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Meecebrook Garden Community Transport Strategy

Executive Summary Report

Staffordshire County Council (on behalf of Stafford Borough Council)

02 July 2020

Notice

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1. Introduction

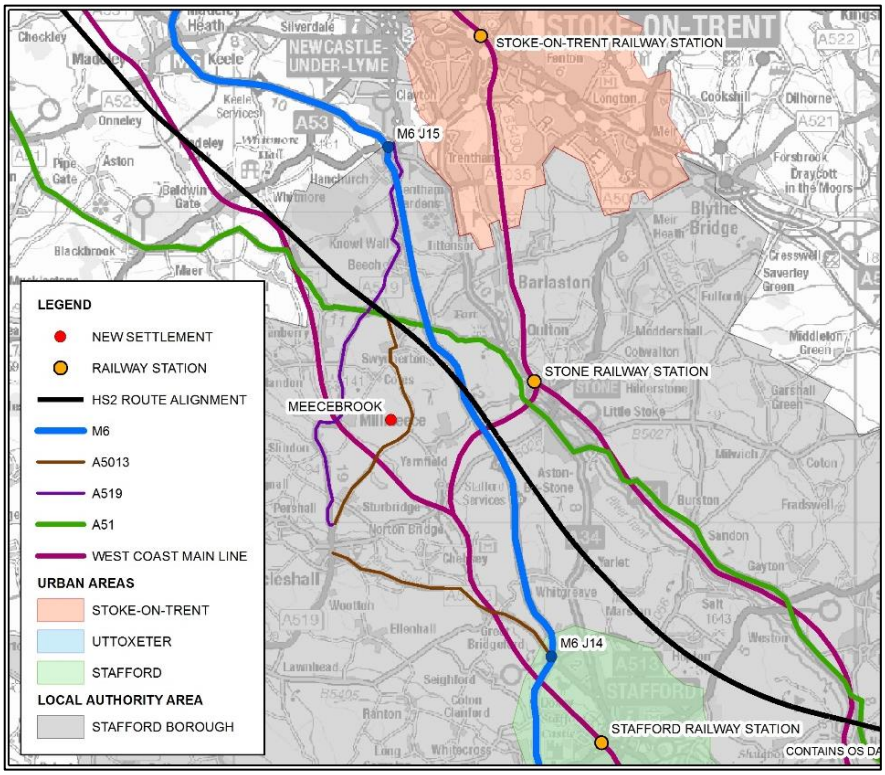
1.1. Meecebrook Garden Community

This transport strategy has been developed as part of the ongoing promotion and development of a new garden community at Meecebrook, Staffordshire (see site location in Figure 1-1). Stafford Borough was chosen as a possible location for this new settlement with the Government contributing funds to develop detailed plans for the key infrastructure required to support sustainable development.

The new settlement could include;

- Around 10,000 homes;
- 20 hectares of new employment land;
- 300 hectares of green space including parks;
- New West Coast Mainline station; and
- New schools and health centres.

Figure 1-1 - Site location



1.2. Purpose of this report

The scope of this project was to design a set of deliverables that would be used to support the Issues and Options stage of the Local Plan, with further strategic modelling required at a later stage. The three deliverables are as follows:

- Future mobility solutions
- Travel demand model
- Traffic modelling strategy

The purpose of this overview is to outline the main findings from each of the deliverables and to make clear the recommendations and next steps as a result. The full reports for each deliverable can be found in Appendix A – C.

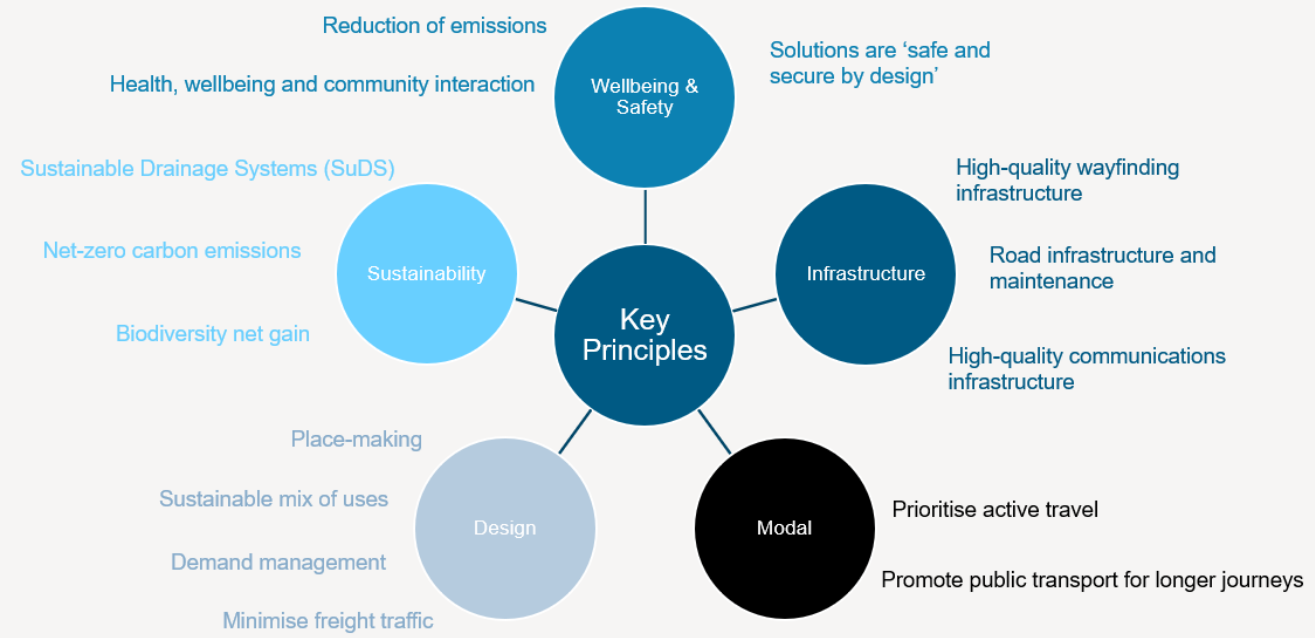
2. Future Mobility Solutions

In order for Meecebrook Garden Community to be planned and developed to a high standard of sustainable, integrated transport, thought must be given to the masterplanning principles that underlie the development. The initial purpose of the Future Mobility Solutions report was to link future mobility to concepts of masterplanning best practice to provide a blueprint for both the Council and the developers.

2.1. Summary of findings

The key planning principles and considerations for the development were established through a policy and literature review and then divided into five groups as shown in Figure 2-1. A hierarchy of modes was preserved throughout, with active travel (walking and cycling) given the highest priority, and private vehicles given lower priority. Similarly, the health and wellbeing of Meecebrook residents was emphasised and masterplanning principles that support a healthy way of life (e.g. those that result in higher levels of physical activity, improvements in air quality and reduced severance within communities) were drawn out. Fundamentally, the way that Meecebrook is designed and built out will define how people move around and the level of sustainability that can be achieved.

Figure 2-1 - Key planning principles for Meecebrook Garden Community



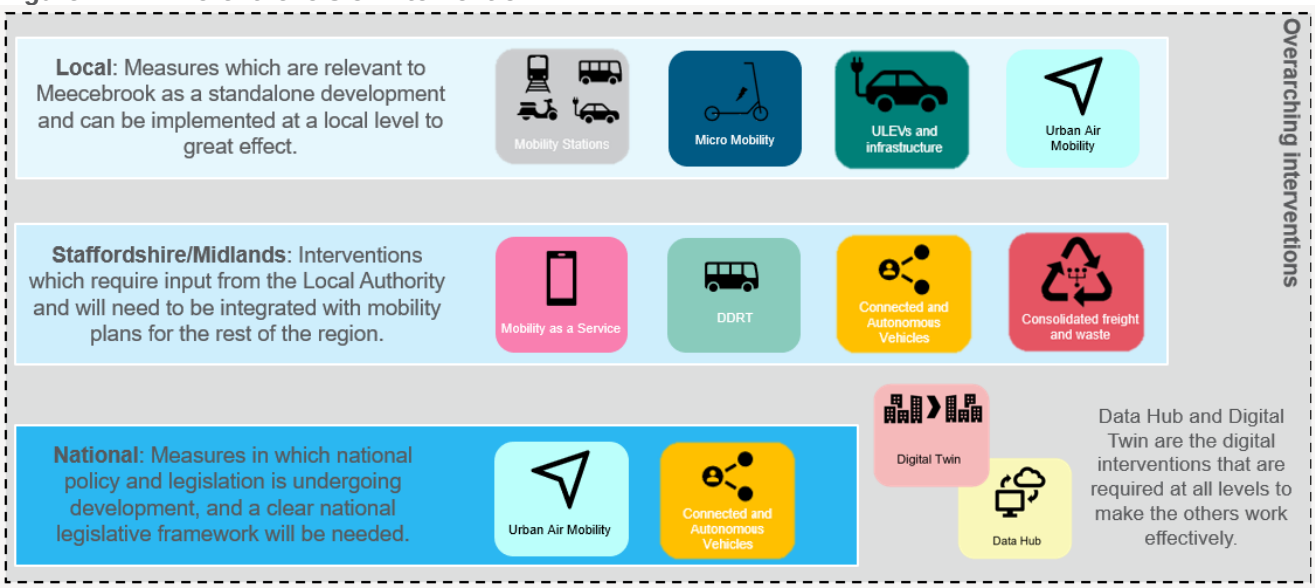
The individual mobility interventions considered in this report were as follows:

- Mobility Hubs/Points
- Mobility as a Service (MaaS)
- Data Hub
- Dynamic Demand Response and Shared Taxis
- Micro-mobility
- Ultra-Low Emission Vehicles (ULEVs) and associated infrastructure
- Freight and Waste Consolidation
- Connected and Autonomous vehicles
- Urban Air Mobility
- Digital Twin

Each of the interventions has the potential to bring new modes of mobility to Meecebrook, although they are relevant at different levels (see Figure 2-2). Once the planning principles have been taken into consideration a connectivity layer must be established, taking into consideration both physical and digital connectivity. The Mobility Hubs and Points are the key to the physical connectivity, as pillars within the transport system that

provide a collection point for all the different modes of transport as well as a place for people to gain access to information, plan journeys, buy tickets, meet other people and even socialise and carry out other tasks such as parcel collection and delivery. In the digital realm, MaaS, Data Hub and Digital Twin are all part of an interconnected online data platform that will allow information to be accessible on the go by mobile device and are key to the success of all of the other interventions.

Figure 2-2 - Different levels of intervention



2.2. Recommendations and next steps

The key recommendation from this work is that masterplanning best practice still remains crucial to the success of Meecebrook as a sustainable, future-proof development that will be attractive to potential residents and function effectively and productively as a new community. From a sustainable transport perspective, there is a need to balance both the physical and the digital elements of connectivity so that the individual transport offerings function as a single system. The priorities for inclusion in any further iterations of the Meecebrook Transport Strategy are the Local Mobility Hubs/Points, MaaS platform, Data Hub and Digital Twin. Without these interventions it is not possible to successfully integrate other modes of transport and respond to the changing ways that people are using transport systems with the advent of new forms of technology.

In order to progress the opportunities identified in this work, the following next steps have been identified:

1. Develop a strategy for applying the key masterplanning principles to Meecebrook Garden Community;
2. Shortlist future mobilities interventions for Meecebrook Garden Community;
3. Identify future resource, infrastructure and logistical issues which will required buy-in from other suppliers and stakeholders;
4. Engage with local and regional authorities and other stakeholders to ensure compatibility with wider schemes.

3. Travel Demand Model

The purpose of the Travel Demand Model (TDM) was to develop a spreadsheet tool for SCC/SBC to use in order to understand the potential transport impact of the proposed development. The tool provides the following:

- Initial appraisal of the number of internal/external person trips generated by Meecebrook;
- High-level understanding of the trip distribution and direction of travel associated with external trip generation;
- Understanding of the mode share associated with trip generation and how this is affected by the origin-destination of the trip;
- Demonstration of the potential impact of constructing a new railway station on the West Coast Mainline;
- Informing origin-destinations for Meecebrook in a future highway model.

Two gravity models were created to establish trip rates from Meecebrook to nearby workplace destinations, and surrounding residential areas into Meecebrook as a workplace destination. Two scenarios were tested; one with a new rail station and one without.

3.1. Summary of findings

Various assumptions were made in order to deliver a set of preliminary findings; these assumptions are discussed within the main report.

An investigation into trip distribution identified Stoke-on-Trent (23%) and Stafford (19%) as the two most significant generators of external trips (between Meecebrook and other towns or cities). 14% of trips are forecast to take place to employment provision within Meecebrook itself.

Table 3-5 within Appendix B, indicates that the construction of a new railway station on the West Coast Mainline would reduce the number of vehicular trips on the external highway network. During the AM Peak, it is forecast that the total number of two-way vehicular trips would reduce by 242 in the AM Peak and 197 in the PM Peak. Overall, it was found that the additional trips on the external highway network as a result of trips from Meecebrook Garden Community would still have a major impact even with the new railway station, and therefore potential mitigation solutions would need to be considered. This could include highway mitigation measures at key locations on the SRN (M6 Junction14 and 15).

3.2. Recommendations and next steps

The TDM report has identified several next steps (from a transport perspective) to support SCC/SBC in the ongoing promotion and development of a new garden settlement at Meecebrook. The recommended next steps to consider are:

- To continue to develop the masterplan for the proposed development and fix the proposed land use assumptions/ development quantum;
- Run the TDM spreadsheet analysis with the fixed masterplan assumptions;
- Use the distributional analysis and modal split from the TDM spreadsheet analysis to inform a run of the Area of Impacts Assessment (see Chapter 4);
- Analyse the outputs from the Area of Impacts Assessment to identify locations on the existing highway network which require mitigation and/or strategic intervention to accommodate the proposed garden settlement at Meecebrook.

4. Traffic Modelling Strategy

In order to assess the transportation impacts of Meecebrook Garden Community, it has previously been advised that a strategic model is developed to provide an evidence base (Meecebrook Transport Study, 2018) and that the model will meet the following requirements:

- Provide a forecast for the latest Local Plan data;
- Identify traffic flow demands and reassignments;
- Help identify the nature of the transport interventions required to demonstrate that the proposals will not have a severe impact.

The purpose of the Traffic Modelling Strategy is to outline various options for model development as well as their practical constraints.

4.1. Summary of findings

The first consideration was the comparison of existing models covering the geographic area surrounding Meecebrook as identified in the Meecebrook Transport Strategy Fee Proposal (Jan 2020) to identify which is more suitable. There was a greater availability of forecast scenarios in the Midlands Connect Highway Model (MCHM) compared to the Midlands Regional Traffic Model (MRTM), so the MCHM was considered a more suitable tool for assessing the impact of Meecebrook.

On considering the relative strengths and weaknesses of all of the approaches there are three main options which are summarised in Table 4-1. An Area of Impacts Assessment will be an important next step as per the recommendations from this study, but could be followed by either model refinement or a full model update depending on the requirements of the project.

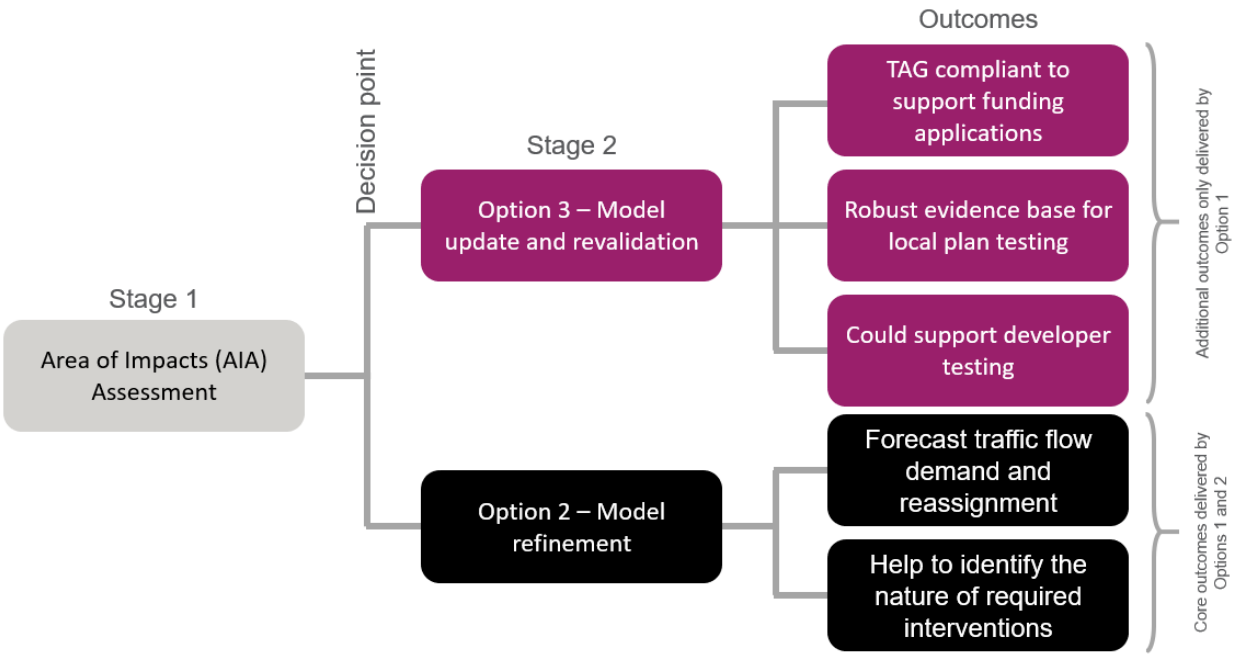
Table 4-1 - Key options summary

Option	Description	Outcomes	Indicative Cost & Timescales
1. Area of Impacts Assessment	An initial modelling assessment using existing tools to identify areas of impact.	An indication of the geographic scope of impacts and potential areas requiring intervention.	£10,000 - £20,000 1 - 1.5 month programme
2. Model Refinement	Refining existing MCHM to provide a more robust evidence base for assessing transportation impacts.	A more robust basis for providing the assessment.	£40,000 – £65,000 3 - 4 month programme
3. Model Update - including revalidation	Update and revalidate the MTRM base year model with up to date data including Mobile Phone Data (MPD) to inform trip distributions.	A fully TAG compliant updated model which will provide an evidence base for funding applications and economic assessment.	£210,000 – £260,000 (excl. data costs) 8 - 10 month programme
4. Bespoke model	Using the 2015 MRTM Base model as a starting point, refine the network and model zoning and revalidate to a more recent year in key study area. New data sources to be obtained to inform trip distributions.	A bespoke, fully TAG compliant updated model which will provide an enhanced evidence base for funding applications and economic assessment.	£400,000 – £450,000 (excl. data costs) 14 - 16 month programme

4.2. Recommendations and next steps

The key recommendation from the Traffic Modelling Strategy report is that an Area of Impacts Assessment (AIA) be undertaken. Firstly, it will provide an initial, high level understanding of where the impacts on the road network are likely to occur and secondly will provide the information required in order to develop a detailed scope for any modelling work required at a later stage. Figure 4-1 illustrates the decision point following the AIA and the outcomes associated with both of the approaches.

Figure 4-1 - Modelling strategy - stages and outcomes



Option 4 is not included in the above diagram as it was considered not to provide best value in terms of cost and programme.

5. Findings

5.1. Summary

This Transport Strategy has been developed to inform the future development of the Meecebrook Garden Community, Staffordshire. The following paragraphs provide a summary:

5.1.1. Future Mobility Solutions report

The Future Mobility Solutions report provides insight into the technologies and opportunities that could be available to Meecebrook to allow it to become fully sustainable and future-proofed. The report outlines the key principles of future mobility and how they link to current understandings of masterplanning best practice. The individual interventions are defined and their relevance to the Meecebrook project outlined. Finally, there are suggestions of next steps that should be taken in order to make the most of the interventions that will have the greatest impact on Meecebrook.

5.1.2. Travel Demand Model

A Travel Demand Model (TDM) has been developed in the form of a spreadsheet tool in order to assess the potential impact of the proposed development. It provides an initial appraisal of the number of external person trips generated by the development, the destination of these trips, and their modal share. The TDM is able to test different assumptions regarding the sustainable transport offering, and their effect on the number of trips from the site.

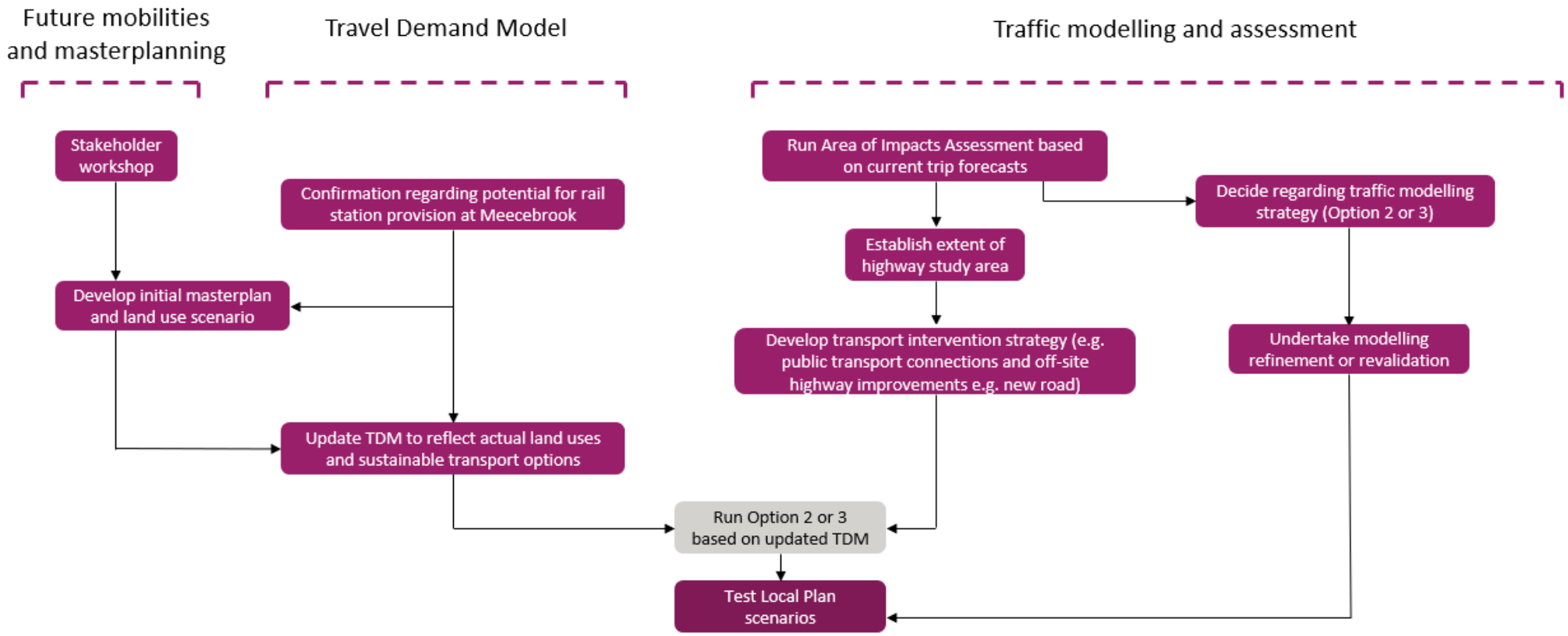
5.1.3. Traffic Modelling Strategy

The traffic modelling strategy outlines the traffic model options available, the potential costs and the risks for which can be added to the risk register. It recommends that an initial Area of Impacts assessment is completed, following which recommendations are made regarding subsequent modelling options. Indicative programmes have been included for each model option, so that they can be aligned with the Local Plan timescales.

5.2. Next steps

Figure 5-1 (overleaf) illustrates the relationship between each of the different elements of the transport strategy and how their outputs inter-relate.

Figure 5-1 - Overarching strategy



Appendix A. Future Mobility Solutions




Meecebrook Garden Community

Future Mobility Solutions

02/07/2020

Future Mobility Policy

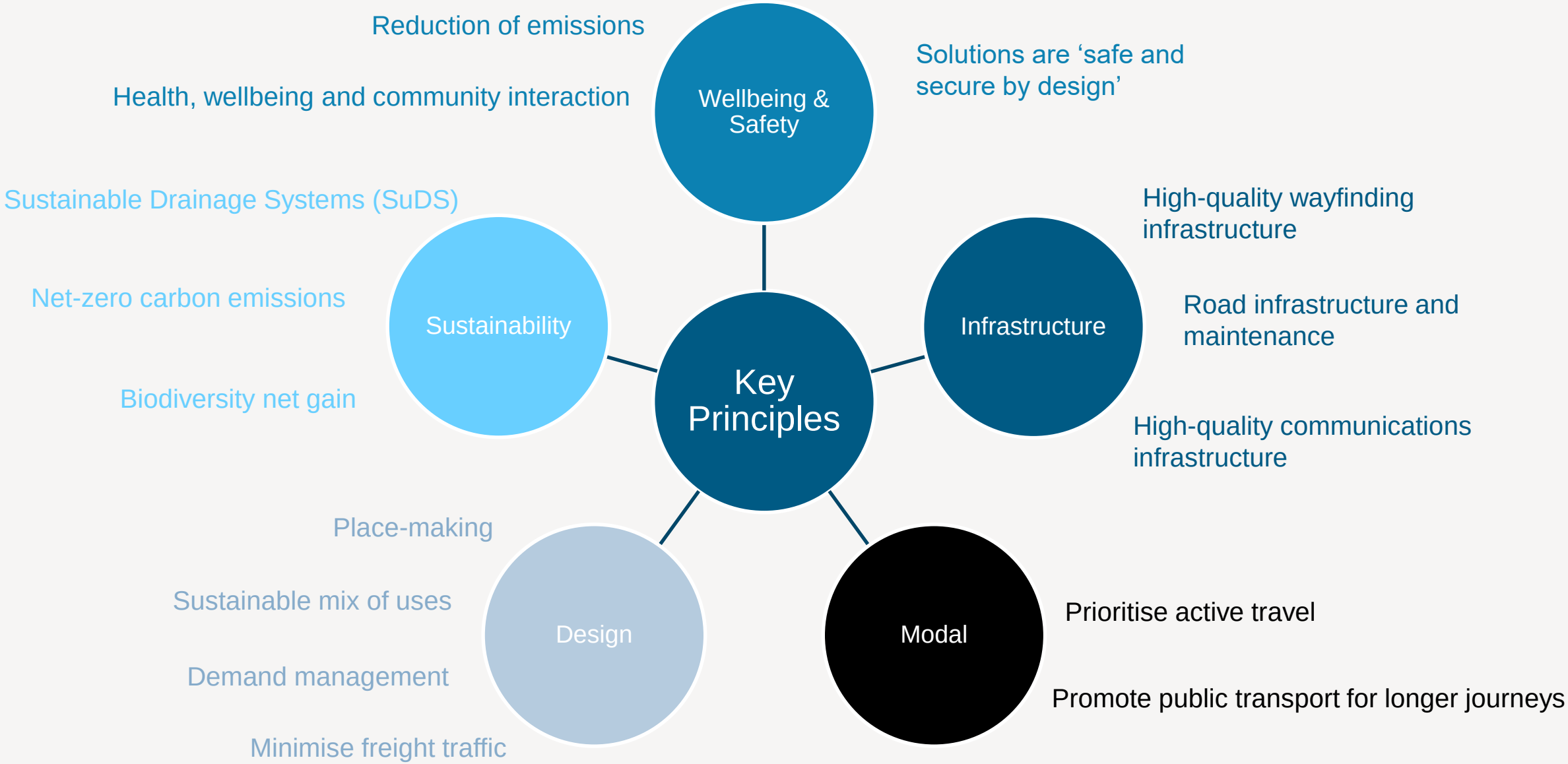
- Important to understand the policy basis for future transport solutions.
- Policy tends to run quite far behind the available technology.
- Investigated existing policy and white papers to understand the current situation with regards to future mobility innovation.
- Established key principles that should be considered in the master planning phase of the development

Document	Description	Link
National Planning Policy Framework (NPPF) (Feb 2019)	NPPF sets out how the government expects the planning policies for England to be applied. The policy mandates that the goal should always be 'sustainable development'. Sustainable transport should be promoted and place-making should be inclusive.	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/810197/NPPF_Feb_2019_revised.pdf
The Future of Mobility: A Time of unprecedented change in the transport system (Jan 2019)	A study containing four different scenarios of future transport technology adoption to test the outcomes of various policy choices. Identifies 10 priority areas for the government to consider.	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/780868/future_of_mobility_final.pdf
Future of Mobility: Urban Strategy (March 2019)	This document outlines the benefits of mobility innovation for the driver and develops 9 principles that will underpin the facilitation of new concepts in urban mobility. It also demonstrated the risks of not managing the change in technology appropriately and delivers some next steps.	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/846593/future-of-mobility-strategy.pdf
Midlands Connect Strategy (Mar 2017)	The overall strategy for the Midlands Connect region; aims to 'lead the technology revolution' to enhance existing networks and improve traveller experience. Particular interest in Mobility as a Service and smart ticketing.	https://www.midlandsconnect.uk/media/1224/midlands-connect-strategy-march-2017.pdf
Staffordshire Local Transport Plan (2011 – 2026)	The Local Transport Plan (LTP) aims to make the best use of current transport solutions, but also looks to reduce road transport emissions and their effects on the highway network including promoting the use of low-emitting vehicles and encouraging active travel and use of PT. However, the LTP is ageing and the use of future mobility interventions is not addressed; this will need to be brought in line with national policies as mentioned above, and a future mobility strategy is a clear next step.	https://www.staffordshire.gov.uk/Transport/transportplanning/localtransportplan/Documents/staffordshirelocaltransportplan2011strategyplan.pdf

Key principles

Establishing the key principles

- Developed five ‘pillars’ of sustainable, future-focused planning based on the literature review.
- Key principles for masterplanning were identified through examination of policies, research and case studies in the future mobilities area. They were then divided out among the pillars.
- The individual principles were created specifically for this project, and are fundamental to the design and execution of a sustainable settlement.
- The principles are unique, although there will naturally be crossover between projects.
- For Meecebrook Garden Community:
  - Prioritisation of active travel, placemaking and wellbeing were of vital importance to the project.
  - Encouraging a mode shift to active travel through design and the transport offering should underpin the key planning principles of any new development.


