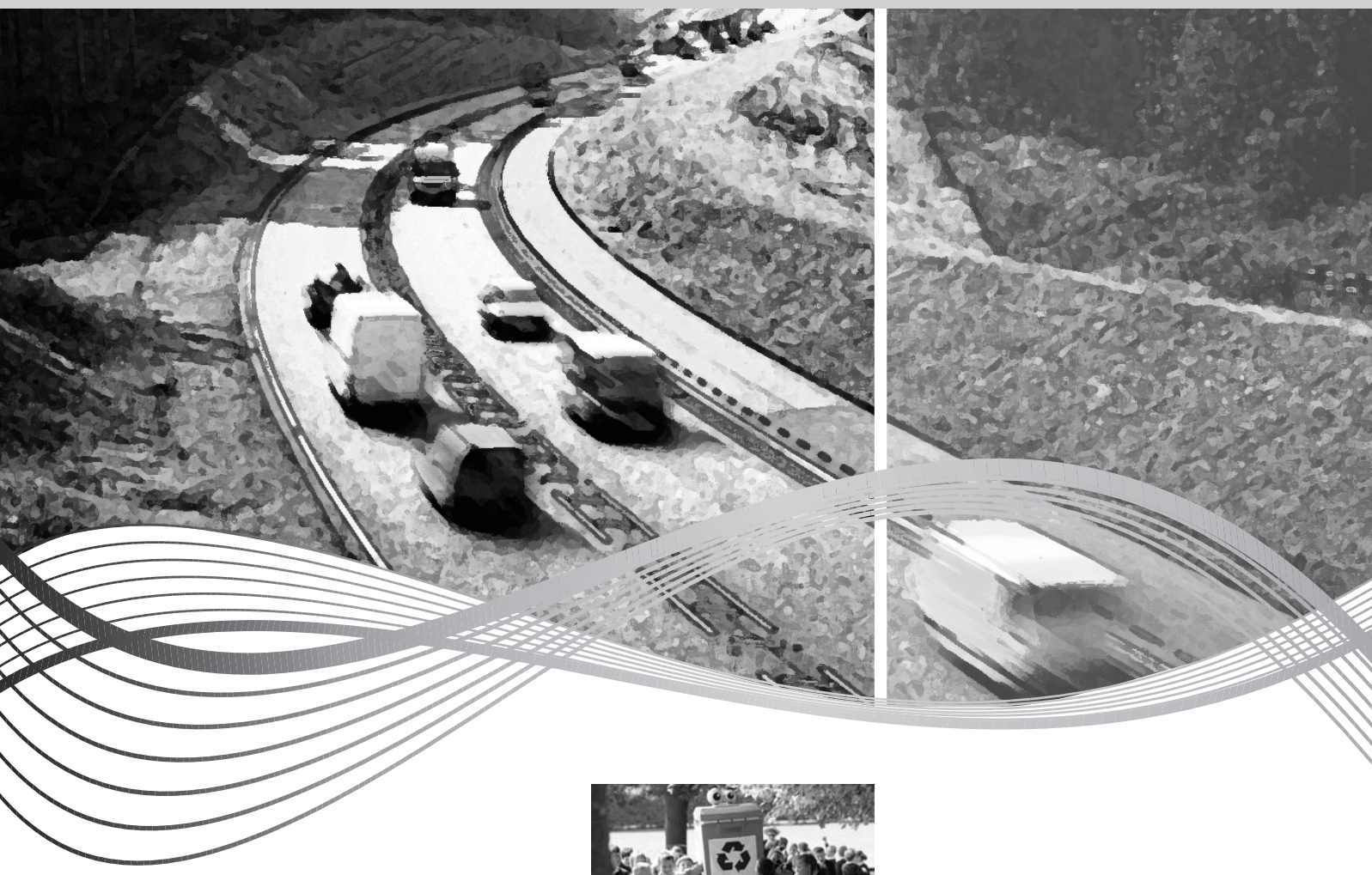
section I

technical appendices



2009

Technical Appendix A

Access to services/accessibility datasets – a general introduction

- The access to services indicators have been calculated in GIS using accessibility modelling software called 'Accession'. Accession principally calculates the journey times between a set of origins and destinations using the timetabled Public Transport Information to complete the journeys. Accession can also be used to calculate distances and typical driving times between origins and destinations using a digitised road network.
- The total travel time by public transport includes the time taken to walk from the initial origin point to a bus stop or train station, the time in waiting to connect to a service, the time spent on the actual journey, and the time taken to walk from the final bus stop or train station to the destination point. Also included in the total journey time is any time associated with interchanging between services.
- The standard Accession calculation calculates for each origin/destination pair the fastest travel time that can be achieved, sampled at 10 minute intervals in the time period specified. The fastest travel time that can be achieved between each O/D pair from all these samples over the total time period is then output and used in the accessibility assessments.
- The base datasets loaded into Accession and used in calculating the access to services indicators in the Condition of Nottinghamshire study are given in table 1 below.

Table 1: General data used in Accession

Data	Description
Origin Data	2007 Royal Mail Codepoint File, point locations of postcodes with domestic delivery points geocoded to census ward in Nottinghamshire County (excludes postcodes from Nottingham UA). The point locations are aggregated to nearest 100 metres, and for each point location the total number of domestic delivery points is calculated. The final dataset comprises some 13,000 individual records.
Destination data	Point locations of destinations, please see separate tables for each indicator.
Public Transport data	Bus & Tram ATCO-CIF file generated by Nottinghamshire County Council in April 2008. Heavy Rail ATCO-CIF file dated April 2008 provided by East Midlands Traveline Data Manager.
Road network	The Ordnance Survey OSCAR road network provided by Nottinghamshire Count Council

- The calculation parameters used in the Accession runs undertaken for the Condition of Nottinghamshire study are given in table 2 below:

Table 2: Calculation Parameters

Parameter	Value	Description
Maximum walking distance	800 metres distance/ 10 minutes walking time (at standard speeds)	The maximum walking distance which can be walked from an origin point to a Public Transport Service (Bus, Tram or Rail). This is the default national standard.
Walk speed	4.8 km/h	This is the default standard
Modes	Bus/Heavy Rail/Tram	The modes used in the calculation
Max interchange distance	500 metres	The maximum distance allowed to interchange between services / modes
Day/time	Monday 0800-1000	The time period for the calculation. Only journeys beginning and ending in this time frame are applicable. This time period allows for journeys in the peak and just outside the peak. The journey time for the Outward journey only (ie from origin to destination) has been included in the accessibility assessments.
