

SRP 9: How street design acts as a barrier to active travel



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Contents

SRP 9: How street design acts as a barrier to active travel	0
Document control	1
Executive summary	4
Recommendations	6
Kerbs	6
Crossings	6
Space for pedestrians	6
Space for motorised vehicles	7
1. The research	8
2. Findings	9
2.1 Introduction	9
2.2 Characteristics of participants and travel behaviours	9
2.3 Street design concepts	10
2.3.1 Routes	10
2.3.2 Commercial	11
2.3.3 Residential	11
2.4 Kerbs	11
2.4.1 Physical readability	11
2.4.2 Consistency	12
2.4.3 Segregation	13
2.5 Crossings	13
2.5.1 Sensory feedback	14
2.5.2 Consistency	15
2.5.3 Compliance	15
2.5.4 Design features	16
2.6 Space for pedestrians	17
2.6.1 Street furniture	17
2.6.2 Pavements	18
2.6.3 Navigation	18
2.7 Space for motor vehicles	19
2.7.1 Pavement parking	19
2.7.2 Parking space	20
2.7.3 Speed limits	20
3. Methods	21
3.2 Street design concepts	21
3.2.1 Area types	21
3.2.2 Sketches of street designs	23
3.2.3 Design principles.	27
3.2.3 Routes: Street elements	29

3.2.4 Commercial: Street elements	29
3.2.5 Residential: Street elements	31
3.3 Interviews	32
4. Glossary	34
5. Future studies	36

Executive summary

This research explored how street design infrastructure can restrict access to active travel for those with accessibility needs. It aimed to identify ways to remove barriers to ensure active travel is accessible to all. The research was funded by Transport Scotland as part of the Scottish Research Programme 2023/24.

The research was based on three inclusive street design concepts created by Sustrans Research and Monitoring Unit (RMU) and the Sustrans design team. These concepts formed the basis for discussions with research participants in interviews and for the recommendations made by participants for ways to improve accessibility to active travel. Conversations involved participants with a range of visual, hearing and mobility impairments.

Sustrans RMU and the Sustrans design team created concepts of the 'ideal version' of three street types: routes, commercial, and residential. The concepts comprised digital sketches, descriptions, and written features. The concepts brought together features of street design into 'ideal' concepts, so that these could be consulted on with the participants.

This research highlights the importance of making active travel infrastructure accessible for all. However, it also reveals the complexities involved in providing infrastructure that works for people with diverse access requirements. Participants provided detailed feedback on a range of aspects of street design.

In terms of **kerbs**, the 'readability' was a key theme. Participants explained the need for kerbs to enable navigation, something that was particularly important for guide dog users. Kerbs were also noted as playing an important role in separating different travel modes to allow users to comfortably use the space together. Consistency was central in terms of which kerbs are used in what contexts.

The design of **crossings** was also an issue for participants. Sensory (audio/visual) feedback and consistent design were regarded as key to safe crossings. The issue of other road users' compliance with crossings signals was raised, with non-compliance leaving participants feeling unsafe. Crossing features such as small refuge islands also contributed to decreased feelings of safety.

Creating secure **space for pedestrians** was essential for participants, who highlighted the role of street furniture (e.g., bins, planters, A-frame) in this. Permanent street furniture enabled confident navigation of pedestrian space, while textured indicators or a building line were also important for participants to orientate themselves. Participants also highlighted the need for pavements to provide sufficient space and be properly maintained to allow comfortable use by all.

Participants also offered views related to **space for motorised vehicles**, highlighting the need for the enforcement of speed limits and pavement parking legislation to improve interactions with motor vehicles. It was also important to provide sufficient parking space for adapted vehicles to enable use of accessibility lifts.

This feedback provides valuable insights into aspects of street design that exclude people from active travel. These insights – and the associated recommendations put forward by participants – highlight key considerations for future street design projects to help ensure public spaces are accessible to all.

Recommendations

The individuals who took part in this study provided recommendations for improving accessible street design. Discussion and recommendations focused on kerbs, crossings, pedestrian space and vehicle space. During the analysis phase of the study, it became clear that there was often no group consensus on achieving accessible street design, and that there is no 'one size fits all' solution. Therefore, the recommendations presented below may address some accessibility needs while not accommodating others. Further study is recommended to understand how to address all accessibility needs.

Kerbs

- Kerbs are important for delineating the segregation between user groups to enable safe navigation of a space. A standardised and consistent approach to the use of kerbs is needed to allow users to confidently use any space.
- Dropped kerbs should retain a small step to ensure the carriageway is identifiable, while also facilitating crossing in safe locations.

Crossings

- Consistency is needed in the design, placement and maintenance of sensory (audio/visual) feedback providers such as tactile paving and signals at crossings to enable users to orientate themselves.
- The need to cross paths with other road users – particularly cyclists – should be minimised, as this helps to reduce conflict and avoids reliance on other users' compliance with crossing signals.
- Pedestrian islands should be large enough to accommodate those using mobility aids, such as guide dogs and wheelchairs.

Space for pedestrians

- Street furniture (e.g., bins, planters, A-frames) should be permanent where possible to aid navigation and avoid creating unpredictable obstacles.
- Important navigational features such as building lines and textured indicators should be permanent to enable confident use of space.
- The quality of pavements must be maintained to prevent additional trip hazards caused by uneven surfaces.

- Pavements must provide enough space for users with mobility scooters, guide dogs or pushchairs to all move comfortably together.
- The safety implications of the rise in e-mobility users (e-scooters and e-bikes) who often travel at speeds faster than appropriate on footpaths shared with pedestrians should be considered.

Space for motorised vehicles

- Pavement parking legislation needs to be enforced to ensure pavements and dropped kerbs remain unobstructed for pedestrians.
- Parking space must accommodate adapted vehicles to provide access for all.
- Speed limits should be enforced to enable users to cross roads safely and confidently.

1. The research

This research explored how street design infrastructure can restrict access to active travel for those with accessibility needs. It aimed to identify ways to remove barriers to ensure active travel is accessible to all. The research was funded by Transport Scotland as part of the Scottish Research Programme 2023/24 and carried out by the Sustrans Research and Monitoring Unit (RMU) in early 2024.

Accessibility is an integral part of street design. However, individuals with accessibility requirements often say that their needs are not always met. This exploratory research aimed to:

- Understand how street design and the implementation of active travel infrastructure can have a negative effect on access to active travel, particularly for those with physical, and sensory impairments
- Identify specific issues of street design that are problematic and propose relevant planning and design guidance to account for these
- Identify means of mitigating/removing barriers to active travel that currently exist as a result of street design/active travel infrastructure
- Support future research on accessible streets in Scotland and the wider UK.