Reduction of emissions
Health, wellbeing and community interaction
Wellbeing & Safety
Solutions are ‘safe and secure by design’
Sustainable Drainage Systems (SuDS)
Net-zero carbon emissions
Biodiversity net gain
Sustainability
High-quality wayfinding infrastructure
Road infrastructure and maintenance
Infrastructure
High-quality communications infrastructure
Key Principles
Place-making
Sustainable mix of uses
Demand management
Minimise freight traffic
Design
Modal
Prioritise active travel
Promote public transport for longer journeys

Key Principle I - Design

Group	Key planning principle	What does this mean for the future?
Design	Sustainably designed mix of uses within the development	• Ensure sufficient provision of local services to maximise the scope of self containment of the community. • Plan the development to reduce journey time between residential properties and local amenities, employment sites and transport hubs and encourage active transport. • Continue to promote walking and cycling as primary modes of travel, and as part of longer journey through good connections to public transport options.
	High quality placemaking to ensure sustainable travel choices	• Importance of promoting place-making to create streets as places to play and dwell (‘8 to 80 city’). • Cutting traffic to maximise interaction between people, providing places to congregate. Promote a sectoral system using traffic cells to create car free areas. • Opportunity for mobility stations alongside high-density development, as an interchange with access to micromobility and Ultra-Low Emission Vehicle (ULEV) charging.
	Consider approaches to manage demand for car travel including parking	• Importance of promoting place-making and locating parking to rear or in shared parking areas on the edges of the community. Consider paid parking as a source of funding EV charging. • Ensure parking controls to avoid parking in inappropriate locations. • Appropriate levels of off street residential parking in out-of-town shared parking areas are required to facilitate EV parking/charging and discourage people from parking on the pavement. • Pavement parking should be designed out with physical barriers to prevent cars obstructing cyclists and pedestrians, especially those with buggies, wheelchairs or other mobility devices. This may already occur as a result of the Transport Secretary’s bid to make parking on the pavement illegal. • Cycle parking in covered, lockable and overlooked storages should be included for all residential dwellings. • Consider out-of-town covered parking where infrastructure can also be used for energy generation (e.g. photovoltaic cells).

Group	Key planning principle	What does this mean for the future?
Design	Minimise the impact of freight traffic through the development	• Restrict freight access to certain times of the day (overnight, and off-peak where absolutely necessary). • Allow for designated consolidation points on the edge of the development to prevent the need for HGVs to access the centre of the development. • Include consolidated parcel drop points within residential areas to prevent LGVs circulating and making multiple returned trips after failed deliveries. • Invest in the use of low-emission Connected and Autonomous Vehicles (CAVs) for freight transport • Use of Urban Air Mobility solutions and cycle and pedestrian porterage for last mile operations.

Key Principle II - Modal

Group	Key planning principle	What does this mean for the future?
Modal	Prioritisation of walking and cycling for short urban journeys	• Continue to promote walking and cycling as primary modes of travel. • Improve street design to encourage permeability for pedestrians, cyclists and scooters. • Avoid potential conflicts between pedestrian and cycle movements by providing some level of segregation. • Enable walking and cycling to form part of longer journeys by improving connectivity and wayfinding to public transport stops/interchanges. • Ensure appropriate levels of secure cycle parking and encourage facilities within buildings to cater for active travel (e.g. showers and changing facilities). • Provide infrastructure for micro-mobility solutions (electric bikes and scooters) at rail stations, bus stops, local mobility hubs and key destinations. • Consider strategic location of public car parking provision to reduce the impact of vehicle movement through key centres leading to reduced congestion, improved air quality and improved public realm. • Minimise availability of public parking around Meecebrook and include car-free areas.
	Promote PT for medium-long term journeys	• Public transport should be predictable, reliable and affordable. It should remain central to the transport system with sufficiently attractive frequencies to Stafford (with onward connections into Wolverhampton), Stoke (via Stone or direct) and further to Shrewsbury and Keele University. This is important as otherwise vehicle miles are likely to rise with the convenience of CAVs. • Providing high quality interchange at Stafford and Stone will be critical. • Mobility as a Service (MaaS) – provide incentives for people to use public transport for longer urban and inter-urban journeys. • Ensure that communications tools (e.g. real time updates at transport hubs and stops, integrated travel apps) are available to provide people with information about public transport such as times, delays, stops, and routes. • Encourage ride-sharing in CAVs and low-emission alternatives for bespoke journeys based on MaaS, but with consideration for strategies to reduce deadheading (empty vehicle miles). • Supporting delivery of Travel Planning using MaaS and integrated travel apps.

Key Principle III - Infrastructure

Group	Key planning principle	What does this mean for the future?
Infrastructure	Ensure the availability of high-quality wayfinding infrastructure	• Wayfinding infrastructure such as maps, poles and signage are important to people who cannot use or do not have access to a smart phone or GPS map. • Paths should be clear and well-structured. • Landmarks and place-making should be used to give different areas an individual feel and character, and landmarks should make them memorable so that people can find them again with ease. • The user should not have too many navigational choices. • Wayfinding infrastructure should be provided in different media to ensure inclusivity (e.g. Braille, audio etc.)
	Ensure adequate provision for road infrastructure and its maintenance	• Road maintenance will be key to the success of any CAVs as road markings are often used for latitudinal positioning and lane keeping. This will also be needed for drivers of legacy vehicles whilst there is a mixed fleet. • Road signs must also be regularly checked for visibility and be kept up to date. • ULEV infrastructure should be planned and well-maintained to ensure sufficient charging points and appropriate compatibility with different types of ULEV.
	High quality communication infrastructure	• Provide high-speed broadband in new homes to enable people to work from home. • Provide ducting along new routes to enable communications networks to be retrofitted at a lower cost without the need for excavation. • Ensure that Wi-Fi hotspots are available to allow people to make travel arrangements on the go, for smart ticketing, and access on-demand transport. • Provide the necessary communications infrastructure to support 5G roll out and allow for the needs of connected vehicles (Vehicle to Infrastructure communications).

Key Principle IV – Wellbeing and Safety

Group	Key planning principle	What does this mean for the future?
Wellbeing & Safety	Wellbeing: Improvements in health, wellbeing and community interaction	• Ensure that plans for transport design and interventions do not cause severance within communities. • Encourage active transport as a measure to improve public health and increase social interaction within the community.
	Health: Reduction of road transport emissions (air quality)	• Provide appropriate parking and charging points for electric vehicles. • Avoid empty vehicle miles in on-demand private vehicles (e.g. Uber) by maximising use of MaaS apps. • Avoid empty vehicle miles for delivery vehicles through the provision of communal parcel drop points. • Encourage mode shift to active modes and electric buses (perhaps with an incentive for new users such as free tickets for a given period). • General MaaS-type incentives to encourage people to reduce their carbon footprint of travel, including apps/gamification.
	Safety: Transport solutions should be 'safe and secure by design'	• New developments should provide plans about how new mobility solutions, especially CAVs, can be used with conventional modes of travel (e.g. non-connected or manual cars) but also how their use can be maximised by designated CAV service routes around key destinations and urban centres, where there are also segregated active travel and public transport routes, providing multiple journey options. • Dedicated driverless spaces should be built into the local highway network either on a static (permanent lanes or segregated sections) or dynamic basis (lanes which open and close to conventional and CAV traffic at different times of the day). • Take into account cyber security when providing for connected vehicles and MaaS platforms.

Key Principle V - Sustainability

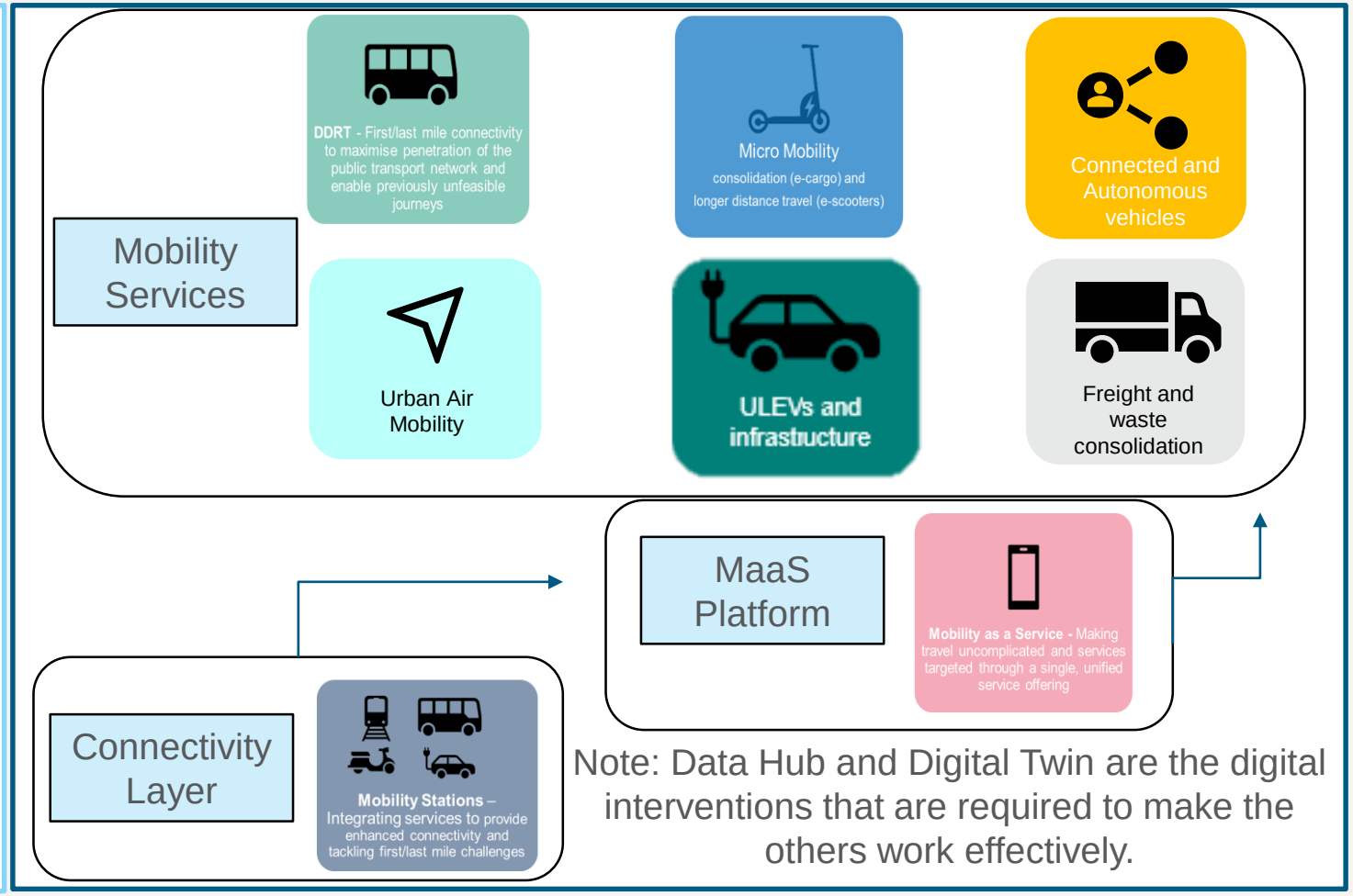
Group	Key planning principle	What does this mean for the future?
Sustainability	Successfully contributing to net-zero carbon emissions	• Future mobility solutions should be planned to be fully consistent with carbon net zero targets for the region. • Emission-free and low-emission solutions, for example walking and cycling, and infrastructure that encourages people to use these modes of transport should be prioritised.
	Commitment to achieving biodiversity net gain	• Design of the development should contribute to biodiversity net gain in the area using green spaces, waterways and ensuring minimal habitat loss. • Transport solutions should have a minimal impact on the environment, with multiple modes using the same corridor (although modes segregated from each other where appropriate) to minimise installation of different systems. • Each route will be subject to rigorous sustainability appraisals to ensure impact of infrastructure is minimised.
	Use of Sustainable Drainage Systems to manage excess water flow	• SuDS should be integrated into the urban planning within the development in order to reduce flood risk and manage surface runoff. • SuDS can be used as a placemaking device as well as having a positive effect on the landscape by recharging lakes, ponds and groundwater supplies.

Future Mobility Interventions

Introduction to Interventions

This section presents potential future mobility interventions and how they could be applied to Meecebrook Garden Community.
To enable the future mobility interventions, a connectivity layer first needs to be established, through both **physical** connectivity through the mobility hubs and **digital** connectivity through the data hub.
A consumer platform is then required to integrate all travel options to provide a seamless door-to-door journey.
Finally, the service layer provides the range of future mobility services that can be made available to enable low-carbon movement that is reliable and convenient.

This approach will ensure that movement around Meecebrook and beyond is active and sustainable, maximising use of transport services.



Mobility as a Service

What is the intervention?

MaaS is the movement away from personally owned and run vehicles to a service-based system of transportation. Public and private transport are all provided by a uniform system (such as an app or website) which has all of the information about the trip, including planning, payment, booking and any loyalty schemes.
MaaS will combine different services to put together the whole trip from door to door, including micro-mobility service booking, taxis or shared cabs, and tickets for public transport. It works with transport 'on demand' so the tickets can be booked anywhere and it will find the best mode to get you to your destination by your chosen time.
MaaS services are generally built around the idea of either a single monthly subscription for all the users of each account, which will then cover the cost of all of the transport that you book within the month, or a pay as you go system for less frequent users. It is designed to cost the same as if you booked your own tickets for these journeys individually. By combining people's journeys into one app, system planners also have the benefit of more data being available to analyse their movements and how they are using the different services.

Opportunities for Meecebrook

MaaS has already begun to be considered by Midlands Connect, with the advent of one single smart ticketing system for the region. This could also include incentives for using public transport such as loyalty schemes or free passes for new users.
For Meecebrook, MaaS will fit well with both the Data Hub and the Local Mobility Hub and Point concepts; most forms of transport will be available from the local hub and points, and a MaaS app will allow users to book onto these for a seamless door-to-door journey in one place, even if it goes outside of Meecebrook itself. The data from these journeys can then be used by the Data Hub for a more up-to-date picture of how people are using these services.

Mobility as a Service

Key delivery, technological and regulatory issues

- MaaS platforms would need to be compatible with services in surrounding areas so that people can move seamlessly between Staffordshire/Midlands Connect and other areas.
- MaaS relies on people to have internet/smartphone access and would not be available to those who do not have/want such technology. This may result in social exclusion and side-by-side alternatives need to be carefully considered to accommodate these groups.
- An integrated MaaS platform requires technical and commercial buy-in from all different service providers.
- Consideration of cost; could be a public scheme paid for by the council, one tendered to private companies who are beginning to provide an all-inclusive service, or a combination
- If MaaS operates with a subscription for all transport in a fixed period, it will need to be open to methods of contactless payment for individual tickets (e.g. for visitors and business people).
- The MaaS and Data Hub platforms will need to be integrated; there are privacy and GDPR risks with collecting, processing and sharing personal data required for operation.

Source: Transportxtra.com

Mobility as a Service - Making travel uncomplicated and services targeted through a single, unified service offering

Data Hub

What is the intervention?

A Data Hub is an IT analytical platform that aggregates different sources of data so that they can work together. It can store, analyse and process large volumes of transport-related data. This could include:

- Detailed mapping grids.
- Mobile network data.
- Traffic movement patterns.
- Vehicle emissions.

It can ultimately provide a single source of data, analysis and simulation techniques required to develop and test required interventions into the transport system.
A Data Hub will allow pooling of different types of data to better understand the way we move, and ultimately to improve security and decision-making.

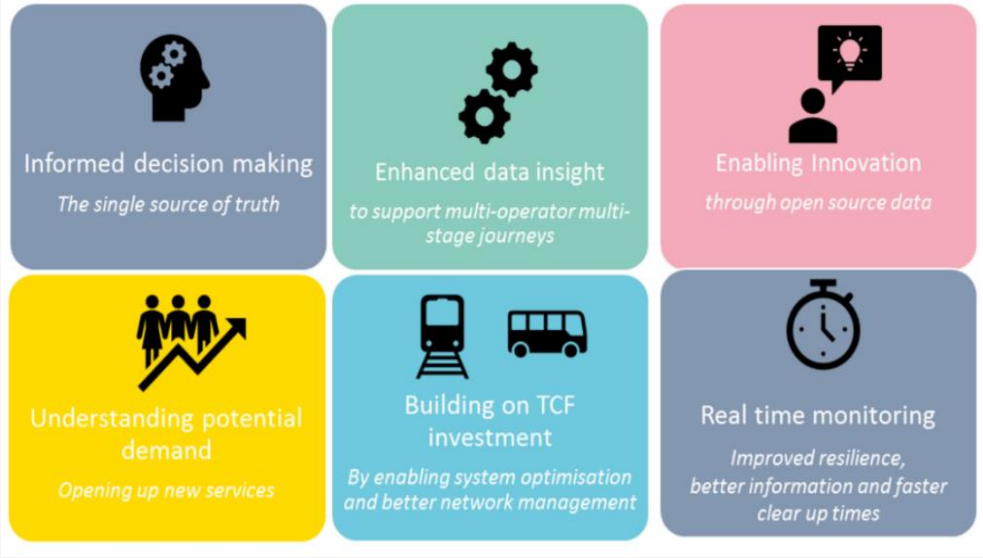
Opportunities for Meecebrook

A Data Hub acts as the central platform which collects, stores, processes and analyses all data that is required for other intelligent interventions such as MaaS, Dynamic Demand Responsive Transport (DDRT), connected vehicles etc.
Aggregating traffic flows and other types of transport-related data will prove useful for Meecebrook for demand management purposes, influencing behaviour, and is essential for the function of Meecebrook as a future mobility hub. It could also feed into a larger Data Hub for Staffordshire as a whole.

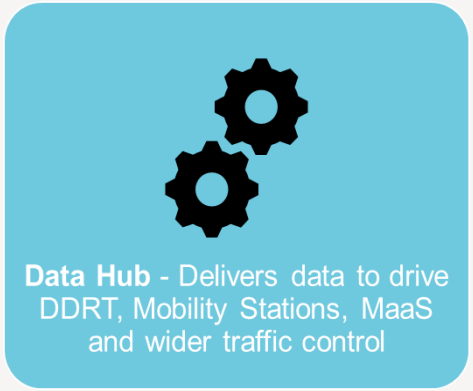
Data Hub

Key delivery, technological and regulatory issues

- Successful development and implementation of a Data Hub is vital for all of the other interventions previously mentioned.
- Significant regulatory considerations concerning data and privacy issues, including GDPR compliance.
- Again, who pays and who controls the Data Hub is a key consideration for the type of service it will provide:
  - If Staffordshire CC owns the datahub, it needs to obtain the data from private companies.
  - This requires cooperation from participating operators and a clear procurement and commercial strategy from the outset.
- Technological limitations pertaining to analysing and processing the large quantities of data required.
- There will be a requirement for suitable infrastructure which is necessary for communication, connectivity and energy to support the Data Hub.



Source: West of England Combined Authority Data Hub proposals



Local Mobility Hubs and Points

What is the intervention?

First and last mile solutions to connect communities to multiple modes of public or shared transport as well as acting as consolidated delivery points for parcels or freight. Mobility hubs and points are defined by:

1. Co-location of public and shared mobility modes.
2. The redesign of space to reduce private car space and improve the surrounding public realm.
3. Clear branding that identifies the space as mobility hub and information and wayfinding to demonstrate the links to the wider transport network.

Mobility hubs and points complement each other and differences are:

	Mobility Hub	Mobility Points
Detail	Larger Mobility Stations, with a range of services offered. This could be in a neighbourhood centre, linked to a train station, park and ride site or a major trip attractor.	Smaller Mobility Stations, that serve local communities. These may just be a bus stop with appropriate branding and route information but could have additional services integrated.
Proposed features	• Integrated public transport services. • Cycle parking infrastructure. • Digital map and wayfinding. • Micromobility options. • EV charging for shared and/or private vehicles. • Car share bays and vehicles. • Drop-off/pick-up points, for passenger/logistics. • A covered waiting area. • Commercial facilities e.g. a cafe. • Parcel locker/freight consolidation.	• Consistent branding. • If located on a public transport route, public transport will be integrated. • Services to connect users to public transport, including micromobility and DDRT. • Cycle parking infrastructure – secure covered storage or lockers. • Static map and wayfinding information. • Potential for parcel lockers/freight consolidation based on size.

Opportunities for Meecebrook

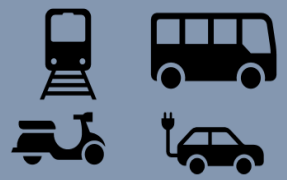
Operating public transport to all corners of Meecebrook will not be viable, therefore mobility hubs and mobility points can extend the reach of public transport services by providing first and last mile solutions to connect people to these services. This is likely to be a crucial part of Meecebrook's future mobility offering as without them it will be difficult to coordinate other mobility interventions and services as they will have nowhere to 'dock', which is particularly key for shared mobility or micro-mobility solutions. The Mobility hubs would act as focal points within Meecebrook, with other satellite Mobility Points placed around the development. Mobility hubs and points also have place-making opportunities, with space for landscaping, art and architecture which make them recognisable and a pleasant place to be.

Local Mobility Hubs and Points

Key delivery, technological and regulatory issues

- For delivery considerations, the larger mobility hubs are to connect people to the public transport network from surrounding neighbourhoods (as a transport interchange point) to reduce the number of vehicles on the main corridors.
- The smaller mobility points should be in every neighbourhood to make the journey from home to destinations or interchange points to reduce car use for local trips.
- It will be essential to make sure the hubs and points are located so that they are accessible to everybody and can be reached preferably by a mode of active travel.
- The main hub will be in an area of premium land cost (centre of the development close to employment sites).
- The technology used in the Hub will require future-proofing so that it does not become obsolete and incompatible with the forms of transport it aims to support.
- All of the hubs and points must have a consistent branding to ensure that they can be identified easily by the user
- The hubs will need to be MaaS-integrated to provide an end-to-end digital transport experience for the user.

Concept design for a Mobility Hub



Mobility Stations – Integrating services to provide enhanced connectivity and tackling first/last mile challenges

Source: West of England Combined Authority Data Hub proposals

Dynamic Demand Responsive Transport and Shared Taxis

What is the intervention?

DDRT is a type of private, shared transport where the route is altered based on demand rather than a fixed timetable. Passengers are generally picked up and dropped off according to their needs.
DDRT has been around for a long time in the form of community transport such as Dial-A-Ride and Door-to-Door; they are initiated in areas of low demand where a regular service is not financially viable, but where people do require some level of service, for example on market days, a one-off bus into town or to other local centres.
A DDRT service will be confined to an operating zone, and the route can take any form. Some DDRT services will always have the same start/finish points (e.g. town centre or rail station) but this does not have to be the case. Bookings must be made with a central dispatch, either online or by phone, and DDRT systems are often equipment with fleet telematics technology which allows the location and timings of the vehicle to be known either by the dispatcher or by the customer.
DDRT could work 'backwards' from a known shift start time, train timetable or other fixed end point, and design its route around the potential users to maximise patronage.

Opportunities for Meecebrook

A DDRT service for Meecebrook would likely operate between residential areas and employment sites, and to key locations such as the mobility hub and the rail station. If integrated with the Data Hub, it would allow for an aggregation of shift data/anticipated train times from its users and provide a route which would maximise the number of possible users while also arriving at its destination on time.
Like other MaaS options this could be bookable through an app, or at the local mobility hub in the centre of the development.
DDRT may also be useful for those who are less mobile, but more flexible with their time such as the elderly, unemployed and parents with children.

Dynamic Demand Response and Shared Taxis

Key delivery, technological and regulatory issues

- DDRT is only economically viable for operation between high-demand start and end points as they require sufficient aggregated data from people's anticipated drop-off time, and enough people using each service to justify its cost.
- Staffordshire will need to work with local businesses, employers and other transport service operators to design appropriate services, but as DDRT could drive patronage to other public transport services from the mobility points, there could be opportunities to integrate ticketing and increase viability.
- DDRT will require a link to both the Data Hub and MaaS platforms to ensure that people can book online. It will also need to collect, aggregate and analyse data for its function.
- There are privacy and GDPR risks with collecting, processing and sharing personal data required for operation.

Source: Severnnet.org

DDRT - First/last mile connectivity to maximise penetration of the public transport network and enable previously unfeasible journeys

Micro-mobility

What is the intervention?

Refers to personal vehicles that can carry one or two people – 'first mile/last mile solutions' - generally an e-bike, e-scooter, e-cargo bike or even very small electric car.
In cities these are generally available on demand using an app, and can be picked up at docking stations or off the street and then returned. They have the potential to make public transport more attractive by solving access issues which users currently experience. They may also lead to wider improvements in road safety, congestion levels and air quality as they remove short car trips from the network.
E-cargo bikes have also been introduced in some cities to allow users to transport heavy or bulky items without the need for a car.
However, they have received mixed reviews as a result of their propensity for being damaged, vandalised or left around the street. Part of the issue is due to a lack of places to park/lock the vehicles at the end of a journey.

Opportunities for Meecebrook

Micro-mobility solutions could be an important part of the transport system in Meecebrook, in order to allow people to access their main transport mode for each journey. Most of the journeys are likely to be from places of residence or offices to the local mobility hub or point, where there will be places to dock the vehicles.
Micro-mobility solutions should be available on demand, and can be paid for by subscription or as a one-off payment for visiting/in-frequent users. Bridging the gaps across the development will be vital in taking private vehicles off the road for completing bespoke trips.

Micro-mobility

Key delivery, technological and regulatory issues

- The regulatory framework will need to be updated to account for people using these new modes either on the road, on the pavement or on dedicated, segregated paths.
- Testing of these vehicles is currently often done on private land; a ‘sandbox’ testing area may need to be created to ensure all testing is under appropriate regulation.
- Sufficient parking infrastructure is needed to encourage responsible behaviour at the end of a journey.
- The council will need to decide who pays for the infrastructure for parking – use of existing companies (OFO, Mobike etc) or will Staffordshire create its own micro-mobility scheme?
- If people are not already able to cycle or ride a scooter, the success of the scheme relies on the majority of the population learning and feeling confident using these new modes.
- Consideration must be given to the technological issues and future-proofing capacity of micro-mobility schemes e.g. charging infrastructure.

Source: cyclelogistics.eu

ULEVs and associated infrastructure

What is the intervention?

There were 1.98 million ULEVs sold in 2018, and there is currently more than twice the average year-on-year sales growth required to meet the sustainable development scenario level by 2030.
There are four types of Electric Vehicle (EV):
Conventional hybrid – combine regular fuel and an electric motor which is charged by regenerative braking.
Plug-in hybrid – similar to hybrid but can be plugged in to charge and can substitute fuel for electricity on the grid.
Battery EVs – run exclusively on electricity via on-board batteries that are plugged in to charge.
Fuel Cell EVs – uses an electric only motor, powered by hydrogen fuel cells.
The range of electric cars currently covers far more than the average journey length in the UK, especially for the commute. However, a consistent and planned approach is required for infrastructure to ensure that people's fears of running out of power on a journey are assuaged. There are other considerations such as load balancing to avoid a rush on grid energy for charging, and installing charging infrastructure in places where it is best available to people.

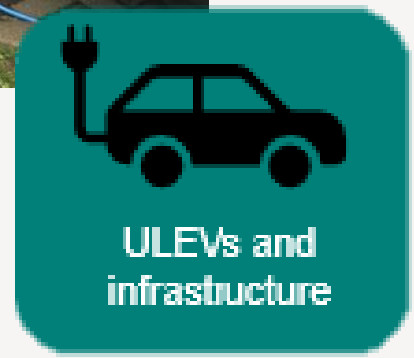
Opportunities for Meecebrook

Approaching plans for ULEVs in a systematic manner is a crucial part of Meecebrook's future transport plans. EVs are already popular and likely to become more so, but there are infrastructure considerations which must be made to facilitate this.
Charging points, such as the Tesla Powerwall, should be made available in at least a proportion of houses and all communal parking areas, and fitting these with solar panels or similar clean energy solutions will help with the pressure on the grid.
Load balancing is crucial using smart charging technology to prevent all cars from charging immediately when plugged in and causing a rush on requirement for electricity.
Furthermore, new National Grid connections can take many years to agree if it is decided that this is necessary for Meecebrook.

ULEVs and associated infrastructure

Key delivery, technological and regulatory issues

- ULEV infrastructure is expensive and will require significant planning to install efficiently.
- If a link to the National Grid is necessary, it requires a long lead-in time.
- There is a need to plan for smart charging to avoid overloading the system and to provide capacity to charge all ULEVs in the development as different companies will have different charger designs.
- Adaptable charging infrastructure will be needed to support the smart charging efforts.
- Provision of ULEV infrastructure will not reduce the number of trips on the network, just the emissions.
- There will still be a significant parking need if most people in the development use ULEVs.
- Consideration of technology compatibility is necessary.



Freight and Waste Consolidation Hubs

What is the intervention?

Freight and waste consolidation works by collecting goods headed for an urban destination into a single hub and consolidating the deliveries into a smaller number of larger loads in order to relieve congestion and air quality impacts that result from many smaller HGV trips. It also reduces the number of empty or partially empty freight containers on the network.

These consolidation solutions are often used in the construction industry and work by sharing the benefits of a ‘last mile’ solution between different freight and waste companies and/or materials providers. The lorries which go between the consolidation hub and any urban destination are ULEVs which further reduces the air quality impact.

