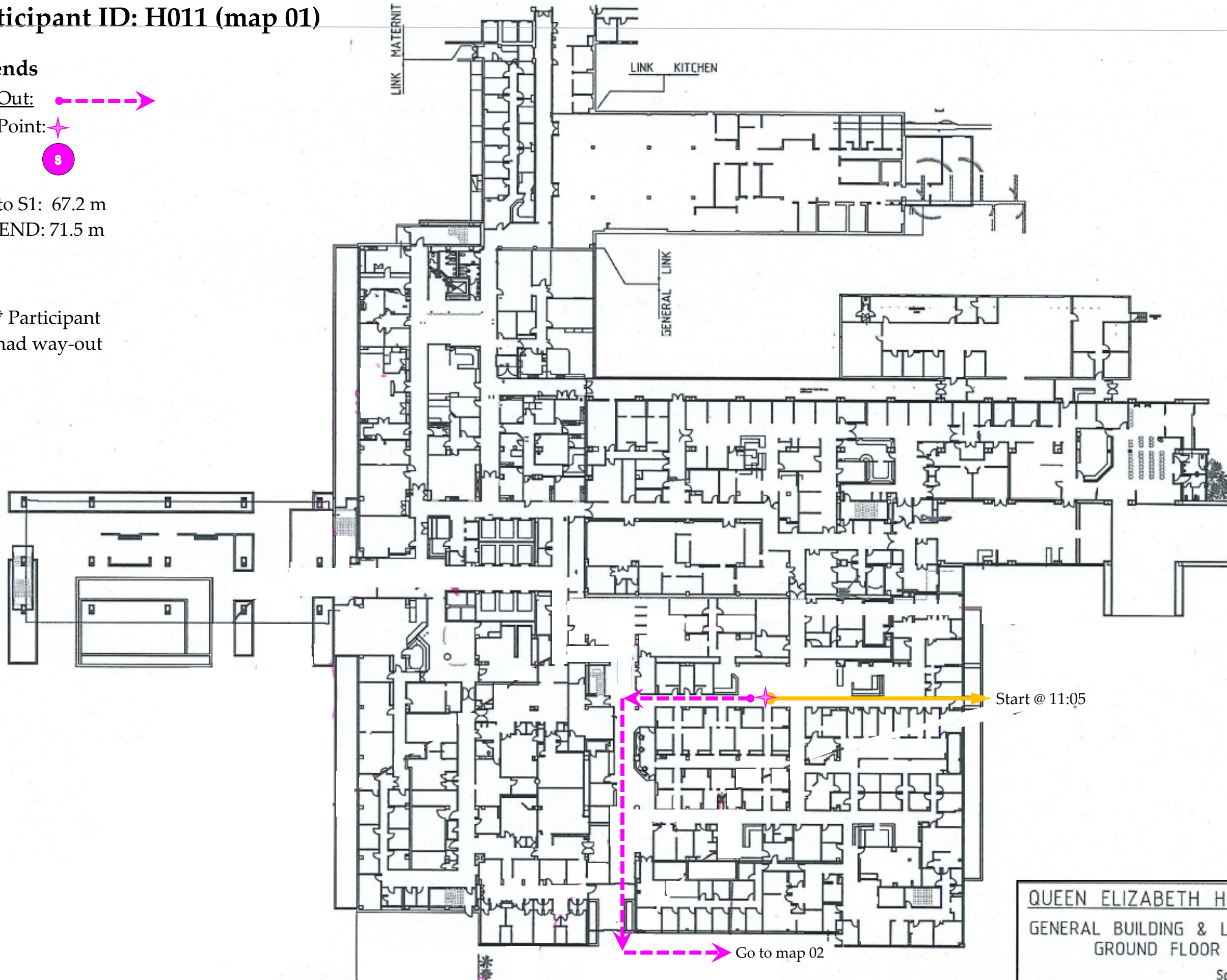
Start Point: 

Stop: 

Start to S1: 67.2 m

S1 to END: 71.5 m

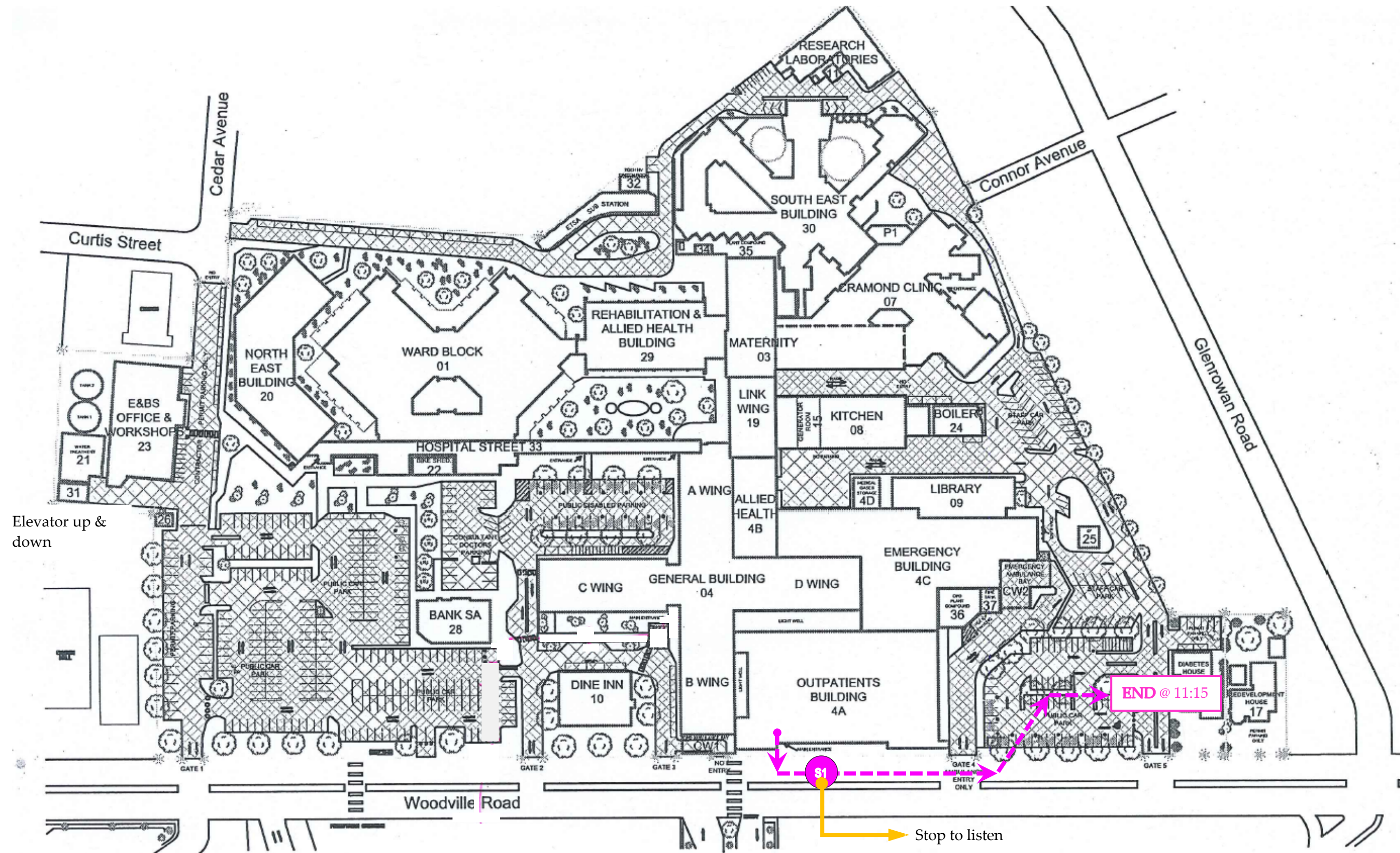
Note* Participant only had way-out



QUEEN ELIZABETH HOSPITAL
GENERAL BUILDING & LINK WING
GROUND FLOOR

Scale NTS

Participant ID: H011 (map 02)



Participant ID: H010 (map 01)

Legends

Way In: 

Start Point: 

Stop: 

Start to S1: 41.5 m

S1 to S2: 30 m

S2 to S3: 16.4 m

S3 to S4: 108.9 m

S4 to end of way-in: 48.9 m

Way Out: 

Start Point: 

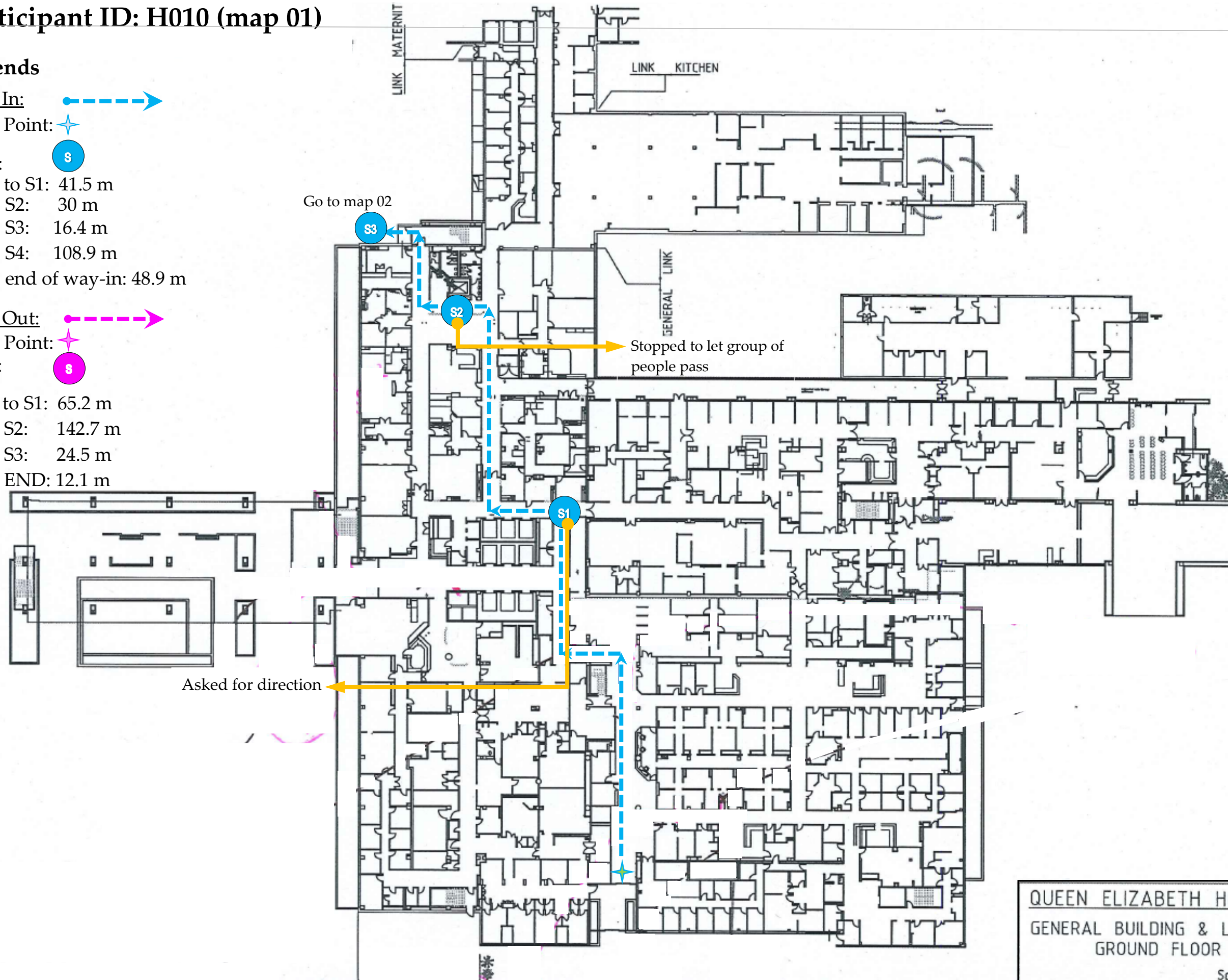
Stop: 

