Movement and Places Calculator Guide

January 2025

This guide has been adapted from the Green Building Council of Australia's guide. This guide is to be used for the Movement and Places credit in Green Star Buildings.

NZGBC
TE KAUNIHERA HANGANGA TAUTAIAO

Document Information

For information on this document, please contact:

New Zealand Green Building Council
(09) 379-3996
greenstarnz@nzgbc.org.nz

This document is updated as necessary: it can be found at https://www.nzgbc.org.nz/.

Change Log

Issue	Description	Prepared by	Reviewed by	Authorised by	Date
1	Initial release	JP	RLG/FN	JQ	13/01/2025

Contents

1 Introduction

The New Zealand Green Building Council (NZGBC) and MRCagney NZ Ltd have developed a Movement and Places Calculator (the Calculator) that may be used to validate the *Reducing Private Vehicle Use* requirement for the Movement and Places credit for Green Star Buildings. This calculator is based upon work by the Green Building Council of Australia and adapted for the New Zealand context.

The Calculator determines the number of points awarded based on the proposed Sustainable Transport Plan for the building or fitout ('the project'). Points are awarded based on the proposed emissions reduction, active mode encouragement, and vehicle kilometres travelled (VKT) reduction.

A Sustainable Transport Plan (or equivalent sustainable transport strategy) must be developed to ensure that all aspects of transport for regular project occupants have been considered and addressed. Points are then awarded, based on a holistic approach to reducing the impacts from transport, where the Proposed Project's performance is improved when compared to a Reference Project. Points are awarded by completing the Calculator with the predicted transport mode split as defined in the Travel Plan.

Compliance requires project teams to demonstrate the carbon emissions from transport generated from the project's typical operations (the 'Proposed Project'). This value is then compared to carbon emissions from transport for a comparable project of a similar type in a similar location (the 'Reference Project'). The Calculator provides carbon emissions reductions predicted as a result of changes in mode share, or reduction in average trip length. These changes may occur due to transport design initiatives, such as removal of a car parking space, provision of cyclist facilities or carpooling initiatives.

2 How to read this guide

This guide is meant to give the reader an understanding of the context, purpose, and use of the Green Start Buildings Movement and Places Calculator.

Section 3 gives an introduction to some key terms used throughout this guide, and in the Calculator.

Section 4 outlines the criteria being assessed in the Movement and Places Credit, that the Calculator assesses.

Section 5 briefly describes the way that the calculator assesses projects.

Section 6 details where you can get access to the Calculator, how you input information, and how to get the Proposed Projects final result.

Section 7 outlines the elements of the Sustainable Transport Plan that need to be developed as part of your submission as they relate to the Calculator.

Section 8 describes the process that happens within the calculator when it picks the Reference Project, and how it estimates travel patterns based on that project.

Section 9 outlines the requirements for submissions that are necessary when claiming improvements in the Movement and Places Calculator.

Section 10 discusses some ways that a Proposed Project could improve its score in the Calculator, and what the impacts of those actions might be.

3 Glossary of terms

Key terms

Mode share – The proportion of trips that take place by a given mode of transport (e.g. bus, car, bicycle).

Project Population – Refers to the population of regular building or fitout users within the project being rated. For example, in an office building, the project population would include office staff and not visitors. This is on the basis that the credit aims to capture the emissions attributed to the project being rated, and therefore, does not take into account visitor populations.

Proposed Project – The building or fitout to be rated by the Green Star rating tool, as designed by the project team.

Reference Project – A hypothetical building or fitout of a similar type in a similar location to the proposed project.

Suitably Qualified Transport Professional – The suitably qualified transport professional shall hold a relevant tertiary qualification (including, but not limited to, architecture, engineering, sustainability and planning), have at least five years experience and has co-authored at least five building Sustainable Transport Plans.

Acronyms

SA2 – Statistical Area Level 2, a Census geographical unit representing a population of 1,000 to 4,000 people generally.

VKT – Vehicle Kilometres Travelled. The distance, in kilometres, travelled by vehicles (e.g. buses, vans, motorcycles, or cars), regardless of how many people are on board.

4 Breakdown of criteria

There are three criteria within the Calculator. These are described below:

Criterion 1. Emissions Reduction

Criterion 1 relates to a reduction in transport emissions directly related to trips to and from the site. Criterion 1 is calculated from commuting trips mode share, average trip length and the proportion of trips that may be avoided (e.g. by working from home). Criterion 1 considers reduction in greenhouse gas emissions which contribute to climate change.