Opportunities for Meecebrook

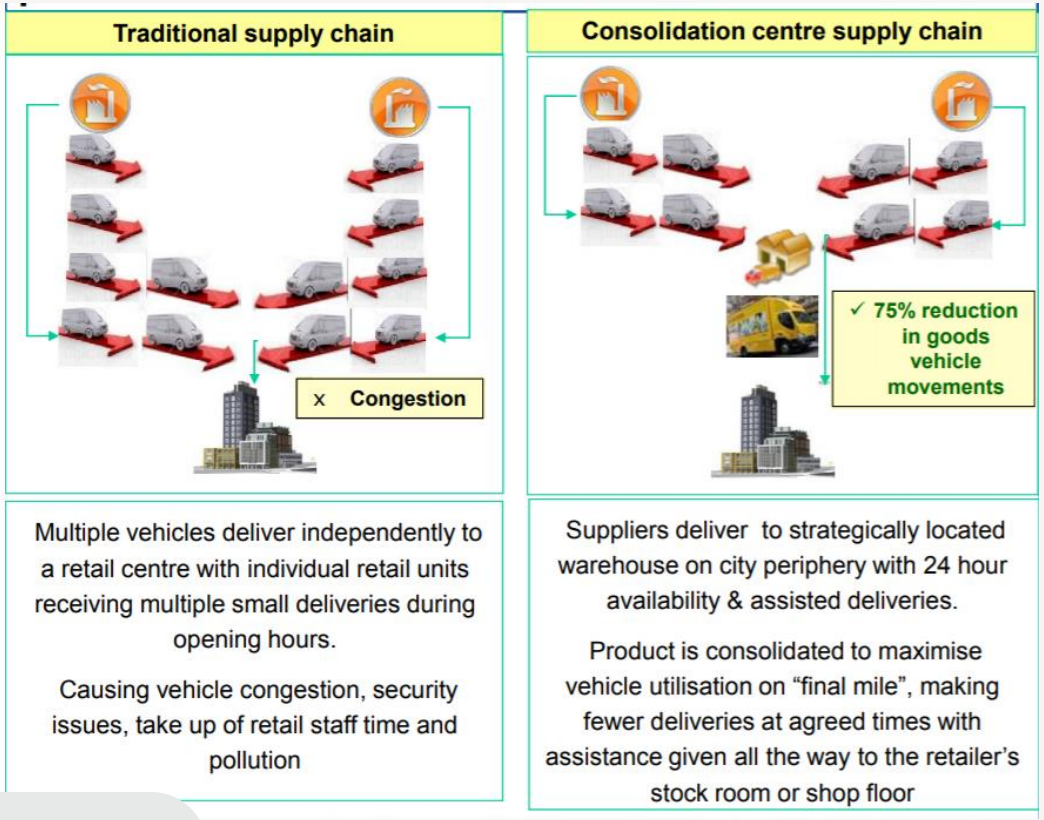
As Meecebrook is a relatively self-contained development, local freight and waste distribution hubs outside the main employment and residential zone will have a positive impact on the number of HGVs on the network, and deal with air quality and congestion risks that come from high-density developments.

Deliveries into the centre of the development can be made at agreed times, with a track and trace system in place in order to keep track of items in transit. It is also likely to result in improved service to end retailers, and cost reduction as a result of the shared storage space and final mile transit solutions.

Freight and Waste Consolidation Hubs

Key delivery, technological and regulatory issues

- Sufficient uptake will be required from local retailers/waste collection services to make the service viable – in order for efficiency savings to be made lorries should be full when leaving the hub.
- The track and trace system will need to be fully secure and be compatible with the Data Hub.
- Local deliveries to/from the consolidation hub must use ULEVs which will require their own infrastructure, such as a depot and appropriate charging infrastructure.
- Who pays for and controls the consolidation hub is crucial:
  - Could be a council-run initiative with retailers paying a per pallet/cage rate.
  - Could be funded by the developer.



Source: civitas.eu

Freight and waste consolidation

Connected Vehicles

What is the intervention?

This often goes hand-in-hand with autonomous and electric vehicles, referred to as CAVs. A connected vehicle is one that can communicate bi-directionally with other systems outside of the vehicle which enables them to share data and information about their surroundings. The technology exists to be applied in two ways; firstly in an individual vehicle to allow it to interact with infrastructure as well as a cloud or back system, and secondly to multiple vehicles acting in a fleet with forward collision warning, lane change and blind spot warning and emergency brake warning for example.
There are different opinions on how 'connected' a successful connected vehicle must be; some are being developed to avoid relying on systems like GPS and network data in order to maintain operation in areas where the coverage of these is low.
The functions of a connected vehicle can also vary. They can be used to provide safety and reliability of journey times by optimising the route, understanding where there is parking availability at the destination and optimising fuel consumption. They could also access services on the go e.g. fuel, parking and tolls, as well as entertainment, driver assistance and breakdown prevention.

Opportunities for Meecebrook

Autonomous, connected and electric vehicles are all likely to be interchangeable in future scenarios as the technology is brought together. This could provide opportunities to optimise traffic flow within Meecebrook as well as driving down emissions by minimising inefficient human driving behaviours like idling and unnecessary braking.
Safety is another major feature of connected vehicles. When fully developed for the road they could result in a better shared space which gives pedestrians and cyclists priority and peace of mind knowing that they are visible to the vehicle far before they would have been visible to a human driver.

Connected Vehicles

Key delivery, technological and regulatory issues

- Requires guaranteed coverage of mobile networks and GPS
- There are privacy and GDPR issues with the sharing of data between vehicle platforms.
- A successful rollout will ultimately require a fully connected fleet.
- Technology compatibility with the autonomous features and the road infrastructure/data platform is important.
- It does not remove the need for parking.
- Retrofitting to older vehicles – eventual phase-in of legislation to limit the use of non-connected vehicles in Meecebrook.
- Legal and insurance issues are not currently resolved.
- There is uncertainty both with the uptake of this technology and the timescale of its rollout.

Source: www.flourishmobility.com

Connected and Autonomous vehicles

Autonomous Vehicles

What is the intervention?

Autonomous vehicles are those which can operate and perform necessary functions themselves without the need for human intervention. They must respond to all external conditions which a human would normally manage.
There are five levels of autonomy:
1 – Driver assistance: driver assistance systems support the driver, but do not take control.
2 – Partly Automated Driving: systems can also take control, but the driver remains responsible for operating the vehicle.
3 – Highly Automated Driving: in certain situations, the driver can disengage from the driving for extended periods of time.
4 – Fully Automated Driving: the vehicle drives independently most of the time. The driver must remain able to drive but can, for example, take a nap.
5 – Full Automation: the vehicle assumes all driving functions, the people in the vehicle are only passengers.
Autonomous vehicles may be able to reduce congestion and improve safety by removing the human behaviours which cause blockages on the road. They are also often more efficient (likely electric) and bring flexible (private) travel to those who cannot access it currently through disability, age or cost.

Opportunities for Meecebrook

Autonomous vehicles are likely to play a major part in any future transport service. Connected vehicles, small Urban Air Mobility (UAM) vehicles and even some mass transit systems will aspire to be autonomous.
For Meecebrook, autonomous vehicles are likely to improve the efficiency with which people drive, reduce the time spent on the network at either end of the journey (e.g. looking for a parking space, searching for a house on a street) and improve road safety.
The technology is not only applicable to private vehicles, but also to mass transit vehicles (as for DDRT) and potentially to micro-mobility vehicles to an extent, so form a fully automated and therefore more predictable system.

Autonomous Vehicles

Key delivery, technological and regulatory issues

- There are currently no autonomous vehicles which can function successfully in mixed traffic. They may need to be segregated from other road users which would increase the overall space that the network requires.
- Other road users may be resistant to autonomous technology as it is new; they may see it as being unreliable and campaign against its usage.
- Where autonomous technology is available in private vehicles and allows the passenger to use their time as they please, it may have the effect of increasing the number of cars on the network.
- Autonomous vehicles require high-quality infrastructure that is carefully and regularly maintained.
- Legal and insurance issues are not currently resolved.
- Technology compatibility with the autonomous features and the road infrastructure/data platform is important.
- There is uncertainty both with the uptake of this technology and the timescale of its rollout.

Source:
www.flourishmobility.com
www.venturer-cars.com

Connected and Autonomous vehicles

Urban Air Mobility

What is the intervention?

NASA define this as ‘safe and efficient air traffic operations in a metropolitan area for manned aircraft and unmanned aircraft systems’.
In an urban environment this mainly refers to Vertical Take-off and Landing aircraft (VTOLs) which do not require a runway and are therefore much more space-efficient. The suggestion would be that existing land could be repurposed with the intention of providing origin hubs for these aircraft e.g. garage roofs, existing helipads, land between road interchanges in order to make the most of the available space.
As more people move into cities, the capacity of the network is stretched. VTOLs can alleviate the pressure by removing light freight (e.g. postal service and couriering), as well as some passenger journeys, to the air.
VTOLs could also be used for medical evacuations, rescue operations, news gathering, ground traffic flow assessment, weather monitoring, package delivery etc.
Airbus has begun to develop the concept of UAM to include MaaS and shared transport opportunities (*Voom*), low-carbon mass transit (*CityAirbus*) and package delivery (*Skyways*).

Opportunities for Meecebrook

UAM has the potential to remove shorter courier trips from the network, in particular LGV courier vans moving from out-of-town warehouses to delivery points within an urban area both commercial and residential.
Consolidation points outside of the town could be used by regular courier services for parcels then to be transported by UAM to lockers at key points within the town, such as the Local Mobility Hub or Point, or to an individual’s house.
The combination of UAM and MaaS is a powerful one, particularly in a shared scenario, as it could not only consolidate but remove several trips from the network simultaneously.

Urban Air Mobility

Key delivery, technological and regulatory issues

- The main risk with implementing a UAM system is the need for a whole new regulatory system, as one does not currently exist:
  - This relies on central government to design the legal framework.
  - Timescales are not in Staffordshire CC's hands.
- The implementation of UAM must not interfere with existing air traffic control regulations or aviation objects.
- UAM must still aim to be zero emissions, even if the air pollution effects would not immediately be felt locally as with private cars.
- UAM infrastructure should be added 'on top' of existing development and not require additional land to be set aside.
- UAM is only relevant for small package delivery for Meecebrook, rather than large-scale transit.
- Public acceptability has the potential of being low due to fears of malfunctions or air crashes.

Source: https://www.airbus.com/innovation/urban-air-mobility.html

Urban Air Mobility

Digital Twin

What is the intervention?

A highly detailed 3D spatial model which is supported by extensive data and simulation capabilities.
Centre for Digital Built Britain definitions:

- A dynamic model of an asset with input of current performance data from the physical twin via live data flows from sensors; feedback into the physical twin via real-time control
- A static strategic planning model of a system, with input of long-term condition data from the physical twin via corporate systems; feedback into the physical twin via capital investment process.

The ultimate aim would be to create a national digital twin which pulls together twins of smaller systems to create one large 'model' of the UK.
The benefits are as follows:
To society – improved stakeholder engagement, better outcomes for the customer and better satisfaction through higher-performing infrastructure.
To the economy – improved national productivity from higher-performing and resilient infrastructure. Possibility of consistently measured outcomes.
To business – new markets, services and products, and better efficiency which benefits the whole chain

Opportunities for Meecebrook

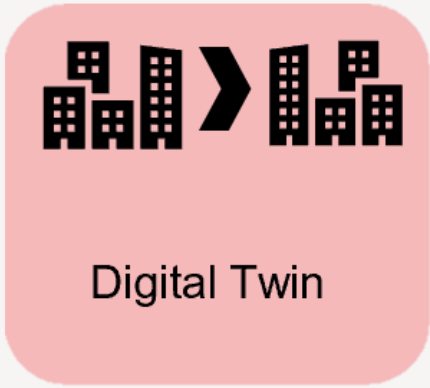
Currently private companies are developing digital twins of their own systems in order to understand how they function in detail, how the parts interact and where the potential savings are.
This could be applicable for the developers of Meecebrook; the Digital Twin provides the outputs of the Data Hub in an engaging and relevant way so that the systems can be streamlined and new interventions can be tested in conjunction with existing ones.
A digital twin could be created for all or parts of Meecebrook, for example buildings, transport and energy, amongst others. This would then be used to optimise the way these systems function, and how they integrate into a broader Staffordshire twin.

Digital Twin

Key delivery, technological and regulatory risks

- If there were a Digital Twin for Meecebrook itself, wider geographic interactions would need to be considered.
- A Digital Twin environment is necessary to ensure a usable format for the outputs from the Data Hub, and to provide a platform for testing.
- Again there are issues with data privacy and GDPR.
- This will produce a highly visual product which can be used in public consultation, but may also provoke more debate as the public can directly see the impacts of interventions on their surroundings.
- Again, who pays and who controls the Digital Twin is a key consideration for the type of service it will provide.
- Sufficient technological expertise and computing power will be necessary for the Digital Twin to function at capacity.

Source: West of England Combined Authority Future Transport Zone proposal

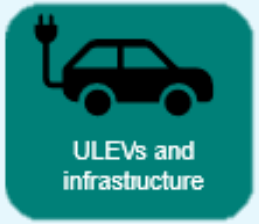


Conclusions

ATKINS
Member of the SNC-Lavalin Group

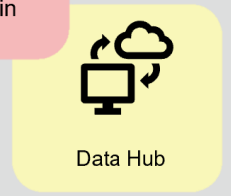
Interventions at Different Levels

Local: Measures which are relevant to Meecebrook as a standalone development and can be implemented at a local level to great effect.



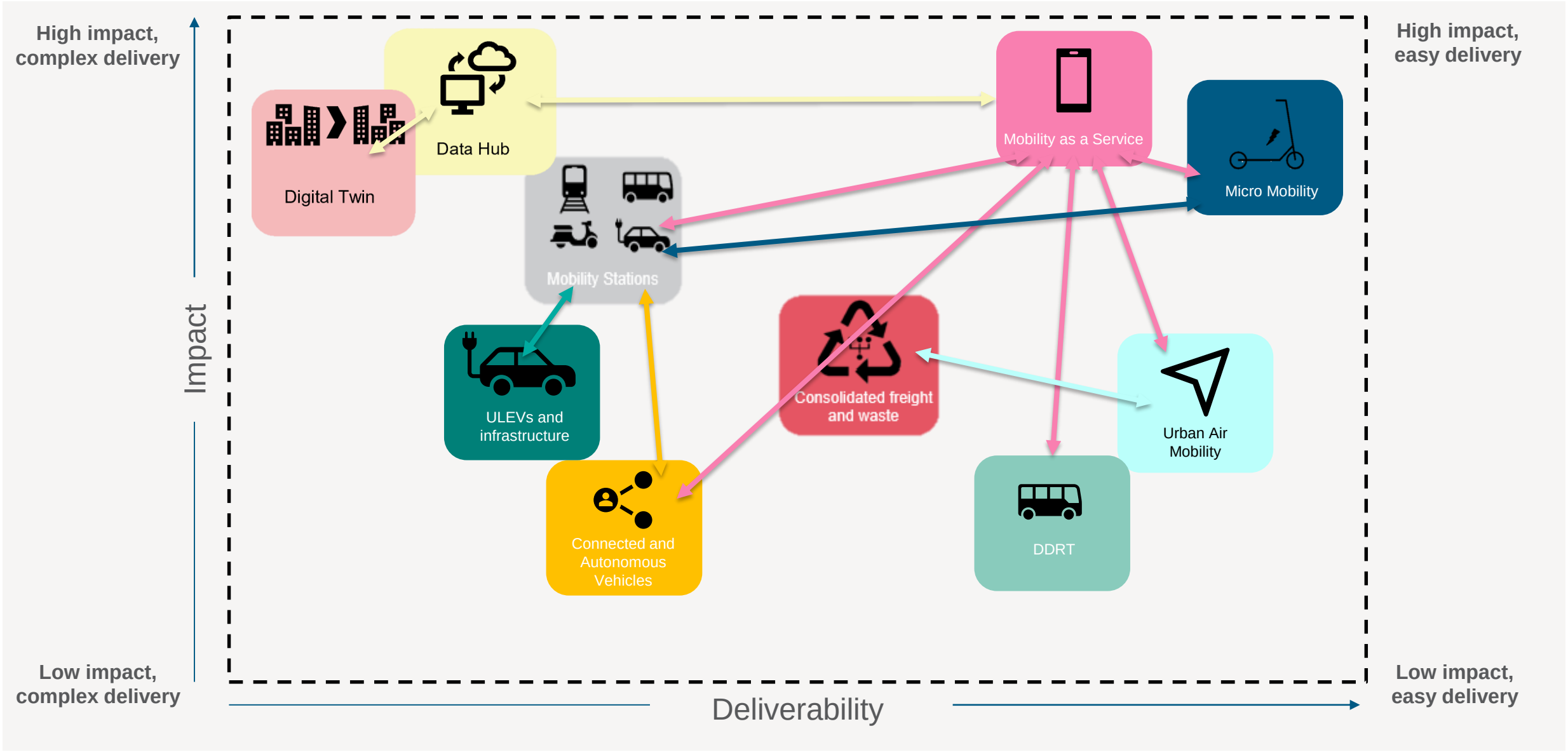
Staffordshire/Midlands: Interventions which require input from the Local Authority and will need to be integrated with mobility plans for the rest of the region.

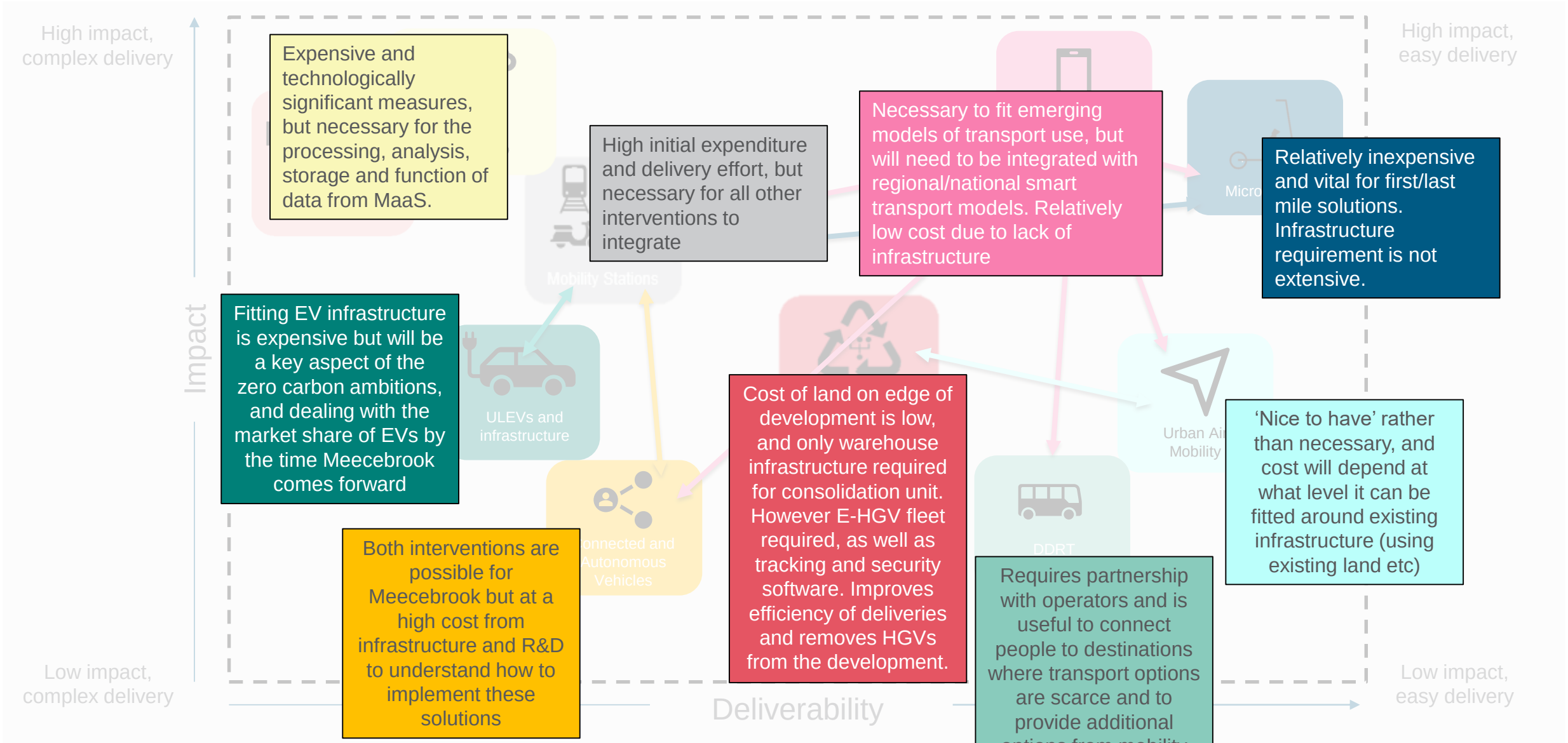
National: Measures in which national policy and legislation is undergoing development, and a clear national legislative framework will be needed.



Data Hub and Digital Twin are the digital interventions that are required at all levels to make the others work effectively.

Overarching interventions


High impact, complex delivery
High impact, easy delivery
Low impact, complex delivery
Low impact, easy delivery
Impact
Deliverability
Data Hub
Digital Twin
Mobility as a Service
Micro Mobility
Mobility Stations
ULEVs and infrastructure
Consolidated freight and waste
Urban Air Mobility
Connected and Autonomous Vehicles
DDRT


High impact, complex delivery
High impact, easy delivery
Low impact, complex delivery
Low impact, easy delivery
Impact
Deliverability
Expensive and technologically significant measures, but necessary for the processing, analysis, storage and function of data from MaaS.
High initial expenditure and delivery effort, but necessary for all other interventions to integrate
Necessary to fit emerging models of transport use, but will need to be integrated with regional/national smart transport models. Relatively low cost due to lack of infrastructure
Relatively inexpensive and vital for first/last mile solutions. Infrastructure requirement is not extensive.
Fitting EV infrastructure is expensive but will be a key aspect of the zero carbon ambitions, and dealing with the market share of EVs by the time Meecebrook comes forward
Cost of land on edge of development is low, and only warehouse infrastructure required for consolidation unit. However E-HGV fleet required, as well as tracking and security software. Improves efficiency of deliveries and removes HGVs from the development.
'Nice to have' rather than necessary, and cost will depend at what level it can be fitted around existing infrastructure (using existing land etc)
Both interventions are possible for Meecebrook but at a high cost from infrastructure and R&D to understand how to implement these solutions
Requires partnership with operators and is useful to connect people to destinations where transport options are scarce and to provide additional options from mobility hubs and points
Mobility Stations
ULEVs and infrastructure
Micro
Urban Air Mobility
DDRT
onnected and Autonomous Vehicles

Recommendations

This report has identified some of the key transport and design priorities and considerations that should feed into the final design and strategic transport planning process for the Meecebrook Garden Community. It has demonstrated some key tenets which underpin the planning of a successful, future-proofed development; the focus should remain on facilitating active travel before other vehicular transport modes, and placemaking which prioritises pedestrians and cyclists should be seen as part of this process. Other future mobilities interventions have been outlined within this report which could then be implemented to maximise the sustainable transport offering within the Meecebrook Garden Community.

To progress these opportunities, the following next steps are summarised as follows, with more details given overleaf:

1. Develop a strategy for applying the key masterplanning principles to Meecebrook Garden Community
2. Shortlist future mobilities interventions for Meecebrook Garden Community
3. Identify future resource, infrastructure and logistical issues which will require buy-in from other suppliers and stakeholders
4. Engage with local and regional authorities and other stakeholders to ensure compatibility with wider schemes

1. Consider the key principles outlined in this report and develop an initial strategy for their inclusion in the design and planning of the Meecebrook Garden Community. This will include making fundamental decisions such as how to structure the land use, how to manage demand for parking, and whether there will be car-free areas of the development.

2. Identify which of the future mobilities solutions best match the needs of Meecebrook as a site, as well as the key principles and priorities set out in this report, and therefore which should be taken forward as part of a strategic plan for Meecebrook. Where measures requiring land take are selected, these must be considered alongside any traditional highways infrastructure or land use decisions.

3. In conjunction with evidence from the TDM spreadsheet and, in the future, modelling outputs, identify the resource and logistical issues pertaining to future mobilities which will require buy-in from key suppliers and stakeholders. This includes the current limitations to power supply for a transport system which will likely be predominately electric thus requiring input from the National Grid, the legal framework requirements arising from the use of CAVs and UAM, and the infrastructure to supply sufficient mobile and digital connectivity.

4. Engagement with local and regional authorities and other stakeholders such as Midlands Connect are key to the compatibility of different transport systems both in and outside of Meecebrook. Consulting with Midlands Connect and Transport for the North regarding plans for smart ticketing schemes and MaaS will be a starting point, and understanding their plans for incorporating mobility technology into their future strategies will help Meecebrook integrate within the region, with sustainable transport options both internally and to other destinations further afield.

Appendix B. Travel Demand Model

ATKINS

Member of the SNC-Lavalin Group

Meecebrook Garden Community Transport Strategy

Travel Demand Model - Methodology Statement

Staffordshire County Council / Stafford Borough Council

April 2020

Methodology Statement

Notice

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Document reference: Methodology Statement

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Rev 2.0	Updated with client comments	AD	AT	SY	SY	02/07/2020

Client signoff

Client	Staffordshire County Council / Stafford Borough Council/ Stafford Borough Council
Project	Meecebrook Garden Community Transport Strategy
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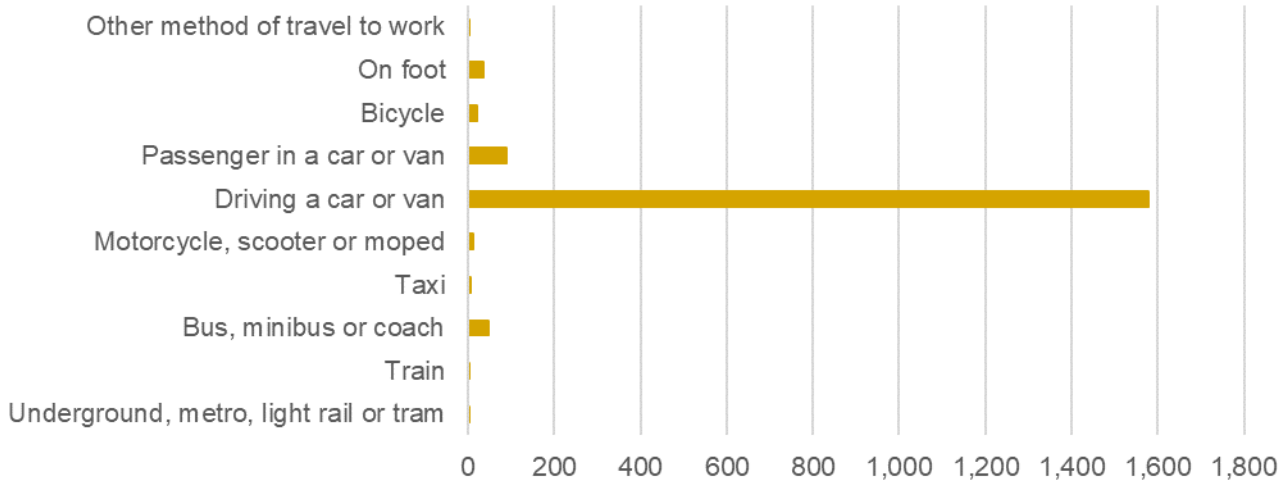

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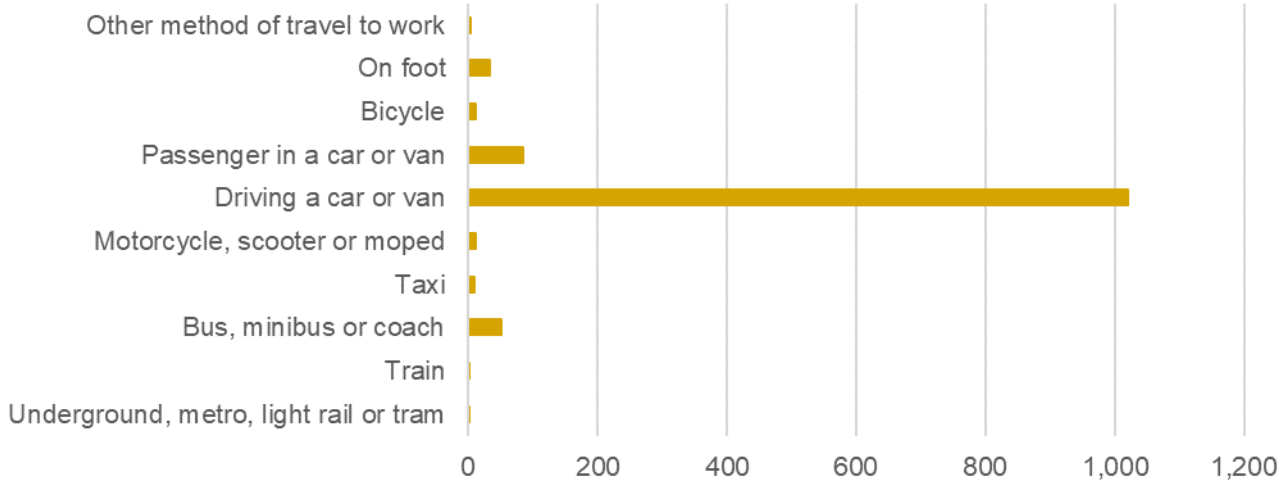

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Figure 3-4 - Modal Split - External Trips from Stafford (Departures AM Peak)

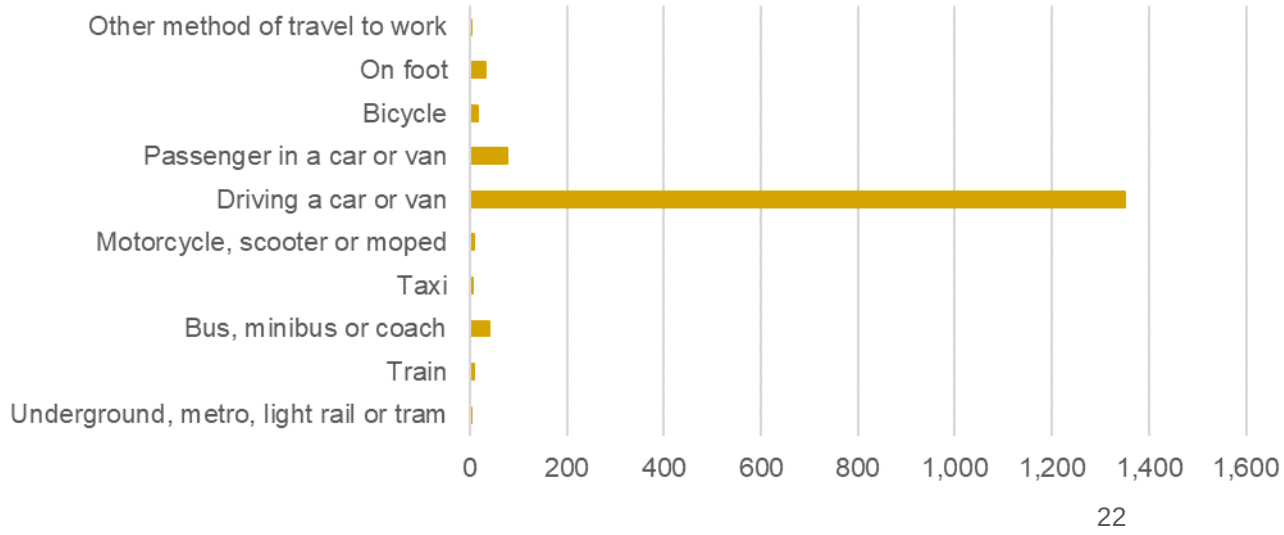

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Figure 3-5 - Modal Split - External Trips from Stafford (Arrivals PM Peak)