The research focused on reflecting the diverse experiences of people with access impairments by highlighting the infrastructure barriers they may face in relation to travelling actively within these specific street typologies.

The project involved two main phases:

- The production of three street design concepts – Routes, Commercial and Residential. These were used as the basis for discussion with research participants
- Interviews with 15 individuals with visual and physical impairments to explore their views and experiences of active travel, and gather feedback on the three street design concepts prepared by Sustrans.

This report presents the findings of the research. Full details of the research methods are presented in Chapter 4.

2. Findings

2.1 Introduction

This chapter presents the main findings from the research. It draws on the interviews carried out as part of the project. The first section of the chapter presents brief information on the characteristics and travel behaviours of research participants. This provides useful context for the substantive research findings. Further sections then cover views and experiences of participants with regard to the three street design concepts developed for the project, and the key themes of kerbs, crossings, space for pedestrians and space for motor vehicles.

2.2 Characteristics of participants and travel behaviours

All 15 research participants resided in Scotland. Most lived in urban areas, and most of those living in suburban/rural areas frequently travelled to urban areas.

In terms of health conditions, all but one participant described a visual impairment. Impairments ranged in type and degree and included poor peripheral vision, photophobia (i.e., sensitivity to light), night blindness, total blindness, and variable levels of acuity (i.e., clarity of vision) at different times. Some participants also described having a hearing impairment, or a mobility impairment, or a combination of all three.

In terms of mobility aids, participants most commonly reported using guide dogs and canes. Participants spoke about the training they received to use these aids, and the cues used by either themselves (when using a cane) or their guide dog, to navigate around streets. The importance of consistency in street design infrastructure (e.g., crossings, kerbs, signals) was highlighted – both for guide dogs in determining the appropriate course of action to take, and for cane users to accurately orientate themselves.

In terms of modes of travel used by participants, public transport was the most discussed, although participants had mixed experiences of this. Buses and trains were used when participants travelled further than their local area. However, some participants recalled negative experiences of using public transport which had reduced their confidence. Examples included having difficulties reading bus numbers and signs, or the bus stopping in a different location to the bus stop. Participants also walked frequently, particularly in their local area where they are familiar with the streets. Participants also reported being driven by relatives, or using taxis, particularly when travelling to unfamiliar places. The main reasons for this were inconsistencies in public transport infrastructure and street design, both of which reduced confidence in safe navigation without assistance.

2.3 Street design concepts

Three street design concepts – Routes, Commercial and Residential – were presented to research participants (in advance of the interview) as a basis for discussion. Full information on the three concepts can be found in [section 3.2](#).

“They look like cool designs, to be honest. I guess it’s just the practicality of rolling it out”.

Participants were generally supportive of the concepts presented. They appreciated that the concepts considered ease of accessibility for all users – particularly pedestrians. However, it was also acknowledged by some that the concepts were idealistic or optimistic. These participants noted that, in practice, unpredictable factors such as vehicle compliance, lack of maintenance, temporary barriers on the footpath etc. would impact on safe and accessible use.

“I appreciate being asked. It’s nice to be asked rather than just people making the decisions who don’t have disabilities”.

Participants also appreciated being consulted and having the opportunity to provide feedback on proposed designs. Several noted previous situations where they felt that consultation by local authorities had been inadequate – they mentioned cancelled or inaccessible site visits, delayed consultation, or being asked to provide feedback on areas that had already been built. Participants said that it was important to have accessibility audits and consultation with relevant groups as early as possible in the process to allow adequate opportunity to revise a design.

Views on each of the concepts are summarised in the sections below.

2.3.1 Routes

On the Routes concept, participants commented that the controlled crossings and separation of cycle tracks using kerbs would increase their feelings of safety. Both measures assist in avoiding conflict with other road users. Participants also liked the fact that they wouldn’t have to cross cycle tracks to reach the bus shelter, which would also reduce potential conflict. Opinion on the refuge islands was mixed – two participants appreciated the space to stop in between traffic, while one participant said that standing in the middle of flowing traffic often felt unsafe.

“In terms of managing conflict between cyclists and pedestrians, it was perhaps the best you’re going to get”.

2.3.2 Commercial

On the Commercial concept, participants raised concerns about the presence of street furniture, signage, and restaurant seating on the footway, which could act as barriers for pedestrians. It was stressed that clear delineation would be needed between unobstructed sections of footway and areas where barriers could be present, and enforcement would be needed to make sure barriers did not spill into the footway.

“...I’ve had issues with street furniture, with lorries loading and unloading and trying to get in and out of streets”.

Participants also commented on the potential for conflict with other road users, particularly cyclists and delivery/service vehicles while loading/unloading goods. They noted the increased potential of these road users crossing the same path as pedestrians and the speed at which cyclists can travel. Furthermore, participants highlighted the importance of keeping traffic volumes in commercial streets as low as possible, ideally restricting such areas to service/delivery vehicles and taxis.

2.3.3 Residential

The Residential concept was the least discussed, with some participants noting that such environments are typically low-traffic and therefore safer overall. Comments in relation to this concept primarily centred on the real-world design of houses and associated outdoor space. For example, one participant noted that driveway designs are inconsistent and can involve varying level changes, which can cause problems when walking down residential streets.

2.4 Kerbs

Participants offered a wide range of comments on kerbs and their key role in enabling accessibility for those with physical or sensory impairments, as discussed below.

2.4.1 Physical readability

The most common theme in comments relating to kerbs was that of the physical ‘readability’ of infrastructure. Readability refers to how clear and understandable the infrastructure is. Minimum time and energy should be needed for users to understand kerbs.

“It [the road] feels the same as the footpaths... I’d rather not be wandering off into the road or not know whether I’ve crossed.”

While several participants mentioned the importance of dropped kerbs for identifying safe crossing locations, they also said it was important to retain a small step to ensure the

transition between the pathway and road remains clear. Flattened kerbs can result in challenges identifying the edge of the pavement and crossing the road safely.

Kerbs are particularly important for guide dog owners as the dog relies on identifying a kerb as a place to stop. One participant said: “As long as there’s a 6mm kerb, just so at least the dog knows there’s something there.” However, another participant noted the complexities in accommodating different disabilities: “It’s hard to please everyone...it [an obvious kerb] might not be suitable for people with other types of disabilities.”

Questions were raised around the use of kerbs to signify the boundary between user types. The angle of the kerb was important to the readability. One participant questioned if a 45-degree kerb (splay kerb) would be distinct enough compared to a dropped kerb: “When you’re walking, often at speed, you’re coming over obstacles, lumps and bumps in the pavement, all the rest of it, those [different kerb types] become less apparent.”

Kerbs and textures are both important in marking changes in infrastructure. However, texture change was felt to be less effective at marking a boundary. One participant stated: “People are less quick to respond to changing textures than they are to physical obstructions in their path...I think that would be really challenging for some people.”