Sampling Interval	10 mins	The frequency which Accession calculates the fastest total journey time between each Origin/Destination pair in the time period window. The fastest total journey time out of the sampled times is then used in the Accessibility analyses.

Lamda parameter	-0.014	Used only in the overall accessibility by public transport calculation. This is the 'deterrence' or 'disbenefit' factor applied to the journey time between each O/D pair calculated by Accession. In the final index, O/D pairs with a short journey time are given a higher value than those with a long journey time. The lamda parameter is used in the following formula relating to each O/D pair: exp(-0.014 * travel time).

- If an assessment for an O/D pair is outside of these parameters a 'not accessible' value is returned. For example, if an origin point is greater than 800 metres (set for the maximum walking distance) from a public transport node, or directly to a destination, then it is deemed to be not accessible. If the origin point is greater than 800 metres from a public transport node but within 800 metres directly of a destination point, it can still connect straight to this by walking and will be given an accessibility value (albeit a low one).
- In the Accession runs for this project, the maximum walking distance which can be walked from an origin point to connect to a Public Transport service has been set at 800 metres. It should be pointed out that a value of 400 metres has been used in the calculation of the accessibility indicators for the Greater Nottingham Local Transport Plan. For the purposes of this study however, it is assumed that people would walk further to a bus stop with a better choice of services/greater service frequency, which could reduce overall travelling time and hence increase accessibility. Also the distribution of settlements & population in the rural areas of Nottinghamshire adds further weight to the argument of using 800 metres as the default maximum walking distance.
- If a journey cannot be made completely within the specified time period, again a 'not accessible value' is returned. A journey can be made at anytime within the time period provided it begins and ends within that period. Therefore, the frequency of services is not necessarily of issue, rather the opportunity of making the journey. A route served by 4 services an hour is effectively treated the same as a route served by one service an hour as long as the service allows the opportunity for the journey to be completed entirely within the defined time period.
- This issue of service frequency perhaps becomes apparent when assessing accessibility in rural areas, where the question is whether a service exists later in the day to enable a return journey to be made. Accession can be used to calculate journey times for the return journey (destination to origin) and also for different time periods throughout the day. An average journey time for each O/D pair over the time periods could then be used in the accessibility assessments, and perhaps include in the final assessments the average journey time of those O/D pairs which have a minimum of 2 journeys (outward and return) throughout the day.
- An indication of service frequency can be obtained by looking at accessibility/walking distances from origin points to bus & tram stops/rail stations with a minimum desired service frequency standard eg bus services running hourly, half hourly, every 10 mins. This has been developed as a separate indicator in the 'Condition of Notts' Study.