Criterion 2. Active Mode Encouragement

Criterion 2 relates to an increase in the mode share of walk and bicycle commuting trips, referred to collectively as "active modes". Criterion 2 considers encouragement of transport modes that promote health and fitness to commuters as well as having financial benefits through reducing the societal cost of healthcare and providing environmental benefits.

Criterion 3. Vehicle Kilometres Travelled Reduction

Criterion 3 relates to a reduction in vehicle kilometres travelled (VKT) for commuting trips, which may be affected by either or both of a reduction in average trip length or a reduction in the mode share of car trips. Criterion 3 considers lessening car dependence which, in addition to reducing greenhouse gas emissions, local pollution, congestion, and vehicle crashes as well as the health benefits mentioned above. Reduced VKT also has potential financial benefits to commuters.

5 How the calculator works

The Calculator works by comparing the Proposed Project with a Reference Project against the criteria listed under Section 4.

The Reference Project characteristics are automatically calculated within the Calculator. Criteria scores are achieved by comparing the performance of the Proposed Project with that of the Reference Project. For information on how the Reference Project is generated, refer to Section 8.

6 Where to find the calculator and how to enter data

The Calculator may be found on the NZGBC website at the following web address: Green Star Buildings NZ (nzgbc.org.nz)

Step 0: Before beginning, ensure that Excel Macros are enabled. Click "Enable Content" when prompted, as shown in **Error! Reference source not found.** below.

Figure 1: Enabling macros

Step 1: Enter the address of the building or fitout to be assessed into the blue address field. The address must be entered with as much detail as possible to give the best chance of getting the correct address. Try the following format,

<Street Number> <Street Name>, <Suburb>, <City>, <Postcode>

For example, *205 Queen Street, Auckland CBD, Auckland, 1010*. The guess will populate the grey cells below once you click the '1. Get Reference Project' button in Step 3.

Step 2: Enter the building or fitout type. There is a drop-down box with a list of possible types. These are listed below:

- Office, for example office buildings, administration centres.
- Education, for example primary schools, high schools, polytechs and universities.
- Healthcare, for example hospitals, clinics.
- Industrial, for example warehouses, distribution centres.
- Retail Centre, for example shopping centres or commercial outlets.
- Public Building, for example libraries, swimming pool complexes, community centres.
- Multi-unit Residential, for example apartment buildings, townhouses.
- Mixed-use Building, for example office buildings with retail spaces.

Step 3: Press the '1. Get Reference Project' button. This is used to populate the reference data for the address and building or fitout type entered and may also be used at any time to reset the assessment to its starting point.

The SA2 field is automatically determined from the address. If these are incorrectly calculated, please adjust the address until the SA2 correctly represents the project's location (see Step 1 above). A map of SA2s can be found on the Stats NZ website.

Steps 1-3 are shown in Figure 2 (taken from Green Star Movement and Places Calculator).

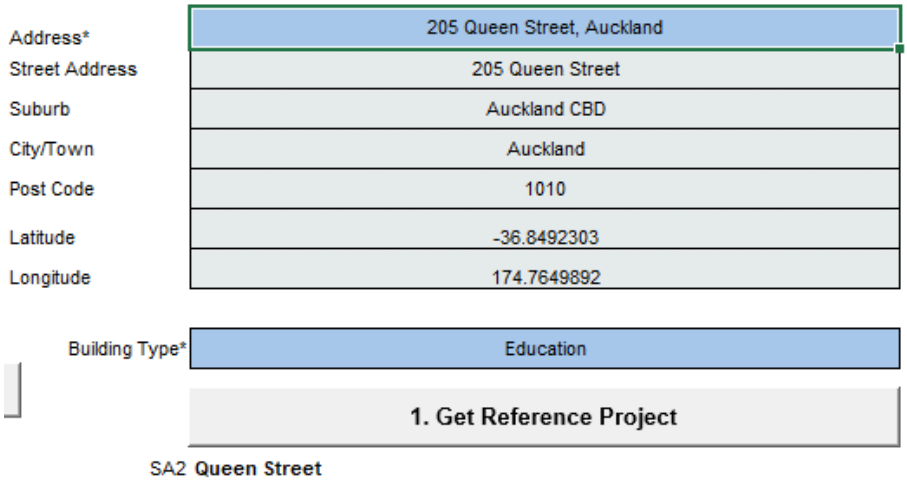

Figure 2: Steps 1 to 3 – Movement and Places Calculator in use

Step 4: The Reference mode share percentages, avoided trips, average trip length and work weeks per annum are automatically populated based on the building or fitout type and location. Your project might expect to have different mode shares because of elements of the associated Travel Plan, such as carpooling.