The importance of kerbs in enabling the physical readability of infrastructure was a key theme throughout the conversations.

2.4.2 Consistency

Consistency was another key theme in relation to kerbs. The lack of a consistent approach in how kerbs are used in different contexts created confusion and additional navigational difficulties for people. One participant articulated the challenge of “determining what all the different kerbs were and what they meant...it’s just being able to identify exactly what that’s leading onto”.

Participants agreed that a standardised approach to kerb infrastructure was needed. This would help people know what specific kerbs signify and where to expect them. One participant commented as follows: “I think it needs to be standardised...It has to be the same...if you don’t know what that material is referring to, you’re not going to know this is a no-go zone.”

“If all dropped kerbs were the same height, you’d know what to expect, but they’re not.”

Once a consistent approach is agreed upon, the next step is raising awareness of the agreed standard. One participant felt that standardising and publicising the approach to infrastructure would give “more confidence going to places that you don’t know”. Another participant

agreeing with this sentiment said that the changes would be “good in the long run, but confusing in the short term”. This commonly expressed view suggests that the longer-term benefits of a standardised approach – in terms of empowering users to navigate active travel infrastructure more confidently and safely – would outweigh the initial short-term disadvantages of change.

2.4.3 Segregation

The importance of kerbs in ensuring segregation between user groups was highlighted. Participants noted that kerbs allow all groups to use the space safely: kerbs were seen as vital for reinforcing the separation of users by clearly delineating the appropriate spaces for different modes of travel.

“Everything’s defined by kerbs, and everyone should know where they’re supposed to be, there’s a place for all the different types of traffic.”

Participants expressed support for the segregation of cyclists and pedestrians. One observed: “A two-way cycle track separate from the footway, that’s a good point.” Another explicitly supported the use of kerbs in enforcing this separation, saying that “they need to be physically separated and a kerb does that”. Kerbs were described by one

participant as “a visual deterrent, to create that segregation between cycle and pedestrian”.

With the increasing use of e-bikes, this segregation was of particular importance. One participant commented that “with the sheer difference [in speed] between pedestrians and cyclists, that kind of separation is important”. This highlights the need for protected space to allow everyone to travel comfortably together.

Participants recounted experiences of using shared space routes, without clear segregation. One said that “where there’s no obvious differentiation between pavement and carriageway, it’s actually quite scary”. For another this had led to “a few near misses because they don’t have a difference between them”. A third respondent commented on implications for those with guide dogs: “The problem is there’s nothing to signify you’re now on the road and a guide dog gets confused because he’s looking for the kerb.” These insights reveal the importance of clear segregation for helping users feel confident when navigating public spaces.

2.5 Crossings

Key themes in discussion relating to crossings relating were sensory feedback, consistency, compliance, and specific design features. Each of these are discussed below.

2.5.1 Sensory feedback

Participants frequently said that effective crossings provide information – or ‘sensory feedback’ – to the user about the location of the crossing and the appropriate course of action to take.

Tactile paving was an essential feature for helping those with a visual impairment in navigating crossings. Participants noted that the tactile feedback from bumps on the paving indicates that they are approaching an interface with the carriageway. Tactile paving is also important to those using mobility aids, such as canes and guide dogs. Thus, participants commonly said that tactile paving needed to extend far enough to provide sufficient advance warning of the risk of stepping onto the carriageway. Their use in different places was also said to assist with orientation in unfamiliar areas.

“I know when I go onto tactile paving, I’m coming up to a crossing somewhere along the line.”

Consideration was also given to the design of tactile paving, with several different points made:

- While tactile paving was regarded as essential for those with a visual impairment, it was frequently acknowledged that the ‘rumble’ from tactile paving is often uncomfortable for wheelchair users, and a hinderance. This was particularly true when there were larger gaps between the bumps.
- Opinions were slightly mixed regarding the optimal material for tactile paving – while some preferred metal studs due to their solidity, others noted that these could be slippery in wet conditions or too hot for guide dogs in the sun.
- Paving with criss-cross lines, or ridges, was also identified as providing adequate tactile feedback.
- Colour was often a secondary concern to the tactile function of the paving, although it was clear that obvious visual distinction between the paving and road was required, particularly for those that had some vision.

Participants also noted relying on feedback from the signals at controlled crossings to decide when it was safe to cross. The most common sources of feedback were rotating cones under pelican crossing control panels, and beeping sounds which indicate when it is safe to cross. Participants expressed a sense of frustration and helplessness when recalling experiences at crossings that had at least one of these features missing. Participants called for consistency in the design of controlled crossings, and for crossing signals to have multiple forms of feedback to indicate when it is safe to cross in case any individual form fails.

“... if you’ve got nothing, either a beeping or the tactile cone underneath, or the wait light is not working anymore, you don’t have a clue.”

2.5.2 Consistency

Inconsistency in design across different crossing locations was highlighted as a major issue. Participants frequently noted that they rely on the consistency of various design elements to orientate themselves at crossings. Examples of particularly critical elements that need to be consistent were the placement, size and material of tactile paving; the location of crossing control panels; and the design of kerbs on either end of the crossing.

“I’ve noticed tactile paving on some crossings is better than others.”

Inconsistent design elements often contradicted the training many participants received in navigating streets with a visual impairment. This would often lead to situations of confusion or risk of injury, created by stepping out onto a carriageway, or tripping over an unexpected kerb.

2.5.3 Compliance

It was common for participants to note that their safety was reliant on other road users complying with road rules. While this was true for all pedestrians, those with a visual impairment are even more vulnerable at crossings as they have less information to adjust their behaviour. There was a sense that even in a perfect, accessible crossing environment, the threat existed of other road users speeding through traffic lights, being unaware of the crossing, or parking over the crossing. While difficult to fully eliminate, participants suggested that crossings which provide a clear instruction to other road users can reduce instances of non-compliance and increase overall awareness. Examples include implementing controlled and/or raised crossings where possible and painting double yellow lines next to crossings.

“You’re still depending on people behaving themselves, going the speed limit, stopping at give-way markings or stop signs.”

Conflict when vehicles sped through traffic lights, edged close to the crossing, or stopped over crossings in gridlocked traffic. Participants also described encountering cars parked over crossings, or pulled up on pavements, blocking the path for users and causing them to navigate using unfamiliar routes. Participants frequently expressed frustration recounting their experience of crossings, due to the seeming lack of awareness of vehicle drivers. Often, these experiences were at uncontrolled crossings.

“...if you’re reliant on the crossing alone, it doesn’t account for driver behaviour.”

Similarly, participants reported conflicts with cyclists related to the unpredictability of cyclist behaviour at crossings, with some stopping at red lights, while others do not. Conflict also extended away from the carriageway as cyclists often occupied the same space as pedestrians on, for example, footpaths, crossings themselves, or shared paths.

