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Calderdale & Huddersfield NHS Trust

Journey Time Assessment Study

June 2014

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Document Control Sheet

BPP 04 F8
Version 15; March 2013

Project: NHS Trust JT Assessment
Client: Calderdale and Huddersfield NHS Trust
Project No: B1991900
Document title: Journey Time Assessment Study
Ref. No:

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DATE **23.05.14**	**Document status Draft**		

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DATE **10/06/14**	**Document status Final**		

REVISION	NAME	NAME	NAME
Approved by	NAME	As Project Manager I confirm that the above document(s) have been subjected to Jacobs' Check and Review procedure and that I **approve them for issue**	INITIALS
DATE	**Document status**		

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Executive summary

This report provides an analysis of the changes in journey times to inform the decision making process for proposals to restructure the provision of health services between Calderdale Royal Hospital and Huddersfield Royal Infirmary. The analysis considers the journey time changes that would typically be incurred for car users and public transport users in the Calderdale and South Kirklees areas.

The methodology for the assessment of car journey times has used industry-standard software to represent the road network and readily available datasets of recent journey time data. A similar method has been used for the public transport assessment, using current public transport timetable information and walking times. Estimates were made of current car and public transport journey times to the two hospitals for various times of the day/week. Estimates were then made of the increases and decreases in journey times of travelling to CRH instead of HRI (and vice versa). The estimated changes in car and public transport journey times are shown on coloured maps. A high level assessment of equality impacts on disadvantaged and vulnerable groups has also been made.

The results of the assessment for car journeys showed that the likely increases in journey times were between 15 and 20 minutes. Changes are likely to be similar whether patients have to travel to Huddersfield instead of Halifax, or vice versa.

The results of the assessment for public transport users showed that the impact on journey times is likely to be more significant than that for car users, and significantly more varied depending on the time of day and day of the week under consideration. The areas to the south of Huddersfield, the south of Halifax, the Queensbury / Ovenden area, Stainland, Hebden Bridge and Todmorden are estimated to have an increase in public transport journey time in excess of 45 minutes.

Regarding the equality impact of the journey time changes, there are many areas within the study area with a high proportion of disadvantaged or vulnerable groups who may be disproportionately affected by the proposals.

It is recommended that the Trust combines the results of the journey time assessments with their patient data to estimate the numbers of patients affected in those areas with the most significant increases in public transport journey times. This will enable a better understanding of the numbers of people affected and enable the identification of mitigation measures to be targeted at those locations. Liaison should also take place with public transport providers to identify any potential opportunities for changes to their services.

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Contents

1 Introduction

1.1 Background

Calderdale Royal Hospital (CRH) in Halifax and Huddersfield Royal Infirmary (HRI) are two hospitals operated by the Calderdale and Huddersfield NHS Foundation Trust. The Trust is proposing to reorganise the provision of health care services at the two hospitals by making both sites more specialised. The Trust will shortly be submitting their proposals to the Clinical Commissioning Group (groups of General Practices that work together to plan and design local health services) for their consideration.

In order to inform the decision-making process, the Trust is seeking advice on the journey time impacts of their proposals, both in terms of on those travelling by car and on those travelling by public transport, to assist with identifying the associated impacts on patients, visitors and staff.

1.2 Purpose of Report

Jacobs has undertaken an analysis of the changes in journey times that could be incurred by transferring services between the two hospitals. This report details the work carried out by Jacobs, and is structured as follows:

- Section 2 describes the methodology used
- Section 3 gives the results of the analysis
- Section 4 summarises the findings

2 Methodology

2.1 Overview

The scope of this study was agreed with representatives of the Trust and consists of three stages:

1. Assessment of changes in journey times for car users
2. Assessment of changes in journey times for users of public transport
3. Equality impacts looking at five disadvantaged or vulnerable groups:
    - Those without access to a car;
    - The disabled;
    - The elderly;
    - Ethnic minorities; and
    - The socially deprived

The methodology for each stage is given in more detail in the sections 3.4 to 2.6.

2.2 Study Area

The main study area covers South Kirklees and Calderdale, the area for which the CRH and HRI hospitals provide the majority of emergency medical services, out-patient services and planned procedures. The analysis also extends slightly into the wider West Yorkshire and Lancashire area, although it should be noted that several other hospitals serve those areas.