Start to S1: 65.2 m

S1 to S2: 142.7 m

S2 to S3: 24.5 m

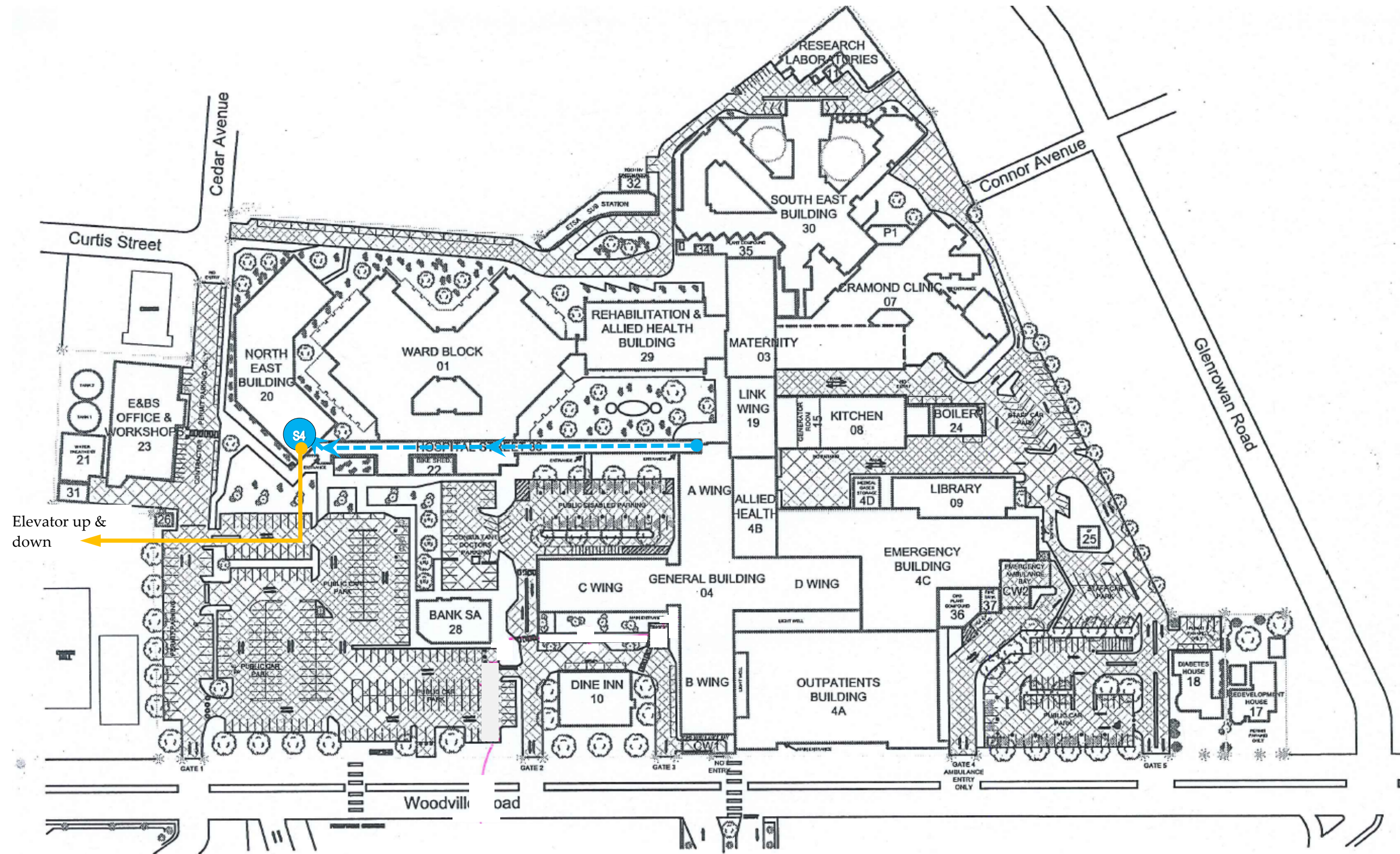
S3 to END: 12.1 m



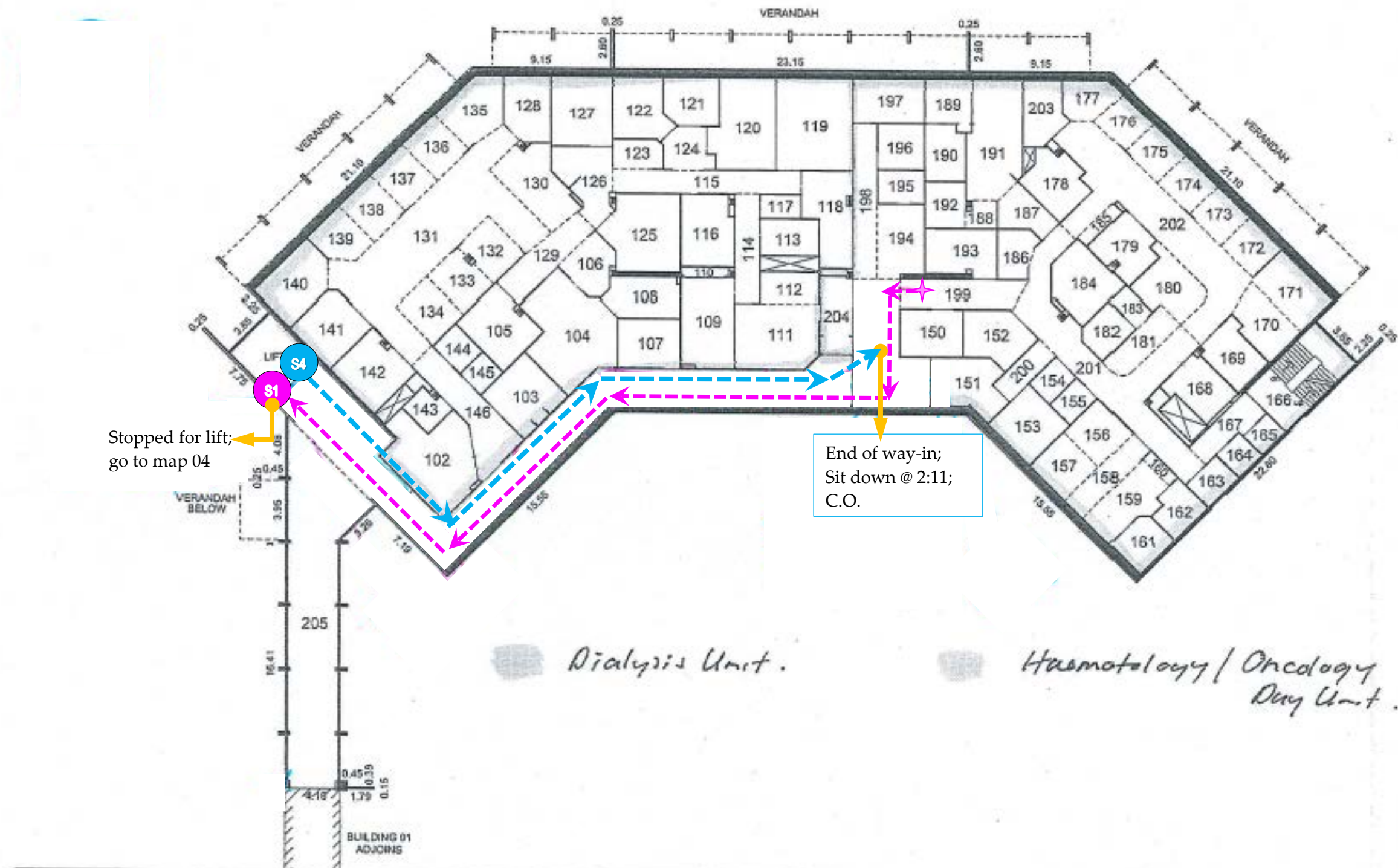
QUEEN ELIZABETH HOSPITAL
GENERAL BUILDING & LINK WING
GROUND FLOOR

Scale NTS

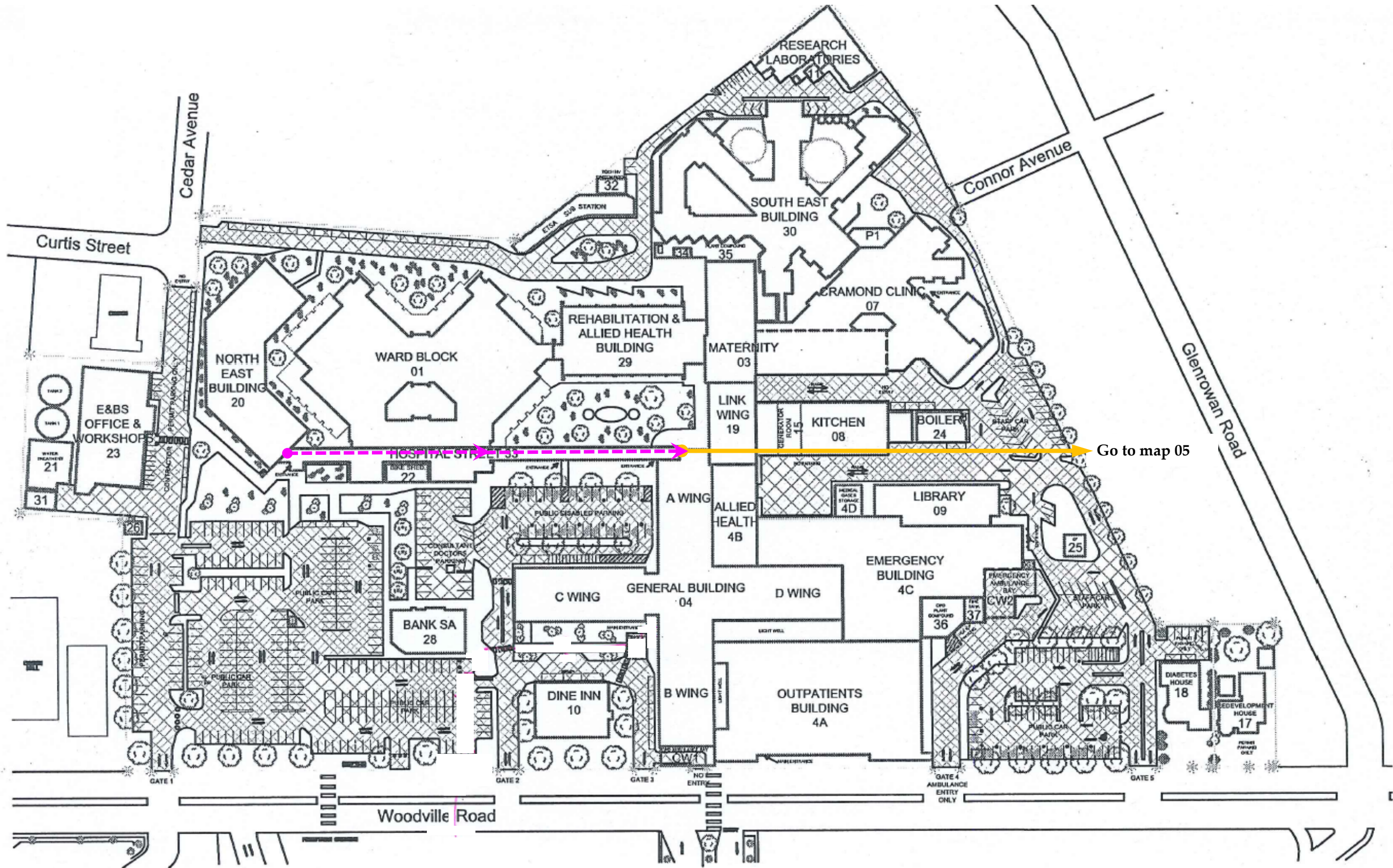
Participant ID: H010 (map 02)



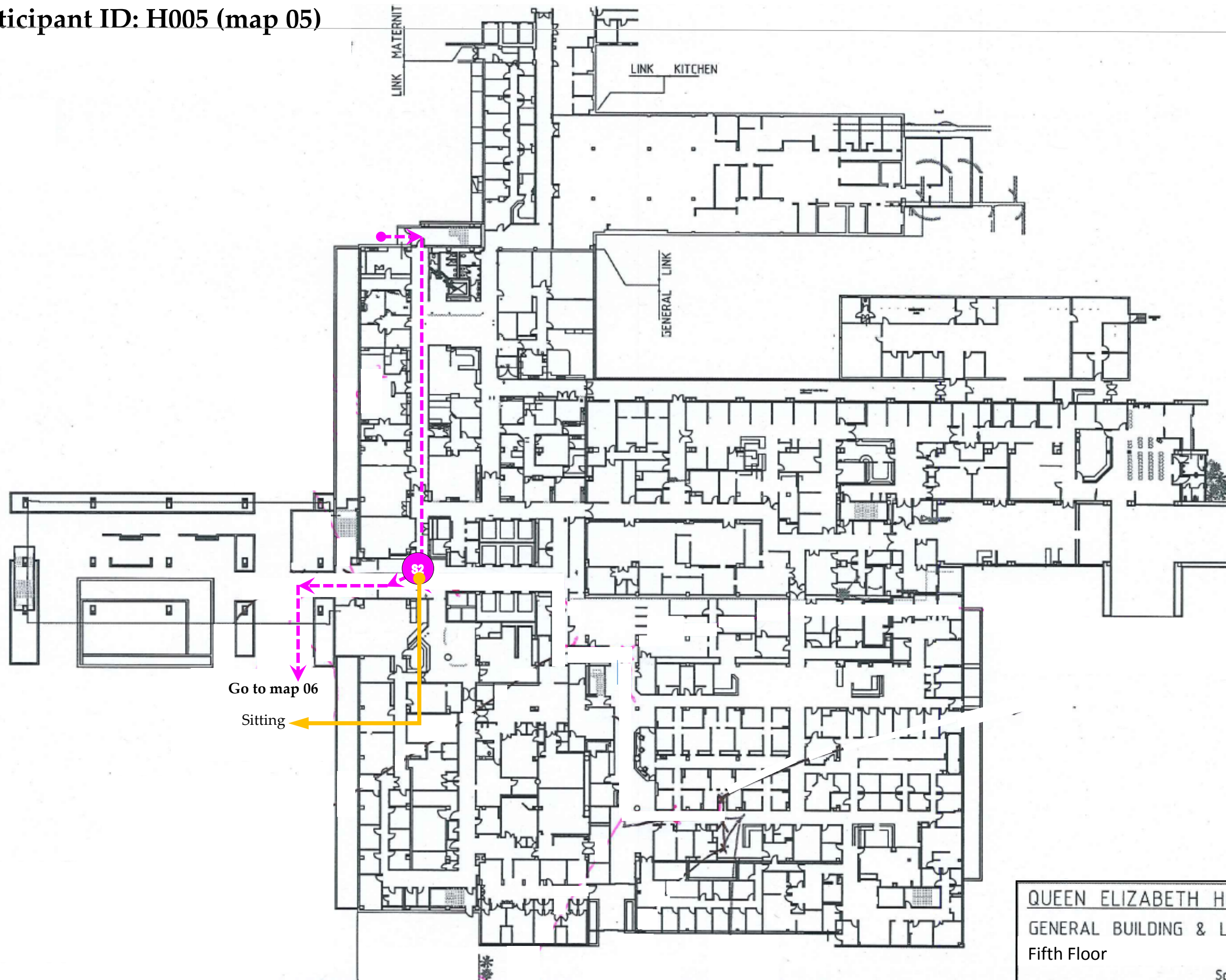
Participant ID: H010 (map 03)