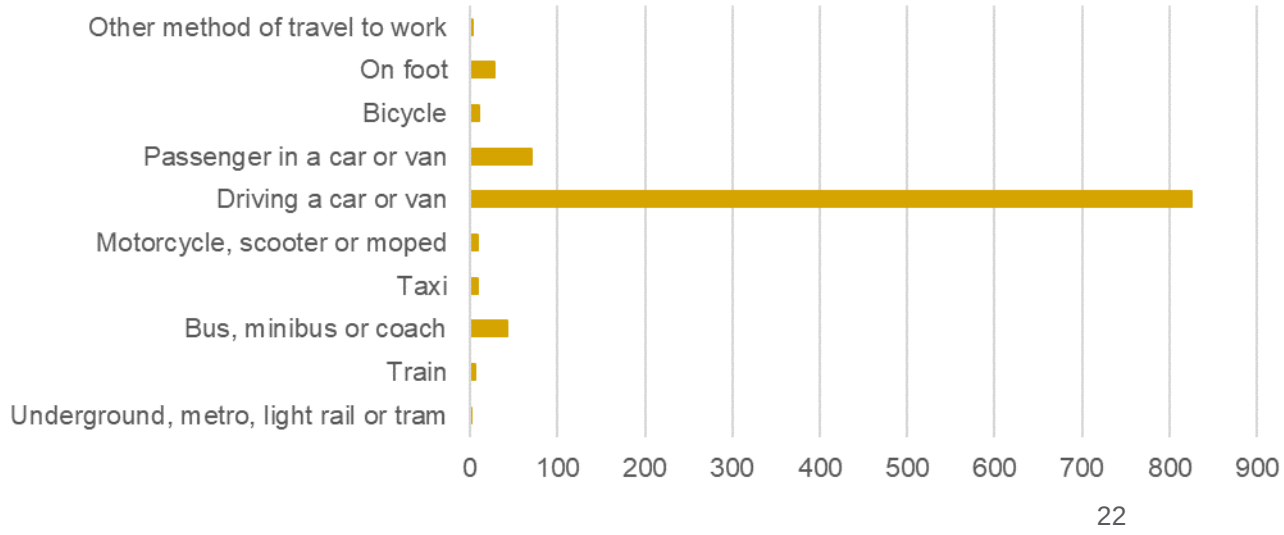

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Figure 3-6 – Vehicular Trip Generation by Destination

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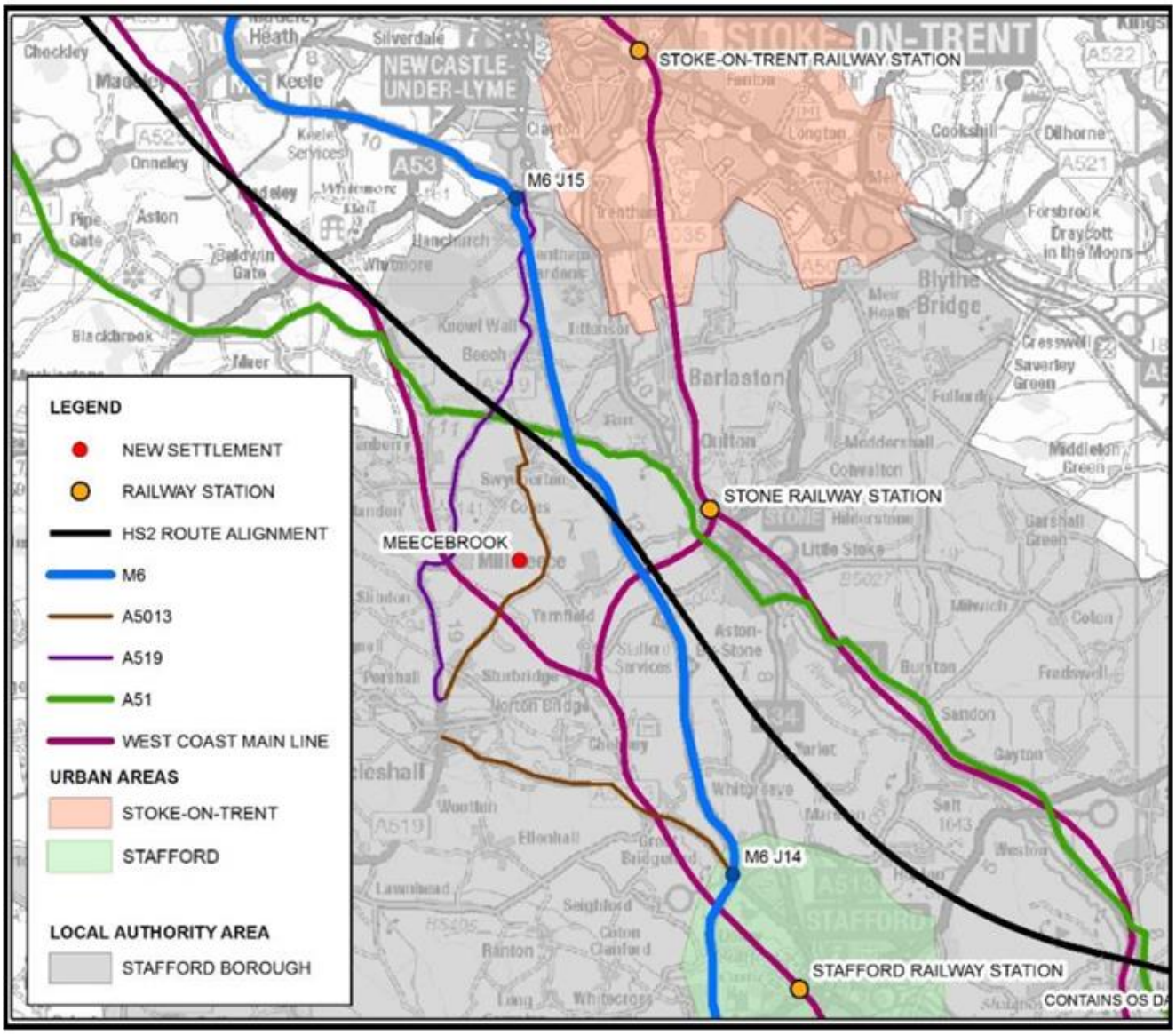
1. Introduction

1.1. Background

Atkins has been commissioned by Staffordshire County Council (SCC), on behalf of Stafford Borough Council (SBC), to provide transport planning services to support the ongoing promotion and development of Meecebrook Garden Community, Staffordshire (see site location on Figure 1-1). As part of the commission, Atkins has agreed to construct a Travel Demand Model (TDM) to establish the potential transport impacts associated with the proposed garden community at Meecebrook.

It should be noted that the TDM to accompany this report is saved as a spreadsheet model and has been provided to SCC for their use in relation to the ongoing development of Meecebrook Garden Community.

Figure 1 -1 – Meecebrook Garden Community Site Location Plan



1.2. Meecebrook Garden Community

It is understood that Stafford Borough has been selected by Government as a possible location for a new garden community with the Government contributing funds to develop detailed plans for the key infrastructure required to support a sustainable development.

The proposed development quantum associated with the proposed garden community is unknown at this stage, however it is assumed that the development proposals could include;

- Approximately 10,000 new homes;
- 20 hectares of new employment land;
- 300 hectares of green space including parks and recreational space; and
- New schools and health centres.

In addition to the development quantum outlined above, it is understood that SCC are engaging with Network Rail regarding the potential to deliver a new railway station on the West Coast Mainline.

1.3. Site Location and Existing Transport Network

As outlined on Figure 1-1, Meecebrook is located within Stafford Borough, approximately 12km to the south of Stoke-on-Trent and 15km to the north of Stafford. The A5013, A519 and the A51 provide local connectivity between the site and the nearby urban areas, including Stone.

The site is also located in close proximity to the Strategic Road Network (SRN) with J14 of the M6 located approximately 11km to the south and J15 of the M6 located approximately 8km to the north. The M6 which runs in a north-south direction and provides connectivity between Coventry, Birmingham, Stoke-on-Trent, Preston, Lancaster, and Carlisle.

Stafford Borough has good rail connectivity and is served by the West Coast Main Line with existing railway stations located at Stone, Stafford and Stoke-on-Trent. It is important to note that the proposed alignment of HS2 runs to the north of the site. It is proposed that Stoke will become an 'integrated high-speed station' where passengers can travel on classic-compatible HS2 trains and access the high-speed network to the South.

1.4. Report Purpose

The purpose of this report is to provide SCC/SBC with a methodology statement outlining the analysis undertaken to inform the TDM. This report will also outline the preliminary findings associated with the TDM which has been constructed to establish the potential scale of vehicles generated from the proposed garden community at Meecebrook. This will help support SBC promote and develop the proposed development.

It should be noted that the preliminary findings associated with the TDM are based on several assumptions in relation to the proposed development quantum. These assumptions are outlined in Section 3 of this report.

1.5. Report Format

This report is structured into the following sections:

- Section 2 provides a summary of the methodology and assumptions used to inform the TDM;
- Section 3 provides a summary of the initial findings associated with the TDM; and
- Section 4 provides a summary of the recommended next steps for stakeholder consideration.

2. Travel Demand Model

2.1. Introduction

A TDM spreadsheet tool has been constructed to establish the potential scale of trips generated from the proposed garden community at Meecebrook. The purpose of the TDM is as follows:

- To provide an initial appraisal of the number of internal/ external person trips generated by the development proposals;
- To provide a high-level understanding of the trip distribution and direction of travel associated with the external trip generation;
- To provide an understanding of the mode share associated with the trip generation and how this is affected by the origin-destination of each trip;
- To demonstrate the potential impact of constructing a new railway station on the West Coast Mainline; and
- To inform the origin-destinations for the proposed garden community at Meecebrook in a future strategic highway model.

This section of the report provides a summary of the methodology and assumptions used to inform the construction of the TDM.

It should be noted that the TDM spreadsheet tool forecasts the number of trips by mode based on existing trip patterns. Therefore, the TDM does not consider any specific mitigation measures other than the potential impact of constructing a new railway station on the West Coast Mainline. The outputs from the TDM spreadsheet tool therefore represent a 'worst case' scenario and provide the client with an indication of the key transport corridors which will serve the proposed development.

These key transport corridors will require mitigation and/or investment in order to promote alternative sustainable modes of transport and reduce car dependency. Therefore, the findings of this report and the TDM spreadsheet tool should be considered alongside the analysis undertaken by Atkins regarding the potential surrounding Future Mobility Solutions to determine the long-term strategy for delivering the transport infrastructure required to serve the proposed garden community at Meecebrook.

2.2. Trip Generation

To calculate the proposed trip generation associated with the potential development quantum, person trip rates were obtained using the Trip Rate Information Computer System (TRICS) database (v.7.6.3). A summary of the key person trip rates used to inform the TDM spreadsheet are presented in Table 2-1. The full TRICS outputs are provided in the TDM spreadsheet.

Table 2-1 – Summary of Person Trip Rates

Land Use	Units	AM (08:00-09:00)			PM (17:00-18:00)		
		Arrivals	Departures	Total	Arrivals	Departures	Total
B1 (A) Office	Trips/ 100m^2	2.76	0.26	3.02	0.29	2.37	2.65
B1 (C) Light Industry	Trips/ 100m^2	1.00	0.25	1.25	0.25	1.01	1.25
B2 Industrial Estate	Trips/ 100m^2	0.45	0.21	0.66	0.13	0.44	0.57
B8 Commercial Warehousing	Trips/ 100m^2	0.23	0.07	0.29	0.02	0.16	0.18
Average Residential	Trips/ dwelling	0.20	0.70	0.91	0.50	0.31	0.67
Primary School	Trips/ pupil	1.19	0.31	1.50	0.03	0.08	0.10
Secondary School	Trips/ pupil	0.83	0.09	0.93	0.13	0.08	0.20
Local Shopping Centre	Trips/ 100m^2	16.51	16.77	33.27	14.56	16.71	31.27

2.3. Trip Distribution

A gravity model has been used to forecast the trip distribution associated with the proposed garden community at Meecebrook. A gravity model is an analytical tool which can be used to forecast future trip distribution patterns. Gravity model theory states that the trip interchange between zones depends on the relative attraction of each of the zones and on some function of the spatial separation between zones. With regards to the Meecebrook gravity model, the attraction is based on the employment (workday) or residential population within each local authority, and the physical distance between each local authority and the proposed development site. The gravity model then calculates how attractive each local authority area is to a new resident living at Meecebrook or travelling to Meecebrook for work based on the distance and employment opportunities.

Two gravity models have been created for within the TDM spreadsheet to determine the external trip distribution for the site. The first gravity model captures the external trip distribution of those residents within Meecebrook travelling to a single place of employment (workday population), and the second gravity model captures the trip distribution of those residents who travel to Meecebrook for employment (resident population). Understanding the potential trip patterns associated with the proposed development provides an indication of the future travel demand and will allow SCC to understand the potential constraints on the existing transport network.

2.3.1. Workday Population

To determine how many people work in different local authority areas, workday population data from the 2011 Census was extracted from Nomis (WD601EW Economic Activity). This dataset was extracted at the Middle Super Output Area (MSOA) level and then aggregated to local authority areas to determine the workday population. The proposed number of jobs at Meecebrook from the employment land uses has also be included in the workday population to determine the proportion of people who would work and live within Meecebrook and therefore wouldn't use the external transport network.

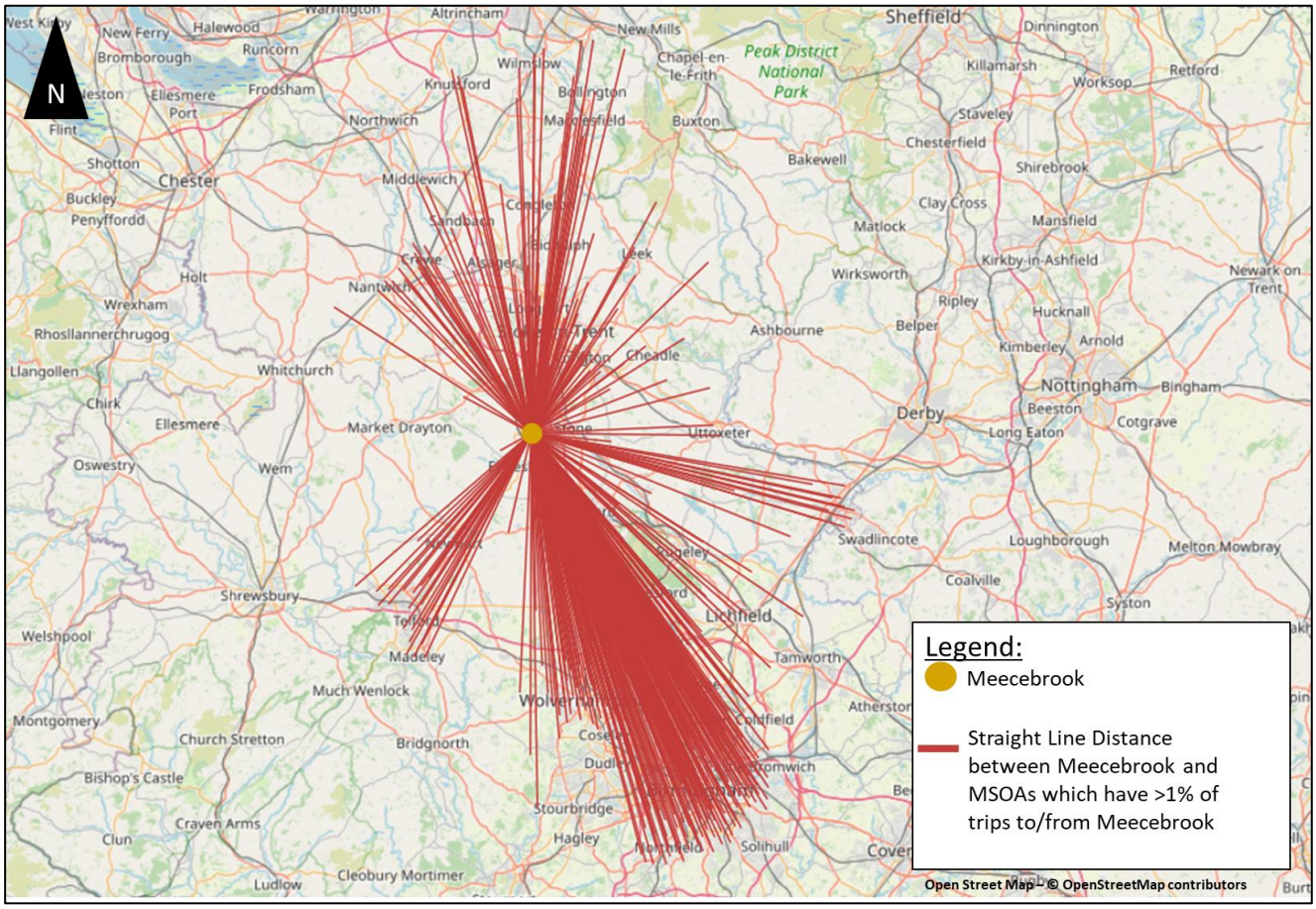
2.3.2. Resident Population

To determine the future demand for employment within Meecebrook, resident population data from the 2011 Census has been extracted from Nomis (KS101EW Usual Resident Population). This dataset was extracted at the MSOA level and then aggregated to local authority areas to determine the resident population.

2.3.3. Straight Line Distance

The physical distance between each MSOA identified and Meecebrook has been calculated as the straight-line distance between the centre of each MSOA and the centre of the proposed development site using Geographic Information Systems (GIS) software (see Figure 2-1).

Figure 2-1 - Straight Line Distance between Meecebrook Garden Community and each MSOA



The straight-line distance between Meecebrook and each MSOA shown in Figure 2-1 was aggregated to the Local Authority Level to produce the average distances outlined in Table 2-2.

The average straight-line distances have been classified based on trip distance into short, medium, or long-distance trips. Short-distance trips are considered to be those trips up to 5km, medium-distance trips are considered to be those between 5km and 30km, and long-distance trips are considered to be those over 30km.

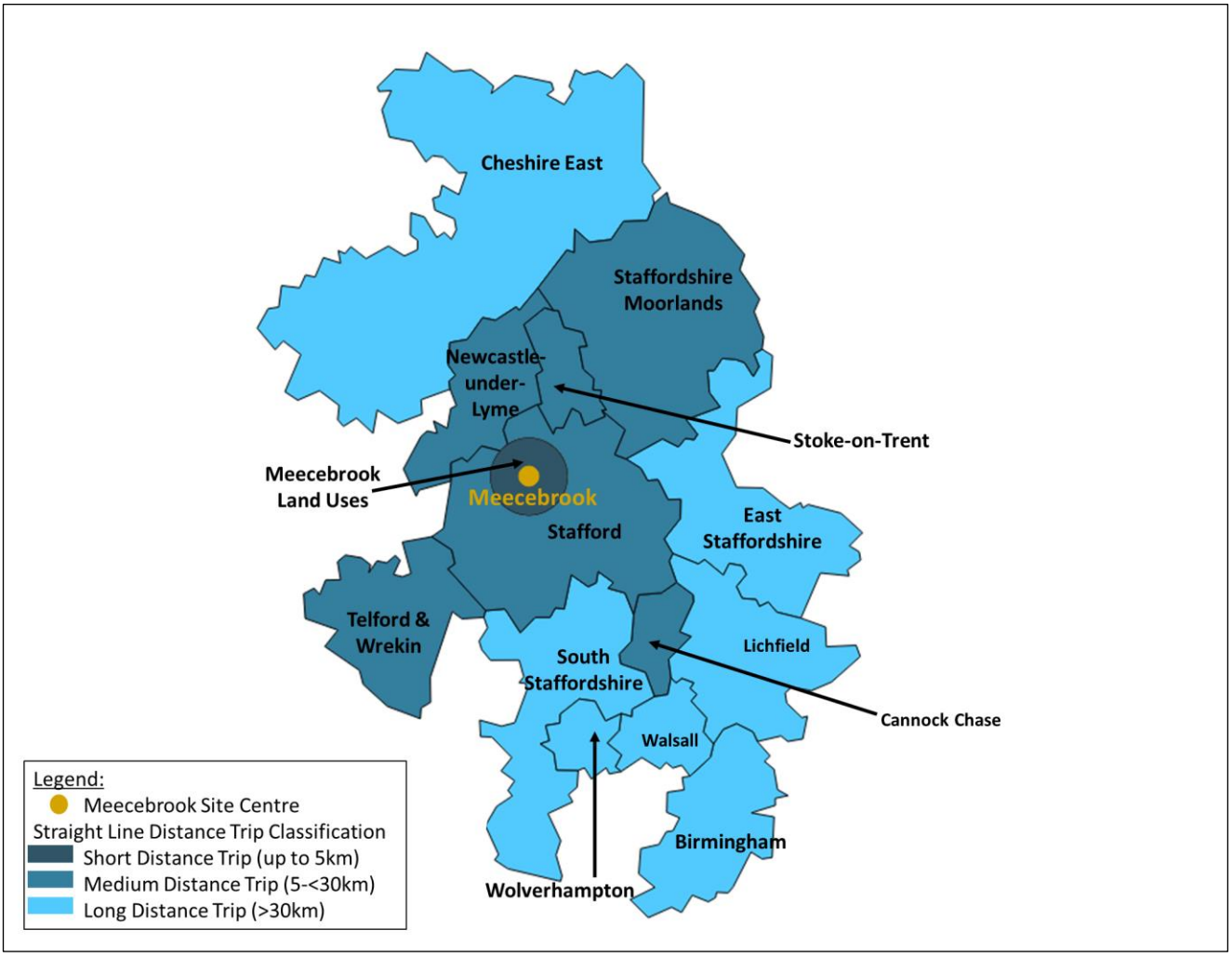
Table 2-2 - Average Straight-Line Distance and Trip Length - Local Authority Level

Destination	Average Distance (km)	Trip Distance Classification
Birmingham	53	Long
Cheshire East	35	Long
Stoke-on-Trent	14	Medium
Wolverhampton	35	Long
Walsall	37	Long
Telford & Wrekin	27	Medium
Stafford	11	Medium
East Staffordshire	36	Long
Newcastle-under-Lyme	15	Medium

Destination	Average Distance (km)	Trip Distance Classification
Lichfield	35	Long
Cannock Chase	26	Medium
South Staffordshire	32	Long
Staffordshire Moorlands	24	Medium
Meecebrook	5	Short

Figure 2-2 shows that out of the 14 Local Authority Destinations, one is classified as a short-distance trip, six are classified as medium-distance trips, and seven are classified as long-distance trips. This reflects the nature of the proposed development, with Meecebrook serving as a new settlement rather than an extension to an existing urban area.

Figure 2-2 - Trip Distance Classification from Meecebrook Garden Community by Straight Line Distance



2.4. Gravity Model Outputs

Table 2-3 presents the outputs from the gravity model for the Workday Population. This shows the trip distribution breakdown for where people who live in Meecebrook travel to a single place of employment.

Table 2-3 - Trip Distribution – From Meecebrook Garden Community to Workplace Destination

Workplace Destination	Trip Distribution (%)
Birmingham	6.8%
Cheshire East	5.3%
Stoke-on-Trent	21.2%
Wolverhampton	3.4%
Walsall	2.9%
Telford and Wrekin	4.1%
Stafford	18.3%
East Staffordshire	1.6%
Newcastle-under-Lyme	7.6%
Lichfield	1.3%
Cannock Chase	2.1%
South Staffordshire	1.3%
Staffordshire Moorlands	2.2%
Meecebrook Employment[1]	21.7%

Table 2-4 presents the outputs from the gravity model for the Resident Population. This shows the trip distribution breakdown for where people who work in Meecebrook currently reside.

Table 2-4 - Trip Distribution - From Place of Residence to Meecebrook Garden Community for Employment

Usual Residence	Trip Distribution (%)
Birmingham	8.4%
Cheshire East	6.4%
Stoke-on-Trent	26.6%
Wolverhampton	4.4%
Walsall	4.2%
Telford and Wrekin	4.8%
Stafford	21.4%
East Staffordshire	1.9%
Newcastle-under-Lyme	11.2%
Lichfield	1.8%
Cannock Chase	3.0%
South Staffordshire	2.3%
Staffordshire Moorlands	3.7%

[1] Meecebrook Employment accounts for the new employment opportunities proposed as part of the development. This represents those trips from residents within Meecebrook to the employment located within Meecebrook and therefore would be considered 'internal' trips.

2.5. Mode Share

The outputs from the Gravity Model provide an indication of the trip distribution and the origin/ destination of the resident and employment trip generation. However, the outputs do not provide an indication of how these trips will be made. Modal choice analysis determines what mode of transport will be used to make these trips (e.g. train, bus, car driver, bicycle). Mode share data for the Meecebrook TDM spreadsheet model has been obtained from Nomis using Census 2011 data (WU03UK Location of usual residence and place of work by method of travel to work).

The TDM spreadsheet takes into consideration two separate scenarios to represent the mode share;

- Scenario 1 - with a new railway station on the West Coast Mainline (as part of the development proposals); and
- Scenario 2 - without a new railway station on the West Coast Mainline.

The mode share for Scenario 1 has been benchmarked against Stafford, as Stafford has a rail connection onto the West Coast Mainline and it is therefore assumed Meecebrook could have similar travel characteristics. For Scenario 2 the modal split has used benchmarked data for Newcastle-Under-Lyme. Newcastle-under-Lyme was chosen as a robust alternative location to obtain a train mode share split from, as the town does not have its own railway station but is located near to Stoke-on-Trent and Crewe which have railway stations available.

This is considered comparable to the proposed development site, however, the mode shares used should be treated as preliminary estimates. It is anticipated that the SLC study into the feasibility of constructing a new railway station on the West Coast Main Line will identify the available capacity and rail forecast demands. Following a review of the SLC Study the estimates and assumptions included within the TDM will be refined.

Table 2-5 and Table 2-6 present the mode share of people travelling to work in Meecebrook, and people travelling to work from Meecebrook respectively. This scenario assumes that a new railway station would be constructed on the West Coast Mainline.

Table 2-7 and Table 2-8 present the mode share of people travelling to work in Meecebrook, and people travelling to work from Meecebrook respectively. This scenario assumes that a new railway station would not be constructed on the West Coast Mainline, however, it is assumed that some people will still travel to one of the nearby existing railway stations and continue their onward journey,

It is important to note that the modal splits presented in the following tables are for external trips from Meecebrook and exclude internal trips within Meecebrook. It is assumed that most internal trips would be sustainable, either by walking or cycling.