Travel times by public transport to key facilities

An average score for each census ward has been calculated with reference to public transport travel times lying within key travel time thresholds. The destinations used in the calculations are given in table 3 below.

Table 3: Travel times by public transport to key facilities - Destination datasets used

Destination Set	Travel time threshold	Data sources
Supermarket/Major Food Store	10 mins	Nottinghamshire County Council Strategic Transport & NET Team (via Department for Transport (DfT) data provided June 2005)
GP Surgery/Health Centre	15 mins	Nottinghamshire County Council Strategic Transport & NET Team (via Neighbourhood Statistics website, information provided by PCTs)
Primary School	15 mins	Nottinghamshire County Council Strategic Transport & NET Team (via C&YP Department, DfES Edubase tool)
Post Office	15 mins	Nottinghamshire County Council Strategic Transport & NET Team (via Post Office/Royal Mail websites)
Public Library	15 mins	Nottinghamshire County Council public website, websites of other Districts/Counties
Public Indoor Leisure Centre	20 mins	District Council websites
Dentist	20 mins	Neighbourhood Statistics website
Secondary School	30 mins	Nottinghamshire County Council Strategic Transport & NET Team (via C&YP Department, DfES Edubase tool)

Basis of calculation

- The choice of destinations and travel time thresholds has been based on those used in the calculations of the 'Geographical Access to Services' domain of the 2005 Welsh Index of Multiple Deprivation (Welsh Assembly, 2005).
- Accession is used to calculate the total travel time by Public Transport from each origin point to its nearest destination point, and the journey time is scored as to whether it falls within the defined time threshold set for each destination set: 1 if journey time is within the time threshold, 0 if journey time is outside of the time threshold, or if the particular journey cannot be made.
- An aggregate score for each origin/postcode across the whole range of destination/facilities listed above is calculated and this is multiplied by the total number of domestic delivery points attached to the postcode.
- An average score for each census ward is calculated by summing the aggregate score weighted by the number of domestic delivery points for each postcode, and then dividing this number by the total number of domestic delivery points in the census ward.

Walking distances to key facilities

An average score for each census ward has been calculated with reference to walking distances to key facilities that the public expect to be provided locally lying within a key distance threshold. The destinations used in the calculations are given in table 4 below.

Table 4: Walking distances to key facilities - Destination datasets used

Destination Set	Distance Threshold	Data sources
Supermarket/Major Food Store	800 metres/ 10 mins walk	As per table 3
GP Surgery/Health Centre	800 metres/ 10 mins walk	As per table 3
Primary School	800 metres/ 10 mins walk	As per table 3
Cash Dispenser/ATM which does not charge for withdrawals	800 metres/ 10 mins walk	Point locations of Cash Dispensers/ATMs which do not charge for cash withdrawals provided by Vocalink Ltd August 2008
Post Office	800 metres/ 10 mins walk	As per table 3
Public House, Inn or Hotel	800 metres/ 10 mins walk	Search done using OS Mastermap text file, to contain either of the following text or phrases in their entirety: '(PH), 'PH', 'Inn', 'Hotel'. The list checked to ensure that the letters 'PH' didn't appear in any street name. Point co-ordinates created to align with identified text, buffer of 250 metres created for each point to allow for duplicate text on the base map.