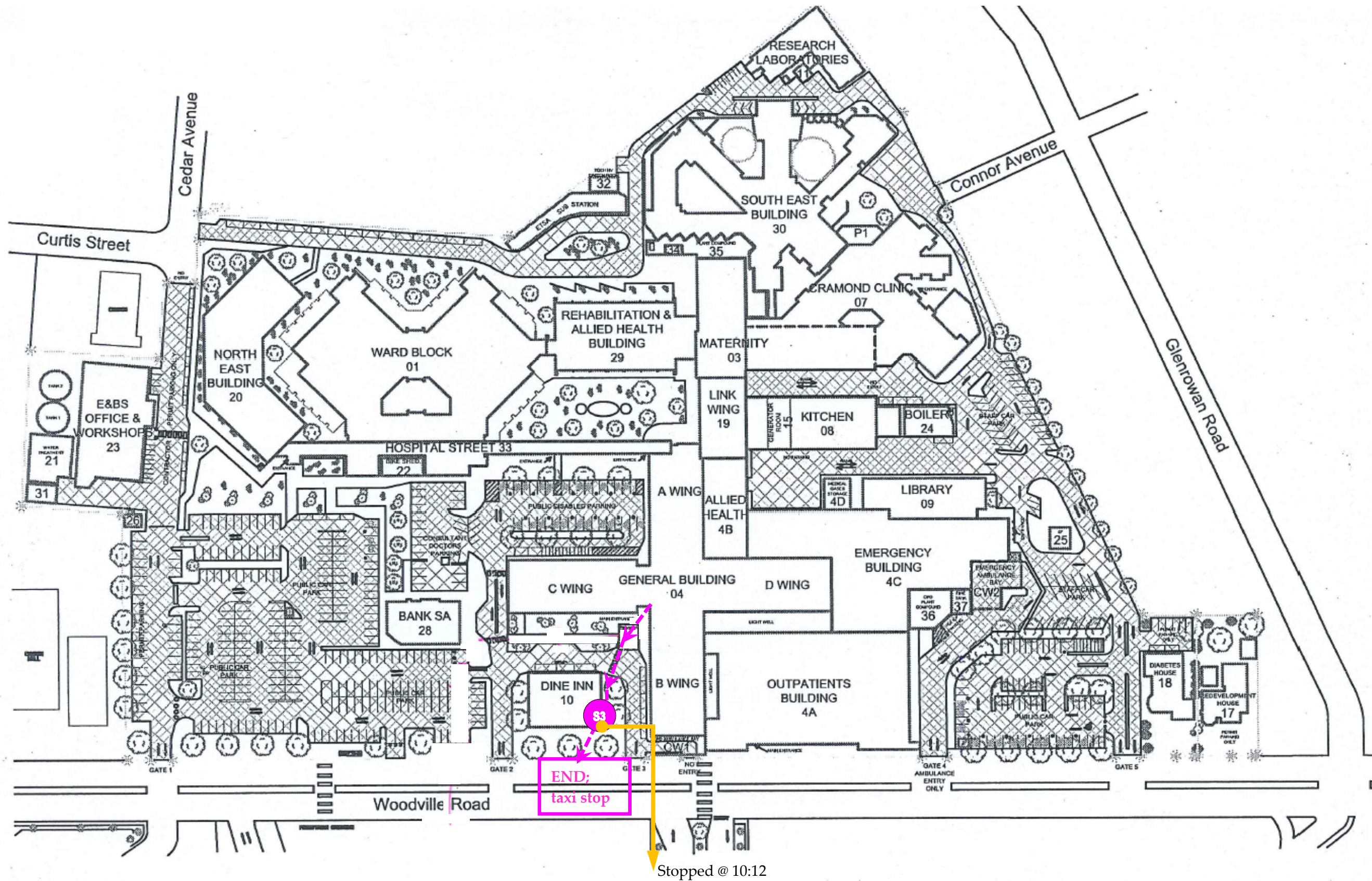
Asset Name	THE QUEEN ELIZABETH HOSPITAL						Government of South Australia
Building Use	NORTH EAST BUILDING						Department of Planning,
Building Use	LEVEL 02 - FIRST FLOOR						Transport and Infrastructure
Created by:	Archlink	Drawn	E Roberts	Date	Apr 2016	Strategic Asset Management Information System Plan	
Modified by:	Archlink	Drawn	E Roberts	Date	Apr 2016		
Plans group no	1711	Map group no	177	Plan no			
							SAMIS 14.01.20.02



Participant ID: H005 (map 05)



QUEEN ELIZABETH HOSPITAL
GENERAL BUILDING & LINK WING
Fifth Floor
Scale NTS



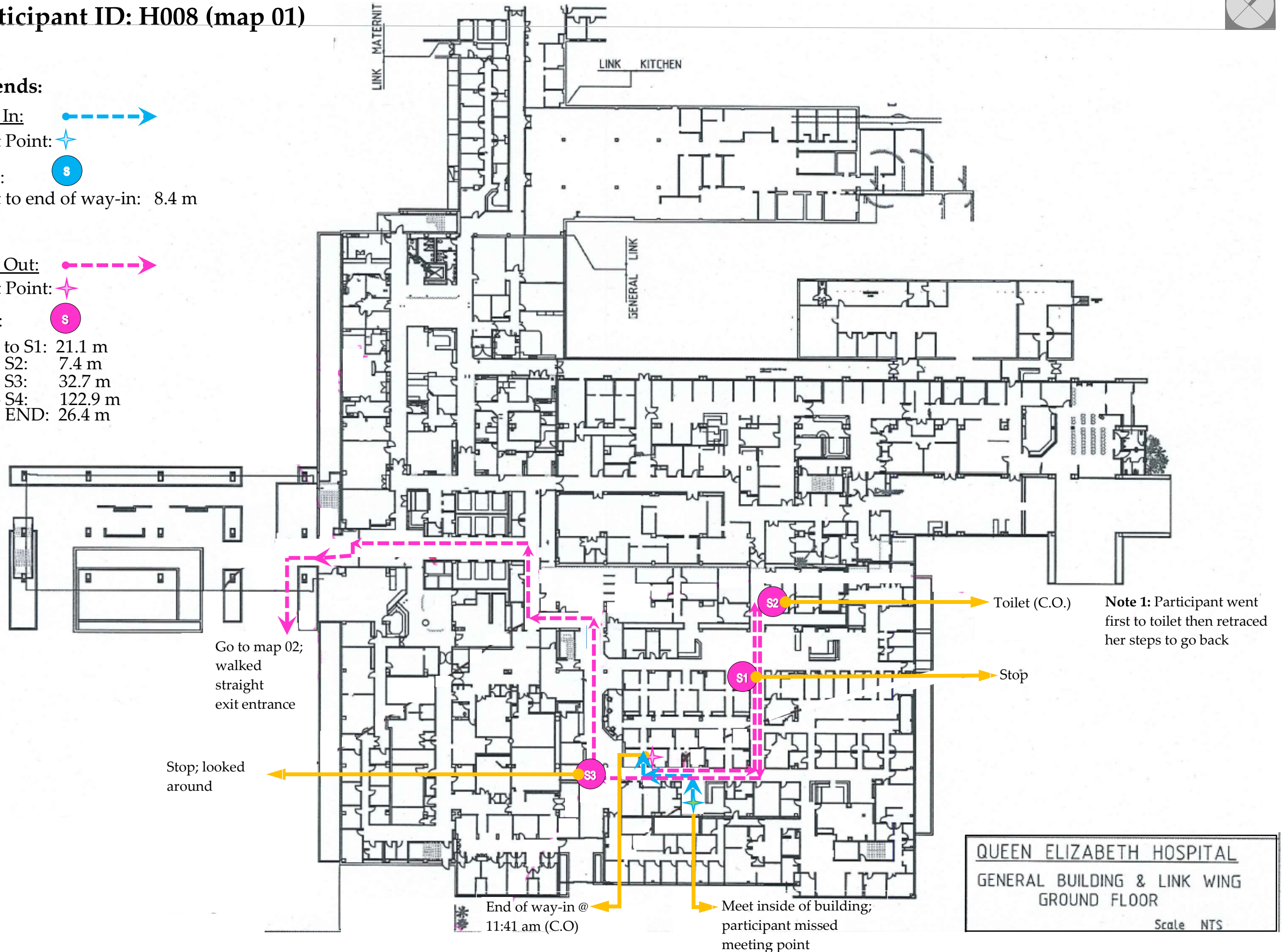
Participant ID: H008 (map 01)



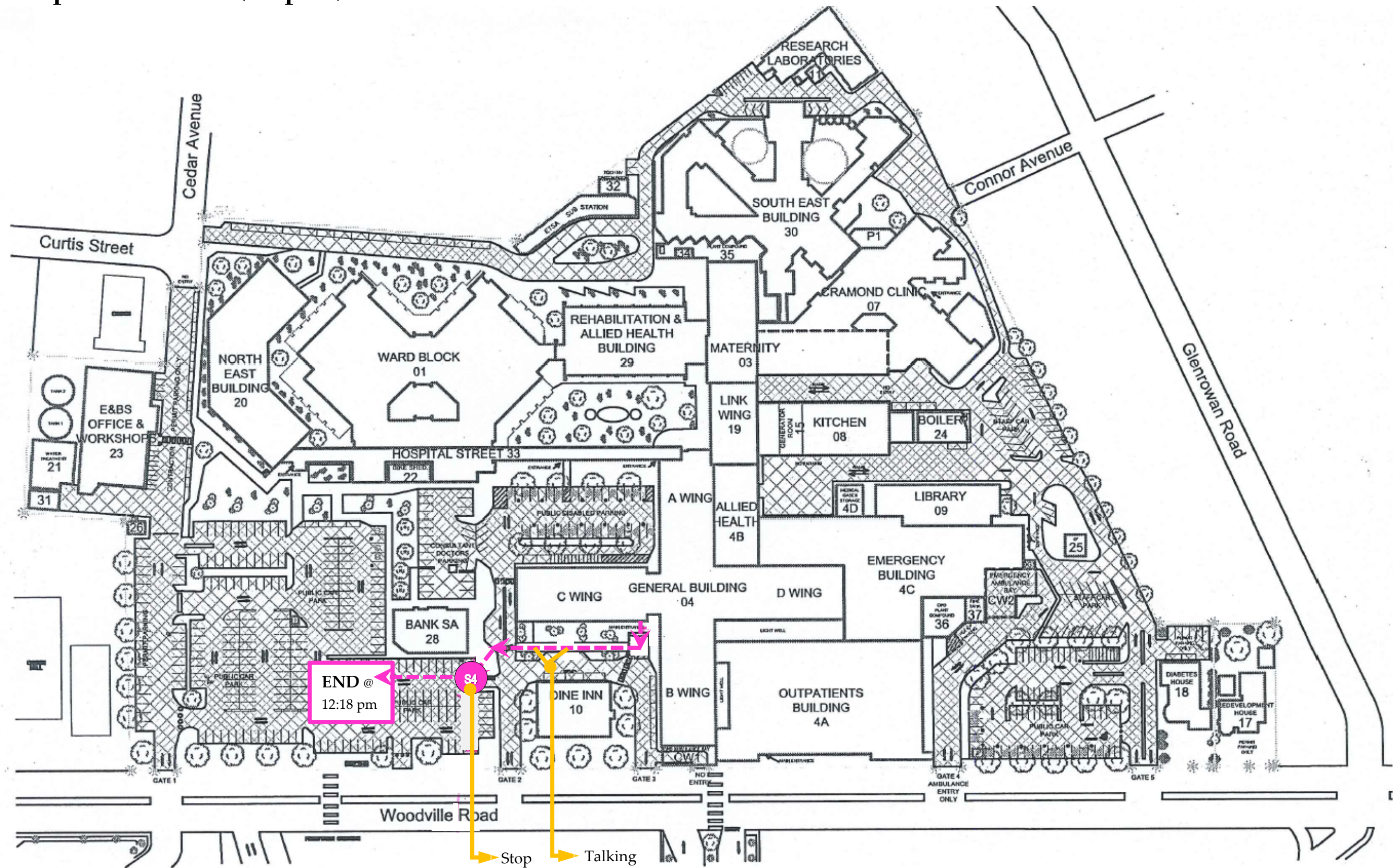
Legends:

Way In: 
Start Point: 
Stop: 
Start to end of way-in: 8.4 m

Way Out: 
Start Point: 
Stop: 
Start to S1: 21.1 m
S1 to S2: 7.4 m
S2 to S3: 32.7 m
S3 to S4: 122.9 m
S4 to END: 26.4 m



Participant ID: H008 (map 02)



Participant ID: H007 (map 01)

Legend:

Way Out: 

Start Point: 

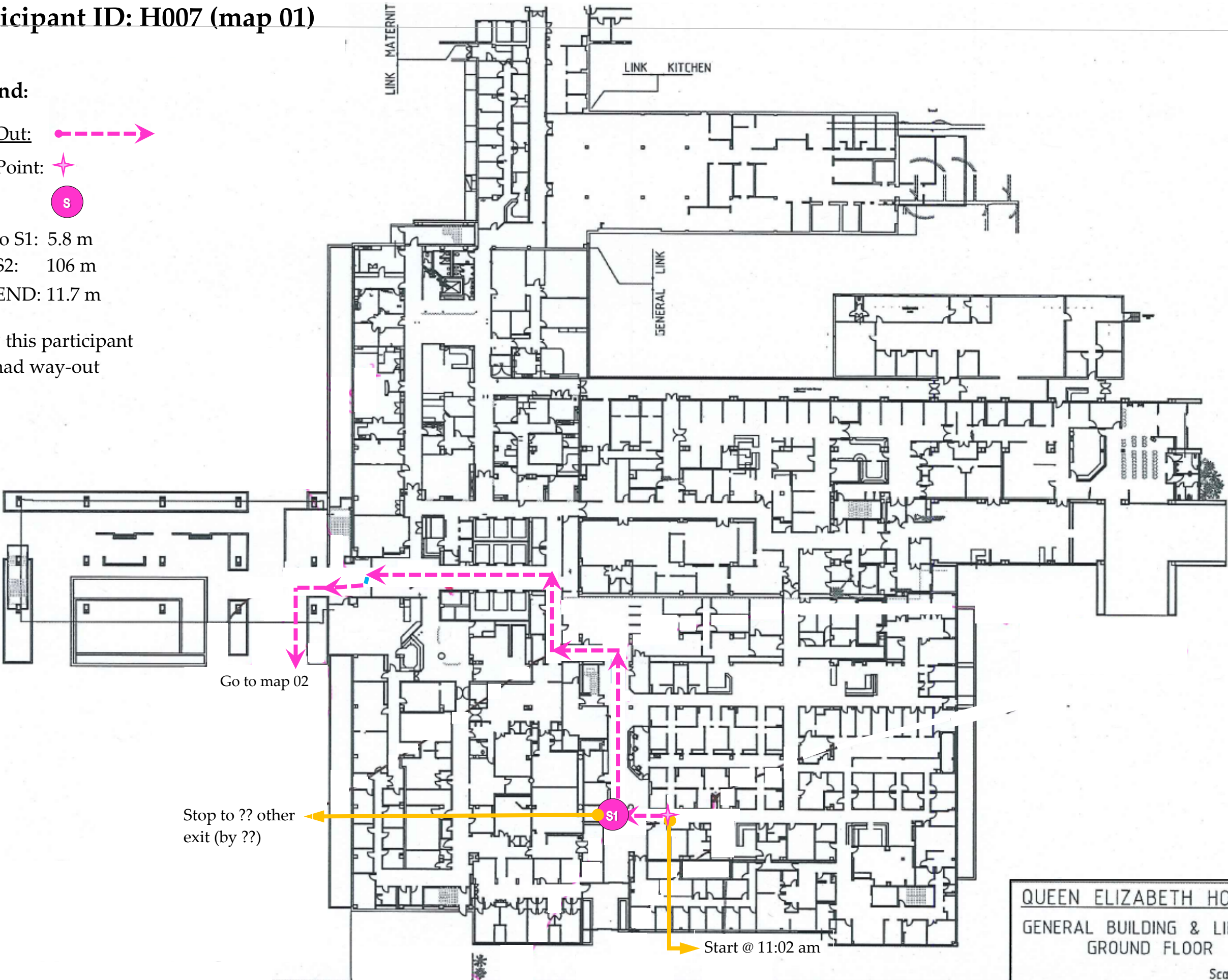
Stop: 