“... I live ...where there’s a big cycle project and it’s great but it means you have more to contend with, as someone who struggles to cross the road, because there’s so many different lanes of traffic.”

Participants described often using sound cues (e.g., the sound of a running vehicle engine) to decide if it was safe to cross. However, this approach is ineffective with cyclists, and there is increased reliance on cyclists using their bells as a warning.

Conflicts with e-mobility vehicles (e.g., e-scooters and e-bikes) and electric cars were often described separately to conflicts with traditional vehicles and cycles. Electric cars were noted for their quietness, which made it difficult for participants to determine if they were approaching the crossing, had passed, or were reversing. E-scooters and e-bikes were highlighted as becoming increasingly common, particularly in urban areas among food delivery workers. Participants described these road users as being particularly dangerous as they might share the same road space as pedestrians but travel much faster than is appropriate.

2.5.4 Design features

Participants provided opinions on various features of crossing design. The most frequently discussed features were pedestrian refuge islands and raised crossings. Opinions on refuge islands were mixed, primarily due to their design rather than their function. Some participants described pedestrian refuge islands as useful, as they provided an opportunity to be safe from vehicles while navigating a large multi-lane crossing. This was seen as being particularly true for larger, tree lined islands across the middle of a carriageway. However, participants said that most pedestrian islands were inaccessible for those with sensory or physical impairments and decreased their sense of safety while crossing.

Refuge islands were described as often not large enough to accommodate many pedestrians comfortably, particularly if people are using mobility aids such as wheelchairs or guide dogs. Participants commented that their narrow design, and lack of tactile paving in some cases, can cause them to

overshoot the island and inadvertently stand in the carriageway. Some participants also described not knowing if, after starting crossing and encountering a kerb or other change in infrastructure, they had reached the other side of the road or were on a refuge island.

“[refuge] islands have to be big enough for your all-singing, all-dancing wheelchairs”.

Raised crossings were generally preferred as they ensured cars slowed down on approach and offered an increased sense of safety. Some participants also noted that crossings that were raised to the level of the pavement (in contrast to those where the kerb dropped down to the crossing) were more comfortable to navigate.

2.6 Space for pedestrians

Comments related to space for pedestrians focused on three main themes of street furniture, pavements, and navigation, as discussed below.

2.6.1 Street furniture

The most frequently mentioned theme in relation to space for pedestrians was the presence of street furniture. This includes items such as bollards, A-frame signs, benches, bins etc. which can create hazards for some people.

The most mentioned street furniture elements were A-frames and bollards. Participants recounted regularly experiencing A-frames with insufficient space to manoeuvre around them.

“If we can’t walk safely in our own environment because there are these hazards in our way, then it’s going to prevent us.”

Participants also said that bollards create unnecessary obstacles and add to an already cluttered street environment. One participant said: “I loathe bollards, they’re a health hazard.” Repeated injuries caused by collisions with street furniture had impacted users’ confidence. Participants said that such adverse experiences resulted in decreased feelings of safety and discouraged them from active travel.

“Bins, benches, even planters, if they can be moved, some person will move it.”

Moveable street furniture was reported to be particularly hazardous. The issue here was twofold. Firstly, street furniture that moves cannot provide a reliable navigation aid. Secondly, moveable street furniture can create unpredictable obstacles that will impact people’s feelings of safety and confidence.

2.6.2 Pavements

Pavement space and quality were both mentioned as important in enabling the safe and confident use of pedestrian spaces.

The most important issue in relation to pavements was ensuring there was enough space for everyone to travel safely.

Participants felt that typical street design often failed to provide enough space, leading to

conflict between users. Problems were particularly acute where streets included outdoor seating on one side, and street furniture on the other, leaving only a small space in between for pedestrians. Participants were very positive about the prioritisation of wide pedestrian space in the street design concepts considered in the research.

“I liked the way that it had given priority to pedestrians and the walkways were wide.”

Poor pavement quality could cause problems. Old paving tiles could become unbalanced and create additional obstacles for pedestrians. Participants also noted that unmaintained tree roots caused trip hazards. This reinforces the need for ongoing maintenance of infrastructure.

2.6.3 Navigation

Participants highlighted various navigation aids as essential for those with visual impairments who rely on landmarks to orientate themselves.

Visually impaired people use building lines as navigational aids. This can involve counting doorways or side streets while following a building line. Participants stressed the importance of following a building line at ground level with

a long cane to confidently navigate a space.

One participant felt most comfortable using the building line and sticking to the left-side of the pavement as they found walking in the middle of the pavement challenging.

“As long as it’s [building line] there and consistent, you can follow that.”

Texture and colour were both noted as helpful in assisting participants with navigation. Participants stressed the importance of tactile markers to orientate themselves along their journey, and noted how navigation was made harder in wide footpaths without tactiles.

Participant feedback reinforces the importance of regular tactile markers to support safe and confident use of the space by all users.

Participants also highlighted the value of using clearly contrasting colours to aid navigation. This was particularly important for those with some visual acuity in helping them to ensure barriers or obstacles are easily identifiable. Yellow was the most referenced colour in terms of visibility. Participants also felt contrasted surface materials had some value, particularly for those with less visual acuity.

Overall, although street furniture can cause hazards at times, it also provides key navigational aids. One participant articulated this as follows: “Sometimes it’s a good thing, other times it’s not...those landmarks you rely on might change position from time to time, which can throw you.” This reinforces the problems caused by temporary street furniture and highlights the importance of consistent street design. So, while one participant said, “sometimes an obstruction can help because you know where you are”, another commented that “working out what’s permanent and what’s moveable...can be tiring and challenging”.

2.7 Space for motor vehicles

Key themes in comments related to space for motor vehicles were pavement parking, space for parking, and speed limits.

2.7.1 Pavement parking

Pavement parking was the most referenced theme with regards to space for motor vehicles. Pavement parking creates unpredictable obstacles that can block a pedestrian’s journey. Participants told us they are often forced onto the carriageway to get around cars parked on the pavement, which impacts feelings of safety.

“I’m not able to cross at my usual spot...that can be quite an obstacle.”

Participants had also experienced pavement parking across dropped kerbs. This means crossing points are hard to locate and pedestrians may be forced to cross at unsafe locations.

Participants were aware of the recent legislation in Scotland which had made pavement parking illegal. However, multiple participants raised concerns over enforcement of the legislation.

“We’ve got the no parking on the pavement law, I love that.”

2.7.2 Parking space

Participants who used adapted cars highlighted the importance of having enough space to park so accessibility lifts can be used.

Those using such vehicles could never use parallel parking because of the need to access the back of the vehicle.