Basis of calculation

- Accession is used to calculate the distance by road (through the road network) from each origin point to its nearest destination point, and the distance is scored as to whether it falls within it falls within the defined distance threshold (800 metres): 1 if distance is within the threshold, 0 if distance is outside of the distance threshold.
- An aggregate score for each origin/postcode across the whole range of destination/facilities listed above is calculated and this is multiplied by the total number of domestic delivery points attached to the postcode.
- An average score for each census ward is calculated by summing the aggregate score weighted by the number of domestic delivery points for each postcode, and then dividing this number by the total number of domestic delivery points in the census ward.

Walking distances to Post Offices

The following datasets have been calculated:

- Percentage of total domestic delivery points in each census ward within 1 mile of a Post Office (national target set by Royal Mail in summer 2007: 90% of population to be within 1 mile of a Post Office);
- Percentage of total domestic delivery points in each census ward within 3 miles of a Post Office (national target set by Royal Mail in summer 2007: 99% of population to be within 3 miles of a Post Office).

Table 5: Walking distances to Post Offices – Destination datasets used

Data	Description
Destination data	Point locations of Post Offices in Nottinghamshire County and Nottingham City UA (and in neighbouring Counties within 2 miles of the county boundary) downloaded using the Branch Locator on the Royal Mail website during June 2008. Outreach services are not included in this analysis.

Basis of calculation

- Accession is used to calculate the distance by road (through the road network) from each origin point to its nearest destination point.
- Queries are then run using Microsoft Access to calculate the total number of domestic delivery points in each census ward within 800 metres /10 mins walk) of a destination point.

Walking distances to Cash Dispensers/ATMs which do not charge for cash withdrawals

The following datasets have been calculated:

- Percentage of total domestic delivery points in each census ward within 800 metres (10 mins walk) of a Cash Dispenser/ATM which does not charge for cash withdrawals;
- Percentage of total domestic delivery points in each census ward within 1 mile of a Cash Dispenser/ATM which does not charge for cash withdrawals.

Table 6: Walking distances to Cash Dispensers/ATMs – Destination datasets used

Data	Description
Destination data	Point locations of Cash Dispensers/ATMs which do not charge for cash withdrawals provided by Vocalink Ltd August 2008

Basis of calculation

- Accession is used to calculate the distance by road (through the road network) from each origin point to its nearest destination point.
- Queries are then run using Microsoft Access to calculate the total number of domestic delivery points in each census ward within 800 metres /10 mins walk and 1 mile of a destination point.

Overall accessibility by public transport

A composite public transport accessibility index by has been created for each census ward in Nottinghamshire. The method used to calculate overall accessibility by public transport takes into account the following:

- The extent of the public transport network (bus, tram & heavy rail) across the County - in particular the relative ease which people can use the public transport network to travel to facilities across the whole County;
- Journey times using the public transport network - shorter journey times are valued more than longer journey times;
- The full range of facilities in an area i.e. from each origin point to all destinations in the dataset across the County. The index does not measure accessibility to the nearest facility as is assumed in standard accessibility threshold analysis (e.g. percentage of households within 15 mins travel time of a Hospital). This is important when considering for example access to employment, where people do not generally take a job which is closest to their home;
- The different weightings to be applied to different types of facilities e.g. within each category, employment destinations valued more highly than leisure destinations. Or within each sub-category, facilities which the public expect to be provided 'within walking distance' eg Post Offices to be valued more highly than facilities to which people would expect to travel eg Hospitals. The weightings have largely been taken from a study by Halcrow Consultants for South Buckinghamshire District Council - 'Accessibility & Infrastructure Study' (Autumn 2006).

A table of the weightings used for the destination sets is given in table 7 below, and a table listing the data sources used to create the destination sets is given in table 8 below.