Start to S1: 5.8 m

S1 to S2: 106 m

S2 to END: 11.7 m

Note* this participant only had way-out



QUEEN ELIZABETH HOSPITAL
GENERAL BUILDING & LINK WING
GROUND FLOOR
Scale NTS

Stop to look her way ←

→ Bump on ??, missed it

- ▶ Bump on ??, missed it

Participant ID: H005 (map 01)



Legends

Way In: 

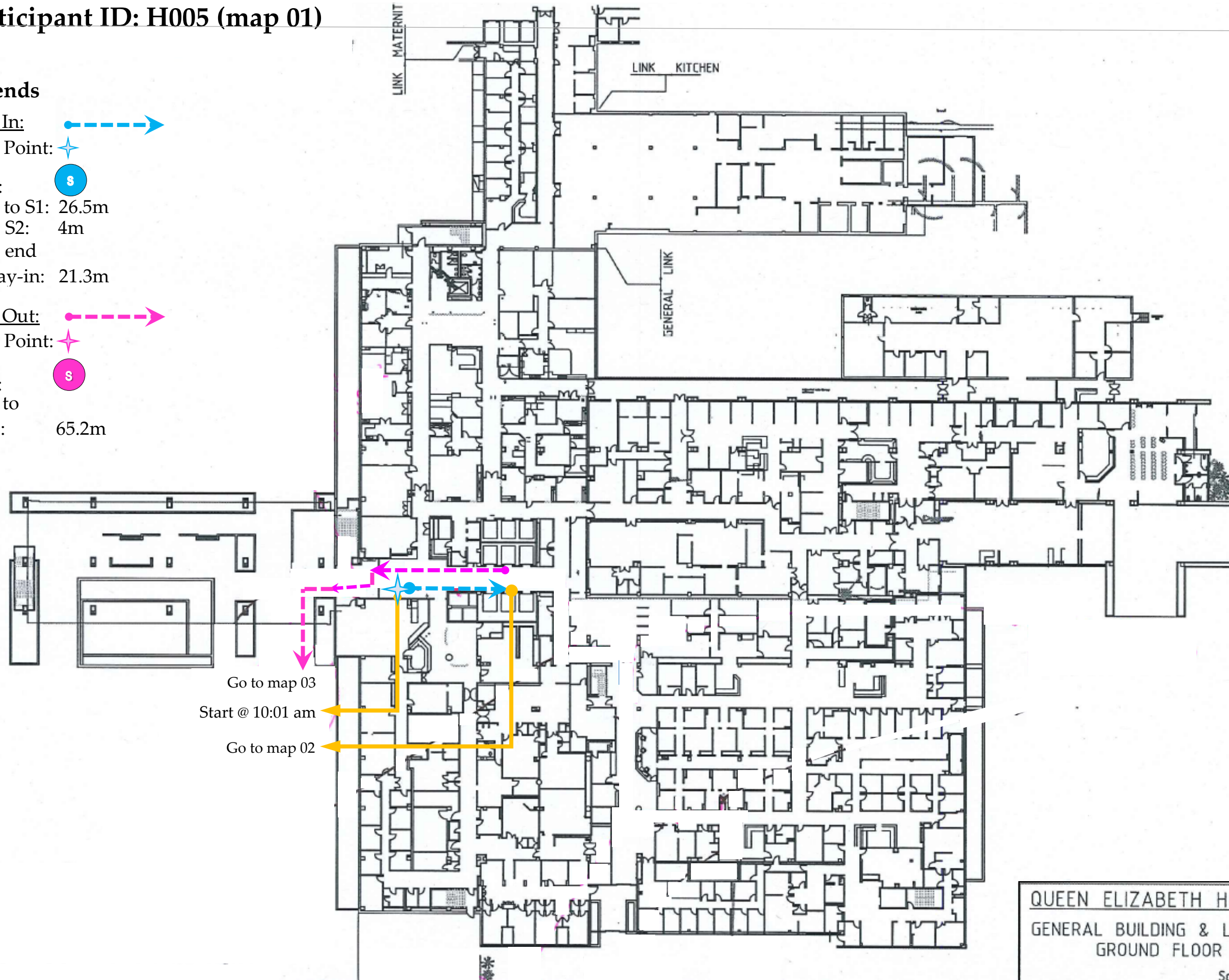
Start Point: 

Stop: 
Start to S1: 26.5m
S1 to S2: 4m
S2 to end
of way-in: 21.3m

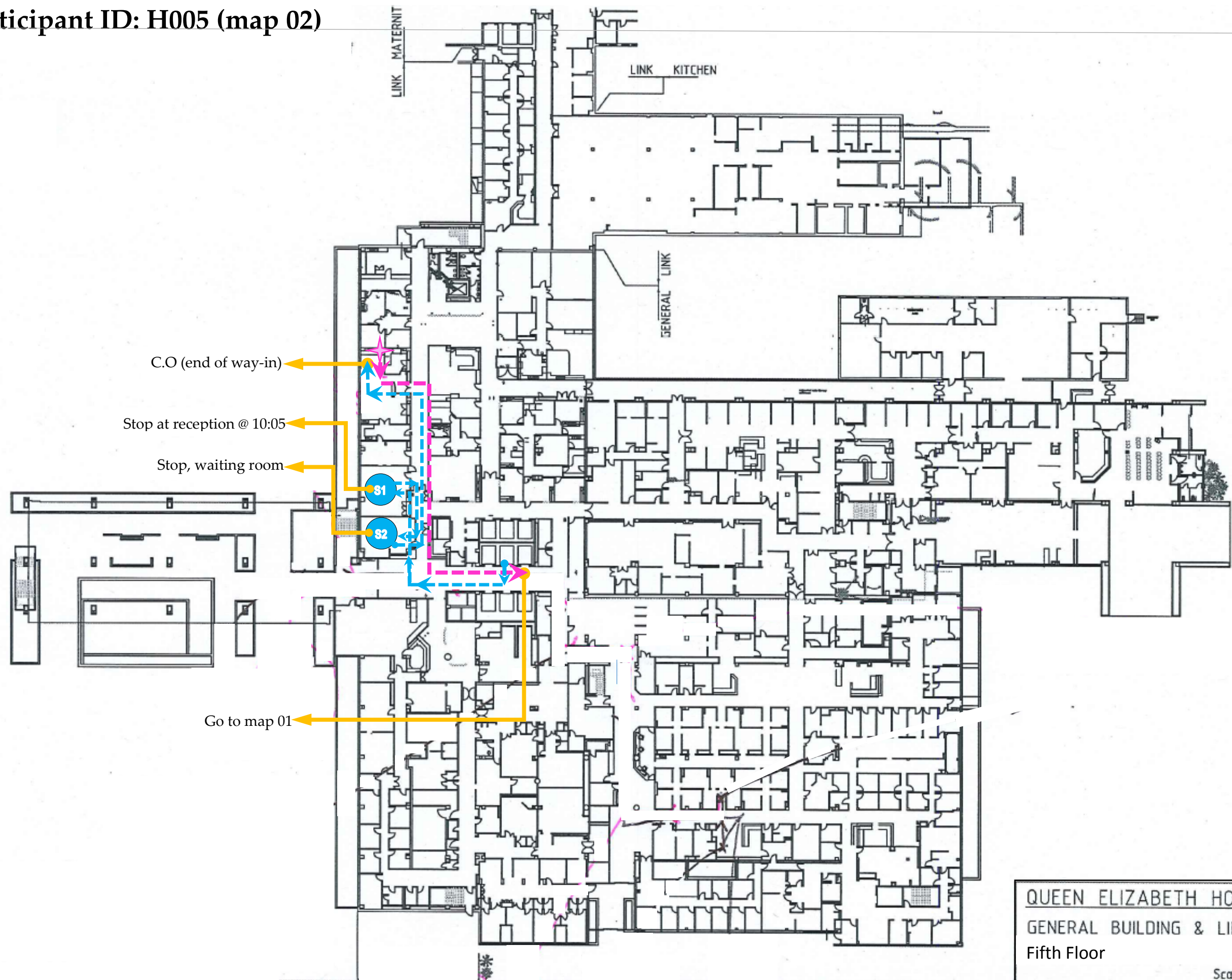
Way Out: 

Start Point: 

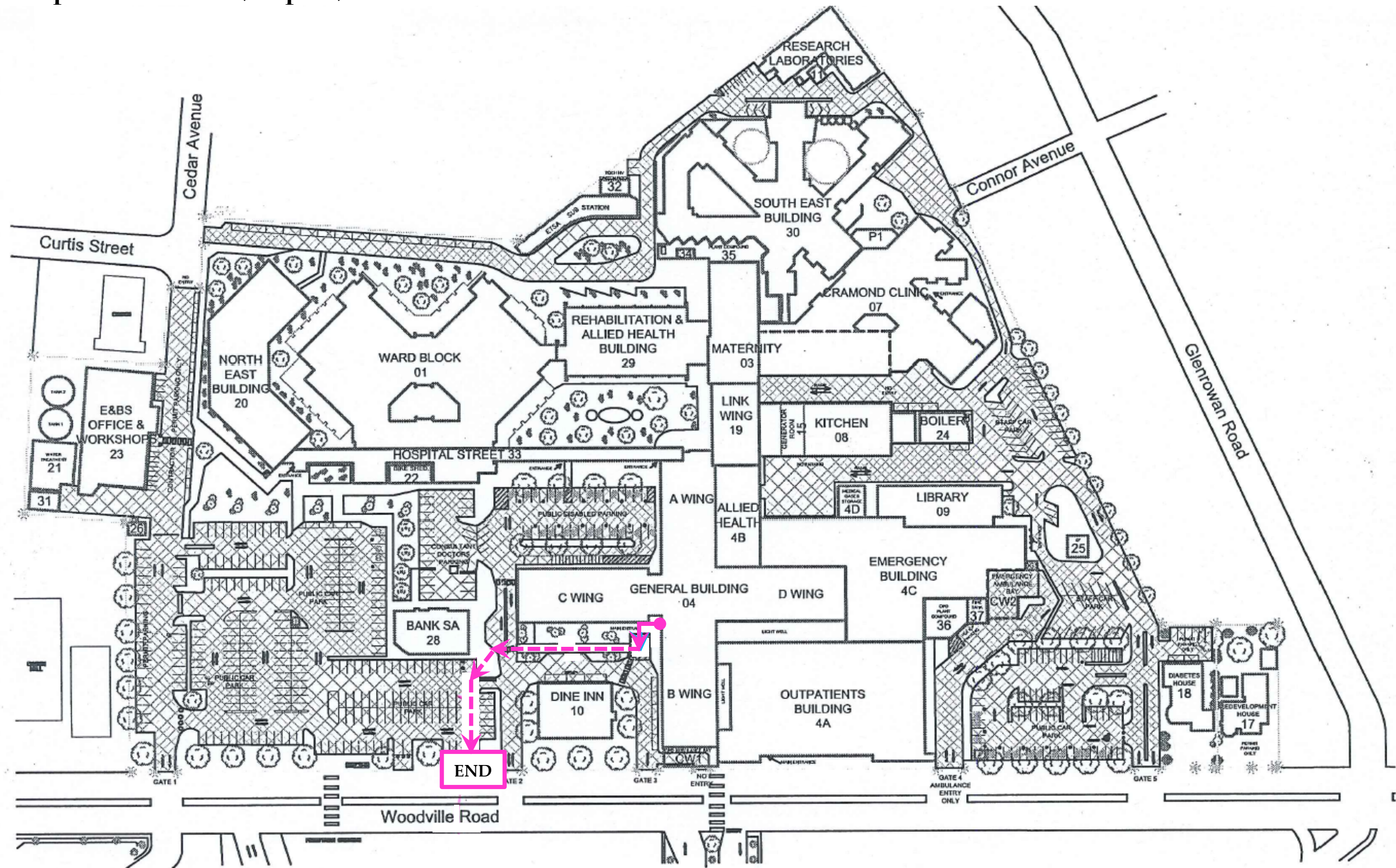
Stop: 
Start to
END: 65.2m



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GENERAL BUILDING & LINK WING
GROUND FLOOR
Scale NTS



QUEEN ELIZABETH HOSPITAL
GENERAL BUILDING & LINK WING
Fifth Floor
Scale NTS



Participant ID: H002 (map 01)



Legends

Way In:

Start Point:

Stop:

Start to S1: 60m

S1 to S2: 4m

S2 to end
of way-in: 5m

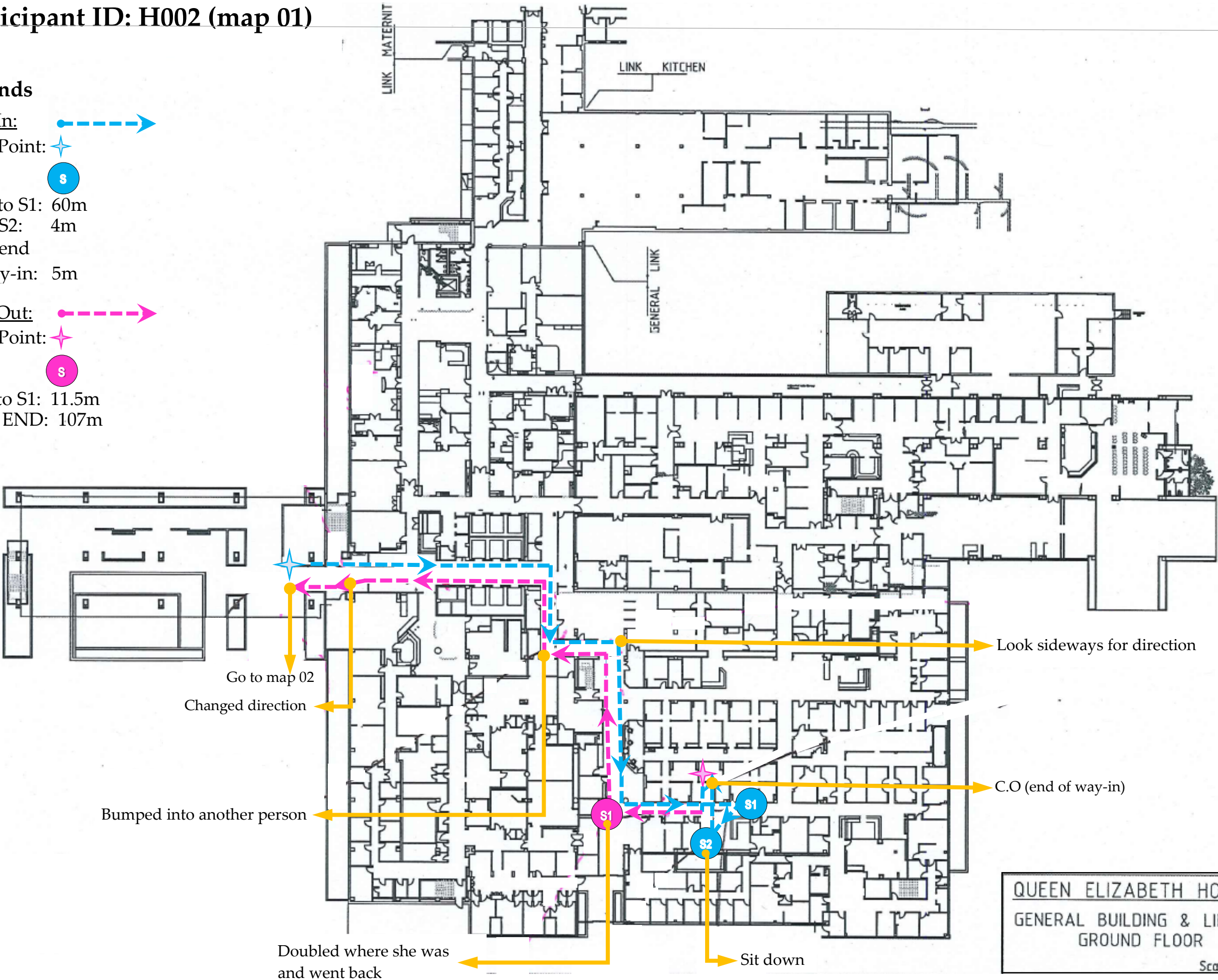
Way Out:

Start Point:

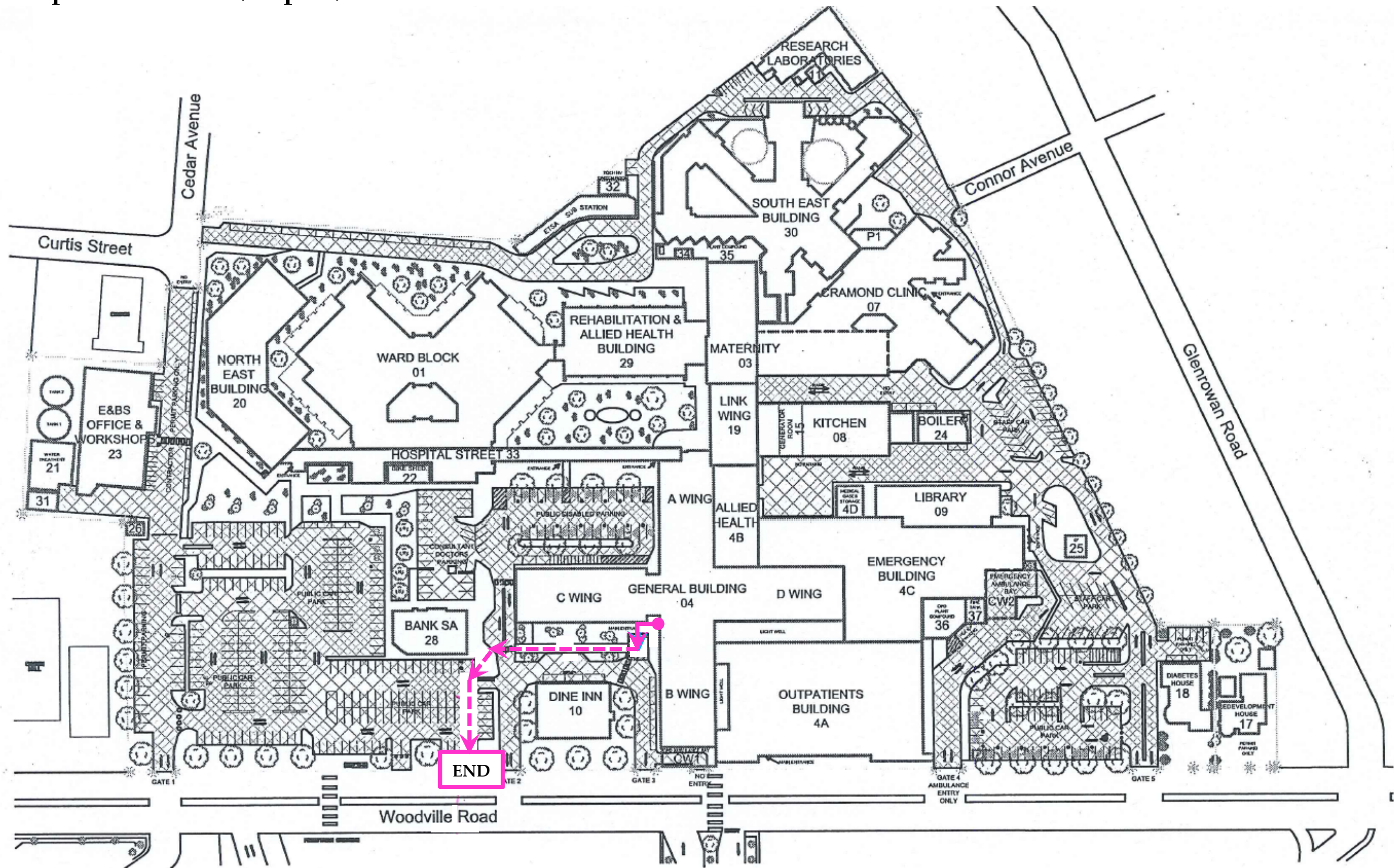
Stop:

Start to S1: 11.5m

S1 to END: 107m



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GENERAL BUILDING & LINK WING
GROUND FLOOR
Scale NTS



Participant ID: H001



Legends

Way In:

Start Point:

Stop:

Start to S1/ end
of way-in: 49.5m

Way Out:

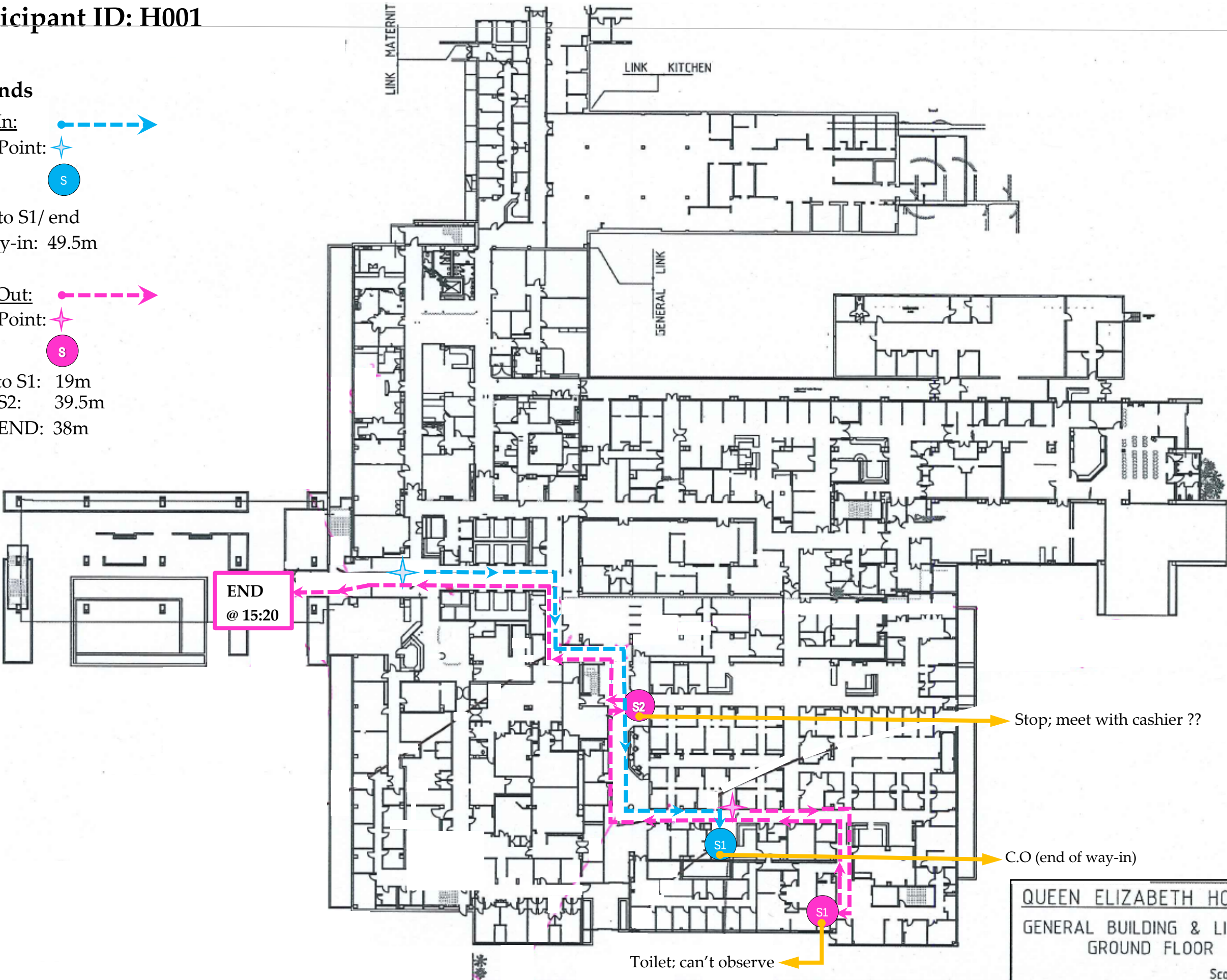
Start Point:

Stop:

Start to S1: 19m

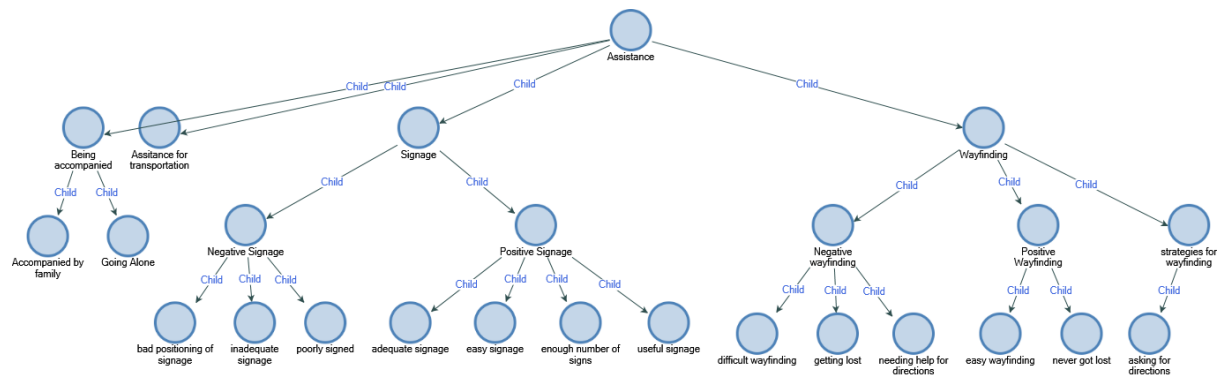
S1 to S2: 39.5m

S2 to END: 38m

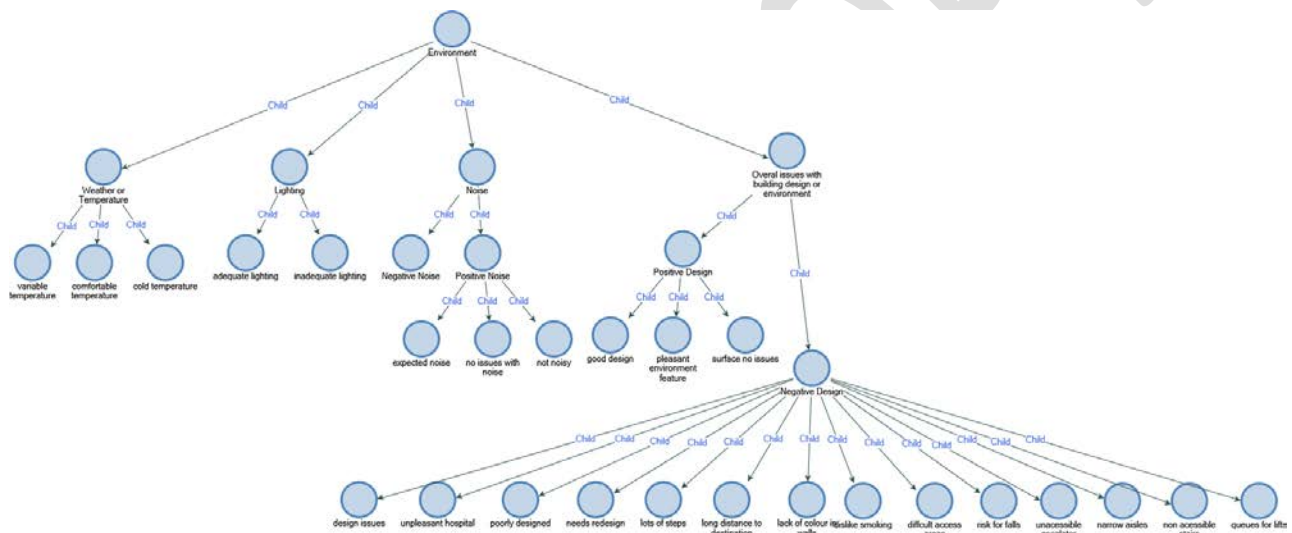


QUEEN ELIZABETH HOSPITAL
GENERAL BUILDING & LINK WING
GROUND FLOOR
Scale NTS

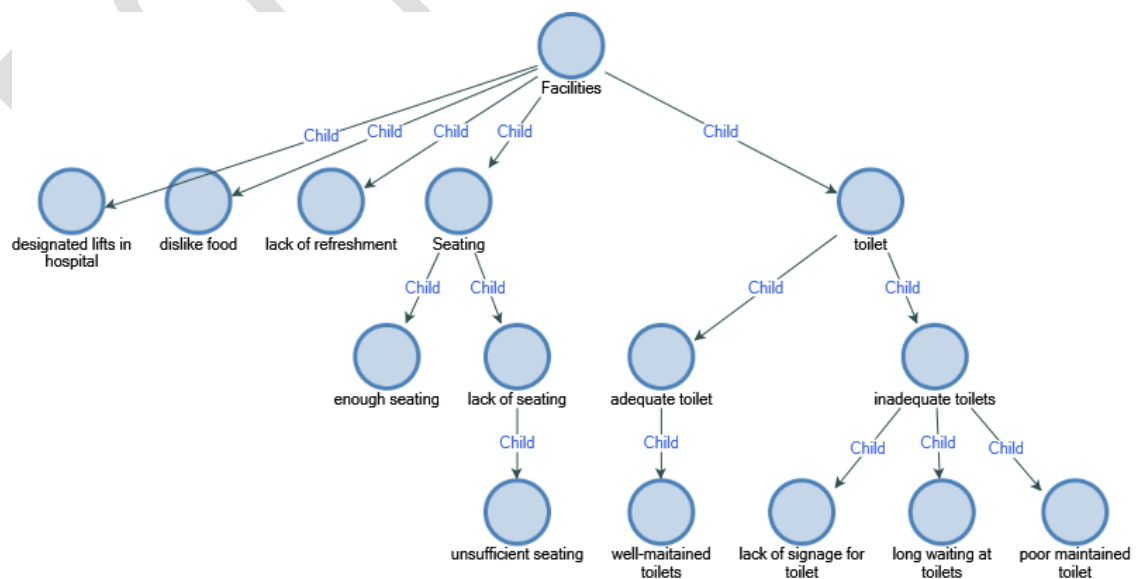
Appendix 6 – Audit Trails from Semi-structured Interviews



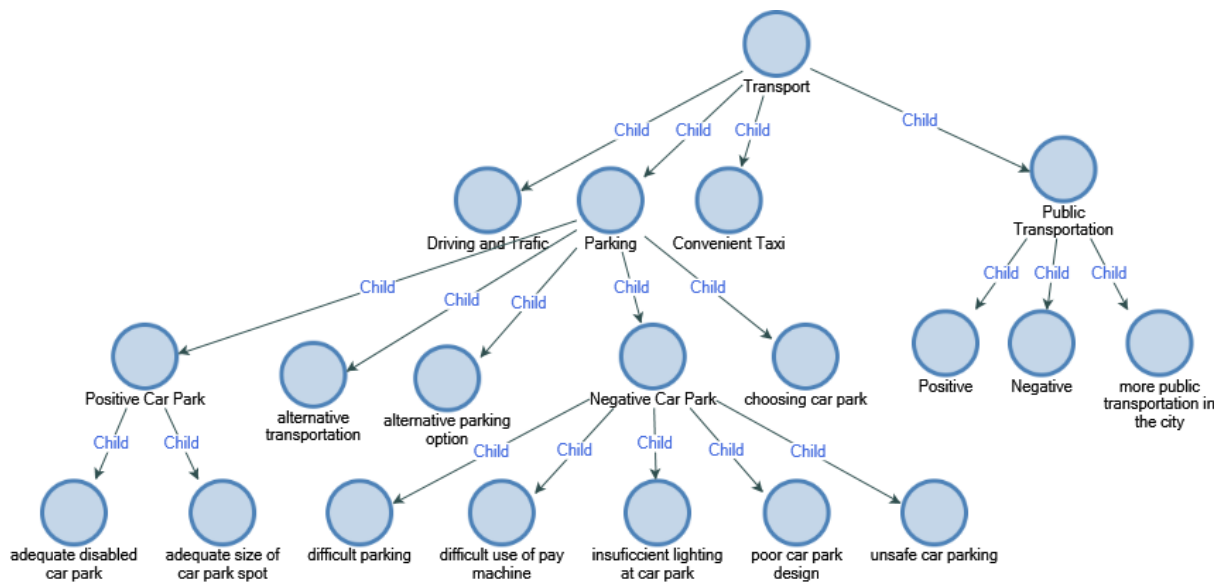
App. 6-1. Audit trail for the Assistance Theme – Hospital



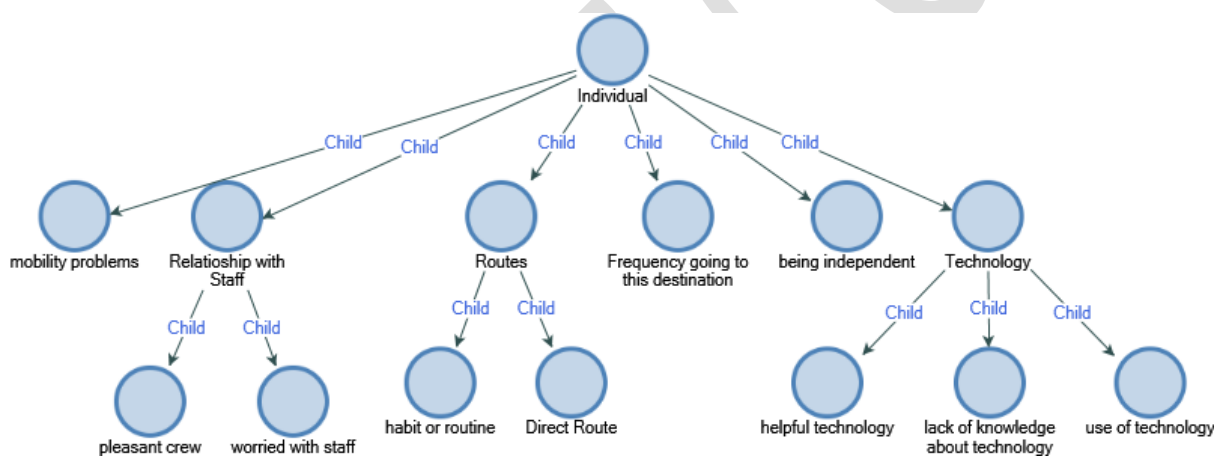
App. 6-2. Audit trail for the Environment Theme – Hospital



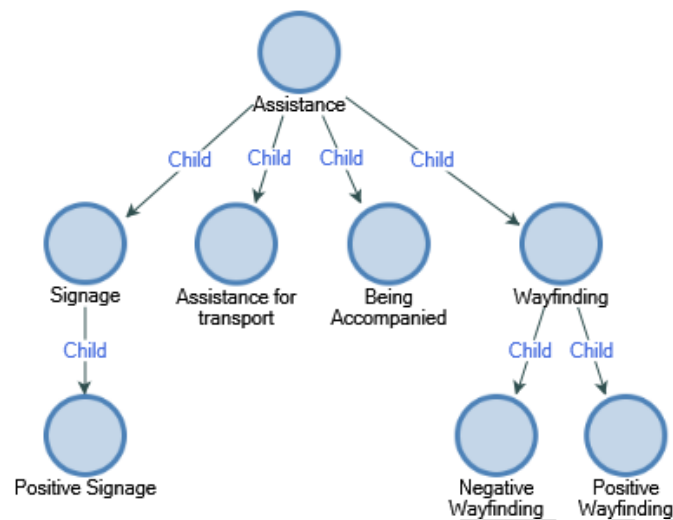
App. 6-3. Audit trail for the Facilities Theme – Hospital



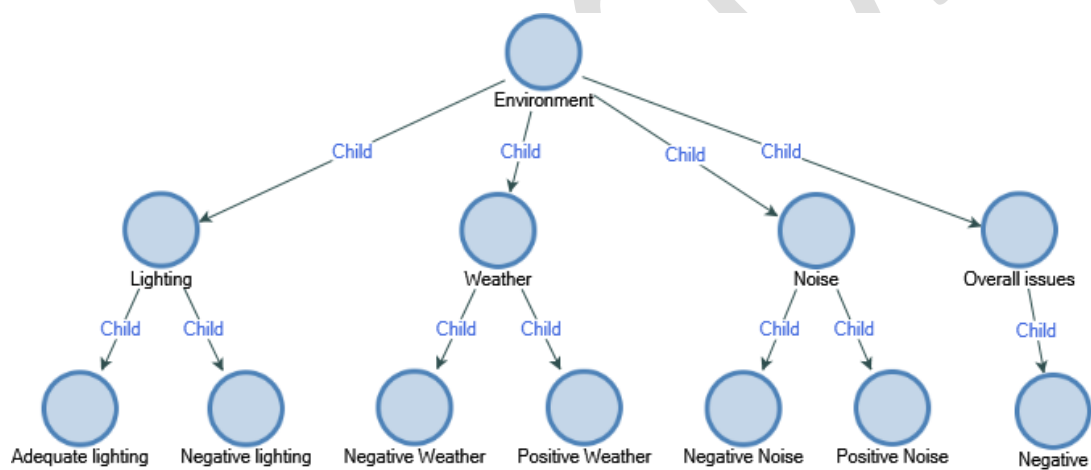
App. 6-4. Audit trail for the Transportation Theme – Hospital



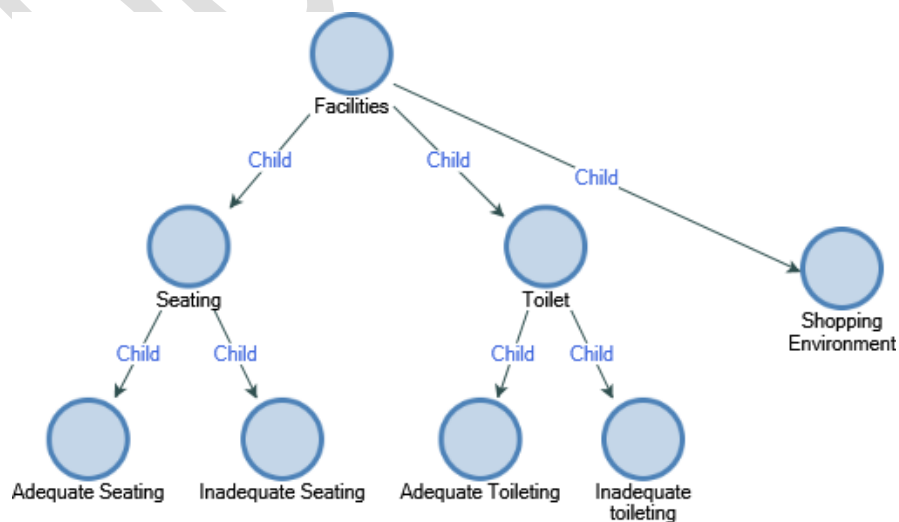
App. 6-5. Audit trail for the Individual Experiences Theme – Hospital



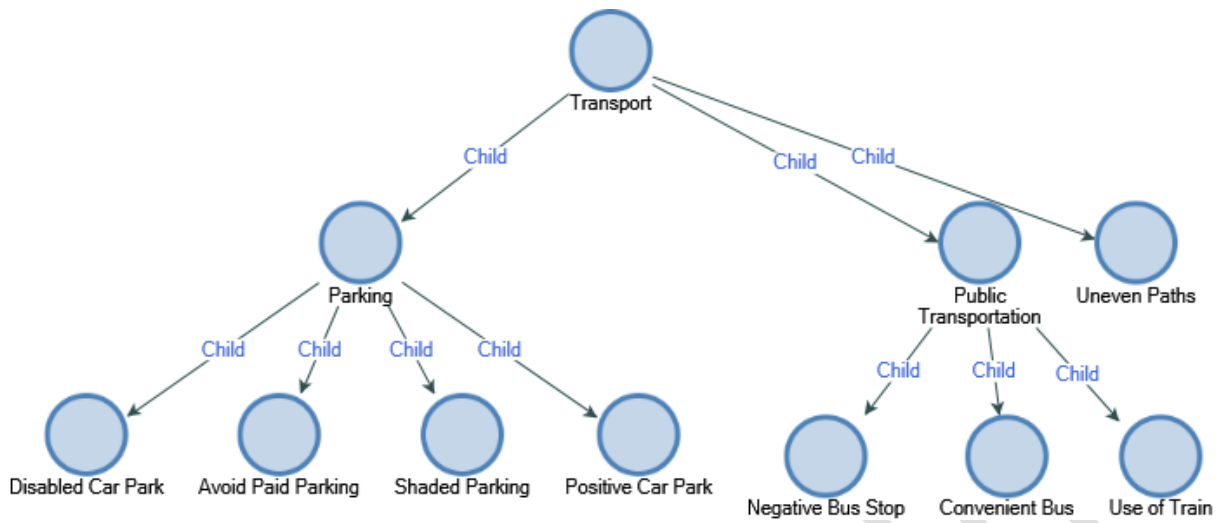
App. 6-6. Audit trail for the Assistance Theme – Shopping Centre 1