You can adjust any of the mode shares by manually entering the adjusted figure into the blue Proposed cells shown in Figure 3. The cells will change colour to indicate that a user change has been made. The other fields, including total emissions, total VKT and percentage of trips using active modes are automatically calculated, once the user clicks 'Get Altered Mode Shares'.

Refer to Section 9 for guidance on how to justify changes in mode share.

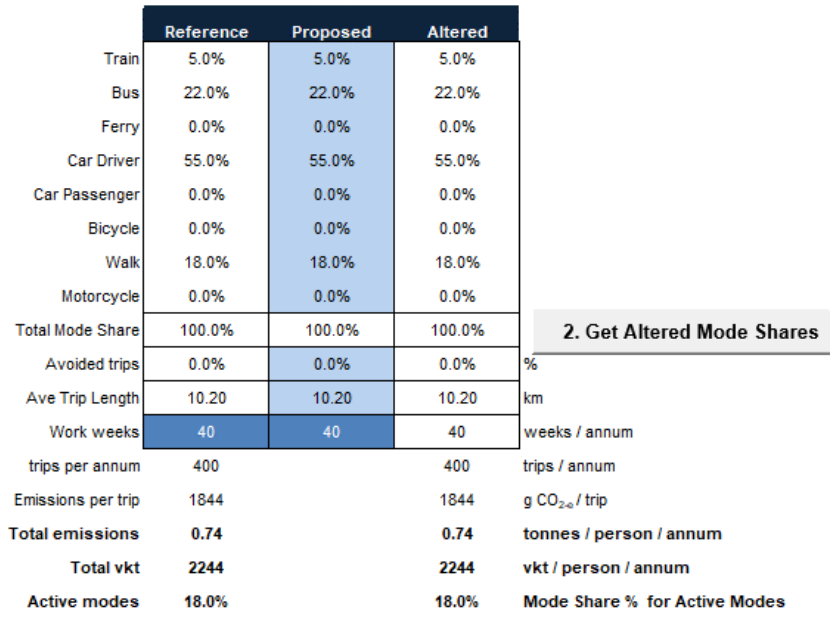

Figure 3: Step 4 – adjusting mode share percentages

Step 5: The emissions intensity of each transport mode is automatically calculated for the Reference Project. Again, your project may have different emissions intensity because of things like Electric Vehicle bays in the project.

The blue cells containing the emissions intensity of car drivers can be modified. Note that car emissions intensity is per VKT and is applied to the drivers and passengers, and should be altered if you believe passengers could justify a lower intensity, due to carpooling initiatives and encouragement The interface is shown in Figure 4.

Refer to Section 9 for guidance on how to justify improvements in vehicle emissions intensities.

Emissions Intensity	Reference	Proposed	Unit
Train	19	19	g CO_{2-e} / passenger km
Bus	155	155	g CO_{2-e} / passenger km
Ferry	19	19	g CO_{2-e} / passenger km
Car Driver	265	265	g CO_{2-e} / vehicle km
Car Passenger	265	265	g CO_{2-e} / passenger km
Bicycle	0	0	g CO_{2-e} / passenger km
Walk	0	0	g CO_{2-e} / passenger km
Motorcycle	131	131	g CO_{2-e} / passenger km
Total	**161**	**161**	**g CO_{2-e} / passenger km**

Figure 4: Step 5 – the emissions intensity of each mode is used to calculate transport emissions

7 Sustainable Transport Plan

A Sustainable Transport Plan (or equivalent alternative transport strategy) must be completed at a stage early enough in the design phase to ensure that the recommendations can be considered and implemented in the project.
The project team must report how the recommendations of the Sustainable Transport Plan have been included in the project. The Plan must be prepared by a suitably qualified Transport Professional (see Glossary section).
The Plan must include, as a minimum, the items listed below:

7.1 Site-specific transport assessment

The assessment must be carried out before the development approval and reviewed at the final design stage (prior to or during construction). The assessment must consider:

- The local environment for pedestrians and cyclists;
- Public transport links serving the site;
- Facilities for cyclists; and
- Car parking provisions (with a view to minimising the use of private cars).