The journey time analysis has been carried out using industry-standard Geographical Information Systems (GIS) software at the Lower layer Super Output Area (LSOA) level of detail for census data. These detailed LSOA census areas are defined as having a population of between 1000 and 3000 people, and between 400 and 1200 households. Within Kirklees and Calderdale there are 387 of these detailed LSOA census areas. It is the boundaries of these detailed LSOA census areas that have been used to build the journey time maps.

The detailed data outputs that lie behind the maps also contain data for each detailed LSOA census area, together with corresponding postcodes.

2.3 Time periods

In order to reflect the impact on patients, visitors and staff, each group having a different reason for traveling to hospital, and so a different propensity to travel at different times of the day, and indeed on different days of the week, seven time periods are analysed in this assessment. The time periods below have been chosen to assess the impacts on out-patients, those with planned procedures, staff on shift working and those travelling for visiting hours. The assessed time periods agreed with the Trust are as follows:

- Weekday 0900-1700hrs
- Weekday 0800-0900hrs
- Weekday 1700-1800hrs
- Weekday 0630-0800hrs
- Weekday 2000-2100hrs

- Saturday 0900-1700 hrs
- Sunday 0900-1700hrs

Car journey times vary during the day and public transport provision is significantly different in the early morning and in the evening, compared to during the working day. The selection of time periods above ensures that increased journey times at morning and evening weekday peak times (rush hours) are taken into account, as is the reduced provision of public transport outside of peak times.

2.4 Journey Time Assessments for Journeys Taken by Car

The methodology adopted for the car journey time assessment is shown in the diagram below and explained in more detail in the subsequent paragraphs.

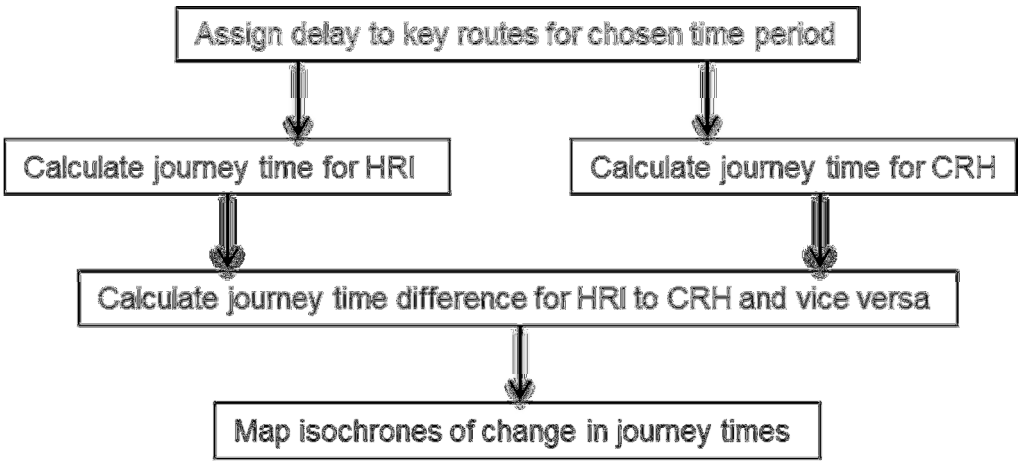

Figure 2-A: Methodology for car journey time assessments

The industry-standard Google Maps traffic tool has been used to assign delay to the highway network created for the analysis. This tool uses very significant volumes of recent detailed journey time data from satellite navigation systems to estimate current journey times with a 95% level of confidence. In order to make the assessment of the changes in car journey times as accurate as possible, delay has been added for the following key routes

- A629 between Huddersfield and Halifax
- The Huddersfield approach from M62 J23
- The Huddersfield ring road and all major approaches
- All major approaches to Halifax
- The A646 approach to Calderdale Royal Hospital.

The journey times from each of these detailed LSOA census areas to each hospital were then calculated using a GIS network analyst tool. The results were then adjusted (calibrated) using recent travel time data for key routes. This calibration ensures that a suitable accumulation of waiting time at junctions is included in the analysis, so that a suitable speed is represented for each time period.

2.5 Journey Time Assessments for Journeys Taken by Public Transport

VISUM is a GIS-based industry-standard modelling software tool which has been used to simulate the public transport network. The simulation uses timetable data

for buses and trains, together with bus stop / rail station locations, extracted from the latest version of the industry-standard ATCOCIF database.