**“We can’t use street parking.
We can’t risk someone parking
behind us and obstructing our
access to get back in.”**

For some, parking at a 45-degree angle was preferable as it facilitates easier parking with a larger vehicle. This angle also allows more room for a tail lift to come down from the back of the vehicle and allows users to exit safely.

Concerns were raised over the parking arrangements in the Residential concept. One participant felt that the lack of consistency within this arrangement would increase the difficulty of navigating the space. Participants recounted the importance of knowing where to expect vehicles when learning a new route.

2.7.3 Speed limits

A number of participants commented on speed limits. Participants were supportive of the speed limits proposed within the concepts. They felt that lower speed limits were preferable, particularly in commercial or residential areas. Participants felt that 20mph was acceptable in a city centre, while 10mph was appropriate for a residential area. However, one participant raised concerns over drivers adhering to speed limits, stating that they “live in an area where speed limits are not paid attention to”.

3. Methods

This research was carried out by Sustrans RMU as part of the Scottish Research Programme for 23/24 (SRP9) funded by Transport Scotland. The data collection was conducted via interviews carried out over January and February 2024.

3.2 Street design concepts

This project involved conceptualising inclusive and accessible street design using digital ‘sketches’ and accompanying principles for three street typologies: routes, commercial and residential.

These concepts were then used to create interview guides, and the sketches were used as prompts to discussion.

The sketches and accompanying principles of each concept have **not** been updated in light of the findings of the research and do not reflect final conclusions of what inclusive street design looks like.

3.2.1 Area types

The project focuses on three types of areas (non-exhaustive) which were classified as routes, commercial areas, and residential areas.

These area types were differentiated based on the following factors, each of which are elaborated further in Figure 1 below:

- The purpose of the area
- The feel/character of the area (regardless of specific context and density)

Figure 1: Categorisation of three types of areas: Routes, Commercial & Residential

Areas	Routes	Commercial	Residential
Definition	Street enclosed with mixed urban use classes (residential, office, services, retail, etc.) where the focus is	Street enclosed on both sides with retail units of various sizes, including, but not limited to, shops,	Street enclosed on both sides by homes including, but not limited to, flats, terraced, semi-

	on the street, used mainly as a transit area for all users	restaurant, cafés, public houses, hot food takeaways, financial professional and other services	detached or detached houses
Feel/character	May be loud, busy with various types of transport, but safe; functional space enabling travelling	Street lined with shops on both sides; space to spend time/dwell	Calm, welcoming, child-friendly; slow traffic (10–20mph)
Purpose	Area is for going through quickly and efficiently	Space is for pedestrians; people on bikes can use the carriageways provided; motorised traffic should be minimal and feel out of place; access to shops, meeting, socialising, public realm, seating, events space, bike parking, public transport at close proximity	Street is a communal space for people to meet, share, talk, play; flexible space; small placemaking/public realm, more greenery
Street design elements	<i>Motorised traffic</i> – unrestricted, both ways (30 mph); maybe parking depending on surrounding uses	<i>Motorised traffic</i> – restrictions on general traffic: limited or no access and slow speed (10–20mph); access on the street likely restricted to delivery, service vehicle, here restricted to one-way (southbound); parking and public transport connections in close proximity, but not	<i>Motorised traffic</i> – general traffic is allowed for access only; parking in driveways or on street in an organic manner, at an angle, designed as part of the overall layout

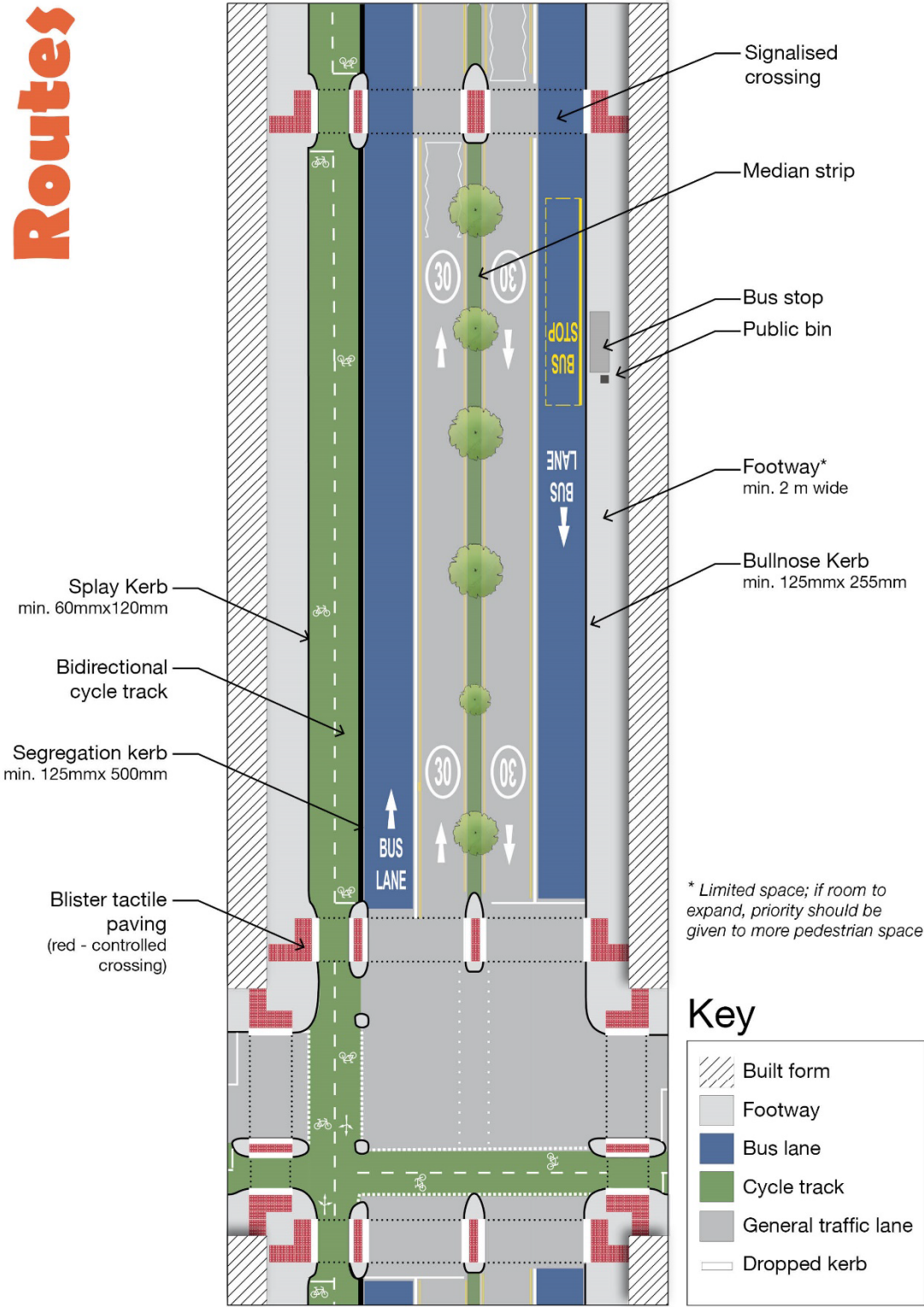
necessarily on the street		
<i>Active travel</i> – specific crossing, with refuges, if necessary, controlled, depending on speed and volume; appropriate width and dedicated space for walking and cycling	<i>Active travel</i> – prominence of walking and intention to maximise footfall for businesses; continuous footways suitable, where pedestrians are present in higher numbers	<i>Active travel</i> – informal, organic, free movement in the dedicated spaces