Table 2-5 - Mode Share of people travelling to Meecebrook Garden Community (New Railway Station)

Origin	Underground, metro, light rail or tram	Train	Bus, minibus or coach	Taxi	Motorcycle, scooter or moped	Driving a car or van	Passenger in a car or van	Other method of travel to work
Birmingham	0%	11%	3%	0%	0%	76%	7%	2%
Cheshire East	0%	6%	1%	0%	0%	88%	4%	1%
Stoke-on-Trent	0%	0%	4%	1%	1%	81%	7%	5%
Wolverhampton	0%	7%	2%	1%	1%	82%	4%	3%
Walsall	0%	1%	3%	0%	1%	85%	6%	3%
Telford & Wrekin	0%	0%	2%	0%	1%	90%	6%	1%
Stafford	0%	1%	4%	1%	1%	81%	7%	4%
East Staffordshire	0%	0%	1%	0%	1%	91%	3%	4%
Newcastle-under-Lyme	0%	0%	3%	0%	1%	85%	6%	4%
Lichfield	0%	1%	3%	0%	0%	89%	5%	3%
Cannock Chase	0%	1%	7%	0%	1%	83%	5%	3%
South Staffordshire	0%	2%	4%	0%	1%	86%	4%	3%
Staffordshire Moorlands	0%	0%	1%	0%	1%	90%	4%	4%

Table 2-6 - Mode Share of people travelling from Meecebrook Garden Community (New Railway Station)

Destination	Underground, metro, light rail or tram	Train	Bus, minibus or coach	Taxi	Motorcycle, scooter or moped	Driving a car or van	Passenger in a car or van	Other method of travel to work
Birmingham	1%	39%	1%	0%	1%	55%	2%	0%
Cheshire East	0%	7%	1%	0%	1%	83%	4%	4%
Stoke-on-Trent	0%	0%	2%	0%	1%	88%	5%	4%
Wolverhampton	0%	9%	0%	0%	1%	86%	3%	1%
Walsall	0%	2%	1%	0%	1%	91%	4%	2%
Telford & Wrekin	0%	0%	4%	0%	1%	89%	4%	1%
Stafford	0%	1%	2%	0%	1%	88%	5%	3%
East Staffordshire	0%	1%	0%	0%	1%	92%	4%	2%
Newcastle-under-Lyme	0%	1%	3%	0%	1%	88%	5%	3%
Lichfield	0%	0%	2%	0%	1%	92%	3%	2%
Cannock Chase	0%	0%	3%	0%	1%	89%	4%	2%
South Staffordshire	0%	0%	4%	0%	1%	79%	7%	8%
Staffordshire Moorlands	0%	0%	1%	0%	1%	86%	6%	6%
Meecebrook Employment	0%	0%	0%	0%	0%	0%	0%	100%

Table 2-7 - Mode Share of people travelling to Meecebrook Garden Community (No Railway Station)

Origin	Underground, metro, light rail or tram	Train	Bus, minibus or coach	Taxi	Motorcycle, scooter or moped	Driving a car or van	Passenger in a car or van	Other method of travel to work
Birmingham	0%	6%	3%	0%	0%	81%	7%	2%
Cheshire East	0%	1%	1%	0%	0%	93%	4%	1%
Stoke-on-Trent	0%	0%	4%	1%	1%	82%	7%	4%
Wolverhampton	0%	4%	2%	1%	1%	85%	4%	3%
Walsall	0%	0%	3%	0%	1%	86%	6%	3%
Telford & Wrekin	0%	3%	2%	0%	1%	88%	6%	1%
Stafford	0%	1%	4%	1%	1%	82%	7%	4%
East Staffordshire	0%	2%	1%	0%	1%	89%	3%	4%
Newcastle-under-Lyme	0%	0%	3%	0%	1%	85%	6%	4%
Lichfield	0%	0%	3%	0%	0%	89%	5%	3%
Cannock Chase	0%	0%	7%	0%	1%	84%	5%	3%
South Staffordshire	0%	0%	4%	0%	1%	88%	4%	3%
Staffordshire Moorlands	0%	0%	1%	0%	1%	90%	4%	4%

Table 2-8 - Mode Share of people travelling from Meecebrook Garden Community (No Railway Station)

Destination	Underground, metro, light rail or tram	Train	Bus, minibus or coach	Taxi	Motorcycle, scooter or moped	Driving a car or van	Passenger in a car or van	Other method of travel to work
Birmingham	1%	18%	1%	0%	1%	77%	2%	1%
Cheshire East	0%	1%	1%	0%	1%	89%	4%	4%
Stoke-on-Trent	0%	0%	2%	0%	1%	89%	5%	3%
Wolverhampton	0%	4%	0%	0%	1%	91%	3%	1%
Walsall	0%	1%	1%	0%	1%	91%	4%	2%
Telford & Wrekin	0%	1%	4%	0%	1%	88%	4%	1%
Stafford	0%	0%	2%	0%	1%	89%	5%	3%
East Staffordshire	0%	0%	0%	0%	1%	92%	4%	2%
Newcastle-under-Lyme	0%	0%	3%	0%	1%	89%	5%	3%
Lichfield	0%	5%	2%	0%	1%	87%	3%	2%
Cannock Chase	0%	1%	3%	0%	1%	89%	4%	2%
South Staffordshire	0%	1%	4%	0%	1%	79%	7%	8%
Staffordshire Moorlands	0%	0%	1%	0%	1%	86%	6%	6%
Meecebrook Employment	0%	0%	0%	0%	0%	0%	0%	100%

2.6. Conclusion

This section of the report has provided a summary of the methodology and assumptions used to inform the construction of the TDM spreadsheet. The next section of this report will outline the development assumptions used to undertake a preliminary run of the TDM spreadsheet.

3. Preliminary Findings

3.1. Introduction

As part of this commission, Atkins has constructed a TDM to establish the potential transport impacts associated with the proposed garden community at Meecebrook. It should be noted that the TDM to accompany this report is saved as a spreadsheet model and has been provided to SCC for their use in relation to the ongoing development of Meecebrook Garden Community.

In order to run the TDM, Atkins have made several assumptions regarding the proposed development quantum associated with the Meecebrook garden community. It should be noted that these assumptions have been made because SCC do not have a fixed set of land use assumptions or a fixed masterplan for the development proposals at the time of writing this report.

Therefore, the preliminary findings presented within the section of the report are based on the assumptions stated and the findings are subject to change once SCC have agreed a fixed masterplan.

3.2. Assumptions

Atkins has taken into consideration the development quantum associated with the draft masterplan for the St George's Rutland mixed-use development site in Rutland. The development is a predominantly residential led development on the site of a former MoD army barracks. It is proposed to construct 2,215 residential dwellings on the site in addition to a local centre, schools and commercial buildings. Atkins has considered the land use assumptions associated with the St George's Rutland development when developing the preliminary land use assumptions associated with Meecebrook. These preliminary land use assumptions can be revised following completion of the masterplan for the site.

Table 3-1 outlines the assumed development quantum associated with the proposed Meecebrook Garden Community.

Table 3-1 - Meecebrook Garden Community Development Assumptions

Land Use	Quantum	Units
Residential Area	10,000	Dwellings
Commercial Uses	316,027	m^2
School (Primary)	295	Pupils
School (Secondary)	965	Pupils
Local Shopping Centre	500	m^2
Superstore	4,000	m^2
Doctors Surgery	1,000	m^2
Pub	10,000	m^2
Corner Shop	100	m^2
Restaurants	7,000	m^2
Community Centre	3,000	m^2
Fitness Centre	3,000	m^2

3.3. Trip Generation

Based on the development assumptions outlined in Table 3-1 and the trip rates extracted from the TRICS database, the forecast trip generation associated with each land use has been calculated using the TDM spreadsheet. To account for internalisation, those trips associated with the ancillary land uses (e.g. Local Shopping Centre) have been removed from the residential trip generation. It has been assumed that those trips associated with the residential and employment land uses would also generate trips on the external transport network. It is assumed that the majority of internal trips associated with the ancillary land uses would be sustainable, either by walking or cycling.

Table 3-2 outlines the split between internal and external person trips as a result of the development assumptions identified.

Table 3-2 - Proportion of Internal/ External Person Trips

Trip Type	AM Peak (Two-Way)	PM Peak (Two-Way)
Internal (Ancillary Land Uses)	1,920	2,456
External (Residential)	8,250	6,534
External (Employment)	4,786	4,289

Table 3-2 indicates that 87% of the total person trips during the AM Peak period would be external and would therefore interact with the external transport network. Whilst 82% of the total person trips during the PM Peak Period would be external.

3.4. Trip Distribution

To determine the trip distribution associated with the external person trips identified, the distributional analysis undertaken using the Gravity Model has been applied to the total two-way external person trips (see Table 3-3).

Table 3-3 - Two-Way External Person Trips by Destination

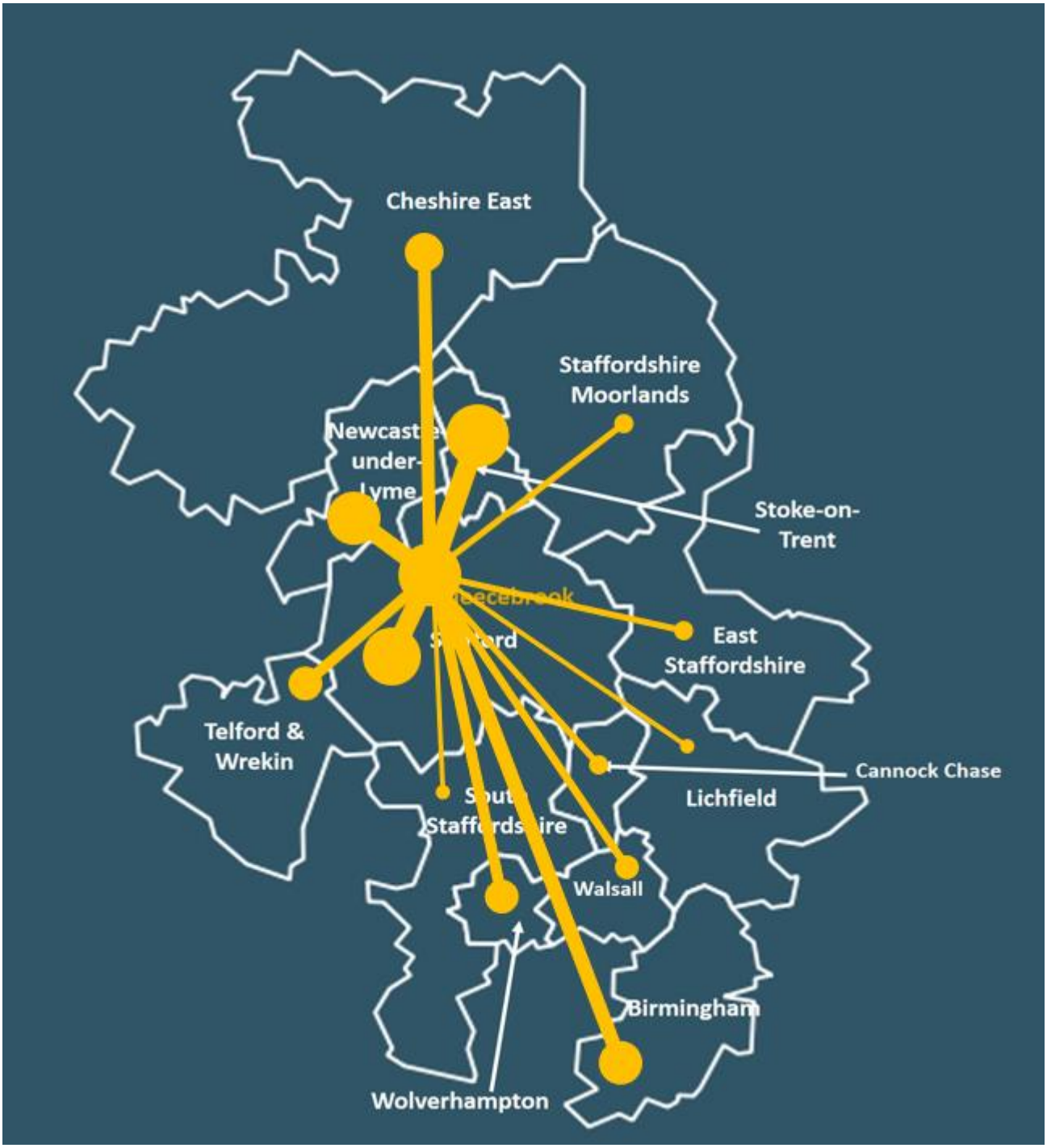
Destination	AM Peak (Two-Way)	PM Peak (Two-Way)
Stoke-on-Trent	3,027	2,530
Stafford	2,538	2,117
Newcastle-under-Lyme	1,168	981
Birmingham	962	803
Cheshire East	745	622
Telford and Wrekin	565	471
Wolverhampton	491	411
Walsall	442	371
Staffordshire Moorlands	361	304
Cannock Chase	314	263
South Staffordshire	218	184
East Staffordshire	222	185
Lichfield	192	161
Meecebrook Employment[2]	1,792	1,419
Total	13,037	10,822

Table 3-3 indicates that the majority of external trips (23% in both Peak Periods) are between Meecebrook and Stoke-on-Trent, followed by Meecebrook and Stafford (19% in both Peak Periods) and the employment provision located within Meecebrook (14% in both Peak Periods). It should be noted that the person trips to the employment provision within Meecebrook would not be considered external and therefore would not generate trips on the external transport network.

Figure 3-1 shows the two-way external person trip generation by destination.

[2] Meecebrook Employment accounts for the new employment opportunities proposed as part of the development. This represents those trips from residents within Meecebrook to the employment located within Meecebrook and therefore would be considered ‘internal’ trips.

Figure 3-1 - External Trip Destination Map



3.5. Mode Share

Following the assessment of the external trip distribution, it is important to consider the modal split associated with the external person trips from Meecebrook to each of the destinations identified.

The TDM spreadsheet calculates the number of trips by each mode to each of the destinations identified. However, for the purpose of this report, the preliminary findings are only going to consider the mode share associated with the key destinations, Stoke-on-Trent and Stafford.

3.5.1. Stoke-on-Trent

The modal split for external trips to Stoke on Trent (AM Peak) from Meecebrook is outlined on Figure 3-2 and the modal split for external trips from Stoke-on-Trent (PM Peak) to Meecebrook is outlined on Figure 3-3. The analysis indicates that 1,579 vehicle trips will depart Meecebrook in the AM Peak with Stoke-on-Trent as the end destination, whilst 1,022 vehicle trips will arrive back at Meecebrook during the PM Peak from Stoke-on-Trent. This analysis indicates that external trips via car or van dominate the mode share between Meecebrook and Stoke-on-Trent during the AM and PM Peak Periods.

Figure 3-2 - Modal Split - External Trips to Stoke-on-Trent (Departures AM Peak)

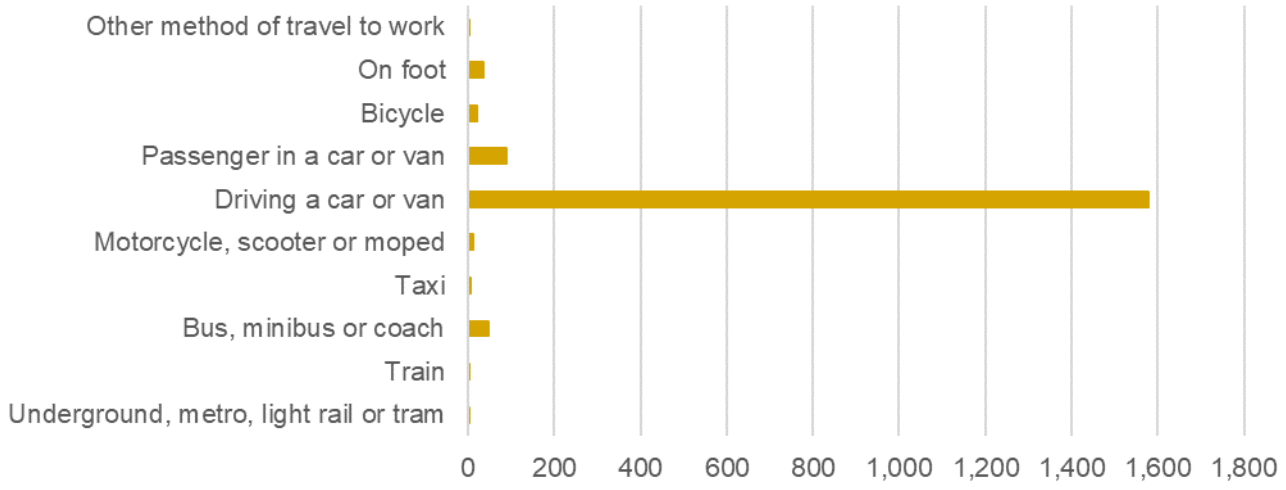
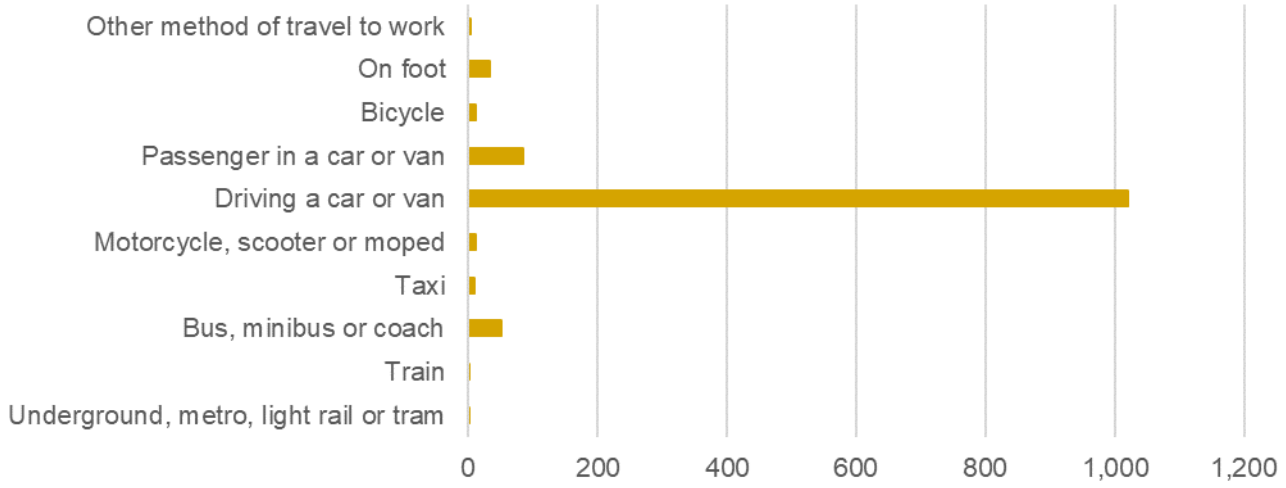


Figure 3-3 - Modal Split - External Trips from Stoke-on-Trent (Arrivals PM Peak)



3.5.2. Stafford

The modal split for external trips to Stafford (AM Peak) from Meecebrook is outlined on Figure 3-4 and the modal split for external trips from Stafford (PM Peak) to Meecebrook is outlined on Figure 3-5. The analysis indicates that 1,350 vehicle trips will depart Meecebrook in the AM Peak with Stafford as the end destination, whilst 825 vehicle trips will arrive back at Meecebrook during the PM Peak from Stafford. This analysis indicates that external trips via car or van dominate the mode share between Meecebrook and Stafford during the AM and PM Peak Periods.

Figure 3-4 - Modal Split - External Trips from Stafford (Departures AM Peak)

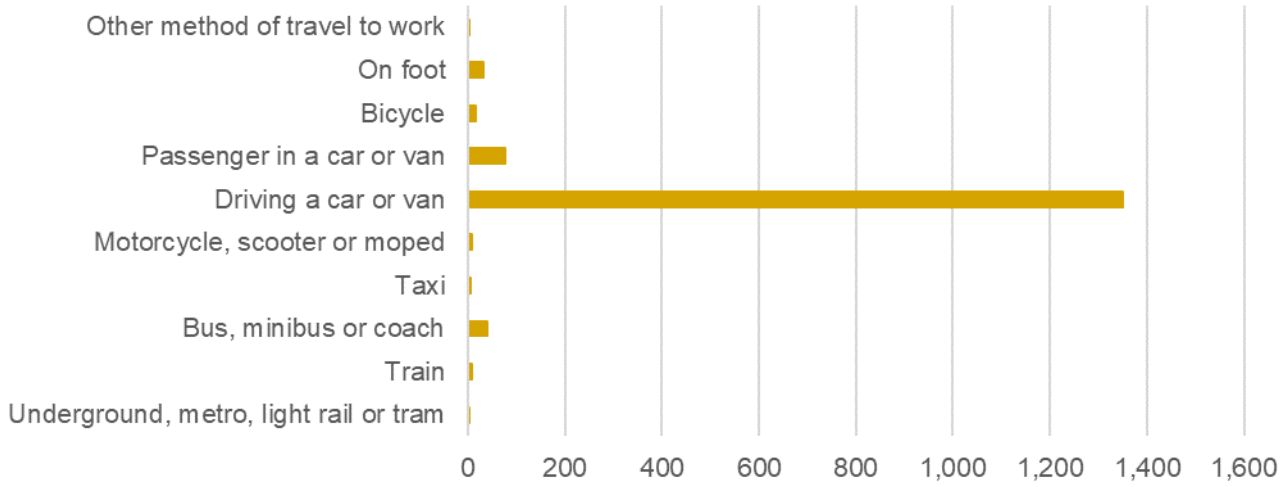
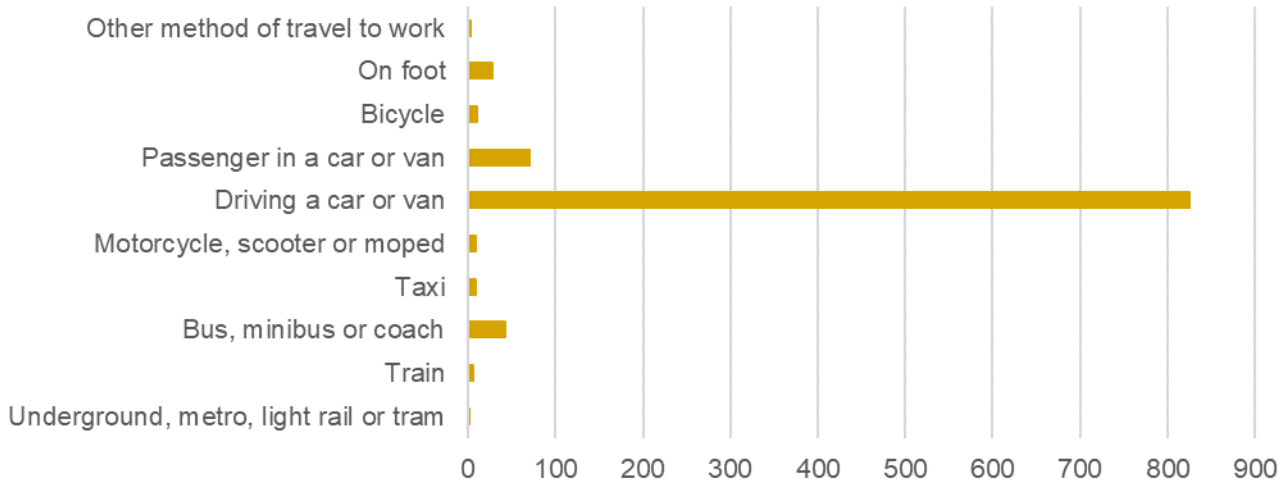


Figure 3-5 - Modal Split - External Trips from Stafford (Arrivals PM Peak)



3.6. Alternative Assumptions

As identified, Stoke-on-Trent and Stafford account for the majority of the external trips associated with the assumed Meecebrook development assumptions. Further analysis indicates that external trips via car or van dominate the mode share between Meecebrook and these destinations during the AM and PM Peak Periods. Therefore, it is assumed that the development will generate a significant quantum of vehicular trip generation on the external highway network.

The TDM spreadsheet calculates the number of two-way vehicular trips between Meecebrook and each of the destinations (residential and employment) to demonstrate the potential demand on the external highway network (see Table 3-4).

Table 3-4 - External Two-Way Vehicular Trip Generation (By Destination)

Destination	Vehicular Trips (AM Peak)	Vehicular Trips (PM Peak)
Lichfield	169	141
South Staffordshire	182	154
East Staffordshire	202	168
Cannock Chase	271	227
Staffordshire Moorlands	318	269
Walsall	393	329
Wolverhampton	433	362
Telford and Wrekin	496	414
Birmingham	754	631
Cheshire East	676	565
Newcastle-under-Lyme	1,018	854
Stafford	2,175	1,810
Stoke-on-Trent	2,601	2,168
Total	9,688	8,091

Table 3-4 indicates that there will be an additional 9,688 vehicle trips on the external highway network during the AM Peak and an additional 8,091 vehicle trips during the PM Peak. This is a significant number of additional vehicle trips and therefore the analysis indicates that the impact of the proposed garden community at Meecebrook on the external highway network will have to be mitigated.

As outlined, SCC are engaging with Network Rail regarding the potential to deliver a new railway station on the West Coast Mainline. Therefore, the TDM spreadsheet has considered an alternative scenario to determine the potential impact of a new railway station on the forecast mode share and the number of two-way vehicular trips between Meecebrook and each of the workplace destinations.

Table 3-5 provides the outputs for the alternative scenario from the TDM spreadsheet.

Table 3-5 - External Two-Way Vehicular Trip Generation by Destination (with Railway Station)

Destination	Vehicular Trips (AM Peak)	Vehicular Trips (PM Peak)
Lichfield	173	145
South Staffordshire	180	153
East Staffordshire	203	170
Cannock Chase	271	227
Staffordshire Moorlands	318	268
Walsall	389	326
Wolverhampton	415	346
Telford and Wrekin	505	421
Birmingham	615	519
Cheshire East	634	531
Newcastle-under-Lyme	1,014	850
Stafford	2,158	1,796
Stoke-on-Trent	2,570	2,143
Total	9,446	7,894

Table 3-5 indicates that the construction of a new railway station on the West Coast Mainline would reduce the number of vehicular trips on the external highway network. During the AM Peak, it is forecast that the total number of two-way vehicular trips would reduce by 242 in the AM Peak and 197 in the PM Peak. The TDM spreadsheet indicates that the construction of a new railway station would reduce the external vehicular trip generation by approximately 2%, however, there would still be a significant quantum of vehicular trips on the external highway network. Therefore, the impact of the proposed garden community at Meecebrook would likely require additional mitigation solutions.

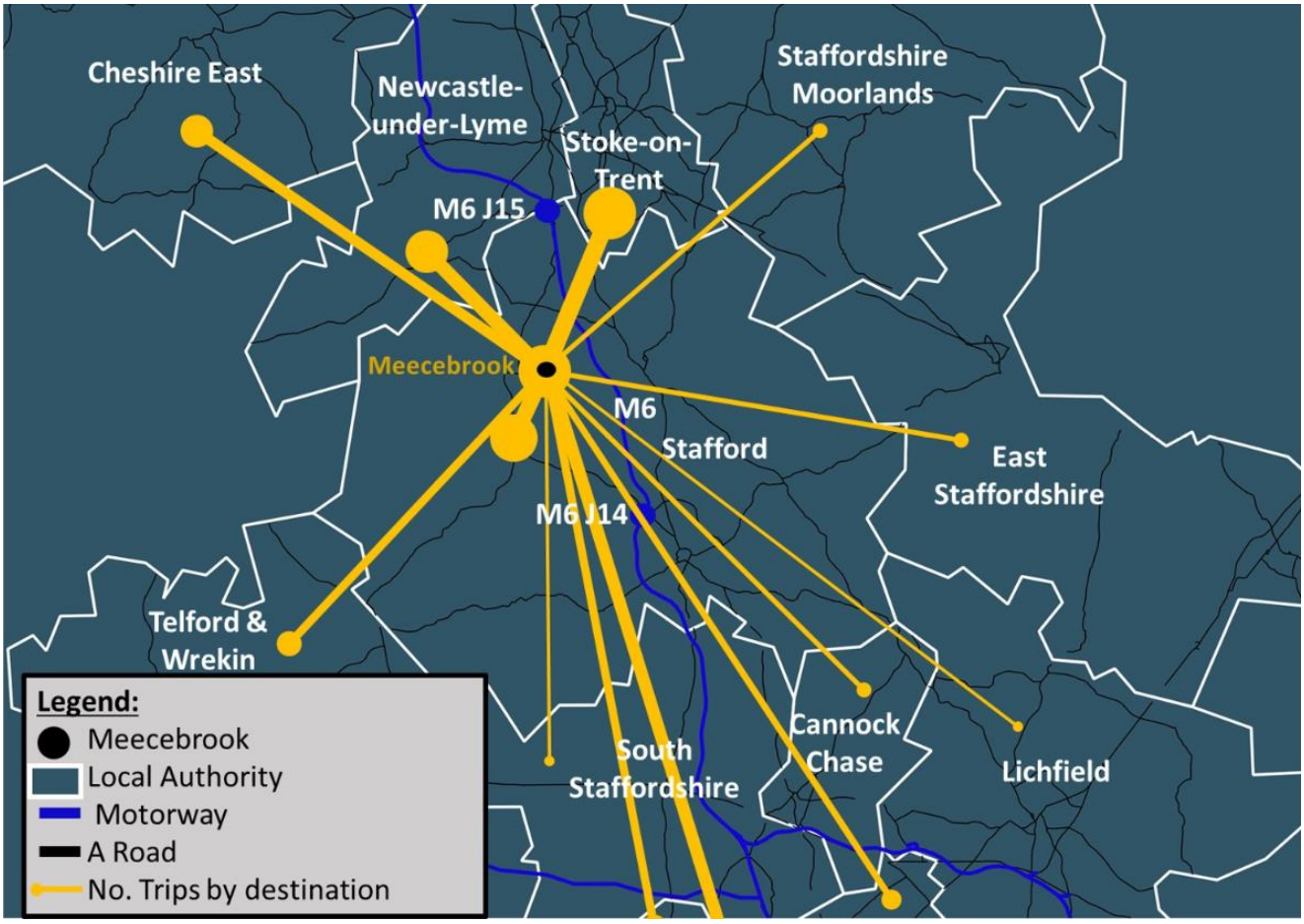
3.7. Potential Mitigation Solutions

As identified, the TDM spreadsheet indicates that if a new railway station is constructed on the West Coast Mainline there would still be 9,446 vehicular trips on the external highway network during the AM Peak and 7,894 vehicular trips during the PM Peak. Approximately 5,742 (during the AM Peak) and 4,789 (during the PM Peak) of these trips are between Meecebrook and destinations to the north including Newcastle-under-Lyme, Stafford and Stoke-on-Trent. In addition, approximately 2,043 (during the AM Peak) and 1,716 (during the PM Peak) of these trips are between Meecebrook and destinations to the south including Birmingham and Wolverhampton etc.

According to Table 2-2 in Section 2 of this report, the majority of destinations are considered to be medium or long-distance trips and therefore it is likely given the proximity of the site to the SRN that the majority of vehicles would make use of the M6 at either J15 or J14 (see Figure 3-6). This would potentially generate highway capacity issues at these two locations and along the adjacent A Roads on the approach. Therefore, potential highway mitigation solutions may include;

- Highway mitigation measures along existing corridors or junctions to improve the existing highway capacity;
- An additional motorway junction to provide additional access to the SRN; or
- The promotion of alternative sustainable modes of transport to reduce car dependency.

Figure 3-6 – Vehicular Trip Generation by Destination



4. Summary and Conclusion

4.1. Summary

Atkins has been commissioned by SCC to provide transport planning services to support the ongoing promotion and development of Meecebrook Garden Community, Staffordshire. As part of the commission, Atkins has constructed a TDM to establish the potential transport impacts associated with the proposed garden community at Meecebrook. This report has outlined the methodology undertaken and the preliminary findings associated with the TDM based on the assumptions outlined.