Table 7: Overall accessibility by public transport : infrastructure types and weightings used

Main categories & weightings	Sub-categories to include	Weighting within each category	Extent of coverage (miles)
Education 20%	• Pre-School Nurseries • Primary Schools (inc. Infant) (Public only) • Secondary Schools (Public only) • Colleges & Further Education (up to 19 years old) (Public only)	15% 40% 30% 15%	County/City + 2m County/City County/City County/City + 2m
Community Facilities 10%	• Libraries (excluding mobile libraries) • Community Centres/Village Halls • Public Indoor Leisure Centres • Recreation grounds/Play areas • Sports grounds (both private and public, including football, cricket, rugby. Also including private golf courses)	30% 30% 20% 10% 10%	County/City + 2m County/City + 2m County/City + 2m County/City + 2m County/City + 2m
Health 25%	• NHS Trust Hospitals (both 'acute' and Community') • GP Surgeries/Health Centres • Dentists • Opticians	 25% 50% 15% 10%	 County/City + 10m County/City + 2m County/City + 2m County/City + 2m
Shopping 20%	• Supermarkets/Major Food Stores • Major Retailing Centres • Pharmacies • Post Offices	30% 25% 15% 30%	County/City + 2m County/City + 10m County/City + 2m County/City + 2m
Employment 30%	• Major Employment Locations (Lower Super Output Areas with over 500 employed) • Main District Centres • Job Centres	50% 30% 20%	County/City + 10m County/City + 10m County/City + 10m

Table 8: Overall accessibility by Public Transport: Destination datasets used

Destination Dataset	Data sources
Pre-School Nurseries	Neighbourhood Statistics website
Primary Schools	As per table 3
Secondary Schools	As per table 3
FE Colleges	Nottinghamshire LSC 2007 – point locations of all FE Colleges (including branch sites) with more than 10 students enrolled
Libraries	Nottinghamshire County Council public website, websites of other Districts/Counties
Community Centres/Village Halls	Search done using Royal Mail Addresspoint file for Notts of all non-residential premises, name to contain either of the following text or phrases in their entirety: 'Village Hall', 'Community Centre', 'Memorial Hall', 'Institute', 'Jubilee Hall'.
Public Indoor Leisure Centres	As per table 3
Parks/Recreation Grounds	Search done using OS Mastermap text file, to contain either of the following text or phrases in their entirety: 'Recreation Ground', 'Play area'. Point co-ordinates created to align with identified text, buffer of 250 metres created for each point to allow for duplicate text on the base map.
Sports Grounds	Search done using OS Mastermap text file, to contain either of the following text or phrases in their entirety: 'Sports Ground', 'Football Ground', 'Cricket Ground', 'Rugby Ground'. Point co-ordinates created to align with identified text, buffer of 250 metres created for each point to allow for duplicate text on the base map. Private Golf clubs identified via a search on the text/phrase 'Golf Club' in the Royal Mail Addresspoint file for Notts.
NHS Trust Hospitals	As per table 3
GP Surgeries/Health Centres	As per table 3
Dentists	As per table 3

Opticians	Neighbourhood Statistics website
Supermarkets/Major Food Stores	As per table 3
Major Retailing Centres	Nottinghamshire County Council Strategic Transport & NET Team
Pharmacies	Neighbourhood Statistics website
Post Offices	As per table 3
Major Employment Locations	Nottinghamshire County Council Strategic Transport & NET Team
Main District Centres	Nottinghamshire County Council Strategic Transport & NET Team
Job Centres	JobCentrePlus website

Basis of calculation

- Accession is used to calculate the total travel time by public transport between each O/D pair.
- The whole O/D table is then imported into Microsoft Access and a series of queries run to calculate the overall index for each origin point, taking into account the journey time between each O/D pair, the travel time disbenefit/deterrence, the weightings applied to each destination set, and the overall weightings applied to each 'grouping' of destination sets.
- An average overall accessibility score is then calculated for each census ward. The table listing the score for each ward is sorted descending, and the ward with the highest score is given a final score of 100%. The average score for each census ward is then expressed as a percentage of the average score of the highest scoring ward.