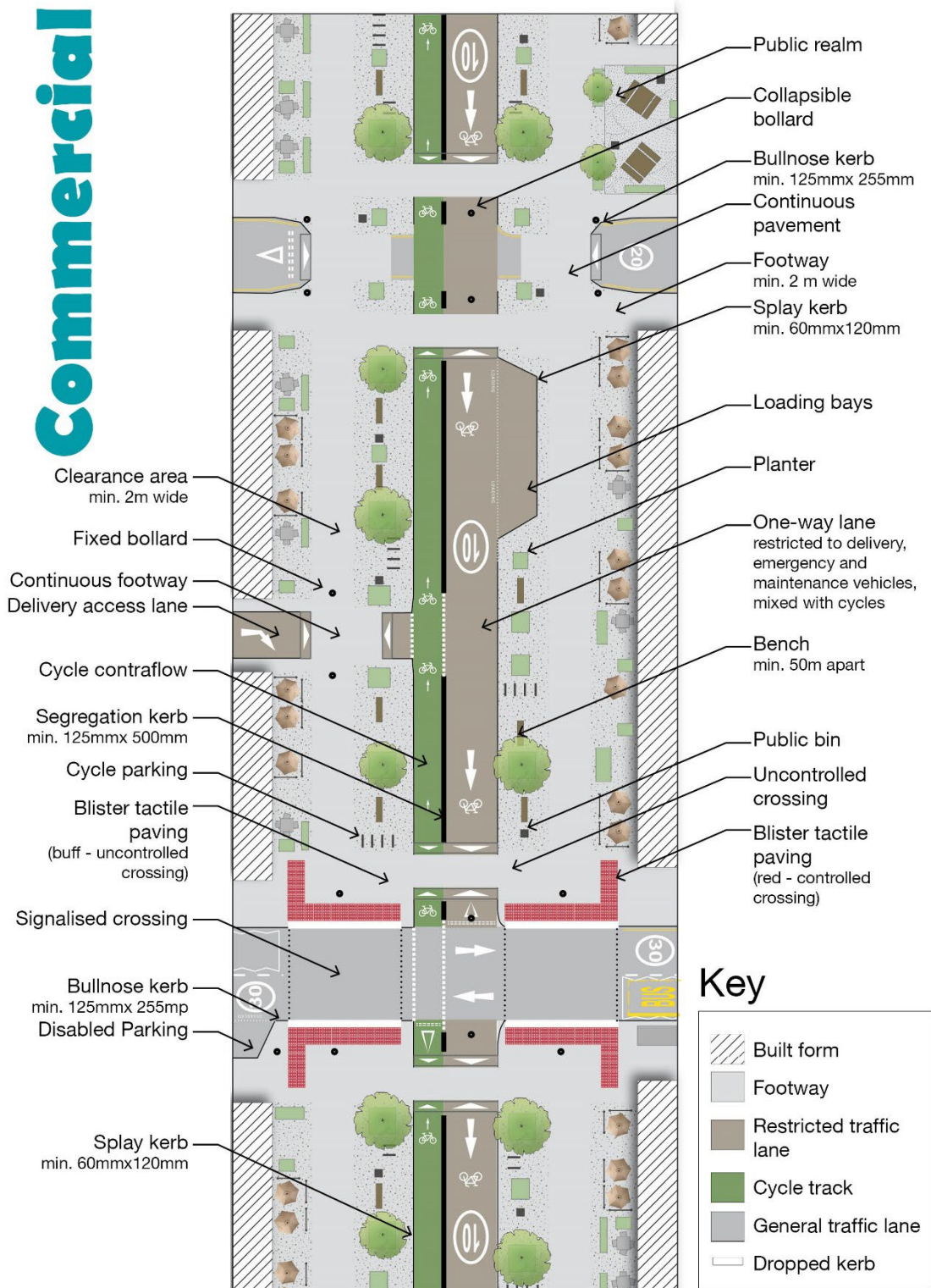
3.2.2 Sketches of street designs

Caveats

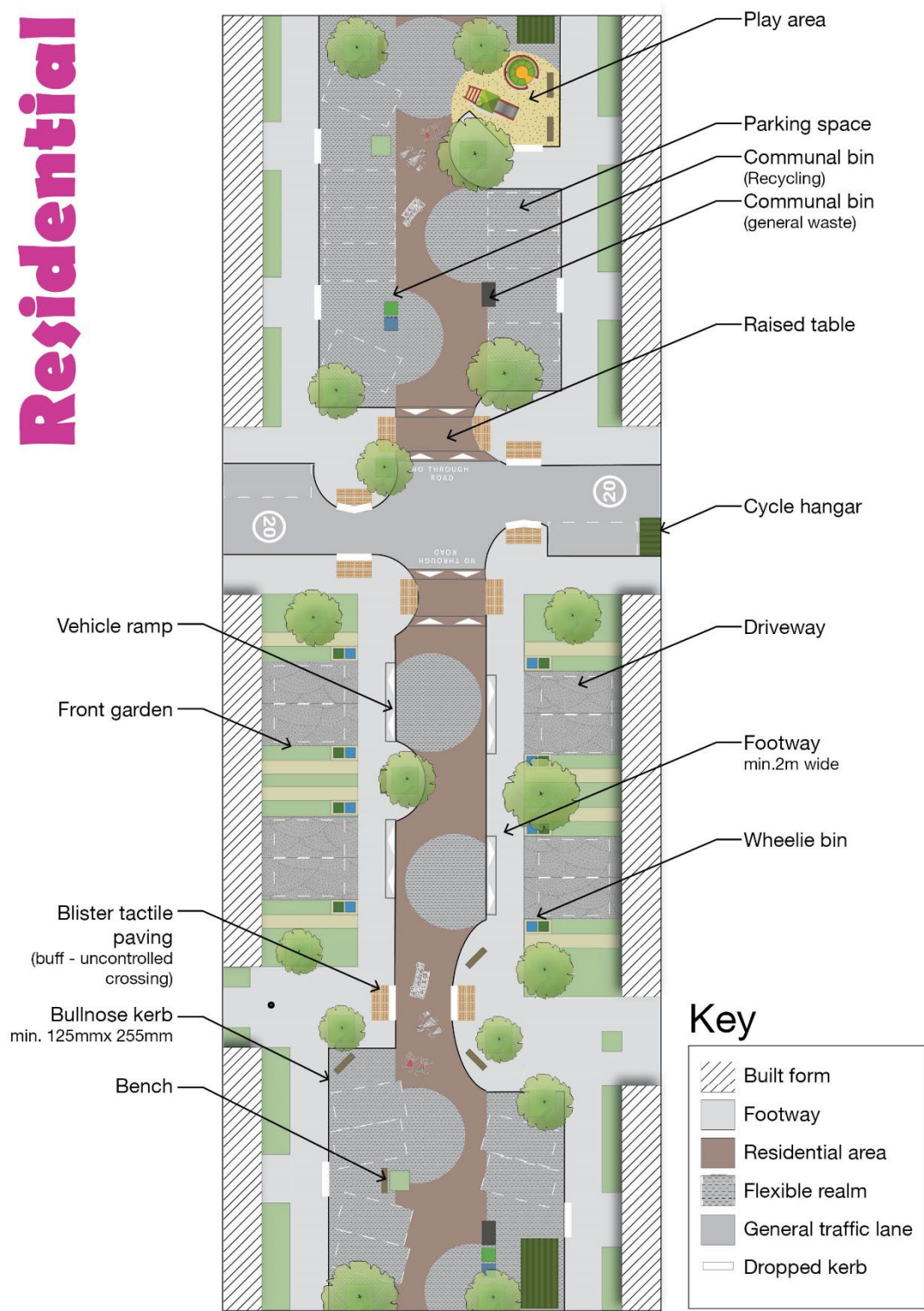
- The sketches represent abstract places without reference to specific context or density.
- The sketches are not to scale but aim to offer an idea of proportionality across the balance of the spaces.
- The intention is to conceptualise the defined urban environment by laying out a set of principles for design defined by the surrounding built environment.
- It is not intended to restrict street design to the layouts shown; they are examples of how a street could be balanced to address different user needs.
- The practical application of the principles illustrated should follow a thorough design process and be context specific.

Routes





Residential



3.2.3 Design principles.

Figure 2: Design principles for each area type

Area	Principles
Routes, Commercial and Residential	General design principles for walking, wheeling and cycling: • Coherence • Attractiveness • Directness • Safety • Comfort
Routes	• Areas for motor vehicles (including bus lanes where applicable), cyclists, and pedestrians are clearly delineated using a continuous kerb. • Controlled crossings are used to improve safety (especially for people with a disability or impairment). • Tactile paving elements are used consistently across the area for uncontrolled crossings, to ensure safety and easy navigation by people with impairments. • Features such as street trees are used to improve the look and feel of the area.
Commercial	• The street is shared among businesses (and their customers), pedestrians and cyclists, with some access for selected types of motor vehicles (e.g., emergency vehicles, maintenance vehicles, and delivery vehicles). • Space is allowed for businesses to spill out onto the street while still creating a straightforward corridor free of obstacles, including street furniture – this is balanced with the navigation requirements of white cane users, by creating a detectable hard edge to the retail area, mimicking

	the building line, either with pavement or retail elements (e.g., fences, etc.). • Pedestrians and cyclists have priority over cars. • Footway provision is continuous at sections where pedestrians are present in number and access is minor. • Materials are used consistently throughout the shared footway. • Controlled crossings on busier sections of the road are wide and direct. • Cycling provision includes a range of options – unidirectional, mixed street, and/or contraflow cycling – to allow better connectivity while still allowing easy local stop-offs. The infrastructure proposed should follow Cycling by Design 2021. • There is access for public transport to or near the area, as well as car parking provision near the area to ensure that people with a physical disability are also able to access the shops in the area. • Features such as planters, street trees, benches, and landscaping are used in the pedestrian area to ‘soften’ the feel of the area and improve the feeling of safety and better use of the space.