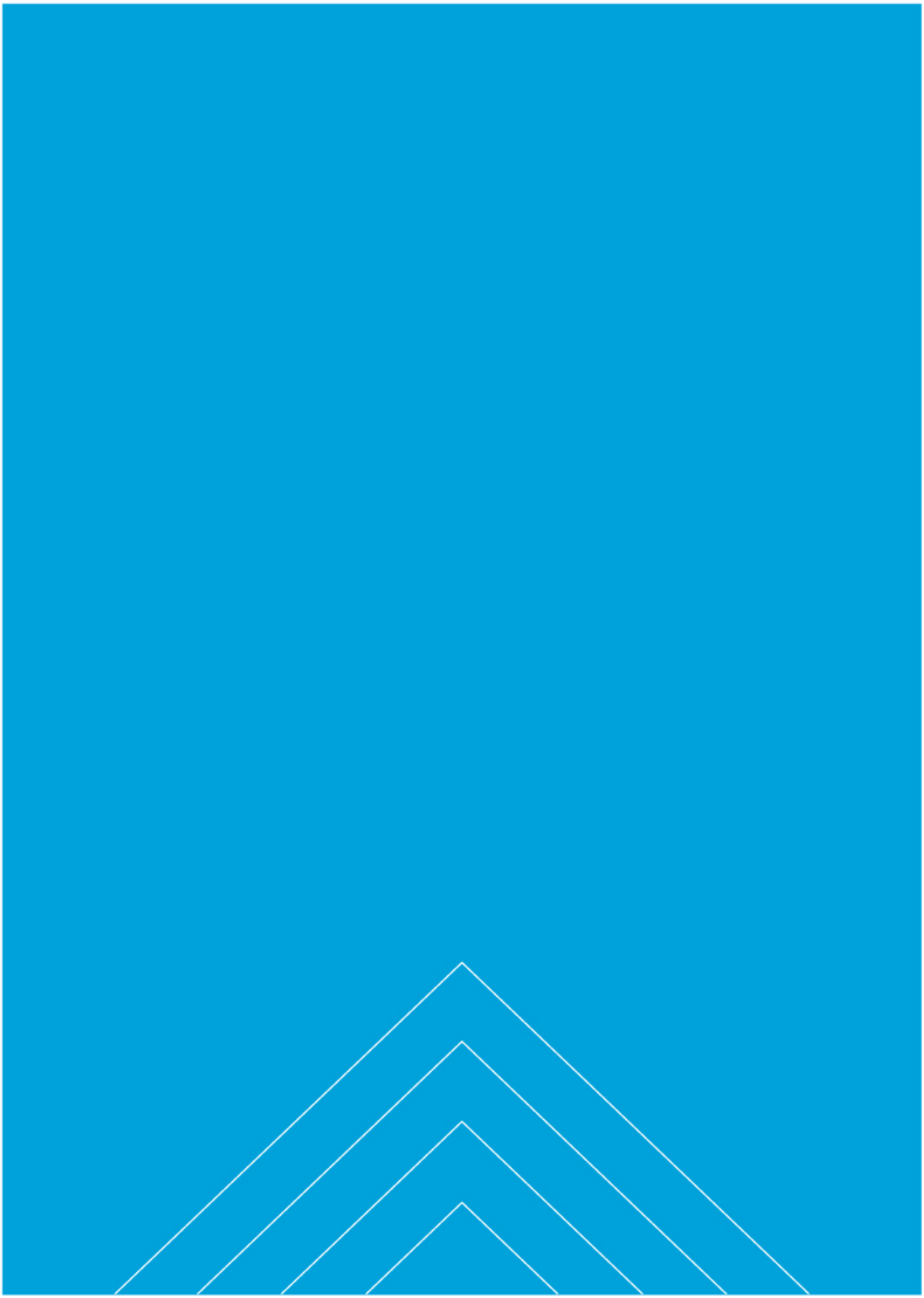
It should be noted that the TDM spreadsheet tool forecasts the number of trips by mode based on existing trip patterns. Therefore, the TDM does not consider any specific mitigation measures other than the potential impact of constructing a new railway station on the West Coast Mainline. The outputs from the TDM spreadsheet tool therefore represent a 'worst case' scenario and provide the client with an indication of the key transport corridors which will serve the proposed development.

These key transport corridors will require mitigation and/or investment in order to promote alternative sustainable modes of transport and reduce car dependency. Therefore, the findings of this report and the TDM spreadsheet tool should be considered alongside the analysis undertaken by Atkins regarding the potential surrounding Future Mobility Solutions to determine the long-term strategy for delivering the transport infrastructure required to serve Meecebrook Garden Community.

4.2. Recommended Next Steps

The preliminary findings of this report have identified several next steps (from a transport perspective) to support SCC in the ongoing promotion and development of Meecebrook Garden Community. The recommended next steps for SCC to consider are:

- SCC to continue to develop the masterplan for the proposed development and fix the proposed land use assumptions/ development quantum;
- Run the TDM spreadsheet analysis with the fixed masterplan assumptions;
- Use the distributional analysis and modal split from the TDM spreadsheet analysis to inform a run of the Midlands Regional Transport Model; and
- Analyse the outputs from the Midlands Connect Highway Model to identify locations on the existing highway network which require mitigation and/or strategic intervention to accommodate the proposed garden community at Meecebrook.



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Appendix C. Transport Modelling Strategy

ATKINS

Member of the SNC-Lavalin Group

Traffic Modelling Strategy

Staffordshire County Council & Stafford Borough Council

02 July 2020

Notice

This document and its contents have been prepared and are intended solely as information for Staffordshire County Council & Stafford Borough Council and use in relation to the Meecebrook Garden Community.

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Client signoff

Client	Staffordshire County Council & Stafford Borough Council
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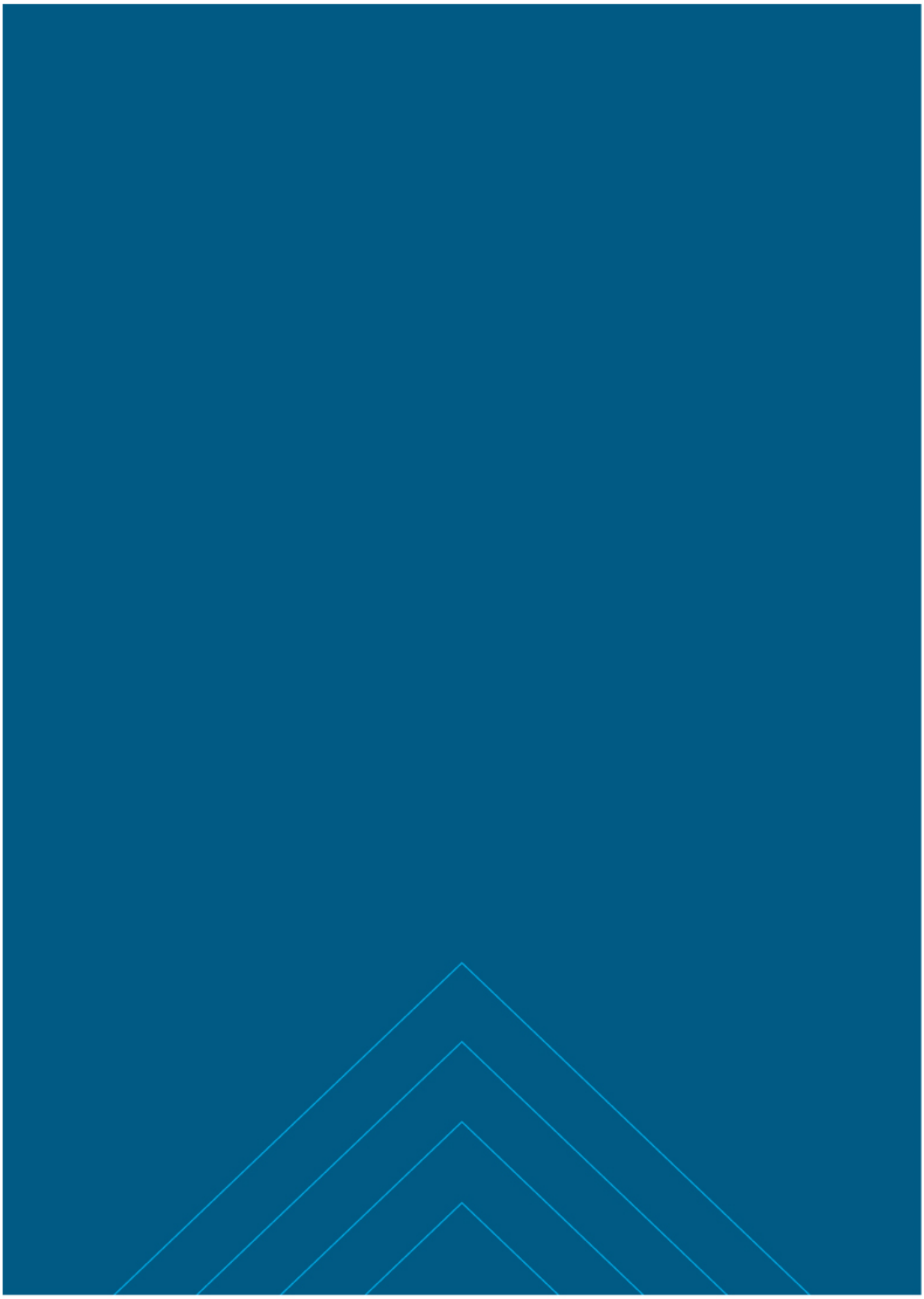


Executive summary

Introduction

Staffordshire County Council, on behalf of Stafford Borough Council (SBC), has commissioned Atkins to provide professional services to support the ongoing promotion and development of a new garden community at Meecebrook, Staffordshire. The garden community could include around 10,000 homes and up to 500 hectares of employment land and green spaces.

In order to assess the transportation impacts of this development, Atkins has advised that a strategic transport model would provide an evidence base for the promotion of the development including:

- Forecast traffic flow demands and vehicle assignments/reassignments;
- Help identify the nature of the transport interventions required to deliver a sustainable development, which would not have a severe impact on the existing transport infrastructure;
- Provide an evidence to support the Local Plan process, including Examination in Public (EiP); and
- Potentially provide a tool for developers to test their respective planning applications for selected land parcels at Meecebrook (only certain modelling options provide this capability).

Option analysis

The purpose of this report is to provide the various options that could be undertaken, outline the practical constraints of each option (programme, costs, risks and limitations etc.) and the evidence provided by each option.

Two broad approaches have been identified. The first would make use of existing models to undertake the assessment, the alternative would be to develop a new bespoke model. Two models exist which are suitable for the assessment and their strengths and limitations are discussed in the Existing model review section. The work required to build a new, bespoke model has been outlined but it is noted that this would be significant and unless there is a specific need identified in future, this approach is unlikely to be suitable.

Area of impacts

An important first stage in developing a detailed scope for a strategic model is an Area of Impacts Assessment which utilises existing tool to provide an initial assessment of the geographic scale of impacts. It is recommended that the existing Midlands Connect Highway Model (MCHM) is used to undertake this assessment.

Existing model review

The suitability of the Midlands Regional Traffic Model (MRTM) and the MCHM for providing a basis for assessing the transportation impacts of the Meecebrook development has been reviewed. Though both models cover the geographic area of interest there are some limitations to the network and zoning structure which would need to be addressed in order to provide a robust assessment of the local and wider impacts of the development.

Key options

The outcome from the option analysis and the existing model review was the identification of four traffic modelling solutions, summarised in the table below. The four options have different timescale and cost implications, as well as different strengths and limitations. Indicative programmes are also provided as an Appendix.

Key Option - Summary

Option	Description	Outcomes	Indicative Cost & Timescales
1. Area of Impacts Assessment	An initial modelling assessment using existing tools to identify areas of impact.	An indication of the geographic scope of impacts and potential areas requiring intervention.	£10,000 - £20,000 1 - 1.5 month programme
2. Model Refinement	Refining existing models to provide a more robust evidence base for assessing transportation impacts.	A more robust basis for providing the assessment.	£40,000 – £65,000 3 - 4 month programme
3. Model Update - including revalidation	Update and revalidate the base year model with up to date data including Mobile Phone Data (MPD) to inform trip distributions.	A fully TAG compliant updated model which will provide an evidence base for funding applications and economic assessment.	£210,000 – £260,000 (excl. data costs) 8 - 10 month programme
4. Bespoke model	Using the 2015 MRTM Base model as a starting point, refine the network and model zoning and revalidate to a more recent year in key study area. New data sources to be obtained to inform trip distributions.	A bespoke, fully TAG compliant updated model which will provide an enhanced evidence base for funding applications and economic assessment.	£400,000 – £450,000 (excl. data costs) 14 - 16 month programme

The timescales provided are indicative of the time required to undertake the initial stages of modelling work and do not include scenario and scheme options testing outside of a core development scenario. The timescales are also based on the assumption that Atkins will not be significantly restricted in their capability to deliver work due to the measures imposed to reduce the transmission of the COVID-19 virus in the following weeks. Atkins has a robust business continuity plan and is well equipped to deliver work digitally, however should any specific issues arise Atkins will discuss these with SCC and SBC at the earliest opportunities in order to make any necessary arrangements.

Recommendations and next steps

It is recommended that an AIA be undertaken to provide an initial understanding of the geographic area impacted by the Meecebrook development. Following this assessment there is a decision point at which it will necessary to decide whether to undertake a more limited assessment which will provide an understanding of both the impacts of the developments and the nature of any transport interventions required or; alternatively, to bypass this stage and advance to a full model update and revalidation which will support Local Plan testing and any funding applications.

1. Introduction

Stafford Borough was chosen by Government as a possible location for a new settlement with the Government contributing funds to develop detailed plans for the key infrastructure required to support sustainable development.

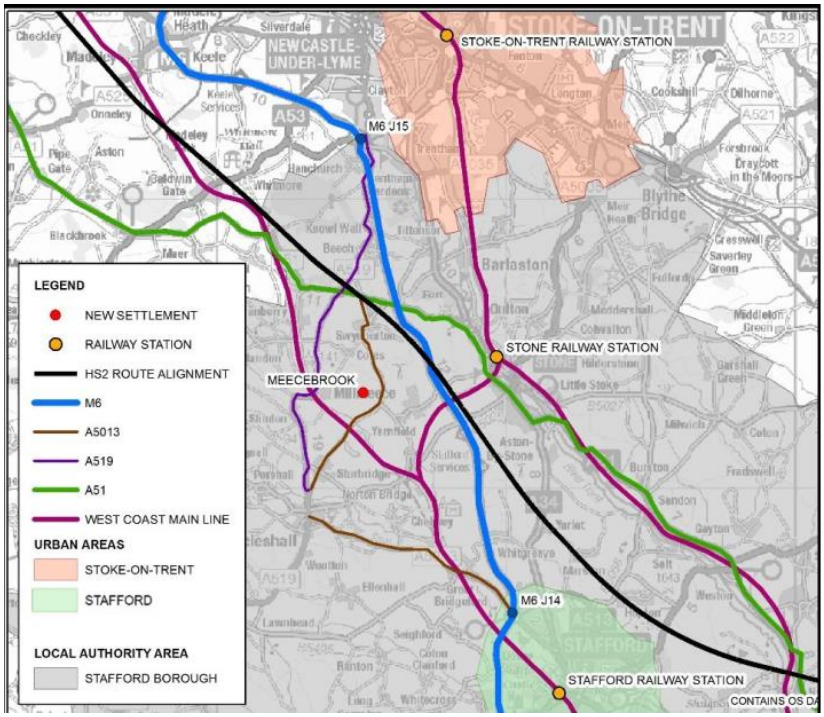
In November 2018, Atkins produced the Meecebrook Transport Study in which it was recommended that a strategic model would be required in order to assess the transportation impacts of the proposed development.

This report outlines the evidence base requirements for Local Plan allocations and presents the different traffic modelling approaches that can provide them, with consideration given to existing tools and data, risks, programme requirements and costs.

The site is located at Meecebrook (Figure 1-1) and could include;

- Around 10,000 homes;
- 20 hectares of new employment land;
- 300 hectares of green space including parks;
- New West Coast Mainline station; and
- New schools and health centre.

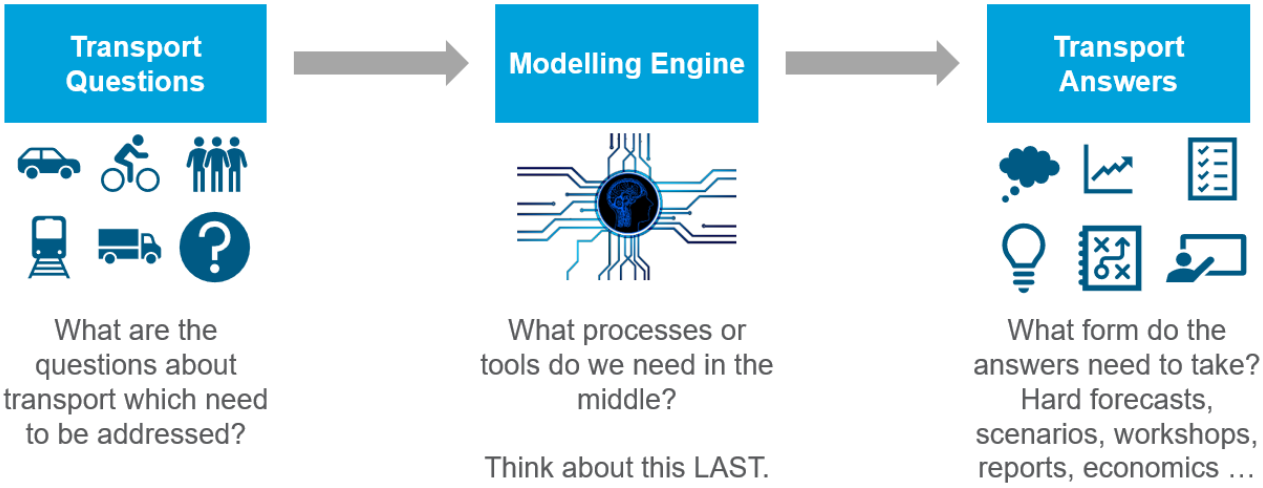
Figure 1-1 - Meecebrook Garden Community Location



1.1. Approach

Atkins approach to building and using strategic models has three main considerations.

- Firstly – what are the transport questions that need answering as part of the study?
- Secondly – what form do these answers need to be in? Are these in the form of hard forecasts and economic appraisal or workshops and reports?
- The answers to these questions inform the third consideration; the modelling strategy and the specific engine or model that's used is based on aims rather than defaulting to what's most readily available.



At the time of writing the UK is experiencing significant disruption and facing uncertainty resulting from the impacts of COVID-19. The full scale of these impacts is still emerging, as are the longer term effects on transport behaviours, local and central government priorities and the wider economy.

In the face of this uncertainty the ambitions, aims and strategic objectives of any modelling work are potentially subject to change.

Therefore, at this early stage in the development of the strategic modelling strategy, Atkins will present the various approaches that could be adopted and discuss the information and evidence provided along with any limitations and risks. The purpose of this report is to provide Staffordshire and Stafford Borough with the information required to facilitate decision making at a later stage.

1.2. Structure of this report

This report is structured as follows;

- Chapter 2 – Option analysis;

This chapter outlines the two main approaches towards undertaking the assessment of the development impacts. That is; to make use of existing models or to build a new, bespoke model.

- Chapter 3 – Area of impacts;

This chapter describes the need for an AIA and discusses the different options available for doing so.

- Chapter 4 – Existing model review;

A review of the suitability of the two identified existing models is undertaken.

- Chapter 5 – Key options;

Having discussed each option associated with the various elements of a strategic transport model, three key options or strategic approaches to providing an evidence base for the transportation impacts of the Meecebrook development are provided along with indicative costs and timescales.

- Chapter 6 – Recommendations and next steps.

The final chapter provides recommendations and next steps in relation to the traffic modelling strategy.

2. Option analysis

2.1. Introduction

This section discusses several different options for each of the key elements that comprise a strategic transport model. The advantages and limitations for each of these options is provided and three modelling strategies are proposed based on these different approaches.

There are two broad strategies, each with its own advantages and limitations.

1. Use an existing base model to develop a forecast model scenario;
    a. Either refine the model where necessary; or
    b. Update, refine and revalidate the model.
2. Build a new, bespoke base model which will form the basis of a new forecast model.

2.2. Existing models

Atkins has identified two existing models that cover the geographic area surrounding Meecebrook. The Midlands Regional Traffic Model (MRTM) – which has a base year of 2015 and was developed for Highways England – and the Midlands Connect Highway Model (MCHM), which is the same model under a different name but for which alternative forecast scenarios have been developed and can be supplied.

The MRTM and MCHM have been constructed using the SATURN Version 11.3.12U highway modelling suite. SATURN is a proprietary software suite able to encompass strategic modelling at a regional level down to the assessment of individual junctions at the simulation level. As a simulation modelling tool, SATURN is capable of analysing relatively minor changes in the network such as traffic management and provides detailed analysis of traffic behaviours at junctions. SATURN is an industry respected assignment modelling tool used widely for the assessment of highways schemes and can provide robust analysis of small to large infrastructure developments.

A brief description of the key model characteristics, common to both the MRTM and MCHM is provided below;

- 2015 Base year;
- 5 User classes (Car Business, Car Commute, Car Other, LGVs and HGVs);
- Peak period average hour for AM, PM and IP.

In addition to these two strategic models, the M6 J13 – J16 model which was developed on behalf of Highways England also covers the relevant geographic area. This model has a base year of 2012 and is considered to be outdated relative to the more recent MRTM.

As a result, a comparison of the MRTM and MCHM is provided in Table 2-1 below. Areas of consistency are highlighted in blue, differences in yellow.

Table 2-1 - MRTM and MCHM Comparison

	MRTM	MCHM
Base year	2015	2015
Base network	Focused on the SRN with template coding in rural areas (see Section 4.1 for details)	Focused on the SRN with template coding in rural areas (see Section 4.1 for details)
Model zoning	Comprised primarily of MSOAs (see Section 04.1 for details)	Comprised primarily of MSOAs (see Section 04.1 for details)
Base demand	Prior matrices developed from Mobile Phone Data (MPD) (see Section 4.34.1 for details)	Prior matrices developed from Mobile Phone Data (MPD) (see Section 4.34.1 for details)
Forecast networks	Future year scheme coding is supplied as 'include' files and	Existing 2026, 2031, 2041 forecast year networks available

	forecast networks are to be developed by the consultant	
Forecast demand	Forecast matrices not provided	Existing 2026, 2031, 2041 and 2031 Alternate Growth forecast matrices available
Demand Model	Use of the MRTM DIADEM demand model	Use of the MRTM DIADEM demand model

With the availability of forecast scenarios being the main difference between the MRTM and MCHM; it is considered that the MCHM would provide a more suitable tool for assessing the impacts of the Meecebrook development. From here on, this report will refer primarily to the MCHM however it is stressed that the base year model is consistent between MCHM and MRTM.

Atkins has approached Midlands Connect to discuss the use of the MCHM for this assessment. Midlands Connect are supportive in principle at this early stage, however it is noted that further conversations and formal agreement would be required.

The existing models are based on peak periods. That is; there are separate models for the AM, Inter-peak and PM which are based on the average conditions across the time-period. The AM peak represents the hours between 07:00 and 10:00, the Inter-peak 10:00 – 16:00 and the PM peak 16:00 – 19:00.

It is recognised that the use of peak period average hour models may be less representative when considering areas with defined peaks and where a development may have a greater impact in a single hour as opposed to averaged across a period as may be the case for Meecebrook.

2.3. Build a new, bespoke model

An additional possibility would be to develop a new, bespoke model with a specification designed to meet both the strategic aims for the Meecebrook development and wider SCC objectives. As these aims and objectives are still emerging this report focuses on the existing tools; a brief exploration of this option is included in Appendix C.

3. Area of impacts

Where possible i.e. where there exists a tool which facilitates doing so, undertaking an initial assessment using estimates of development or scheme details allows the key geographic area for a model to be determined over which there is expected to be a significant impact on the road network.

This initial Area of Impacts Assessment (AIA) will inform both the geographic scope of the model as well as the level of network and geographic zoning required at distances further away from the Meecebrook development site. The assessment may also enable early indications of 'pinch points' on the more strategic routes to be identified which may influence the scheme assessment going forwards.

There are two possible approaches to undertaking this assessment – each associated with the existing models identified.

3.1. MRTM

A forecast model for a horizon year (e.g. 2041) would be developed by applying (National Trip End Model) NTEM growth factors from TEMPRO to cars and NTM growth factors for Staffordshire to LGVs and HGVs. The values of time and vehicle operating costs will also be updated in line with the latest TAG Databook. It is noted that, unlike the MCHM forecast matrices, which can be supplied for the post demand model runs, the use of the MRTM would require either a rerun of the DIADEM demand model or the assumption of a fixed forecast matrix, i.e. no demand model applied which, particularly due to the SRN network changes on the M6, may not be appropriate.

Trip generation using the TRICS database is currently being undertaken by Atkins as part of the Meecebrook Travel Demand Model (TDM). The TDM will also include a trip distribution which is based on a gravity model and would be used to inform the model distribution. Where a greater level of spatial resolution is required for the distribution, existing zones within the MRTM, which are of close to the Meecebrook site and of similar land use may be used. The additional trips generated by the development would be added to the forecast matrix, loaded onto the existing network, and a highway assignment undertaken.

3.2. MCHM 2041 forecast scenario

Using the 2041 Forecast scenario, previously developed for Midlands Connect, as a basis for the AIA would remove the need to apply growth factors to the 2015 base year to develop a forecast matrix. As with the MRTM the development trips would be added and distributed in the same way.

Table 3-1 below compares the features and limitations of both approaches.

Table 3-1 – Area of Impacts Assessment

Option	Advantage	Limitation
A1. Develop a forecast scenario from the MRTM	• Able to choose which forecast year would be most appropriate to undertake the assessment; • Future year scheme coding will be supplied, and relevant schemes included; • Use of the MRTM Demand model could constrain overall growth to National Trip End Model (NTEM) Forecast growth.	• Future year schemes are based on 2015 data and may not be fully up to date; • Future year scheme coding is unlikely to include any local schemes not on the SRN; • Peak Period assessment as opposed to a peak hour; • Would also need to run the MRTM demand model to obtain forecast year matrices; • Would be more costly and increase time compared to Option A2.

A2. Use the 2041 MCHM forecast scenario	• Quicker and more cost effective compared to Option A1; • Initial post demand model forecast matrices already available; • Will contain committed highway schemes for 2041; • Demand model will already have been run for the 'without development' scenario.	• Highway schemes included may not be up to date with most recently available information; • Forecast year fixed; • Peak Period assessment as opposed to a peak hour; • Addition of Meecebrook would be over and above the NTEM growth however this may be appropriate at this stage to consider worst case scenario.

Overall, based on the table above, it is considered that Option A2 would be most appropriate to undertake at this initial stage to understand the potential extent of impact of the Meecebrook development.

4. Existing model review

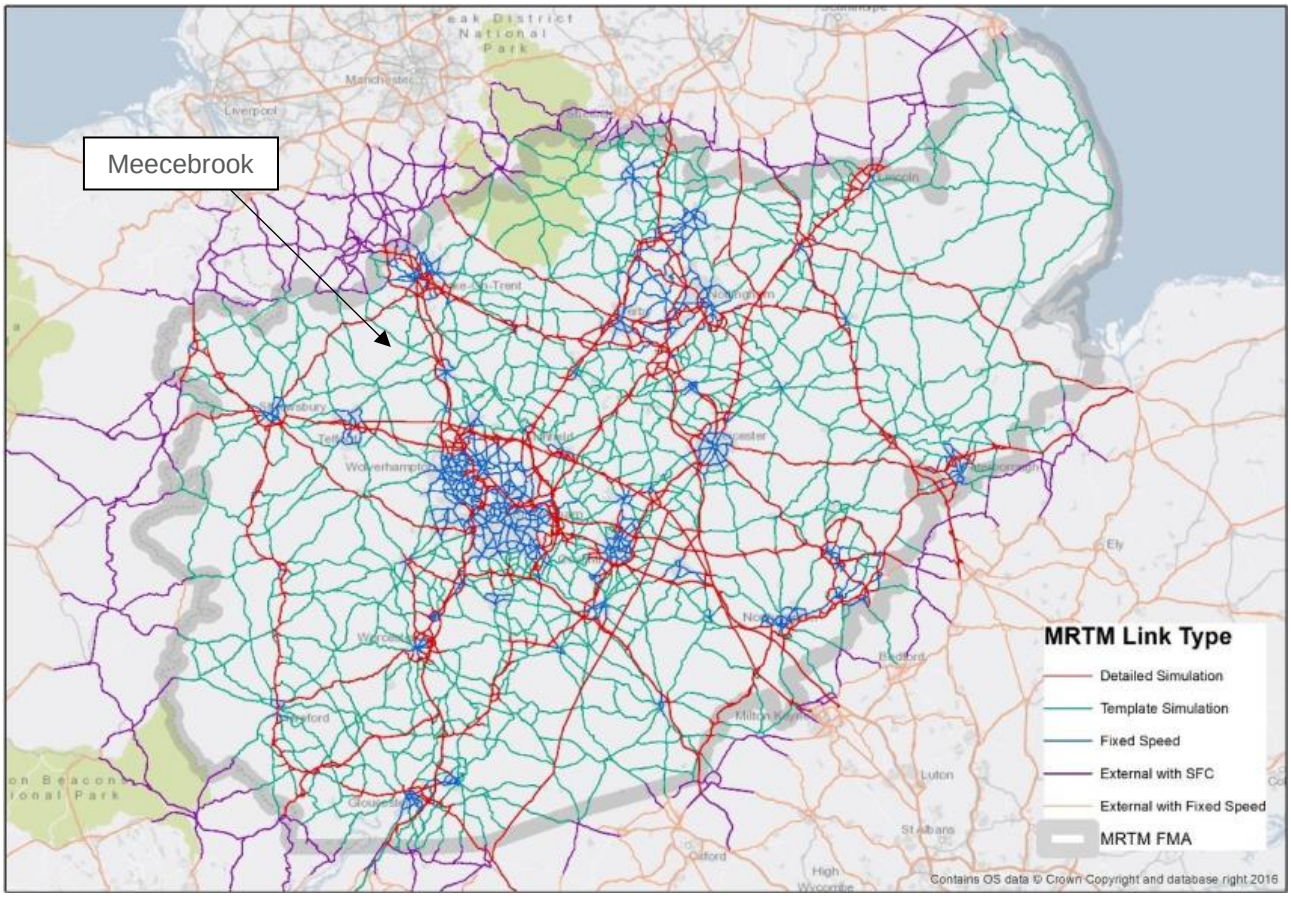
Determining the geographic area of impact resulting from the Meecebrook development in future years will provide the necessary information to determine the scope of a geographic model. The geographic scope or Fully Modelled Area is described in TAG Unit M3.1 reproduced below.