VISUM has then been used to estimate public transport journey times from all bus stops within the study area to CRH or HRI for all the time periods being assessed. The estimated journey times include interchange times from bus to bus or bus to train (and vice versa). An additional allowance for walking time to the origin stop is also included.

Journey times associated with each point (bus stop) are then imported to GIS to enable journey time isochrones to be produced.

Journey times for public transport have been estimated for both the current situation and the proposed situation in the same way as that for cars described above, and the difference between the two sets of journey times calculated to produce the change in journey times.

Changes in public transport journey times, when mapped, have been grouped using the same categories of journey time increases / decreases as those for car journey time changes. The maps showing changes in public transport journey times are therefore directly comparable to those for cars.

2.6 Assessment of Equality Impacts

A high-level assessment has been made of the equality impact of the journey time changes. A number of equality indicators have been used, as agreed with the Trust, these being the elderly, those without access to a car, ethnicity, the socially deprived and those with a registered disability. The assessment makes best use of freely available population data, but does not use any data for the patients or staff of the Calderdale Royal Hospital or Huddersfield Royal Infirmary. The assessment is based on the bottom “quartile” of data i.e. those areas where the bottom 25% of population have the characteristic in question.

2.6.1 Reliance on Public Transport

Understandably, necessity of public transport use will usually incur a greater journey time than the equivalent car journey, and relies on the coverage and frequency of services.

Using the 2011 census data for car and van availability for households, and assuming that a household with only one vehicle will have 20% availability of this vehicle for hospital trips, and 100% availability for households with 2 or more vehicles, an approximation has been made, for each of the detailed LSOA census areas, of the percentage of households reliant on public transport.

In order to identify areas with a disproportionately high reliance on public transport, those detailed LSOA census areas lying in the upper quartile of reliance on public transport in the districts of Calderdale and Kirklees have been identified. These have then been compared against the maps showing the changes in journey time to identify those locations where transferring services may significantly disadvantage those most reliant on public transport. The results are presented in Section 3.

2.6.2 Registered disability

Data of registered disability is not freely available. However, 2011 census data asked questions on disability and has therefore been used to identify those detailed LSOA census areas in the upper quartile for Calderdale and Kirklees of people with a disability which limits their day to day activities either “a little” or “a lot”. Overlaying this data on changes in journey time reveals the areas of high disability that may be disadvantaged by the restructuring of services. The results are presented in Section 3.

2.6.3 The Elderly

An assessment of impacts on the elderly is split into two, as agreed with the Trust: those over 60 and those over 75, which fits with the census data available. 2011 census data has been used to identify the upper quartile for Calderdale and Kirklees in each category, so that those locations with the highest proportions of elderly people that may have the greatest impact from the restructuring of services can be identified. The results are presented in Section 3.

2.6.4 Ethnicity

In the same way as the previous equality groups, 2011 census data has been used to identify those locations in the upper quartile for Calderdale and Kirklees which may be impacted the most by transferring health services. For this assessment, ethnic groups (as defined in the census) comprise:

- Mixed/multiple ethnic groups
- Asian/Asian British
- Black/African/Caribbean/Black British
- Other ethnic group

The results are presented in Section 3.

2.6.5 Social Deprivation

To assess the impact on the socially deprived, the English Indices of Deprivation (2010) are used. From this, it is the Overall Index of Multiple Deprivation (IMD) for the Calderdale and Kirklees districts that has been used to identify the upper quartile of detailed LSOA census areas in terms of IMD score. The results are presented in Section 3.

3 Results

3.1 Journey Time Assessment Results - Overview

The results of the analyses for both cars and public transport have been mapped and are enclosed in the appendices.

3.2 Journey Time Assessment Results - Cars

The results for car journeys can be summarised as follows:

1. Increases in journey times are estimated to be 15-20mins.
2. The most significant journey time increases occur in the Weekday AM and PM peak hours.
3. Lesser increases occur in weekday early mornings, evenings and at weekends.
4. For those areas that would benefit, decreases in journey times are similar to the increases in the opposite direction.

3.3 Journey Time Assessment Results - Public Transport

As expected, the increases in journey times are significantly higher for public transport than those for cars, with more areas affected. There is a noticeable increase in journey times in the late evening when public transport provision tails off.