Residential	• The street is a flexible space where vehicles are guests and pedestrians and cyclists have priority. • Modal filters (or other means) are used to limit traffic to local access only. • A continuous kerb helps people with impairment navigate the footway; the remaining street space (between the kerbs) has no clear division between pedestrian, cyclists and motor vehicle space, forcing motorists to slow down and travel with caution. • Features such as planters, street trees, benches, children’s play elements and other outdoor furniture and landscaping improve residents’

	feeling of safety, promote greater use of the shared space and limit motor vehicle speed. Their use is designed to ensure clutter-free and 'readable' routes.
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3.2.3 Routes: Street elements

Figure 3: Street Elements of the Routes areas

Elements	Description
Carriageway	• The carriageway is clearly delineated for different users. • Road markings communicate priority for cars.
Footway/pavement	• Segregated footway
Cycle tracks	• Cycle track provision is segregated – a bidirectional cycle track is suggested, as the street is wider, filled with more traffic and the character is less of a 'place' and more of a 'going through area'.
Crossings	• Controlled crossings (e.g., puffin crossings) are used where possible, giving confidence for people with a disability
Parking	• Provision is made for parking away from junctions to avoid obstruction of view (where applicable) – if placed along the cycle track, parking should be located on the road side and allow space of 0.5m for door opening.

3.2.4 Commercial: Street elements

Figure 4: Street Elements of the commercial areas

Elements	Description
Continuous kerb	• A continuous kerb creates some separation in a predominantly pedestrian space. • A continuous kerb along cycle and vehicle access provision helps disabled people navigate the space (note: 60mm is the height that is detectable by

	people with visual impairment and those using a cane). • A dropped kerb is used at uncontrolled crossings.
Cycle track	• Mixed street¹ or unidirectional cycle tracks are used² – if traffic is restricted to one-way, a cycle contraflow should be created.
Continuous footway (level surface)	• A combination of materials (different surface materials, coloured materials, etc.) helps demarcate and strengthen the boundary between footway and carriageway. • Contrasting colours highlight hazards and are consistent across the area. • Road markings that communicate priority for cars are removed.
Public transport and vehicle access	• Bus stops have seating – which is good for disabled people. • There is access for delivery, emergency, and maintenance vehicles. • Limited parking close to the shops facilitates loading and delivery of goods as well as access by disabled people.
Crossings	• Both controlled and uncontrolled crossings are used to facilitate movement of people from one side to the other. Controlled crossings should be used where possible to support the needs of visually impaired people.
Cycle parking	• Cycle parking is provided in a way that does not obstruct pedestrians.
Outdoor furnishing and landscaping	• Benches and seating + On pavement but not obstructing it

¹ A mixed street is one where bikes are mixed with motorised traffic, an arrangement which is reasonable when the volume and speed of vehicles are low.