- ***Fully Modelled Area:*** *the area over which proposed interventions have influence; further subdivided as set out below*
  - ***Area of Detailed Modelling****. This is the area over which significant impacts of interventions are certain. Modelling detail in this area would be characterised by: representation of all trip movements; small zones; very detailed networks; and junction modelling (including flow metering and blocking back); and*
  - ***Rest of the Fully Modelled Area.*** *This is the area over which the impacts of interventions are considered to be quite likely but relatively weak in magnitude. It would be characterised by: representation of all trip movements; somewhat larger zones and less network detail than for the Area of Detailed Modelling; and speed/flow modelling (primarily link-based but possibly also including a representation of strategically important junctions).*

4.1. Network

The MCHM covers a broad geographic area and is certain to be broad enough to capture the impacts of the new Meecebrook development. The key consideration however is whether the network and zoning structure contain sufficient detail to provide reasonable forecasts of these impacts in the key study area. Figure 4-1 below shows the network structure with the proposed development site shown for context. Figure 4-2 shows the same network with a focus on the area surrounding Meecebrook.

Figure 4-1 - MCHM Base Model Network – Fully Modelled Area



Source: MRTM Local Model Validation Report (March 2016)

Figure 4-2 – MCHM Base Model Network - Local Area

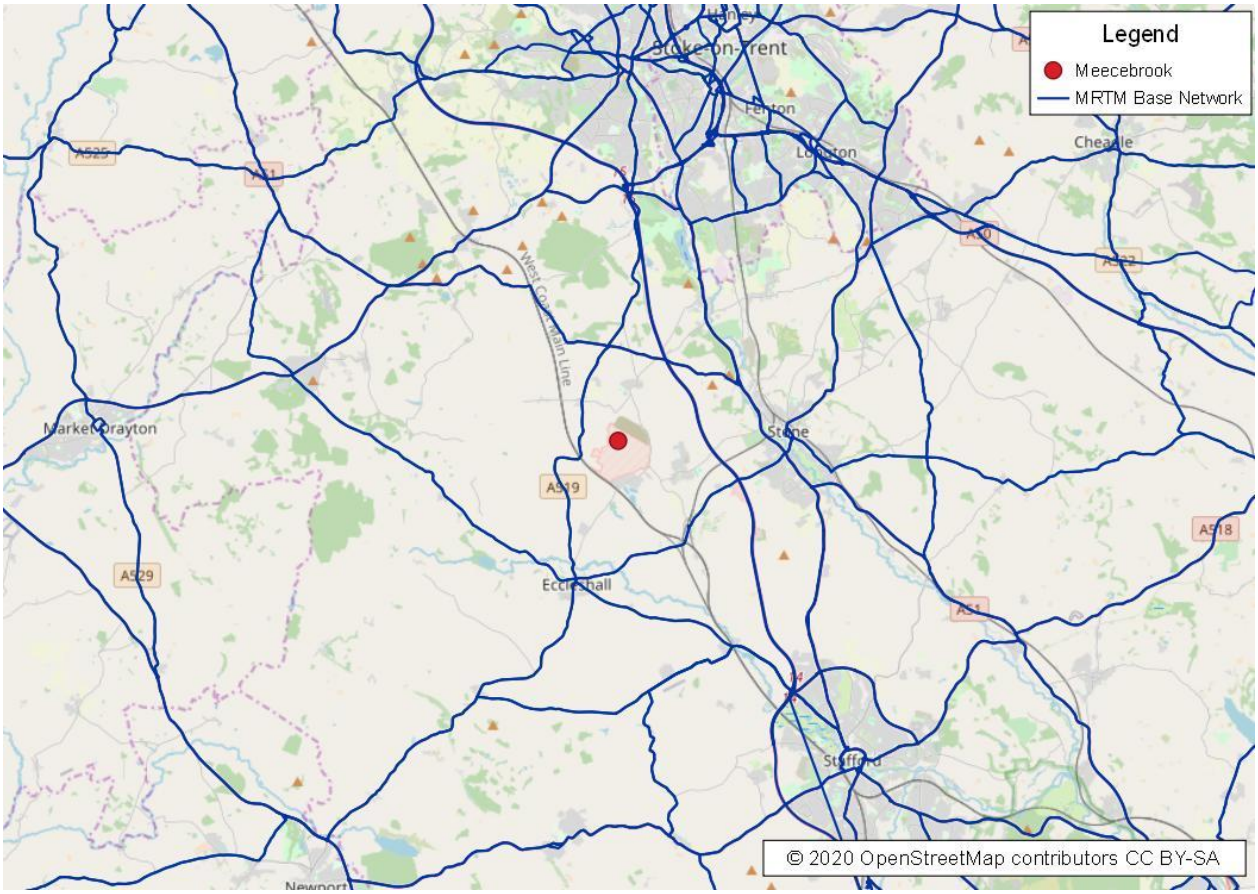


Figure 4-1 shows that the main strategic roads bounding the development i.e. the M6 to the east, the A53 to the north and the A518 to the south are included in detailed simulation coding. This detailed simulation contains accurate junction layouts and capacities and so the MRTM base model can be considered reliable at SRN level in the immediate vicinity of the proposed development.

The light green lines presented in Figure 2-1 are template simulation coding, which are non-specific to the roads. That is, standard capacities and lane allocations have been assumed without detailed observations of true network conditions undertaken. In addition, the blue lines represent fixed speed areas which are mostly in more congested urban areas. These links do not have any coding of capacities or junctions and are based solely on observed speeds in each time period. It is noted that the routes within Stafford are coded in this way.

During the calibration and validation process of the MRTM significant issues and unrealistic behaviours have been investigated to determine whether the template coding and matrix demand used was providing a reasonable representation of the network conditions.

This process, while likely to have removed any significant issues in the network, is not equivalent to a high level of calibration and validation along the non-SRN road links and hence traffic flows in the existing base model may be less realistic.

An initial desktop study of the local road network in the vicinity of the development has shown that, with few exceptions (The A5109 Newcastle Road and Mill Lane), the surrounding roads are single track and are currently likely to carry only a very small amount of traffic. As a result, it may be expected that the development of Meecebrook would ensure that appropriate infrastructure was put in place to enable the development traffic to access to the more appropriate higher-level routes.

4.2. Zoning

Along with the required level of network detail it is necessary to provide the correct level of spatial disaggregation of land along with realistic loading points onto the network to model road users routing behaviour. Figure 4-3 below shows the MCHM zoning in the vicinity of the Meecebrook development.

Figure 4-3 - MCHM - Model Zoning

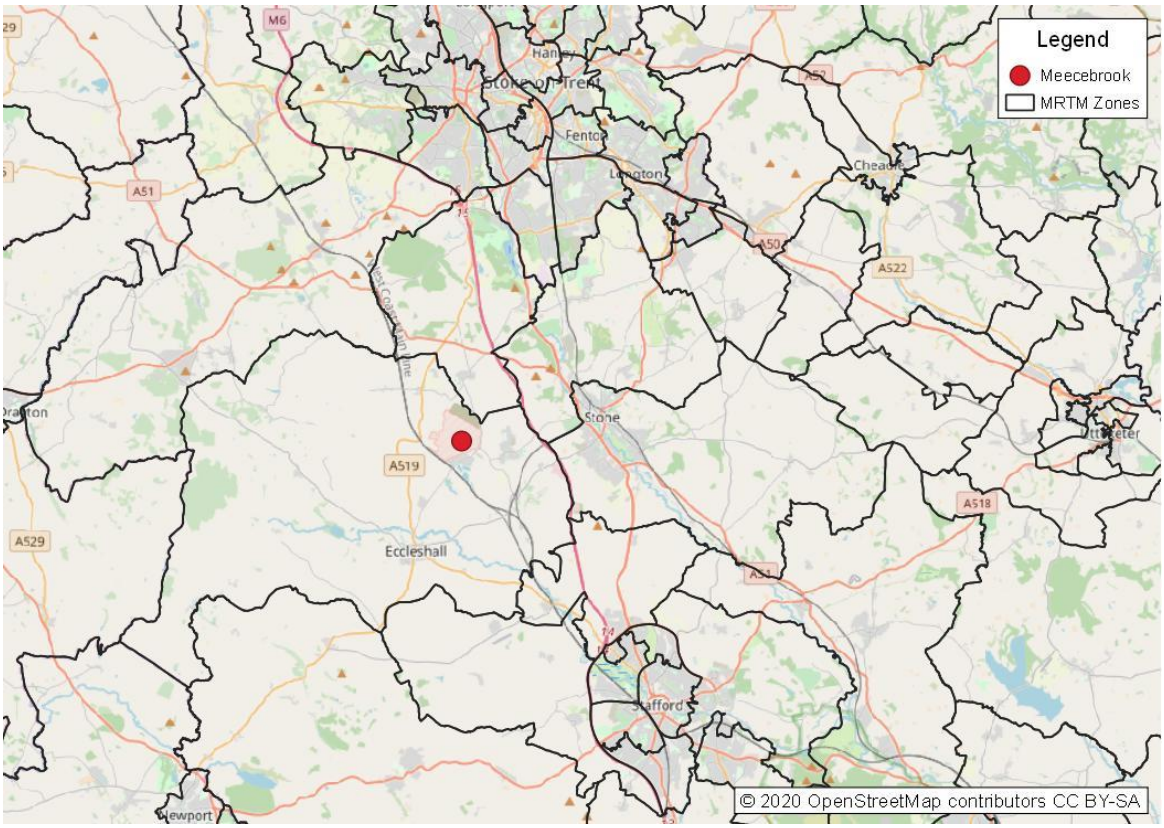


Figure 4-3 shows that the model zoning in the area surrounding the proposed development covers a large geographic area and is based on Middle Super Output Areas (MSOAs). Whilst it is recognised, that there are few large settlements or employment centres within the Meecebrook vicinity, in its current form the model zoning will not provide a detailed understanding of trip patterns in the area immediately surrounding the development. In particular the Stone urban area is contained within a single large zone which also includes several smaller villages.

In addition, the close proximity of Eccleshall to the development site means that there's likely to be a significant impact on the number of trips both through and to/from the settlement. As a result, it may be expected that a more detailed assessment of the local impacts of the Meecebrook development will be required and hence these existing model zones may be disaggregated based on surveys or available household and employment data.

4.3. Base year demand

The MRTM base year demand was developed using mobile phone and synthetic model data and calibrated and validated using traffic counts and journey times.

TAG Unit M3.1 state that a base year model is acceptable for use up to 6 years after its development which means that the 2015 base year developed for the MRTM would not become outdated until after 2021. It is noted however that it is not simply the age of a base model that determines its suitability and a detailed review of the model will be necessary before any conclusions are drawn, particularly in the key study area identified in the AIA, as discussed in the Calibration and validation section below.

It is also noted that the existing model time periods are all based on an average hour during each peak period. For example, the AM Peak model is an hourly average of observed data between 07:00 and 10:00. It is also noted that this is likely to provide an underestimation of the most significant network impacts which will occur when highway traffic is at its maximum.

Using existing local traffic count data, it is possible to determine the ratio of the peak hour traffic flows to that of the peak period. This ratio can then be used as a peak hour conversion factor to uplift the peak period matrices to produce estimated peak hour matrices. This approach, though relatively simple can provide an indication of the network conditions under the true peak in traffic flows without the need to undertake a lengthy recalibration and validation process. It is recognised, however that this approximation may be challenged by reviewing authorities, e.g. DfT however we are aware of its application on other model and scheme assessments across the country. Consideration of the suitability of a peak period model would need to be discussed with Staffordshire County Council and checks undertaken using available count data to highlight its potential use and hence this adjustment has not been assumed at this stage.

4.4. Calibration and validation

Of particular importance to the assessment is the level of model calibration undertaken and validation achieved both within the key area surrounding Meecebrook and on the SRN links which are most likely to provide access to major towns.

A review of the MRTM Model Validation Report has been undertaken in order to assess suitability of the MRTM both for use in its current format and should it form the basis of a refined or updated model.

It was found that the level of calibration and validation obtained was within TAG criteria along the M6 mainline between Junctions 14 and 15 and wider calibration has been undertaken in the Meecebrook vicinity. Full details are provided in Appendix A.

4.5. Base model options

Having reviewed the base model network, zoning system and the level of calibration and validation near to the Meecebrook development, four approaches are proposed below with their associated advantages, limitations and the associated outcomes.

Each of the proposed approaches concerns only the key study area identified by the AIA and where any revalidation is to be undertaken it will focus on the key study area only. Outside the study area, the MRTM will be considered well validated enough so as to enable traffic to enter the study area at the appropriate point.

An additional consideration is whether to use the model as is or to take a cordon sub area model. The advantages and drawbacks of each approach is discussed in Section 4.8.

Table 4-1 – Base Model Options

Option/Approach	Advantage	Limitation	Outcomes
B1. Use the 2015 base model as is but undertake a review of the model in the development vicinity to enable any necessary caveats to be made when reporting modelled impacts. (e.g. recognise where the validation flows are too high / low etc which may affect the results when considering the forecasting)	• Allows any limitations to be identified at an early stage; • Low cost.	• Full consequences of limitations e.g. poor flow validation along the A519 may not be fully apparent without modelling the counterfactual, corrected scenario with any necessary interventions made; • Limited network detail in the area surrounding the Meecebrook development and beyond the SRN default coding, speed flow curves or fixed speeds applied; • 2015 base year is now 5 years old and is approaching the limit of what's acceptable under DfT guidance. As this assessment is unlikely to occur for another 1-2 years the model may be outdated by this time; • Would not stand up to scrutiny at the Local Plan Stage but may be appropriate at the early stage testing.	• Would enable the development of a forecast scenario from the base model to be used to assess the transport impacts of the Meecebrook development to be undertaken; • Provides a basis for understanding of the impacts of the scheme to enable initial assessment of mitigations to be undertaken.
B2. Undertake a detailed review of the 2015 base model in the development vicinity and make high level interventions to improve the model suitability where deemed necessary. This approach would not be a full revalidation in key areas but would involve matrix factoring and	• Allows any limitations to be identified and proportionate intervention undertaken; • Provide additional confidence that the base model is a more robust basis for forecasting highway impacts of the development; • Relatively low cost.	• Having identified limitations and adjusting network or matrices to address these, this may have wider, knock on effects that cause further uncertainties in the model; • Limited network detail in the area surrounding the Meecebrook development and beyond the SRN	• The refined base model may be used either as basis for an updated 2041 MCHM forecast scenario (by carrying through any network or matrix changes) or could be used to form the basis of a new forecast model scenario; • Provides a basis understanding of the impacts of the scheme to

adjustments to try and improve the overall validation as appropriate.		default coding, speed flow curves or fixed speeds applied; • 2015 base year is outdated and trip patterns in the base year matrix may not be fully representative of current distributions. (the potential for this would be discussed with SCC); • May not stand up to scrutiny at the Local Plan Stage unless it's possible to demonstrate that patterns have not been affected by the adjustments.	enable initial assessment of mitigations to be undertaken.
B3. Refine the 2015 base model, adding in additional network detail in the development vicinity and updating template coding to detailed simulation coding. Retain the 2015 base year but undertake additional calibration using available historic data.	• Improved model detail in the development vicinity enabling a better understanding of local network impacts; • Improved model calibration and validation in key areas to enable a more robust basis for forecasting.	• Calibration and validation are often time consuming and relatively expensive; • Though calibration and validation would be improved the base year of 2015 is now five years old. It may be necessary to also do some present year validation checks using available up to date counts to ensure the model is still appropriate for use. This may be difficult for the M6 due to the significant amount of roadworks (e.g. J13-15 Smart Motorway) that have been present around this area over the last number of years. This would need to be taken into account.	• Refining and improving the calibration and validation of the model in key areas will provide a more robust basis for forecasting.
B4. As above using the 2015 base model as a starting point refining the network and model zoning and revalidate to a more recent year. New	• Improved model detail in the development vicinity enabling a better understanding of local network impacts;	• New data would need to be obtained including (for example) mobile phone data (MPD) and	• Refining and improving the calibration and validation of the model in key areas will provide a more robust basis for forecasting;

data sources to be obtained to inform trip distributions, link flows and journey times in key area.	• Improved model calibration and validation in key areas to enable a more robust basis for forecasting; • More up to date understanding of trip patterns in the key areas. • Model development would be able to focus on areas identified in the Impacts Assessment as being significantly affected by the development • Developed in line with TAG guidance	traffic count data in the key study area; • Difficulty associated with gathering traffic data due to the longer-term impacts of COVID-19. Collection of new data may need to be postponed or historic (though more recent than 2015) data used.	• An updated and expanded model may provide an evidence base for several future studies. Enabling scheme and developer testing to be undertaken over the following years.

The suitability and feasibility of each of the base model development strategies is dependent on the approach necessary for developing model forecast scenarios that will be used to assess development impacts. The options outlined in Table 4-1 and how they relate to other aspects of overall modelling strategy are discussed in Chapter 5.

4.6. Forecast network

The future condition of the road network will play a pivotal role in the impacts of the Meecebrook development on the surrounding area. Capturing the reassignment which occurs due to highway schemes will enable a more reliable assessment of the transport impacts of the Meecebrook development to be undertaken.

The criteria for inclusion of a road scheme in the MRTM is outlined in the Traffic Forecasting Report and is as follows;

- SRN - All schemes on or connected to the SRN;
- Urban Areas - New links, turns or road improvements with the potential to impact the SRN;
- All new bypasses and link roads; and
- Planning/development applications with SRN impacting schemes are only included if they introduce significant potential for rerouting.

Table 4-2 below outlines some of the potential options for developing forecast networks along with the advantages and limitations of each.

Table 4-2 – Forecast Network Options

Option	Advantage	Limitation	Outcomes
FN1. Use the 2015 base network.	• No additional work required; • Assessment may be undertaken quickly with relatively low cost.	• No future highway schemes, even those already opened since 2015 would not be included. • Would not reflect changes to the M6 such as the M6 J13 – 15 smart motorway scheme which is currently being built	• A limited understanding of transport impacts with re-assignment resulting from changes in demand only.
FN1.1 Use the 2015 base network and develop a future year network from the existing scheme coding include files	• Minimal need for network coding as 'include' files can be added to the base network; • Able to reflect changes to the M6 (such as the J13-J15 scheme) as well as the wider road network; • Assessment may be undertaken quickly with relatively low cost.	• Scheme coding may be somewhat dated as the work was undertaken in 2016 and as scheme opening date nears then scheme design may be changed; • Smaller Local Authority schemes may not have been included	• A reasonable understanding of transport impacts with re-assignment resulting from changes in demand and future year schemes.
FN2. Use MCHM 2041 Forecast Network.	• No additional work required; • Assessment may be undertaken quickly with relatively low cost.	• Highway schemes included may not be up to date with the latest funding and planning allocations; • Area of focus for inclusion of future highway schemes is not in the vicinity of Meecebrook and so future scheme coding may not be well detailed; and • Fixed forecast year which may not be best suited for assessing the Meecebrook development.	• A reasonable understanding of transport impacts with re-assignment resulting from future highway scheme as well as demand changes.
FN3. Update/refine the MCHM 2041 Forecast Network with a focus on SRN schemes	• Will contain committed highways schemes in line with most up to date information; • From a 2041 forecast year it is possible to develop other alternative	• Additional work will be required to update/refine the Uncertainty Log of committed highway schemes and code these into the model;	• An understanding of the transport impacts of the Meecebrook development on the wider road network using the most up to date information.

	forecast years relatively easily by excluding or adding highway schemes based on their opening year.		
FN4. Develop forecast network from a refined base model	• Improved network detail in the Meecebrook development vicinity; • Will contain committed highways schemes in line with most up to date information; • Flexible with regard to forecast years.	• This approach would be the most time consuming and costly but most accurate.	• An understanding of the transport impacts of the Meecebrook development using the most up to date information, with a greater level of detail than other options, particularly in the vicinity of the development itself.

4.7. Forecast matrix development

This section outlines the various approaches that may be undertaken in developing forecast matrices that will enable assessment of the transportation impacts of the Meecebrook development and will focus on the three key elements:

- Meecebrook development trips;
- Other key development trips; and
- Background growth and constraining.

These are discussed below.

4.7.1. Meecebrook development trips

The addition of Meecebrook development trips will be required to assess the impact of the scheme.

A common methodology for determining trip distribution for new development zones is to use similar existing model zone trip distributions which are based on observed data. It is noted, however that due to its location there are no similar zones that would represent the level of demand from the proposed Meecebrook development and hence this would need to consider the distribution from an aggregation of zones in the local area.

An alternative approach would be to use the Travel Demand Model (TDM) currently being developed by Atkins which uses a gravity model to provide an initial understanding of how the Meecebrook development trips are likely to distribute geographically. This TDM could be used to inform the trip distribution used in strategic modelling and could be further disaggregated to the model zoning system based on available household and employment data or the existing demand in each zone. This is considered a proportionate but acceptable approach

It is noted that these Meecebrook trips could be added directly to the post demand model 2041 MCHM matrices to provide an initial assessment of the demand and this approach would be appropriate for the AIA assessment.

4.7.2. Background and external growth

To enable fair comparison of the impacts and benefits between schemes, the Department for Transport (DfT) mandates that the total forecast growth applied in developing forecast model scenarios is in line with the National Trip End Model (NTEM). NTEM provides growth factors for forecast years up to 2051 for several trip purposes and by geographic region, both at the county and local authority level.

The AIA will inform the appropriate level of resolution needed to assess development impacts and the level of disaggregation at which the background growth is applied.

The simplest approach would be to derive growth factors for all car trips in Staffordshire to extrapolate between the base year and the desired forecast year. These growth factors may then be applied to the base year matrix which contains the Meecebrook development trips to produce forecast matrices which account for both Meecebrook development trips and background growth. A final constraining process is then necessary to ensure the total traffic growth is in line with NTEM. (Base + Meecebrook + Background Growth).

NTEM does not provide growth factors for Light or Heavy Goods vehicles and though the procedure is similar and is applied at the same level of resolution the growth factors are derived from Road Traffic Forecasts (RTF).

4.7.3. Other key development trips

TAG guidance states that an uncertainty log should be developed to consider those developments that are *'near certain'* or '*more than likely'* to be built in the future. These developments should then be explicitly included within the model. As noted, at present the existing MCHM 2041 model forecasts, as with the MRTM's, exclude explicit developments and focus only on overall growth forecasts across the region as a whole, based on NTEM. Whilst this approach may be considered appropriate for an initial stage, further refinement would be required at any more detailed assessment of the development. This would include those additional developments that meet the TAG criteria and the overall growth would be constrained to the NTEM levels in line with guidance

Based on this Table 2.6 summarises the potential options.

Table 4-3 - Forecast Matrix Options

Option	Advantage	Limitation	Outcomes
FM1. Meecebrook Development + MCHM 2041 post demand model matrix	• Simply to apply; • Enables quick initial assessment of development impacts.	• Does not account for other known developments and may not produce a full reflection of network impacts resulting from Meecebrook development; • Not TAG compliant.	• Suitable for a high-level assessment of the transport impacts of the development on the surrounding road network.
FM2. Meecebrook Development + Background Growth Scenario	• Removes the need to develop an Uncertainty Log of known developments; • No need to gather information from local authorities; • Lower cost and shorter programme requirements.	• Does not account for other known developments and may not produce a full reflection of network impacts resulting from Meecebrook; development; • For the AIA it is suggested that constraining to NTEM will not be necessary as the objective is to understand the impacts of the development itself. This approach would not be TAG compliant and would need to be refined should the development proposal need to be advanced to the next stage.	• Suitable for a high-level assessment of the transport impacts of the development on the surrounding road network.
FM3. Meecebrook Development + Other Known Developments (in line with TAG uncertainty Log definitions) + Background Growth Scenario	• Accounts for all key developments in the study area; • Allows greater differentiation between impacts of known developments.	• This is a more time consuming and costly approach; • Relies on planning information which may be subject to uncertainty or incomplete.	• More detailed understanding of the transport impacts of the Meecebrook development using the most up to date information available (depending on the level of network coding also undertaken).

4.8. Cordoning and external areas

In addition to the Fully Modelled Area (FMA) described in TAG and reproduced in Section 3, consideration must be given to the External Area, described in TAG unit M3.2 as follows

- ***External Area:*** *In this area impacts of interventions would be so small as to be reasonably assumed to be negligible. It would be characterised by: a network representing a large proportion of the rest of Great Britain, a partial representation of demand (trips to, from and across the Fully Modelled Area); large zones; skeletal networks and simple speed/flow relationships or fixed speed modelling.*

In traffic routeing terms, a primary objective for the External Area is to ensure that traffic enters the Fully Modelled Area at the right locations and that opportunities to avoid travelling through the Fully Modelled Area are properly represented.

The FMA of the MRTM and MCHM, as shown in Figure 4-1, covers a large area and it is expected (following the results of the AIA) that the appropriate FMA for assessing the Meecebrook development will be significantly smaller.

To limit the effects of model noise, reduce model run times, and to improve convergence a cordon model may be derived from the existing MRTM base model.

Whilst this approach may be considered appropriate it is noted that not cordoning the model, and hence leaving the full model structure, will enable the continued use of the MRTM DIADEM demand model which has been calibrated for the model as a whole. This, as discussed in Section 4.9 below, also enables the use of the rail cost skims to provide an element of mode choice and hence would be in line with TAG guidance. This functionality would be lost through the cordoning process and hence should be taken into account

An alternative option to cordoning that will also reduce model noise and run times in the future year models is to simplify the external model network by applying a fixed cost flow (FCF) transformation. This process retains the geometry of the wider simulation network, allowing all turning movements at junctions during later assignments but with fixed cost-flow curves for each turning movement.

The main advantage of applying an FCF to the network is that it leaves the entire network and zoning structure intact, facilitating the use of the existing MRTM demand model and retaining a level of consistency with the underlying Highways England model, as, as noted above, the Midlands Connect model is also based on this.

Both the FCF and cordoning approach have the advantage of significantly reducing model run times, though of course the size of the cordon and FCF network play a role. As model size and detail increase the computational power needed and therefore time taken to run both highway assignments and demand models increases. This would be of particular concern should there be a need to refine the MRTM by adding additional network detail and matrix zones whilst retaining the wider model structure for consistency. We are aware that on other studies where the full MRTM gas been enhanced demand model run times of up to one day per forecast year are possible which is not considered appropriate.

As a result, it is considered that for any enhanced model a test would be undertaken to understand the time savings of using the FCF approach. If this was still considered excessive then a cordon approach would be adopted.

4.9. Variable demand modelling

Any change in transport conditions, whether resulting from the implementation of a new scheme, a change in trip numbers on the network or just the growth in traffic over time has the ability to induce a change in demand response.

The size of the proposed Meecebrook development indicates that along with the new housing and employment sites there’s likely to be a need for new transportation infrastructure.

Establishing a realistic demand for both with and without intervention scenarios requires the change in travel behaviours to be modelled. TAG Unit M2 outlines under which circumstances modelling this change in demand is necessary and specifies that unless a robust case can be made that the scheme is unlikely to significantly impact demand then the demand response should be modelled.

For the initial stages of assessing the transportation impacts of the Meecebrook development it is likely that omitting a demand response model, or preferably using the existing post demand model forecast matrices, as proposed through the use of the 2041 MCHM forecast, would be considered proportionate. Should Staffordshire wish to submit a funding application to the DfT for any associated infrastructure, or to provide credibility in demonstrating the impacts of the development in the Local Plan then a full variable demand model would be necessary.

Table 4-4 below outlines the main advantages and limitations of each approach.

Table 4-4 - VDM Options

Option	Advantage	Limitation	Outcomes
VDM1. No new VDM assessment - Use of MCHM Post Demand Model 2041 Forecast Matrix	• Considered proportionate at early stages of testing; • No need for any additional work.	• Assumes no change in demand resulting from Meecebrook development and associated interventions; • Not TAG compliant.	• No understanding of any demand response due to the development.
VDM2. Simplified Origin Destination VDM for a cordon model at a time period level.	• Simplified AM, PM and IP OD DIADEM demand model; • Quicker model run times.	• Not fully TAG compliant but recognise that this approach has been adopted in other scenarios; • Doesn't take changes across the day into account; • Doesn't link to the wider MRTM model structure and may be difficult to account for Mode Choice responses.	• Provides a VDM response to the change in flow over time and due to the development.
VDM3. Use the existing VDM framework associated with the MRTM.	• Allows changes in demand to be modelled; • Relatively cost effective given the existing framework; • The future year rail costs from the MRTM can also be incorporated into the demand model; • TAG compliant.	• Framework is prescriptive, amendments can be made but is often time consuming and difficult to do; • Longer model run times; • Need to review fitting on factors after any adjustment of the base year model.	• An assessment of the demand response resulting from the Meecebrook development and/or related interventions; • In line with TAG.

4.10. Additional opportunities and requirements

Along with an assessment of the transportation impacts of the Meecebrook development on the surrounding highway network, depending on the specification, a strategic model can provide an evidence base for the impacts of a variety of transport interventions. Whilst, at this stage the additional options have not been considered, they are noted below, and we would be happy to discuss these further if considered appropriate.

Wider detailed model

Given the relative proximity of the Meecebrook development site to Stafford a potential option would be to develop an enhanced model covering both areas. This would enable the model to be used beyond the Meecebrook assessment and provide an update to the existing Stafford Traffic model which has a validation year of 2007.

Bus model

Incorporating buses into the strategic model is a significant undertaking and would require new surveys to be commissioned which may be difficult due to the impacts of COVID-19. Should buses emerge as a significant option for providing transport links to the Meecebrook development an alternative and lighter touch approach would be to use external assessments to adjust the highway demand in line with expected bus usage.

Rail demand

Using the MRTM demand model enables long distance rail skims to be incorporated and for this potential mode shift to be represented. Should an assessment of the impacts of a new railway station at Meecebrook need to be represented in the strategic modelling exercise then either the existing MRTM demand model would need to be updated or a new approach agreed.

Developer testing

Depending on the geographic coverage and level of model detail there may be opportunities to use any updated and revalidated model that's developed to assess the Meecebrook development for testing other developments. The location of potential new developments is an aspect to consider when finalising model scope.

4.11. Conclusion

This section has reviewed the existing models and discussed the limitations associated with each aspect. Both the level of robustness and the acceptability of model limitations will vary depending on the overall aims of any modelling work undertaken.