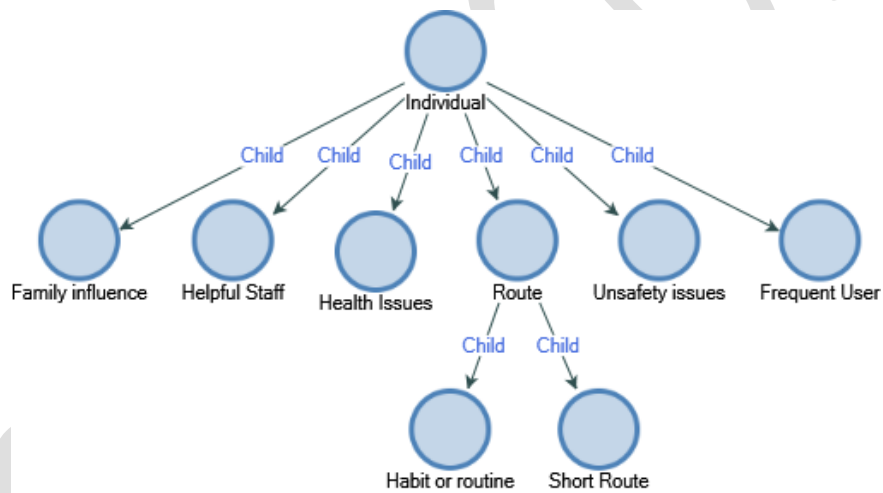
App. 6-7. Audit trail for the Environment Theme – Shopping Centre 1



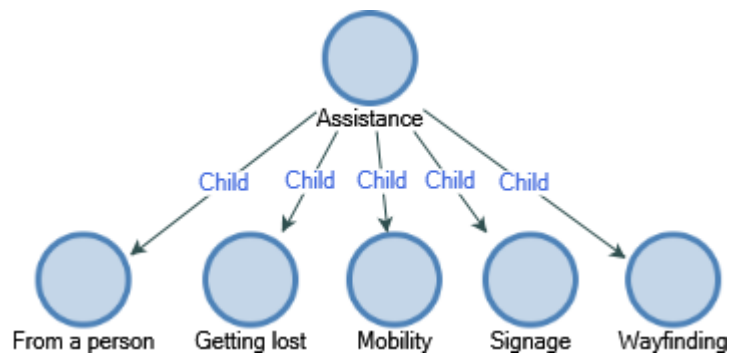
App. 6-8. Audit trail for the Facilities Theme – Shopping Centre 1



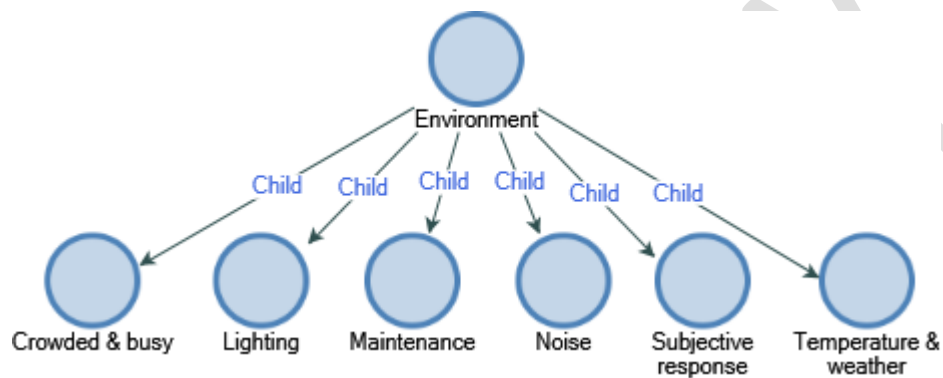
App. 6-9. Audit trail for the Transportation Theme – Shopping Centre 1



App. 6-10. Audit trail for the Individual Experiences Theme – Shopping Centre 1



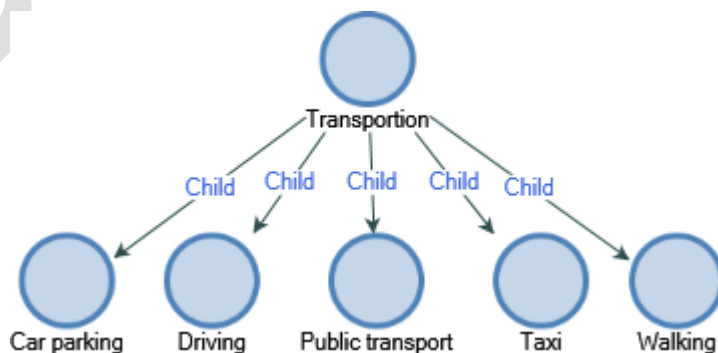
App. 6-11. Audit trail for the Assistance Theme – Shopping Centre 2



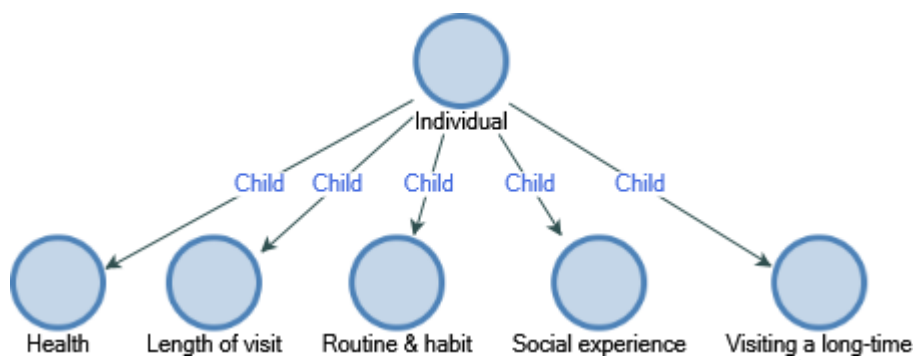
App. 6-12. Audit trail for the Environment Theme – Shopping Centre 2



App. 6-13. Audit trail for the Facilities Theme – Shopping Centre 2



App. 6-14. Audit trail for the Transportation Theme – Shopping Centre 2



App. 6-15. Audit trail for the Individual Experiences Theme – Shopping Centre 2

Appendix 7 – Built Environment Audit App

DO NOT COPY

BE audit app – functionality

1. Select BE audit application “Our Map” (Figure 1).

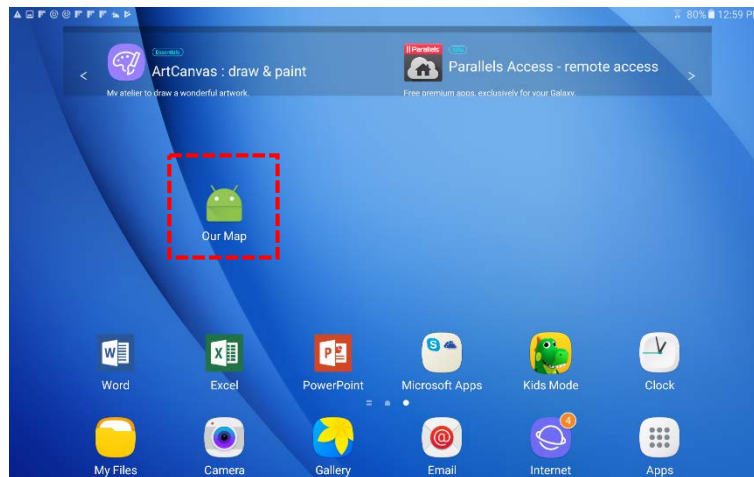


Figure 1. Main screen – BE audit app “Our Map”

2. Type audit name into field (note: only alpha or numeric characters) and press “External” to open new audit page (Figure 2).

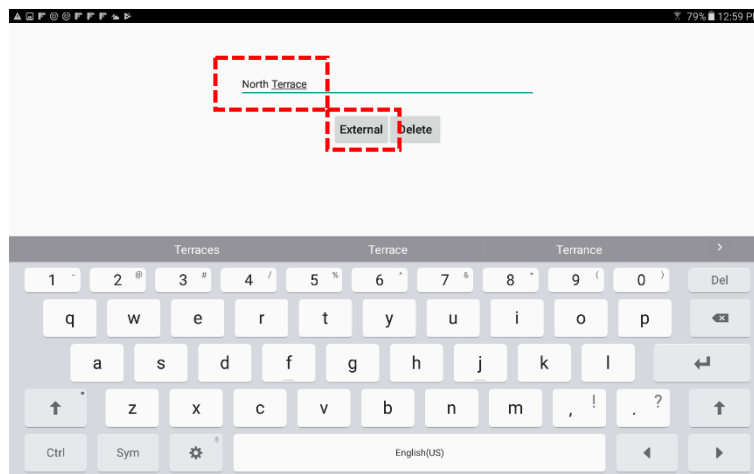


Figure 2. Home screen

3. Navigate to audit location (Figure 3 to Figure 5).
4. User can toggle between ‘Maps view’ or ‘Arial view’ depending on preference (Figure 3 & Figure 4) using the “Type” button.
5. Zoom-in to audit area using standard touch-screen controls (Figure 5)

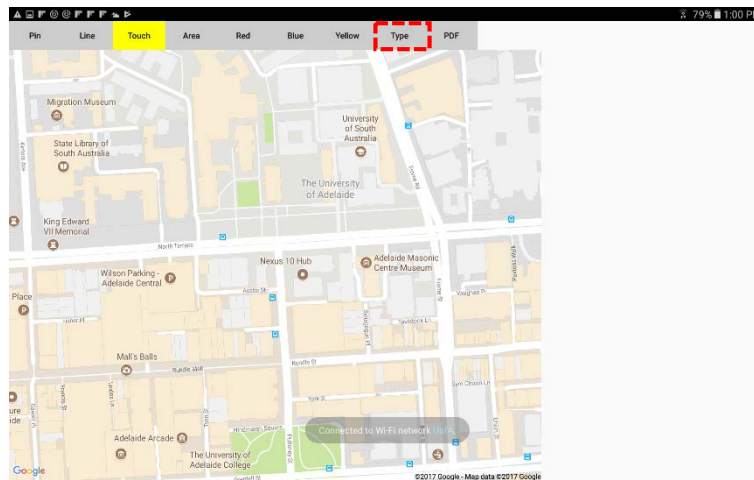


Figure 3. Audit page – 'Maps view'

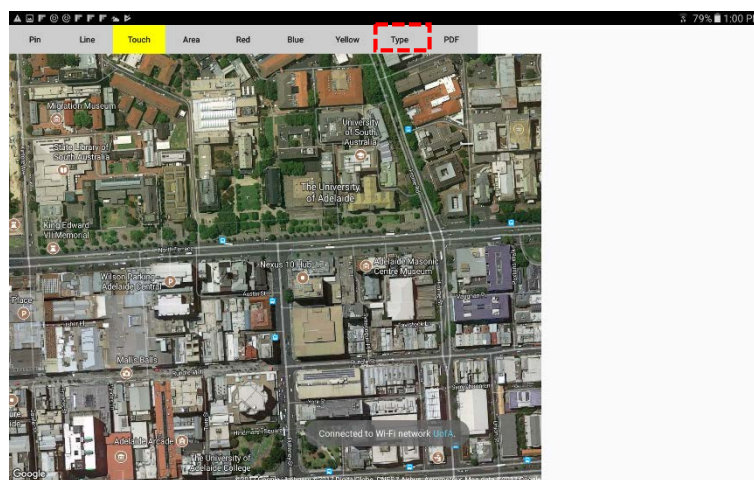


Figure 4. Audit page – 'Aerial view'

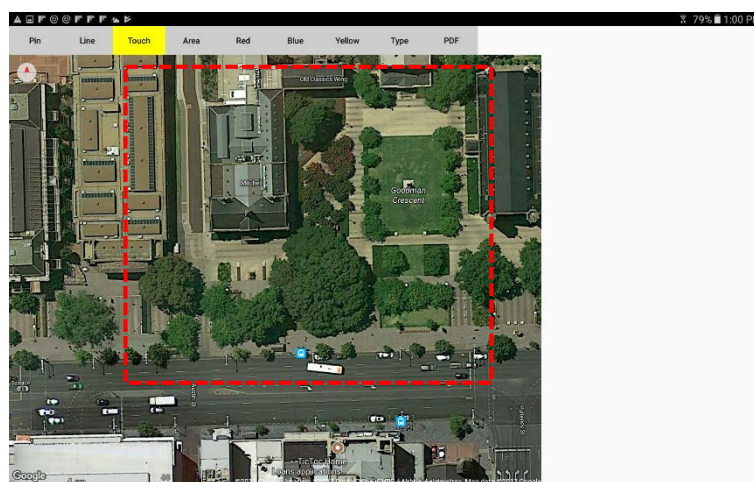


Figure 5. Audit page – zoomed-in

6. Mark audit area by using the “Line” button and connecting 3+ points with the “Area” button (Figure 6). Alternatively, the audit area can simply remain a line (e.g. see Figure 8).
7. Complete audit checklist & “Save” (Figure 6).
8. Images can be included in the checklist via the “Camera” button prior to selecting “Save” (Figure 7). Note: “Retry” & “OK” buttons.

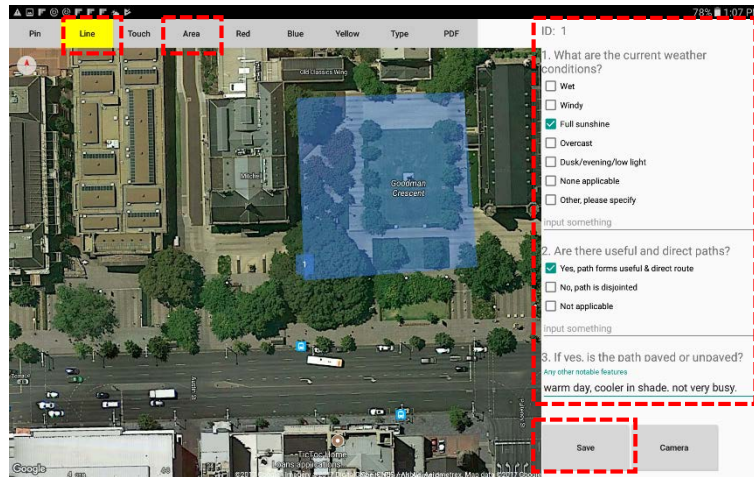


Figure 6. Audit area & checklist



Figure 7. Camera view

9. Multiple areas, lines and pins can be added to one audit project. Note: user can select different colours from the buttons in the top tools ribbon (Figure 8).