The results for public transport journeys can be briefly summarised as follows:

1. Increases in journey times are in excess of 45 minutes in many areas.
2. Significant journey time increases are most widespread during the weekday AM and PM peak hours, and before the AM peak hour on weekdays.
3. Fewer areas are severely affected on weekends or in the middle of the day on weekdays.
4. In most time periods, for those areas that would benefit, decreases in journey times are similar to the increases in the opposite direction.

When reviewing the output maps for public transport, it is important to note:

1. Public transport services are a mixture of different frequencies and different destinations served. For this reason, the pattern of increases / decreases is more complex than that for cars for any given time period.
2. The analysis to derive the difference in public transport journey times is based on the following:

    a) The journey time for an area is an average of the journey times from all the bus stops and train stations within that area.
    b) When assessing the difference in journey times of having to travel to one hospital instead of the other, it is possible that at least one of those bus stops may not have a direct bus service to that different hospital/town. There will therefore be a significant increase in journey time for that bus stop and hence for the average. This is a true reflection of what would happen in reality if bus services weren't subsequently reorganised.

c) To avoid spuriously large increases in journey times (and hence skewing the averages), any unrealistically high journey times have been removed. For example, where one bus stop doesn't have a service to the different hospital/town, those journey times where the model assumes someone would walk for miles to reach another bus stop that does have a bus service to the different town/hospital, have been removed. In reality, such people would probably travel by taxi or get a lift from a friend/neighbour rather than undertake a public transport journey time of many hours.

d) Also, a cut-off of 45 minutes journey time increase in the assessments had been used (as agreed with the Trust,). Therefore, the changes in public transport journey times derived do make use of this 45 minute cut-off within the calculations.

3.4 Journey Time Assessment Results - Impacts by Area

Table 3-A gives a summary of the change in journey time incurred by transferring services from HRI to CRH, and vice versa, for key towns and areas in and around Calderdale and South Kirklees. It represents a summary of the results over all time periods assessed.

Summary of impacts for a transfer from CRH to HRI		
	Car Journey Time Impact	Public Transport Journey Time Impact
Almondbury		
Batley		
Brighouse		
Cleckheaton		
Elland		
Halifax		
Hebden Bridge		
Holmfirth		
Huddersfield		
Littleborough		
Liversedge		
Marsden		
Mirfield		
Mytholmroyd		
Queensbury		
Shepley		
Skelmanthorpe		
Sowerby Bridge		
Thornhill Edge		
Todmorden		

Summary of impacts for a transfer from HRI to CRH		
	Car Journey Time Impact	Public Transport Journey Time Impact
Almondbury		
Batley		
Brighouse		
Cleckheaton		
Elland		
Halifax		
Hebden Bridge		
Holmfirth		
Huddersfield		
Littleborough		
Liversedge		
Marsden		
Mirfield		
Mytholmroyd		
Queensbury		
Shepley		
Skelmanthorpe		
Sowerby Bridge		
Thornhill Edge		
Todmorden		

- Decrease of 45+ mins
- Decrease of 30-45 mins
- Decrease of 10-30 mins
- Change of 10 mins or less
- Increase of 10-30 mins
- Increase of 30-45 mins
- Increase of 45+ mins

Table 3-A: Summary of Journey Time Impacts by Area

3.5 Maximum Change in Journey Time

Table **3-B** shows the maximum changes in journey time calculated for both car journeys and public transport. It can be seen that the increases in car journey times are broadly consistent across the different time periods. However, the public transport times are less consistent. As expected, the maximum changes in public transport journey times are at their lowest when public transport provision is at its greatest (i.e. weekday and weekend daytimes). In the weekday early mornings and late evenings, the increases in public transport journey times are higher.

	Car		Public Transport	
	Maximum increase in journey time [mins]			
	To CRH	To HRI	To CRH	To HRI
Weekday 0630 - 0800	18	17	>60	>60
Weekday 0800 - 0900	20	18	>60	>60
Weekday 0900 – 1700	17	16	60	53
Weekday 1700 – 1800	20	19	>60	>60
Weekday 2000 - 2100	15	14	>60	>60
Saturday 0900 – 1700	16	15	60	52
Sunday 0900 - 1700	15	15	60	52

Table 3-B: Maximum Change in Journey Time

3.6 Equality Impacts of Journey Time Changes

Table 3-C gives an overview of the areas which have detailed LSOA census areas lying in the bottom quartile for Calderdale and Kirklees for the equality categories considered. This identifies where areas with a high proportion of residents from disadvantaged sectors of society, and hence may have a greater reliance on public transport, may find it more difficult to make the hospital journey and/or have a greater propensity to visit the hospital, compared to the population at large.