Bus service frequency

The following datasets have been calculated:

- Percentage of total domestic delivery points in each census ward within 800 metres/10 mins walk of a bus stop with an hourly and better service frequency on weekdays (Mondays-Saturdays) between 0600-1800 hrs;
- Percentage of total domestic delivery points in each census ward within 800 metres/10 mins walk of a bus stop with a half hourly and better service frequency on weekdays (Mondays-Saturdays) between 0600-1800 hrs;
- Percentage of total domestic delivery points in each census ward within 800 metres/10 mins walk of a bus stop with an hourly and better service frequency on weekday evenings (Mondays-Saturdays) between 1830 – 2330 hrs;
- Percentage of total domestic delivery points in each census ward within 800 metres/10 mins walk of a bus stop with an hourly and better service frequency on Sundays between 1000 – 1700 hrs.

Table 8: Bus service frequency - Destination datasets used

Bus stops with desired service frequency	**Description**
Hourly weekday daytime (0600-1800 hrs)	Each bus stop to have a minimum of 5 scheduled departures by all services between 0600-1200 hrs. The same bus stop to have the same number of departures between 1200-1800 hrs. Services to operate weekdays (Mondays to Fridays or Mondays to Saturdays).
Half hourly weekday daytime (0600-1800 hrs)	Each bus stop to have a minimum of 10 scheduled departures by all services between 0600-1200 hrs. The same bus stop to have the same number of departures between between 1200-1800 hrs. Services to operate weekdays (Mondays to Fridays or Mondays to Saturdays).
Hourly weekday evening (1830-2330 hrs)	Each bus stop to have a minimum of 5 scheduled departures by all services between 1830-2330 hrs on weekday evenings. Services to operate weekdays (Mondays to Fridays or Mondays to Saturdays).
Hourly Sunday (1000 – 1700 hrs)	Each bus stop to have a minimum of 7 scheduled departures by all services between 1000-1700 hrs on Sundays. Services to operate Sundays only.

Basis of calculation

- Accession used to calculate shortest distance by road (through the road network) from each origin point to each destination point.
- Queries are then run using Microsoft Access to calculate the total number of domestic delivery points in each census ward within 800 metres /10 mins walk) of a bus stop with the desired service frequency.

Technical Appendix B

Department for Transport (DfT) – Core National Accessibility Indicators 2007

Introduction

- Core national accessibility indicators are being used to monitor accessibility change in England. The Department for Transport (DfT) has identified a set of indicators to characterise the transport geography of England, paying particular attention to social groups at risk of exclusion.
- This note gives details of the datasets used in the calculation of the indicators, a brief description of the calculation processes involved, and finally how the national results have been incorporated into the reporting formats required for the 'Condition of Nottinghamshire' Study. Further details can be found in the report published by DfT: 'Calculation of Core National Accessibility Indicators 2007 – Technical Report (Department for Transport, 2008).
  http://www.dft.gov.uk/162259/162469/221412/221692/368506/accessibilityreport2007.pdf

Indicator specification

- The following indicators and their respective thresholds have been included in the 'Condition of Nottinghamshire' Study:

- % of compulsory school pupils age 5-10 years in each census ward within 15 and 30 minutes of a primary school by public transport/walking;
- % of compulsory school pupils age 11-15 years in each census ward within 20 and 40 minutes of a secondary school by public transport/walking and cycling;
- % of 16-19 year olds in each census ward within 30 and 60 minutes of a further education establishment by public transport/walking and cycling;
- % of people of working age (16-74) in each census ward within 20 and 40 minutes of work by public transport/walking and cycling;
- % of households in each census ward within 30 and 60 minutes of a Hospital by public transport/walking;
- % of households in each census ward within 15 and 30 minutes of a GP by public transport/walking;
- % of households in each census ward within 15 and 30 minutes of a supermarket by public transport/walking and cycling.
- Working Age people with access to employment by public transport & other specified modes (Notts LAA Indicator NI176).

Main datasets used

- Table 1 shows the main datasets used in the calculations.

Table 1: 2007 Core National Accessibility Indicators – main datasets used

Dataset	Description
Origin data	2001 census output areas, population-weighted centroid. Please see table 2 below for details of the population characteristics attached to origin points
Destination data	Point locations of destination sets, please see table 2 below
Public transport network	Snapshot of national public transport data taken in October 2007 from the National Public Transport Data Repository (NPTDR). Includes registered bus and coach services in addition to rail, ferry and light rail services
Demand Responsive Transport (DRT) network	78 Services in England have been identified by DfT.
Road network	Walking and cycling networks based on OS ITN MasterMap data supplied by DfT and used under the DfT Licence

- Point location data relating to each individual 'theme' of accessibility is given in table 2 below.