7.2 Design features for Alternative Transport

This section must be based on the site-specific transport assessment and, as a minimum, provide recommendations on the following issues:

- Provision of priority parking spaces for car share schemes;
- Provision of a dedicated path for pedestrians and cyclists from the site entrance to the major building entrance and bicycle parking facilities (where appropriate);
- Provision of dedicated cycle storage facilities and cycle lanes on-site, and adjoining lanes off-site where applicable;
- Improvements to bus services (where appropriate), e.g. altering bus routes or offering discounts;
- Restricting and/or charging (metering) for car parking; and
- Considerations in the location and design of all alternative transport design features to encourage maximum utilisation of these facilities.

Operational opportunities for Alternative Transport

This section pf the Sustainable Transport Plan must include a list of measures to be taken that will encourage travel options with low environmental impact during building operation and, as a minimum, address the following:

- Reduction in single occupancy car journeys to and from the facility. e.g. car sharing;
- Promotion of walking;
- Promotion of cycling;
- Promotion of public transport;
- Deliveries and contractor vehicles;
- Visitors' transport; and
- Set targets for the mode share for project users' transport to and from the building. The targets must be based on design and operational initiatives recommended by the Travel Plan.

Building / Fitout users' information

This section must provide recommendations on how information about alternative transport facilities (e.g. walking, cycling and public transport) will be communicated to the people who will be using the site once completed.

8 Determining the reference project

This Section describes how the Reference Project's emissions, VKT and active mode benchmarks are determined.

8.1 Mode share

Mode share data is determined using SA2 level data from the NZ 2018 Census 'Main means of travel to work' and 'Main means of travel to education' data. The Reference Project is a building (or fitout within a building) which has the average mode share characteristics of places of employment within the SA2 area with its centroid closest to the location of the building being assessed.

There are three exceptions to the above:

1) When the user selects "multi-unit residential" as the primary building type, the mode share data has the average characteristics of residents leaving an SA2 zone to travel to a place of employment elsewhere.

2) When the user selected "education" as the primary building type, the mode share data has the average mode share characteristics of places of education within the SA2 area with its centroid closest to the location of the building being assessed.

3) When the user selects "mixed-use building" as the primary building type, the option to specify the percentage of the building that is residential will appear (e.g., 50%), as in Figure 5 below. The average mode share data for residents leaving that SA2 zone for employment is combined with the mode share data for places of employment in that SA2 in that ratio (e.g., 50% of the residential mode share + 50% of the employment mode share). This could be used for hotels, or retail buildings that contain apartments.