For an initial assessment to identify the geographic area of impact resulting from the development a high-level exercise using existing tool despite their limitations may be sufficient. Should a funding application or Local Plan testing be required then there will be a requirement for a TAG compliant model that is capable of reflecting both the local and wider impacts of the development and assessing associated transport interventions in detail.

Developing a fully TAG compliant model is a significant undertaking and it may be appropriate to undertake an intermediate stage of modelling which will enable the reassignment of traffic due to the development to be determined and the type of interventions that may be necessary identified. Though this will not stand up to scrutiny at the Local Plan stage it may form an important stepping stone towards building an evidence base to support the developments promotion.

5. Key options

This section considers the various approaches and options outlined above and presents three key options. These options have been aggregated from the review undertaken in this report for each element outlined throughout this report.

Indictive costs have been provided and the options have been presented at increasing levels of model robustness. Each option builds on the previous and is aimed at progressing the Meecebrook development through planning and funding applications. Option 3 would provide a TAG compliant strategic model that could also form the basis of any further economic appraisal.

Timescales required are presented with indicative programmes included in Appendix B.

5.1. Option 1 – Area of Impacts Assessment (AIA)

This option would form the initial stage of any more detailed modelling work and would use the existing MCHM 2041 forecast scenario to provide a basis for assessing the geographic scale of the impacts of the Meecebrook development. It could be undertaken as a stand-alone exercise to provide an initial understanding of the geographic area impacted by the development and to begin to identify areas where intervention may be required.

The elements comprising this option are outlined in Table 5-1 below along with an estimated cost for the fees associated with undertaking this work.

Table 5-1 - Option 1 - Summary

Element	Option	Indicative Cost & Timescale
Forecast Network	**Option FN2:** Use MCHM 2041 Forecast Network	£10,000 - £20,000 1 - 1.5 month programme
Forecast Matrix	**Option FM1:** Meecebrook Development + MCHM 2041 post demand model matrix	
Variable Demand Model	**Option VDM1:** No New VDM	

Outcomes and limitations

Undertaking the modelling work for Option 1 would provide an initial estimate for the geographic scale of the impacts that can be expected due to the Meecebrook development. The impacts on the M6 can be considered reliable given the presence of detailed simulation coding and availability of alternative strategic routes already present in the model and the fact that calibration has been undertaken along the M6 mainline.

This approach may be suited to initially identifying any areas on the network that may need intervention and may provide some evidence for the type of interventions that may be necessary on the road network. This option is considered to be a necessary first step in developing a more detailed scope for any further modelling work. It is recognised, however that beyond the SRN the network coding of the junctions reduces to template coding and hence this would have to be taken into account.

5.2. Option 2 – Model refinement

This approach consists of using the MCHM as a basis for assessing the transportation impacts of the Meecebrook development. The base model would be reviewed, and adjustments made to the matrix and network where deemed necessary. The adjusted base model would then form the basis of an updated forecast scenario which would also build upon the existing MCHM 2041 forecast scenario. The highway schemes included would be updated where necessary with a focus on SRN scheme and local schemes in the key area. No specific developments besides Meecebrook itself would be modelled at this stage.

The elements comprising this option are outlined in Table 5-2 below along with an estimated cost for the fees associated with undertaking this work.

Table 5-2 - Option 2 – Summary

Element	Option	Indicative Cost & Timescale
Base Model	**Option A2:** Undertake a detailed review of the 2015 MCHM Base model in the development vicinity and make high level adjustments to the model to improve suitability for this assessment if necessary.	£40,000 – £65,000 3 - 4 month programme
Forecast Network	**Option FN3:** Update/refine the MCHM 2041 Forecast Network with a focus on SRN schemes where and changes are identified.	
Forecast Matrix	**Option FM2:** Meecebrook Development + Background Growth Scenario	
Variable Demand Model	**Option VDM1:** No new VDM Forecast matrices would be developed using the post VDM 2041 matrices adjusted in line with any base year adjustments.	

Outcomes and limitations

Identifying and addressing any significant shortcomings in the base model will ensure a more robust basis for forecasting and will remove identified sources of systematic error. This will allow greater confidence in the model results than those produced during Option 1 with a greater focus placed on the key area. It is noted that any adjustments made to the base year would not reflect a full revalidation, only a sense check and selective factoring, and it is assumed that existing count data can be made readily available.

5.3. Option 3 – Model update and revalidation

This approach would mean a model update and revalidation using more recent data sources along with making the necessary network and matrix zoning refinements that would be necessary to full represent the local impacts of the Meecebrook developments and any associated infrastructure.

The elements comprising this option are outlined in Table 5-3 below along with an estimated cost for the fees associated with undertaking this work.

Table 5-3 - Option 3 - Summary

Element	Option	Indicative Cost & Timescale
Base Model	**Option B4:** As above using the 2015 MRTM Base model as a starting point. Refine the network and model zoning and revalidate to a more recent year in key study area. New data sources to be obtained to inform trip distributions.	£210,000 – £260,000 (excl. data costs) 8 - 10 month programme
Forecast Network	**Option FN4:** Develop forecast network from a refined base model.	

Forecast Matrix	**Option FM3:** Meecebrook Development + Other Known Developments + Background Growth Scenario
Variable Demand Model	**Option VDM2:** Use the existing VDM framework associated with the MRTM

Outcomes and limitations

The main drawbacks of this comprehensive approach are the significant investments required both with respect to new data sources and work required.

That said, this option would provide a TAG compliant strategic transport model with an up to date base year that would facilitate future uses. For example, should any new schemes be proposed within or around the Meecebrook development or should any new developments need to undergo planning applications an up to date, TAG compliant model could be used to assess the impacts. Charging developers for using this updated model may also provide the means to recoup some of the upfront investment required.

The key consideration for this option is whether there is likely to be any funding available from central government to facilitate the infrastructure required to bring forward this development. Though the model update would require a significant investment, it may prove cost effective in the long run.

6. Recommendations and next steps

This report has outlined several options that are available for each of the elements comprising a strategic transport model. With the view to promoting the Meecebrook development and building a robust evidence base for the transport impacts on the wider road network, three key options have been presented which represent increasing levels of model development and therefore evidence base robustness.

At the time of writing both the medium and longer term aims and ambitions of Stafford Borough and Staffordshire County Council with regards to the Meecebrook development and other schemes and developments are still emerging. With this in mind at this stage the report is aimed at providing the options available along with the practical constraints of each option to facilitate decision making at a later stage.

The key recommendation is that an AIA should be undertaken. This will serve two purposes. Firstly, it will provide an initial, high level understanding of where the impacts on the road network are likely to occur and secondly will provide the information required in order to develop a detailed scope for any modelling work required at a later stage.

It is recommended that MCHM be used both as a basis for the AIA and for any additional modelling work undertaken. Should a full model revalidation be required then many features of the MCHM may be used as a starting point. For example; the SRN network coding is of a good standard and though some updates may be needed using the network coding removes the need for unnecessary re-work.

The limitations of the MCHM in its current form, with regards to its suitability for assessing the Meecebrook development have been discussed and can be summarised as follows;

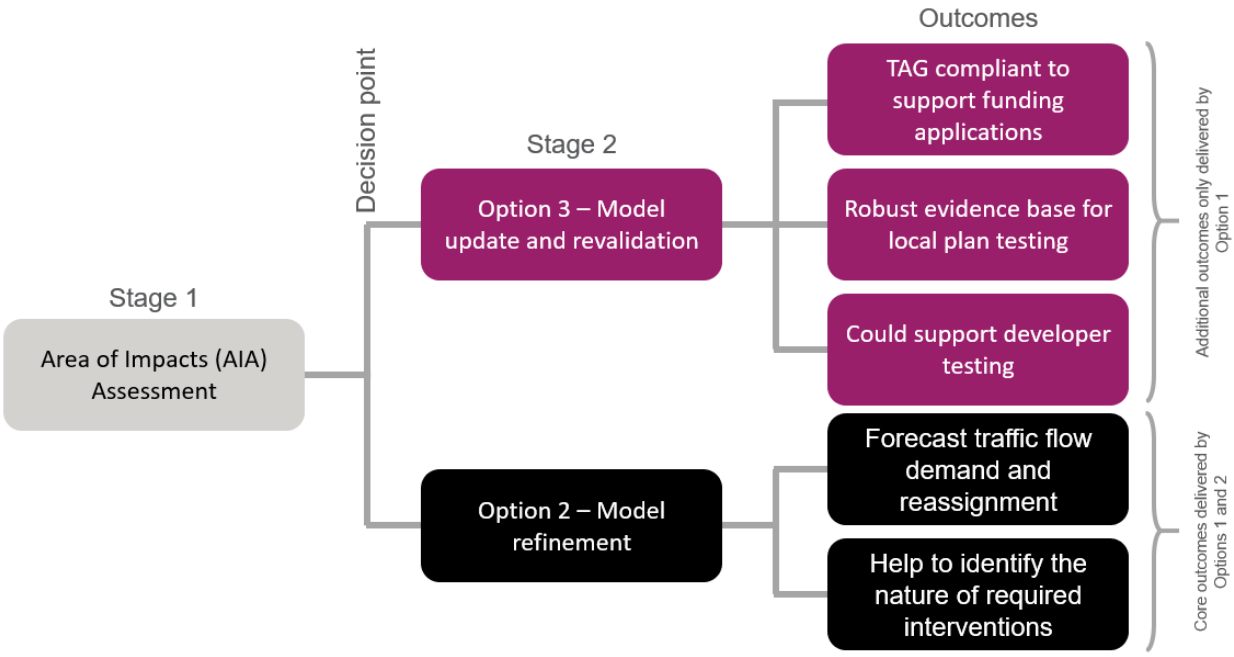
- Base year will soon be outdated;
- Network detail in the Meecebrook area is limited;
- Model zoning in the Meecebrook area is relatively coarse and would need to be disaggregated.

Following the AIA and using the evidence provided it will be necessary to decide whether to invest in a full model update and revalidation or to undertake a more restricted approach in order to provide a more high-level assessment. The more restricted approach (Option 2 – model refinement) can be summarised as follows;

- Undertake detailed review of the MCHM in the key area;
- Make high level interventions to improve model accuracy such as selective matrix factoring where deemed necessary;
- Use the existing MCHM 2041 forecast scenario as a basis for a refined and updated forecast scenario to assess the Meecebrook development, incorporating changes made to the base model.

Figure 6-1 below shows the decision point following the AIA and the outcomes associated with both of the approaches.

Figure 6-1 – Modelling Strategy – Stages & Outcomes



As discussed, the model refinement will provide an understanding of the transportation impacts resulting from the Meecebrook development and will enable the nature of the any required interventions to be identified. However, should SCC wish to build a robust evidence base for securing Local Plan allocation or making a funding application to central government then a TAG compliant model revalidation with a focus on the key area surrounding Meecebrook will be necessary.

Appendices

Appendix A. MRTM calibration and validation results

An additional consideration to network and model zoning suitability is the level of calibration undertaken and validation achieved along links which are most likely to be affected by the Meecebrook development. Figure A-1 below shows the location of calibration and validation traffic count sites used during the development of the MCHM.

Figure A-1 - MRTM Calibration & Validation Sites - SRN

Source: MRTM Local Model Validation Report (March 2016)

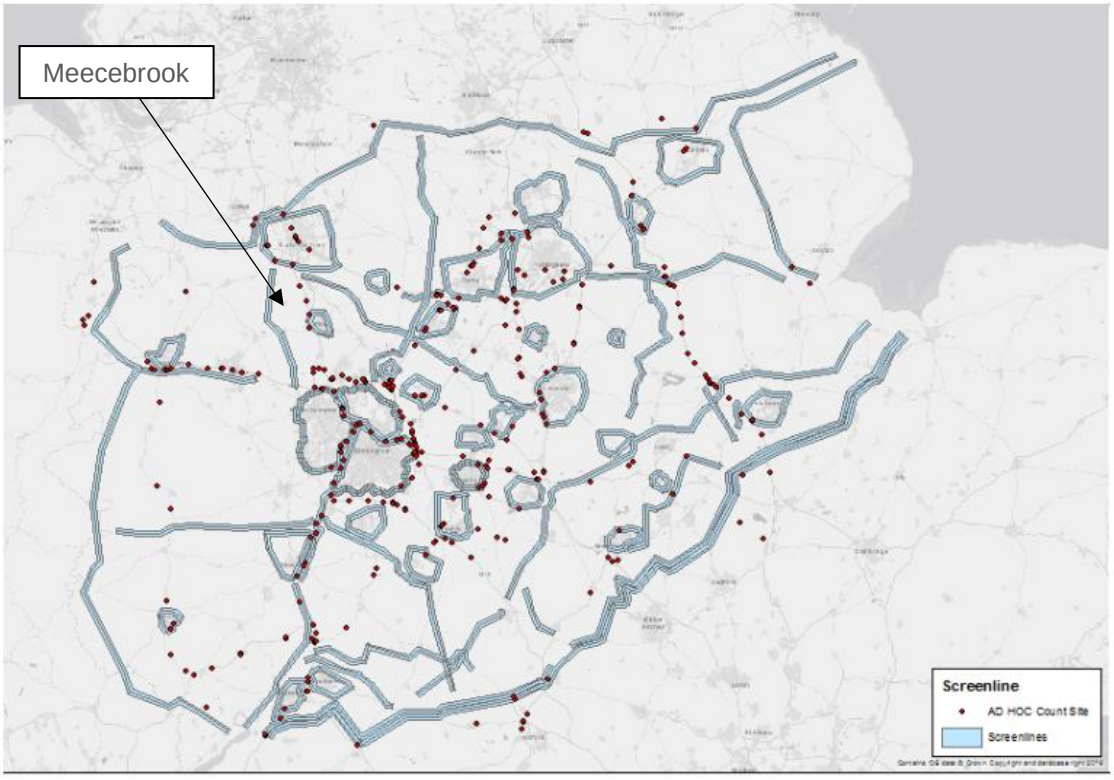
Figure A-1 shows that between the two M6 junctions that provide access to the Meecebrook area (Junctions 14 and 15) there are calibration counts indicating that the model has been calibrated along this key strategic link.

A review of the model documentation revealed that the calibration results along the M6 mainline were, with few exceptions within the TAG mandated criteria . The M6 mainline between J14 and calibration results are summarised below in Table A-1 and highlights that the criteria have been met in all time periods and both directions.

Table A-1 - M6 J14 - J15 Calibration Results

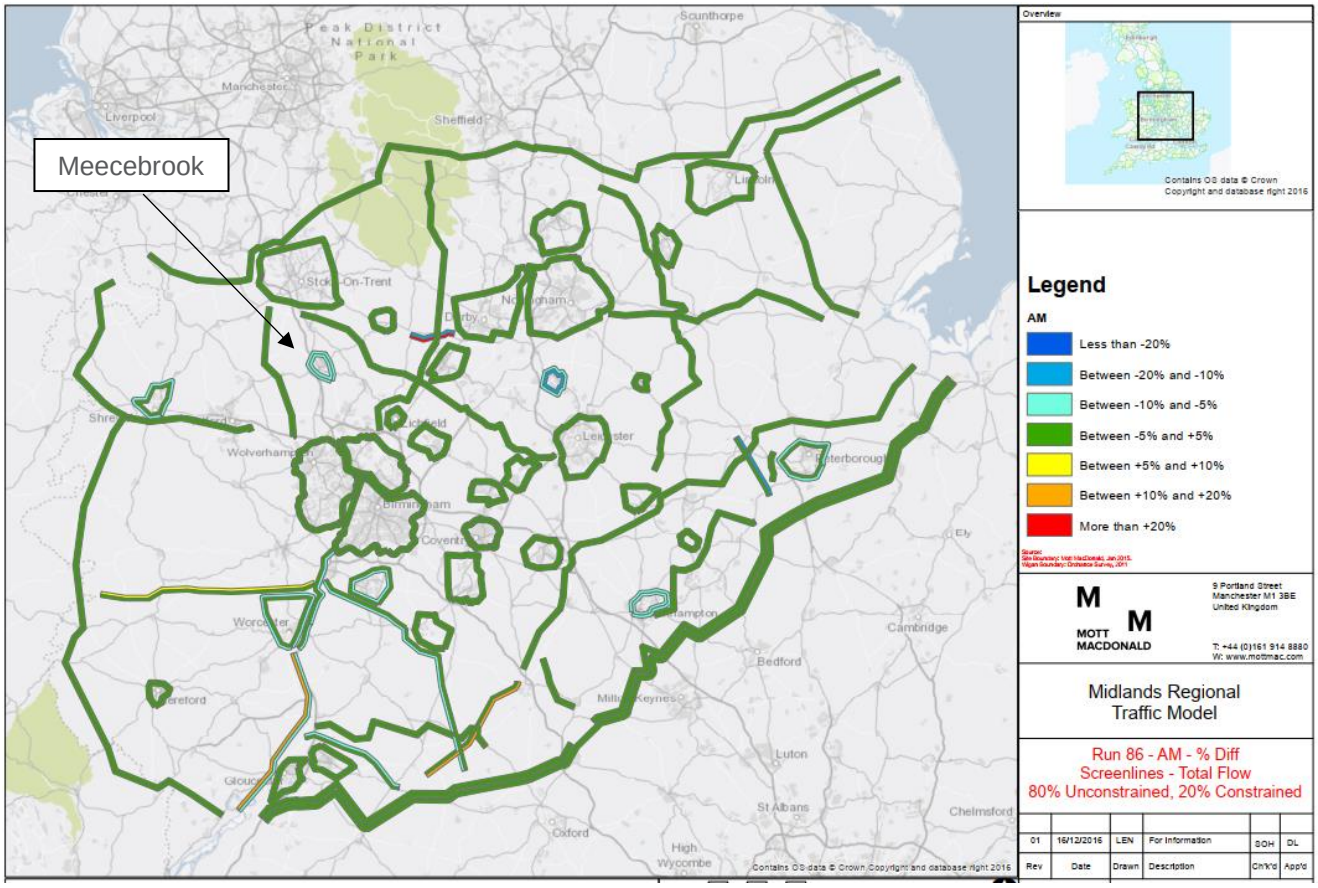
		Total Vehicles			Cars			LGVs			HGVs		
		% Diff	GEH	Pass	% Diff	GEH	Pass	% Diff	GEH	Pass	% Diff	GEH	Pass
AM	NB	3.9%	2.3	✓	6.2%	2.8	✓	0.3%	0.1	✓	0.4%	0.1	✓
	SB	0.5%	0.3	✓	0.1%	0.0	✓	1.6%	0.3	✓	1.4%	0.4	✓
IP	NB	6.7%	4.0	✓	9.9%	4.5	✓	-0.2%	0.0	✓	2.8%	0.9	✓
	SB	0.1%	0.1	✓	0.1%	0.1	✓	0.7%	0.2	✓	-0.1%	0.0	✓
PM	NB	0.7%	0.4	✓	0.8%	0.4	✓	0.3%	0.1	✓	0.5%	0.1	✓
	SB	1.8%	1.1	✓	1.5%	0.7	✓	0.5%	0.1	✓	4.1%	1.0	✓

Figure A-2 - MRTM Screenlines and Ad Hoc Counts



Source: MRTM Local Model Validation Report (March 2016)

Figure A-3 - Illustrative Screenline Results



Source: MRTM Local Model Validation Report (March 2016)

Figure A-2 shows the additional count sites used in calibration and validation on the surrounding road network. It can be seen that although there are few sites on the key roads surrounding the Meecebrook development location a screenline running north to south is located to the west of the site whilst additional cordons are provided around the entries and exits to both Stafford and Stoke-on Trent. In addition, the individual counts at each of the main routes passing through these screenlines have also been assessed.

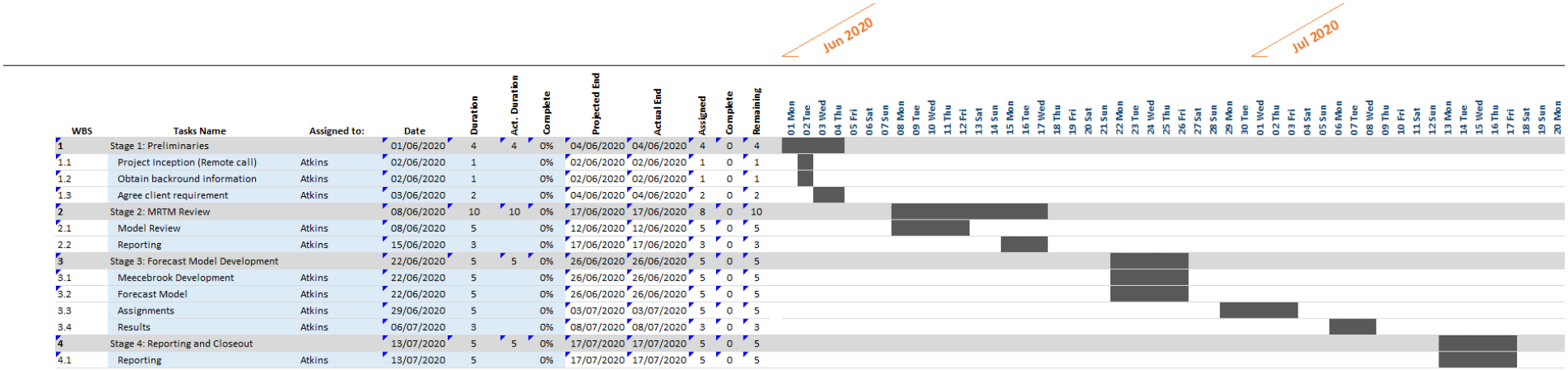
As illustrated in Figure A-3 further investigation of the model documentation revealed that the overall screenline validation results were within TAG criteria, with nearly all within 5% of the observed data. At this stage, unfortunately, it has not been possible to determine whether the specific screenlines which are most relevant to the Meecebrook development are well validated, however the overall results are encouraging. It is noted that this is an area that will need to be reviewed in more detail at a later stage and may highlight model areas which are in need of adjustment.

Following an AIA and giving due consideration to the trip distribution of the new development, a review of historic data and modelled flows would need to be undertaken to establish whether any significant deviations in network conditions and flow validation need to be amended. Where this is the case it may be possible to undertake selective matrix factoring to address any limitations and to provide a more representative basis for forecasting development impact

Appendix B. Indicative Programmes

B.1. Option 1 – Area of Impacts Assessment

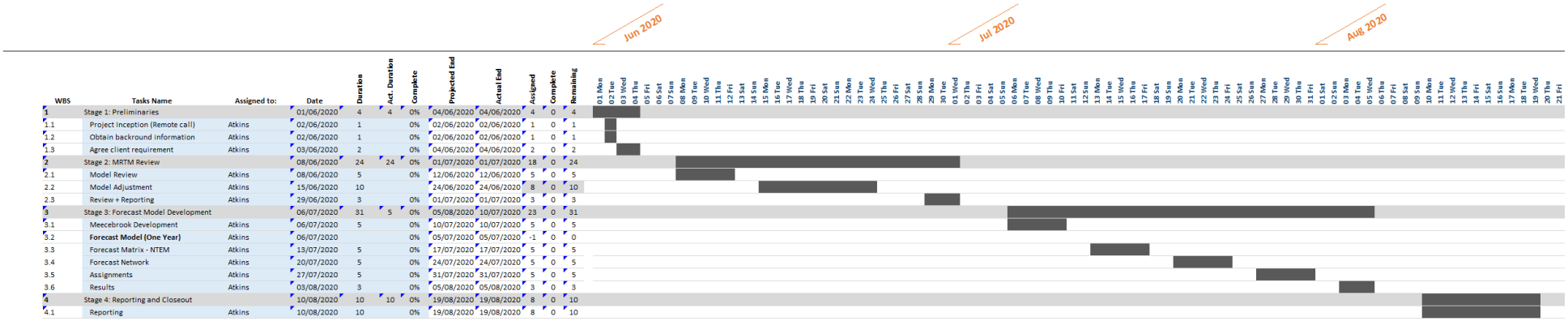
Figure B-1 - Option 1 - Timescales & Indicative Programme



WBS	Tasks Name	Assigned to:	Date	Duration	Act. Duration	Complete	Projected End	Actual End	Assigned	Complete	Remaining
1	Stage 1: Preliminaries		01/06/2020	4	4	0%	04/06/2020	04/06/2020	4	0	4
1.1	Project Inception (Remote call)	Atkins	02/06/2020	1		0%	02/06/2020	02/06/2020	1	0	1
1.2	Obtain backround information	Atkins	02/06/2020	1		0%	02/06/2020	02/06/2020	1	0	1
1.3	Agree client requirement	Atkins	03/06/2020	2		0%	04/06/2020	04/06/2020	2	0	2
2	Stage 2: MRTM Review		08/06/2020	10	10	0%	17/06/2020	17/06/2020	8	0	10
2.1	Model Review	Atkins	08/06/2020	5		0%	12/06/2020	12/06/2020	5	0	5
2.2	Reporting	Atkins	15/06/2020	3		0%	17/06/2020	17/06/2020	3	0	3
3	Stage 3: Forecast Model Development		22/06/2020	5	5	0%	26/06/2020	26/06/2020	5	0	5
3.1	Meecebrook Development	Atkins	22/06/2020	5		0%	26/06/2020	26/06/2020	5	0	5
3.2	Forecast Model	Atkins	22/06/2020	5		0%	26/06/2020	26/06/2020	5	0	5
3.3	Assignments	Atkins	29/06/2020	5		0%	03/07/2020	03/07/2020	5	0	5
3.4	Results	Atkins	06/07/2020	3		0%	08/07/2020	08/07/2020	3	0	3
4	Stage 4: Reporting and Closeout		13/07/2020	5	5	0%	17/07/2020	17/07/2020	5	0	5
4.1	Reporting	Atkins	13/07/2020	5		0%	17/07/2020	17/07/2020	5	0	5

B.2. Option 2 - Model refinement

Figure B-2 - Option 2 - Timescales & Indicative Programme



WBS	Tasks Name	Assigned to:	Date	Duration	Act. Duration	Complete	Projected End	Actual End	Assigned	Complete	Remaining
1	Stage 1: Preliminaries		01/06/2020	4	4	0%	04/06/2020	04/06/2020	4	0	4
1.1	Project Inception (Remote call)	Atkins	02/06/2020	1		0%	02/06/2020	02/06/2020	1	0	1
1.2	Obtain backround information	Atkins	02/06/2020	1		0%	02/06/2020	02/06/2020	1	0	1
1.3	Agree client requirement	Atkins	03/06/2020	2		0%	04/06/2020	04/06/2020	2	0	2
2	Stage 2: MRTM Review		08/06/2020	24	24	0%	01/07/2020	01/07/2020	18	0	24
2.1	Model Review	Atkins	08/06/2020	5		0%	12/06/2020	12/06/2020	5	0	5
2.2	Model Adjustment	Atkins	15/06/2020	10			24/06/2020	24/06/2020	8	0	10
2.3	Review + Reporting	Atkins	29/06/2020	3		0%	01/07/2020	01/07/2020	3	0	3
3	Stage 3: Forecast Model Development		06/07/2020	31	5	0%	05/08/2020	10/07/2020	23	0	31
3.1	Meecebrook Development	Atkins	06/07/2020	5		0%	10/07/2020	10/07/2020	5	0	5
3.2	**Forecast Model (One Year)**	Atkins	06/07/2020			0%	05/07/2020	05/07/2020	-1	0	0
3.3	Forecast Matrix - NTEM	Atkins	13/07/2020	5		0%	17/07/2020	17/07/2020	5	0	5
3.4	Forecast Network	Atkins	20/07/2020	5		0%	24/07/2020	24/07/2020	5	0	5
3.5	Assignments	Atkins	27/07/2020	5		0%	31/07/2020	31/07/2020	5	0	5
3.6	Results	Atkins	03/08/2020	3		0%	05/08/2020	05/08/2020	3	0	3
4	Stage 4: Reporting and Closeout		10/08/2020	10	10	0%	19/08/2020	19/08/2020	8	0	10
4.1	Reporting	Atkins	10/08/2020	10		0%	19/08/2020	19/08/2020	8	0	10

B.3. Option 3 - Model update and revalidation

Table B-1 – Option 3 - Timescales & Indicative Programme

	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
Data Collection										
Survey Spec Preparation										
Data Collection Programme										
Base Model										
Network Development										
Matrix Development										
Model Calibration & Validation										
Model Forecasting										

Table B-1 shows an indicative programme for the full model update and revalidation. As the timescales are significantly longer than for the AIA and the model refinement this programme is presented differently.

There is an additional constraint on this programme as traffic data collection needs to be undertaken during TAG neutral months which broadly align with the spring and autumn. The network development and much of the matrix development – which is suggested to be based on MPD – can still be undertaken before the necessary traffic surveys.

Appendix C. Option 4: Bespoke Model

This Technical note outlines the potential for a fourth modelling option, namely a bespoke new model for the assessment of Meecebrook and should be read in conjunction with the original Meecebrook Transport Strategy report.

C.1. Option 4 – Bespoke model

As with Option 3, this approach would continue to use the MRTM as a basis for the highway network but would undertake a highway model update and revalidation using more recent data sources, including the necessary network and matrix zoning refinements to fully represent the local impacts of the Meecebrook developments and any associated infrastructure. An alternative, would be to await the update of the Regional Transport Models, due over the next year and a half, to use as a new starting basis however this would further extend timescales and may result in further issues if there are additional delays to that programme.

A new bespoke Demand model and PT model would also be proposed to provide a standalone model for the assessment of Meecebrook and the surrounding area.

The elements comprising this option are outlined in Table 5-3 below along with an estimated cost for the fees associated with undertaking this work.

Table 1-2 - Option 4 - Summary

Element	Option	Indicative Cost & Timescale
Base Model	**Option B4 (Enhanced):** using the 2015 MRTM Base model as a starting point. Refine the network and model zoning and revalidate to a more recent year in key study area. New data sources to be obtained to inform trip distributions.	£400,000 – £450,000 (excl. data costs) 14 - 16 month programme
Demand Model	**Bespoke demand model** developed fully in line with TAG guidance	
Public Transport Model	**Bus and Rail** PT model developed based on available data sources (ticketing data etc) and additional surveys required. The costs from this model would feed into the bespoke demand model outlined above	
Forecast Network	**Option FN4:** Develop forecast network from a refined base model.	
Forecast Matrix	**Option FM3:** Meecebrook Development + Other Known Developments + Background Growth Scenario	

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