Calculation process

- Very briefly, travel times by public transport are calculated by generating all the (bus, train and light rail) stop to stop movements by time of day and day of week for each origin/destination pair. Travel times include walk time from origin point to bus stop, waiting time at bus stop, actual in-vehicle time, any time

spent interchanging between PT services and/or modes, and walk time from alighting bus stop to final destination.

- For each trip purpose, the fastest travel time was identified between each O/D pair for each of the travelling time periods under consideration by the public transport path-building algorithm. The travel time used in the indicator calculations was the average of the minimum outbound and minimum inbound travel time.
- Cycling travel times using the OS ITN Mastermap data and computer software to build minimum time and distance paths.

Table 2: 2007 Core National Accessibility Indicators – Origin/Destination datasets used

Accessibility Theme	Origin Data Population characteristics	Destination data
Education	Primary & Secondary pupil numbers: 2001 census and PLASC data for October 2005 and October 2007 FE numbers: 2001 census	Edubase extracts from October 2005 and October 2007
Employment	2001 census updated using mid-year estimates of population to 2005 and 2007	2001 census population-weighted centroids of Lower Super Output Areas (LSOA) with more than 500 workplace population
Health	2001 census updated using mid-year estimates of population to 2005 and 2007	All Hospitals with an A&E department or with over 300 beds All GPs in NHS database (not including satellite surgeries) All data obtained from Department for Health/NHS as of October 2007
Supermarkets & Convenience Stores	2001 census updated using mid-year estimates of population to 2005 and 2007	All Supermarkets and Convenience stores as held on MapInfo Retail Locations database in October 2005 and October 2007

- To take account of DRT and taxi operations in areas where scheduled public transport is absent, a table of drive times was calculated using the OS ITN Mastermap dataset with given speeds for each class of road. The table of car journey times was then compared with the table of public transport/walk journey times. For car journeys longer than 5 minutes, the travel time used in the PT indicator calculations was the lesser of the calculated PT travel time or 10 times the drive time.
- This reflects the reality of public transport operation – where there are no services or very infrequent services, users could use Demand Responsive Transport (DRT) services. It does not differentiate between low cost DRT where local authorities have supported flexibly routed and area based services, and high cost DRT such as private taxis. To account for the low cost DRT services, a table of typical travel times was derived from a national database of DRT services and these travel times were used if they were lower than the values calculated above.
- Further details on the parameters used in the calculation process are given in table 3 below.

Table 3: 2007 Core National Accessibility Indicators – parameters used in calculation process

Parameter	Value	Description
Maximum walking distance	2 km	The maximum walking distance which can be walked from an origin point to a Public Transport Service (Bus, Tram or Rail).
Walk speed	4.8 km/h	This is the default standard
Cycle speed	4.8 km/h or 16 km/h	4.8 km/h along Private Roads (restricted access), Pedestrian Streets, Alleys. 16 km/h along all other roads (except Motorways)
Car speeds		Car Driving speeds (km/hr in brackets below) for different road classifications: Motorway (80), A road (75), B Road (65), Minor road (60), Local street (35), Private road restricted access (30), Private road public access (30)
Public Transport Modes	Bus,DRT,Coach,Heavy Rail, Light Rail,Ferry	The modes used in the calculation
Max interchange distance	500 metres	The maximum distance allowed to interchange between services / modes. Interchange and wait penalties calculated based on the actual scheduled clock arrival times of connecting public transport services for the relevant journey.

Day/time	Various, according to accessibility theme	Public transport network coverage varies by time of day and day of the week. Typical journey times have been modelled for both outbound and return journeys on a Thursday, using 3 separate time windows of 1 hour for arrival times (mainly in the morning), and 3 separate time windows of 1 hour for departure times (mainly in the afternoon). The travel time used in the indicator calculations is the average of the minimum outbound and minimum inbound travel time. A journey will be deemed available if it can be made within the designated time windows.
DRT Services		The geographical boundaries within which each service operates is based on qualitative service descriptions in the data. Services are allocated to one of three categories based on hours of operation and frequency of service. Travel times are estimated for each category based on the distance to each destination type.