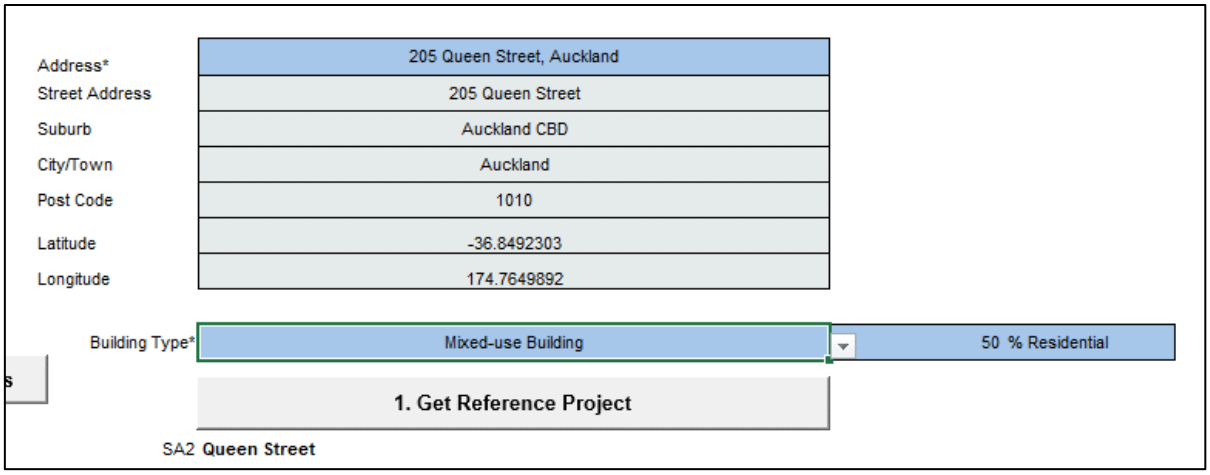

Figure 5: Mixed-use Building options

8.2 Avoided trips

Avoided trips refer to the propensity of employees to work from home or otherwise not take a commuting trip during a work week. Avoided trips are not differentiated by SA2 due to the large fluctuations and the difficulty of separating working from home data in the Census between employees who work from home occasionally compared to self-employed persons who work from home the majority of the time. The

Calculator uses a standard value for avoided trips of 2% for all purposes except Education, which has an assumed 0% avoided trips.

8.3 Average trip length

Average trip length for the Reference Project is determined using the same data as described in Section 8.1. Using geospatial analysis combined with the number of employees who travel to a given SA2 from every other SA2, it is possible to estimate the average trip length for employees who commute to the SA2 of interest.[1]

8.4 Work weeks

'Work weeks' refers to the number of normal working weeks per annum for employees of the Reference Project.
This is assumed to be 48 weeks (assuming 4 weeks of annual leave), except for Education workers who are assumed to work 40 weeks per annum. This is separate from avoided trips (see Section 8.2) which only refers to additional avoided trips.

8.5 Emissions intensity

Emissions intensity is estimated using 'Measuring Emissions: A Guide for Organisations – 2022 a Detailed Guide' prepared by the Ministry for the Environment[2][3].

Table 8-1: Emissions factors by transport mode

Travel Mode	kg CO2-e/PKT	g CO2-e/PKT
Car	0.265	265
Motorcycle	0.131	131
Bus	0.155	155
Tram	0	0
Train	0.019	19
Ferry	0.019	19

[1] This work was undertaken by MRCagney and applied to the Calculator.
[2] Accessed from https://www.mfe.govt.nz/sites/default/files/media/Climate%20Change/Measuring%20Emissions%20Detailed%20Guide%202020.pdf, 11th January 2020
[3] Accessed from https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2020, 11th January 2020

9 Claiming improvements

This section outlines the documentation required to claim improvements for the Proposed Project against the Reference Project.

The justifications must be included in a site-specific Sustainable Transport Plan developed early in the design phase (i.e. Concept Design phase). The Plan must include a site-specific transport assessment, and the recommendations of the Plan should be included in the design, construction and operation of the project. Refer to Section 7 of this Guide for specific requirements of the Plan.

9.1 Submission requirements

The following points must be addressed in the submission.

Mode share changes

Any changes to a mode share percentage in the "Altered" column are carried forward to the "Proposed" column. Any mode share percentages not modified by the user will make up the remaining proportion of travellers (up to 100%), so that each mode share is proportional to the "Reference" mode share.

For example, in Figure 6 the Altered mode shares total to 80%, and the remaining 20% of mode share must be comprised of modes which have not been adjusted by the user (i.e. Ferry and Car Driver). This 20% is allocated to these modes in proportion to their reference values (e.g. for Ferry: (4 ÷ 45)×20 = 1.8, so an additional 1.8% is added to the Ferry mode share in the Proposed column. The dark blue cells show which modes have been altered from the Reference case.

	Reference	Proposed	Altered
Train	9.0%	0.0%	0.0%
Bus	32.0%	0.0%	0.0%
Ferry	4.0%	4.0%	5.8%
Car Driver	41.0%	41.0%	59.2%
Car Passenger	0.0%	0.0%	0.0%
Bicycle	0.0%	0.0%	0.0%
Walk	13.0%	10.0%	10.0%
Motorcycle	1.0%	25.0%	25.0%
Total Mode Share	100.0%	80.0%	100.0%
Avoided trips	2.0%	2.0%	2.0%
Ave Trip Length	8.53	8.53	8.53
Work weeks	48	48	48

Figure 6: Example of mode share changes

The following justifications are to be considered when filling out the appropriate submission template for assessment:

Residential proximity: The project team must justify any assumption that more project users live nearby than average. For example, education or healthcare institutions with associated student or staff

accommodation may be able to justify this. The project team is encouraged to submit a Technical Question to the NZGBC to provide justification of their assumptions.