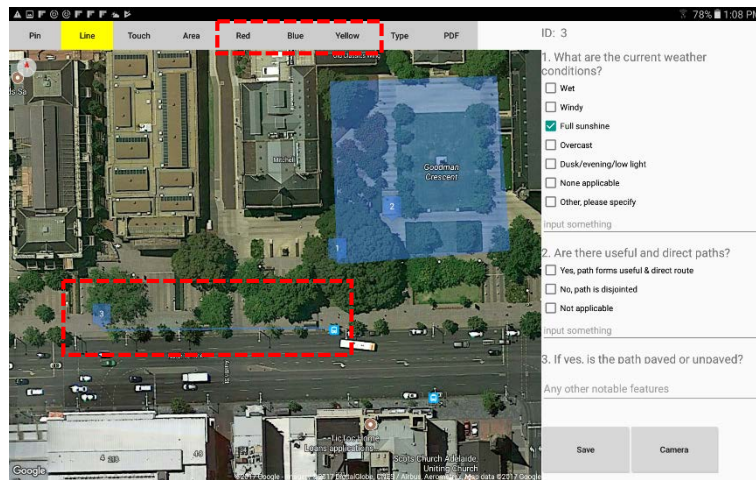


Figure 8. Additional lines & pins

10. User can add pins for any outstanding or notable features e.g. signage under repair (Figure 9).

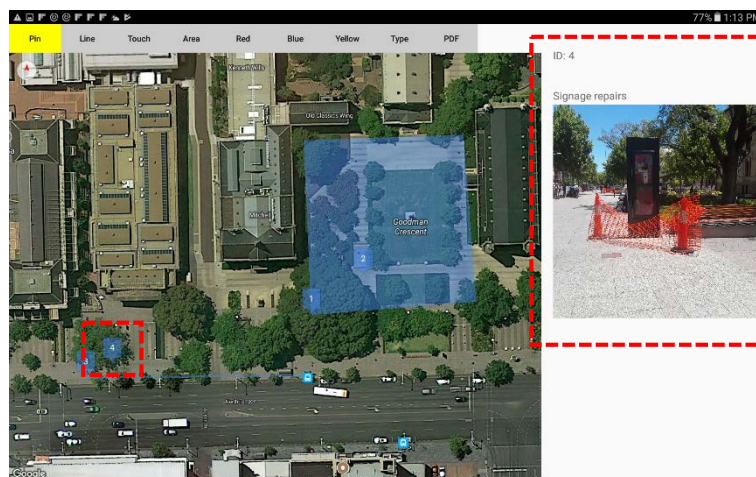
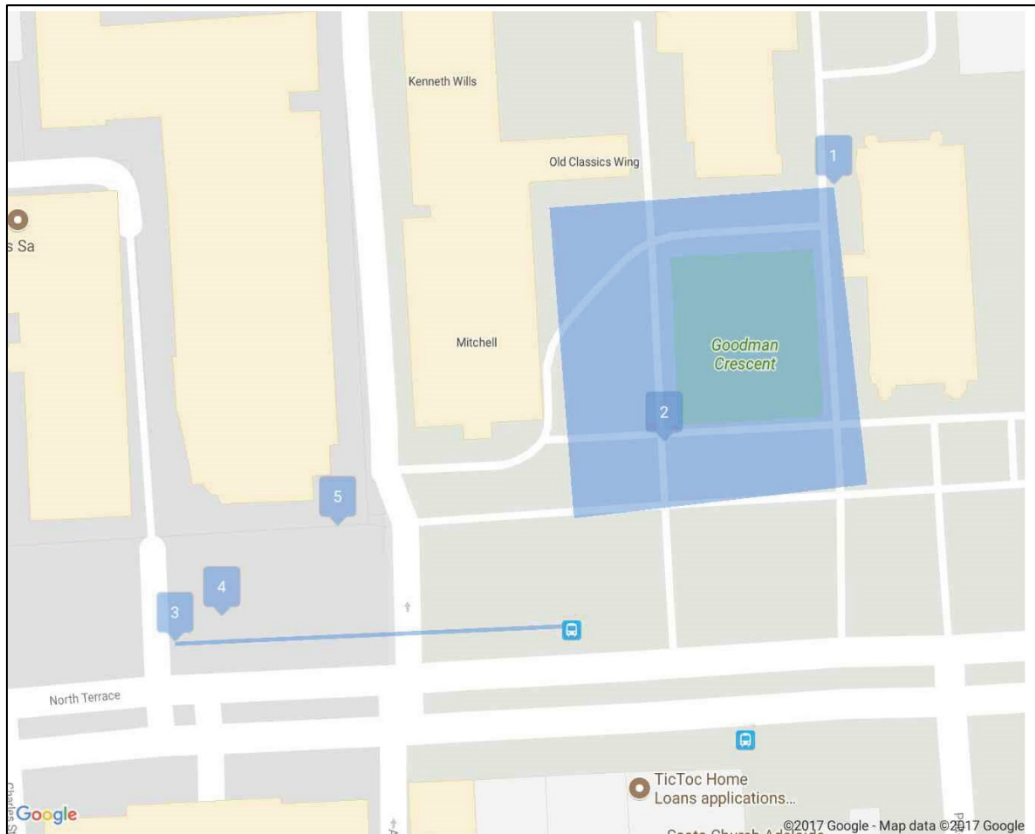


Figure 9. Pin functionality

11. Once audit is complete, select the “pdf” button to generate and send both *.pdf and *.csv files via email to user (example *.pdf output inserted as images below below).



ID:1

Descriptions: warm day cooler in shade not very busy

1. What are the current weather conditions?

Full sunshine

2. Are there useful and direct paths?

Yes, path forms useful & direct route

3. If yes, is the path paved or unpaved?

Paved(or other similar surface)

4. What is the path made from

Pavers (small)

5. Generally, what is the condition of the path?

Good (very few of the above)

6. Overall, is the area?

Slightly gradient

7. What is the usable width of the path?

Suitable for 2 people

Description: seating on western side

9. What is the maintenance of the benches or seating like?

Reasonable

10. Are there any waste bins?

Irregular/few waste bins

11. Is the signage in the area adequate?

Adequate

12. Is there passive surveillance from surrounding buildings?

Observation from <50% of buildings

13. What is the overall aesthetic impression of the area?

Pleasant

14. Is there any litter in the area?

None

15. Is there any vandalism in the area?

None

16. Are there any parks or open spaces in close proximity to the area?

None

17. Are there any street trees?

A lot

18. If yes, what is the approximate height of the trees?

Medium (between head & ceiling height)

Large (higher than ceiling)

19. Are there any gardens or planting in the audit area?

A lot

20. Overall, what is the maintenance of the area like?

Excellent



ID:2

Descriptions: Goodman Crescent



ID:3

1. What are the current weather conditions?

Full sunshine

2. Are there useful and direct paths?

Yes, path forms useful & direct route

3. If yes, is the path paved or unpaved?

Paved(or other similar surface)

4. What is the path made from

Pavers (small)

5. Generally, what is the condition of the path?

Moderate (some of the above)

Good (very few of the above)

Description: varies

6. Overall, is the area?

Mostly level

7. What is the usable width of the path?

Suitable for more than 2 people

8. Are there any benches or seating?

Regular benches or seating

Observation from 50-74% of buildings

13. What is the overall aesthetic impression of the area?

Pleasant

14. Is there any litter in the area?

None

15. Is there any vandalism in the area?

None

16. Are there any parks or open spaces in close proximity to the area?

None

17. Are there any street trees?

A lot

18. If yes, what is the approximate height of the trees?

Large (higher than ceiling)

19. Are there any gardens or planting in the audit area?

A lot

20. Overall, what is the maintenance of the area like?

Excellent



ID:4

Descriptions: Signage repairs



ID:5

Descriptions: View from front of Art Gallery



over

Appendix 8 – Human Research Ethics Approvals

DO NOT COPY

21 February 2017

Associate Professor V Soebarto
Architecture and the Built Environment

Dear Associate Professor Soebarto

ETHICS APPROVAL No: H-2017-010
Planning and design of public spaces to support ageing well

The ethics application for the above project has been reviewed by the Human Research Ethics Committee and is deemed to meet the requirements of the *National Statement on Ethical Conduct in Human Research (2007)*.

The ethics expiry date for this project is: 29 February 2020

Ethics approval is granted for three years and is subject to satisfactory annual reporting. The form titled *Annual Report on Project Status* is to be used when reporting annual progress and project completion and can be downloaded at <http://www.adelaide.edu.au/rb/research-services/human/reporting/>. Prior to expiry, ethics approval may be extended for a further period.

Participants in the study are to be given a copy of the Information Sheet and the signed Consent Form to retain. It is also a condition of approval that you **immediately report** anything which might warrant review of ethical approval including:

- serious or unexpected adverse effects on participants,
- previously unforeseen events which might affect continued ethical acceptability of the project,
- proposed changes to the protocol; and
- the project is discontinued before the expected date of completion.

Please refer to the following ethics approval document for any additional conditions that may apply to this project.

Yours sincerely



 Professor Paul Delfabbro
Convenor
Human Research Ethics Committee



Central Adelaide Local health Network
Human Research Ethics Committee (TQEH/LMH/MH)
The Queen Elizabeth Hospital
Basil Hetzel Institute – DX465101
28 Woodville Road
Woodville South SA 5011
Telephone: 08 8222 6841
Email: Health.CALHNResearchEthics@sa.gov.au

Approval date: 06 December 2016

HREC Reference number: HREC/16/TQEH/256

CALHN reference number: Q20161105

please quote this number on all future correspondence

A/Prof Veronica Soerbato
Architecture and The Built Environment
UNIVERSITY OF ADELAIDE

Dear A/Prof Veronica Soerbato

Project Title: Planning and Design of Public Spaces to support ageing well.

Thank you for submitting the above project for ethical review. The project was considered by the Chairman of The Queen Elizabeth Hospital Human Research Ethics Committee (TQEH/LMH/MH).

I am pleased to advise that your protocol has been granted full ethics approval and meets the requirements of the *National Statement on Ethical Conduct in Human Research* (2007), incorporating all updates. The documents reviewed and approved include:

Document	Version	Date
Covering Letter	-	14 November 2016
LNR Application (AU/15/851A214)	-	-
Application – (1 HREC Application Form – The University of Adelaide)		14 November 2016
Advertisement – (2 Invitation to Participate-	2	November 2016
Participant Information Sheet - (3 InfoSheet AgeingWell Hospital)	3	05 December 2016
Participant Information Sheet (3 InfoSheet AgeingWell Community)		14 November 2016
Participant Information Sheet (3 InfoSheet AgeingWell InterviewatMal)		14 November 2016
Participant Information Sheet (3 InfoSheet AgeingWell FocusGroups)	2	23 November 2016
Consent Form – (4 Consent Form All Participant)	2	22 November 2016
Consent Form – (4 Consent Form Focus Groups)	3	05 December 2016
Survey Questionnaire (5 Survey Questionnaire)		14 November 2016
Protocol – Semi-structured Interview (6 Semi-estructured Aging Well in Public Spaces)	2	28 November 2016
Protocol –Focus Groups Discussions (7 Focus GroupAging Well in Public Spaces)	2	22 November 2016
Protocol – Walking Observation (8 Walking Observation Ageing Well in Public Spaces)		14 November 2016
Protocol – Built Environment Audit Tool (10 BuiltEnvironment Audit Tool_ Internal)		04 November 2016
Protocol – Built Environment Audit Tool (10 BuiltEnvironment Audit Tool Street)		04 November 2016
Health Assessment Summary (Letter to GP)	2	22 November 2016
Health Assessment Summary (Letter to Participant)	2	22 November 2016
Peer Review Submission – Approved Grant Submission Application – (Interdisciplinary-application-form - Ageing Well (Professions-Health_Sciences-Arts-ECMS).pdf)		27 June 2016

Sites covered by this approval:

- The Queen Elizabeth Hospital, SA : CPI - A/Prof Veronica Soerbato

HREC approval is valid from **06 December 2016 to 06 December 2021**

GENERAL TERMS AND CONDITIONS OF ETHICAL APPROVAL:

1. This HREC is the South Australian 'lead HREC' for the purpose of this ethics approval. Any study sites that are not listed on this letter are not covered by this ethics approval. For any SA study-sites within the public health system that are proposed to be added, the CPI must write formally to this HREC requesting the additional study site and a separate formal letter will be issued.
2. Adequate record-keeping must be maintained in accordance with GCP, NHMRC and state and national guidelines. The duration of record retention for all clinical research data is 15 years from the date of publication.
3. Researchers are required to immediately report to this HREC anything which might warrant review of ethical approval of the study, including:
 - (a) serious or unexpected adverse effects on participants which warrant protocol change or notification to participants;
 - (b) proposed changes in the study; and
 - (c) premature termination of the study.
4. Confidentiality of the research subjects shall be maintained at all times as required by law.
5. Approval is valid for **5 years** from the date of this letter, after which an extension must be applied for.
6. **Annual review reports must be submitted to the HREC, every 12-months from the date of approval.** Failure to submit reports may result in the HREC suspending its approval. Each site covered by this HREC must submit a report, and it is the responsibility of the Coordinating Principal investigator to ensure this is carried out.
<http://www.basilhetzelinstitute.com.au/research/information-for-researchers/human-research-ethics-committee/>
7. The HREC must be advised with a final report, or in writing, and a copy of any published material within 30 days of completion of the project.

This Committee is constituted in accordance with the NHMRC *National Statement on the Ethical Conduct of Human Research (2007)* and incorporating all updates.

You are reminded that this letter constitutes ethical approval only. You must not commence this research project at a SA Health site until governance authorisation at that site has been obtained. Please contact the CALHN Research Office Health.CALHNResearchLNR@sa.gov.au

Should you have any queries about the HREC's consideration of your project please contact the HREC Executive Officer on 08 8222 6841 or CALHNResearchEthics@sa.gov.au

The HREC wishes you every success in your research.

Yours sincerely



Professor Richard E Ruffin
Chairman, Human Research Ethics Committee (TQEH/LMH/MH)

RR: LB

Cc: Site Research Governance Officer(s)

Applicant: Associate Professor V Soebarto

School: Architecture and the Built Environment

Project Title: *Planning and design of public spaces to support ageing well*

THE UNIVERSITY OF ADELAIDE HUMAN RESEARCH ETHICS COMMITTEE

Project No: H-2017-010

RM No: 0000022110

APPROVED for the period until: **29 February 2020**

Thank you for the response and amended application dated 17.2.17. Ethics approval is for the research undertaken except for the Queen Elizabeth Hospital participants. It is noted that this study will involve Dr Beatriz Arakawa Martins PhD candidate.

Refer also to the accompanying letter setting out requirements applying to approval.

 Professor Paul Delfabbro
Convenor
Human Research Ethics Committee

Date: 21 February 2017