Presentation of final results

- The census output area (COA) catchment area populations are allocated to the origin points and travel times (by both public transport and cycling) to give an absolute from of the threshold indicator (eg 35000 households within 30 mins, 1750 within 15 mins).
- The absolute results are aggregated up to Lower Super Output Area (LSOA) level.
- Finally, the values of the Indicators for each separate mode (public transport/walking, cycling) are weighted by the percentage modal split from the National Travel Survey (1999 to 2005 average), and the composite value is divided by the total percentage share for the combined modes. For example, National Travel Public Transport % share of total trips is 31%, % cycling share of total trips is 3%. The public transport/walking figure is multiplied by 31, the cycling figure is multiplied by 3, and the two are added together. The final total is then divided by 34.
- For the purposes of the 'Condition of Notts' Study, the results are aggregated up from LSOA level to ward level using lookup tables.

Nottinghamshire LAA Indicator NI 176: Working Age people with access to employment opportunities by public transport & other specified modes

- This indicator calculates the total 'equivalent population' expressed as a percentage of the total number of people of working age 16-74 years living within the vicinity of each origin point who are potentially able to access ALL available employment opportunities nationally by public transport. The 'equivalent population' is a notional figure reflecting the population who can actually access job opportunities and takes into account the constraints of accessing employment opportunities by public transport with respect to:

-the disbenefits of longer travelling times to reach destinations further away (ie the further away the location, the less likely the individual would be to travel to it);
- the choice & frequency of available public transport services;
- the number and choice of destinations (and hence jobs) that can be accessed given the time slots available to complete journeys.

- In other words, the percentage figure represents the degree to which the local population can access all available employment opportunities nationally by public transport, a low figure meaning that the population has difficulty in accessing available employment opportunities.
- Information on the accessibility of sites of employment to population of working age by public transport, demand responsive transport, walking and cycling would enable local authorities to direct interventions (transport and planning measures related to both economic and residential sites) to encourage economic growth and reduce social exclusion.

Main datasets used

Table 4 below lists the main datasets used in the calculations.

Table 4: Notts LAA Indicator NI176 – main datasets used

Dataset	Description
Origin data	2001 census output areas, population-weighted centroid. All population economically active aged 16-74 years, in line with 2001 census definitions of economically active age.
Destination data	Point locations (Lower Super Output Areas) with 500 or more jobs as defined in 2001 census.
Public transport network	Snapshot of national public transport data taken in October 2007 from the National Public Transport Data Repository (NPTDR). Includes registered bus and coach services in addition to rail, ferry and light rail services
Demand Responsive Transport (DRT) network	78 Services in England have been identified by DfT.
Road network	Walking and cycling networks based on OS ITN MasterMap data supplied by DfT and used under the DfT Licence

Calculation process

- Travel times by public transport/walking between origin and destination points are calculated using the processes used to calculate the main core national accessibility indicators outlined earlier on in this note. For each origin/destination pair, the travel time is multiplied by a deterrence parameter representing the sensitivity of accessibility to employment to travel time (i.e. the further away the employment location, the less likely an individual would be to travel to it). The resulting figure is then multiplied by the total population aged 16-74 attached to each origin point.
- This process is repeated for all the destinations available from each origin, and the figures then totalled for each individual origin. The whole process is then repeated using travel times by cycle.
- The two totals are then weighted together using the National Travel Survey figures for modal split as detailed above (i.e. the proportion of journeys made by public transport against the proportion made by walking/ cycling), to give an overall 'equivalent population' for each origin point.
- The 'equivalent' population for each Lower Super Output Area, census ward or Local Authority area is calculated by aggregating upwards from census output area level, and is then expressed as a percentage of the total number of people aged 16-74 for each Lower Super Output Area, census ward, or Local Authority area as a whole.
- Further details can be found in the 2007 Core Accessibility Indicators technical report. http://www.dft.gov.uk/162259/162469/221412/221692/368506/accessibilityreport2007.pdf

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