² Unidirectional cycle tracks are one-way tracks that sit on both side of the street. They are regarded as the 'gold standard' as they offer more options for users to interact with the street function, compared to a bidirectional track.

	+ 50m apart for people using canes etc.
	• Planting/greening • Trees, planters and parklets

3.2.5 Residential: Street elements

Figure 5: Street Elements of the residential areas

Elements	Description
Access junction of the residential area (entry and exit)	• Junction incorporates ramp, raised table and cycle track. • Roads that lead into the area are visibly narrowed to the width of one car.
Continuous kerb	• A continuous kerb creates some separation in a predominantly pedestrian space. • A continuous kerb along vehicle access provision helps disabled people navigate the space. • Ramps are used where vehicles need to access garages and driveways.
Home zone (level surfaces)	• A combination of materials – different surface materials, coloured materials, tactile paving, etc. – helps emphasise the area is access-only for vehicles. • Road markings that communicate priority for cars are minimal, or near non-existent. • Attention is drawn to places (crosswalks, bicycle routes, and building entrances) where people and cars might collide – colour and contrast are used to highlight hazards. • Consider how the movement of people and vehicles within the space is managed; consider ongoing traffic restraints (e.g., traffic speed).

Parking	• Parking spaces (for cars) are at an angle and used as part of traffic calming measures to control vehicle movement and speed through the space.
Cycle parking	• Secure cycle hangars are provided.
Outdoor furnishing and landscaping	• Benches and seating + On pavement but not obstructing it + 50m apart for people with mobility issues. • Planting/greening + Lots of trees • Play areas. + Permanent play equipment

3.3 Interviews

The research used interviews to gather information on the view and experiences of people with accessibility needs.

Qualitative semi-structured interviews were conducted with 15 individuals. This included 11 individual interviews, and 2 joint interviews, each with two participants. 12 interviews were conducted online, and one joint interview was conducted in person. Recruitment was conducted via relevant organisations in Scotland, including Sight Scotland, Guide Dogs, and Mobility and Access Committee for Scotland (MACS). Interviews were undertaken by Sustrans colleagues, and lasted between one-two hours. All participants received a £25 shopping voucher for taking part.

Interview questions were based on the concepts prepared by the research team. The concepts were shared with interviewees 48 hours before the interview took place. For each concept, participants were provided with, a text description of the concept. These were used to structure the discussion. Participants were asked for their impressions on several elements within the concepts. The semi-structured nature of the interviews allowed probing questions to be used to investigate participants' own experiences of the different elements included in the concepts.

Interviews were recorded after gaining consent from participants. Recordings were then transcribed by an external transcription company.

A thematic analysis of the transcripts was undertaken. This involved coding the transcripts in NVivo and then conducting a frequency analysis to identify the most mentioned themes³. The themes attracting the most comments were then used as a basis for the presentation of findings within this report (see Chapter 2).

³ NVivo is a qualitative data analysis computer software package produced by Lumivero.

4. Glossary

A-frame

Portable advertisement device often used by businesses as publicity on the street. It typically comprises of two boards connected at the top and creating the letter 'A' when looked at in profile

Bellmouth radius

Bell shaped footway edge along a road at a junction. The radius refers to the angle of the edge and defines the sharpness of the turn for vehicular traffic

Blister tactile paving, red and buff

Paving unit that bears a distinctive, raised surface profile to be detected by both sighted and visually impaired pedestrians. Blister paving has flat topped 5mm raised dots arranged in a square pattern. It is used to indicate where a pedestrian crossing is located. The red colour is used for controlled crossings, buff colour is used for uncontrolled crossings.

Bullnose kerb

Boundary kerb with a 90 degree angle edge which usually are 250mm wide and 125mm high. Commonly used for the edge of footway

Carriageway

Section of a road or street dedicated to vehicular movement

Clearance area

Area of the footway with priority given to pedestrian movement and free from obstructions

Continuous footway

Uninterrupted footway extending across a side road where it meets another road

Contraflow cycle track

Cycle track physically separated from the rest of traffic which allows bicycle movement in the opposite movement of a one-way street

Controlled crossing

Signal-controlled pedestrian crossing with call buttons, pedestrian signals and traffic lights for vehicular traffic

Dropped kerb

Small ramp built into the kerb of a footway to make it easier for wheels of a pushchairs or a wheelchair to transition from the footway to the carriageway

Floating bus stop

Bus stop arrangement where a protected cycle track runs on the same side of the road as the bus stop, between the footway and the bus stop island. The arrangement

ensures passengers alight from a bus directly onto a footway island, away from the cycle track or oncoming traffic.

Median strip

Reserved area in the centre of a carriageway that separates opposing lanes of traffic

Modal filter

Physical restriction limiting through-access to people walking, wheeling and cycling and prevent motor vehicle access

Pedestrian user-friendly intelligent (PUFIN)

A controlled pedestrian crossing where traffic lights go green for motorised traffic only when no more pedestrian are detected on the crossing by infrared detectors and mats

Raised table

A pedestrian crossing, including controlled or uncontrolled, which incorporates a raised feature to bridge the gap between both footway for pedestrian. The raised feature act as a traffic calming measure that allows people to cross the road at the same level as the footpath

Refuge island

Area of footway located in the middle of a carriageway intended to help protect pedestrians who are crossing a multi-lane road. Sometimes referred to as a crossing island or pedestrian island

Segregation kerb

A 500mm wide and 125mm high (90 degrees angle) kerb creating a hard boundary division between bicycles and vehicular traffic. It aims to protect people cycling from motorised vehicles.

Splay kerb

Boundary kerb with a 45 degree angle edge which is usually 60mm high

Uncontrolled crossing

Simple form of pedestrian crossing with an informal crossing point, dropped kerb and tactile paving but no lights

5. Future studies

Future research could investigate how views and experiences differ in relation to different health conditions. This could begin with a cross-sectional analysis of the initial dataset collected in this study. However, it is recommended that further data collection is undertaken to ensure a representative sample that covers a range of health conditions.

Further work could also be conducted using the insights and recommendations presented in this report as a starting point to refine the proposed concept designs and work towards presenting updated designs that take account of the insights gathered. This could involve producing scale models of the street typologies to help participants in a future study get a better understanding of the concepts and provide more informed feedback.

Alternative research methodologies may also be able to provide more detailed insights about the impact of street design. This could include conducting walking interviews with participants to get a real-time view of how street design can impact active travel for those with health conditions, disabilities or other access issues.

There is great potential to use the work undertaken and data collected here to further our understanding of street design barriers with a view to making active travel more accessible to all.