Cycle: Demonstrate that cycle facilities are available for the claimed proportion of project users. Building / fitout initiatives should be in place to facilitate cycle use, including secure bicycle parking, weather protection, changing facilities with provision of showers and lockers etc. Secure bicycle parking is defined as that which is in accordance with AS 2890.3[4], and examples are given in the Movement and Places credit, as associated resources.

Car (Driver, Passenger): Demonstrate that car parking is only available for the claimed proportion of car drivers and parking is not freely and readily available near the site for occupants to use. An incentive scheme for carpooling or to give up a parking space may also be claimed with documentation of how the scheme works and a justification for the proportion of reduced car trips claimed. Adjustments must also be made to the emissions intensity of passengers when implementing a carpooling scheme (see Section 9.1).

Public Transport (Train, Bus, and Ferry): Demonstrate that a scheme has been developed for incentivising public transport use. The claimed increase must be proportional to the incentive scheme.

Trip length changes

Evidence must be produced that the workforce for this project travels shorter distances than the Reference Project. For example, education or healthcare institutions with associated student or staff accommodation may be able to justify this. This could also apply to a primary or secondary school with a zoning policy for enrolments. The project team is encouraged to submit a technical question to the NZGBC to provide justification of their assumptions. Route distances should be calculated via the route that is taken, rather than in a straight line ('as the crow flies').

Avoided trips changes

An incentive scheme must be demonstrated or evidence of past rates of working from home must be produced to justify increasing the avoided trips percentage for the company or workers/residents in the project. This does not apply to populations such as students, who would not typically receive incentives for working from home.

Work weeks changes

Evidence must be produced of a company policy with a higher than standard allowance for annual leave (i.e. greater than four weeks per annum).

Emissions intensity changes

Evidence must be produced of a company provided green fleet, including vehicle specifications demonstrating the grams of CO2-e per VKT. The vehicles must be available for staff travel between home and work. A fleet made available solely for staff transport during working hours cannot meet the requirements of this credit, as the credit covers only travel between home and the project.

If using a carpooling scheme (as mentioned in Section 9.1), reduce the emissions intensity of vehicle passengers to reflect the proportion of new passengers who are now using the carpooling scheme. The project team must document and justify this proportional reduction in the Sustainable Transport Plan.

9.2 Documentation requirements

Refer to the Submission Guidelines from NZGBC for the Documentation Requirements.

[4] AS 2890.3-1993 Parking facilities - Part 3: Bicycle parking facilities: https://codehub.building.govt.nz/resources/as-2890-3-1993/

10 Actions and Impacts

This section contains some potential actions which could be included to improve the Proposed Project's score compared to the Reference Project. Note that these are a small number of examples compared to the many potential changes, and each of these examples would need to be claimed with the submission requirements outlined in Section 9.

10.1 Potential improvements

Potential improvements for a variety of areas are listed below.

- Company car parking is converted to bicycle storage, to encourage an increase in cycling mode share and a decrease in car mode share.
- Public transport commutes are funded by the company, to incentivise an increase in public transport use.
- For an educational facility, enrolments are prioritised based on distance to the proposed project, reducing average trip length for the travel.
- A company policy encourages working from home several days per week, encouraging an increase in trips avoided.
- Annual leave amounts are increased, to reduce the number of work weeks.
- The company vehicle fleet is transitioned from petrol to hybrid or fully electric vehicles, decreasing the average emissions intensity from cars.

10.2 Incorporation of external infrastructure projects

It is possible that external infrastructure projects will affect the mode shares and trip lengths for the Proposed Project. For example, a new train station close to the Proposed Project would be likely to increase the mode share from public transport. If the Sustainable Transport Plan includes details of the external projects and fulfils the submission requirements, then the Proposed Project can include these improvements in their Travel Plan.

10.3 Hospitals and other sites with large parking needs

Hospitals often require a large amount of car parking for patients who are mobility impaired. The Sustainable Transport Plan should encourage as many people as possible (staff, visitors, and out-patient visitors with mobility) to shift away from driving themselves. As the scores for Active Mode Encouragement or VKT Reduction are based upon percentage changes, so encouraging mode shift in those able to use other transport options will still have a significant impact. It should also be noted that increase in public transport provision to hospitals also helps those who cannot afford or drive a car to access healthcare.

Similarly, other sites which typically require large parking sites should use the Sustainable Transport Plan to encourage mode shift for those who have other transport choices.