It should be noted that the levels of severity of the journey time impact indicated are a summary over all time periods assessed. It is therefore a high-level assessment and indicates those areas where the Trust might want to consider transport mitigation measures as part of their proposals.

3.7 Other Considerations for Journey Time Changes

Some of the towns and villages under consideration are located in the periphery of the Calderdale and South Kirklees areas, and concern has been raised in the past by residents regarding the frequency of “blockages” on key main roads that access such areas. Liaison has taken place with the relevant Officers at both Kirklees and Calderdale Councils, the results of which are described below.

Kirklees Council stated that the A629 between Halifax and Huddersfield would always be kept open during roadworks. Calderdale Council stated that the same section of the A629 had only been closed twice in recent years, neither of which due to roadworks (one incident was where the road was closed by the police following an accident, and the incident was where the road was closed once overnight when a boulder fell from the hillside). Calderdale Council also stated that the A646 between

Todmorden / Hebden Bridge, and Halifax and the A629 between Denholme and Halifax, would seldom be closed for roadworks or adverse weather conditions.

It should be noted that, whilst both Councils keep detailed records of roadworks (both highways maintenance and those by utility companies), neither Council keeps detailed records of closures due to the weather or other miscellaneous incidents.

	Cars to CRH		Cars to HRI		Public Transport to CRH		Public Transport to HRI	
	Important areas for equality	Severity level	Important areas for equality	Severity level	Important areas for equality	Severity level	Important areas for equality	Severity level
Over 60	Kirkheaton Almondbury Linthwaite Honley New Mill Skelmanthorpe Meltham Thick Hollins		Todmorden Mytholmroyd/Midgley Luddenden Sowerby Bridge Halifax Heptonstall Ovenden Illingworth		Shepley Holmfirth Linthwaite Huddersfield (south)		Illingworth Shelf Northowram Brighouse	
					Honley Thick Hollins Netherthong Almondbury Roberttown Heckmondwike		Walsden Todmorden Heponstall Mytholmroyd Greetland Southowram Hipperholme Cleckheaton	
					Huddersfield (north) Skelmanthorpe		Elland Sowerby Bridge	
Over 75	Kirkheaton Almondbury Linthwaite Honley Skelmanthorpe Thick Hollins West Huddersfield Fenay Bridge		Todmorden Mytholmroyd/Midgley Luddenden Sowerby Bridge Halifax Heptonstall Ovenden Illingworth		Linthwaite Armitage Bridge Huddersfield (south)		Todmorden Mytholmroyd Halifax Halifax to Queensbury corridor Northowram Shelf	
					Honley Thick Hollins Netherthong Almondbury Huddersfield (north) Roberttown		Heptonstall Walsden Brighouse Hipperholme	
					Kirkheaton Upper Hopton		Sowerby Bridge Elland Cleckheaton	
Disability	Huddersfield Honley Fenay Bridge Linthwaite Armitage Bridge Skelmanthorpe Emley Moor		Sowerby Bridge Todmorden Halifax to Queensbury corridor		Linthwaite		Todmorden Brighouse Halifax to Queensbury corridor	
					Skelmanthorpe Honley Roberttown Mirfield Heckmondwike Huddersfield		Halifax	
					Batley		Sowerby Bridge Cleckheaton	
Ethnicity	Huddersfield		Halifax		Linthwaite		Halifax	
					Huddersfield Mirfield Ravensthorpe			
					Batley Thornhill Edge			
PT reliance	N/A	N/A	N/A	N/A	Huddersfield (south)		Todmorden Halifax to Queensbury corridor Hebden Bridge Sowerby Bridge	
					Almondbury Huddersfield (north) Mirfield Ravensthorpe			
					Batle Heckmondwike Thornhill Edge		Halifax Elland Rastrick Brighouse	
Social deprivation	Almondbury Fenay Bridge Huddersfield		Sowerby Bridge Todmorden Halifax to Queensbury corridor		Golcar Huddersfield (south)		Todmorden Halifax Halifax to Queensbury corridor	
					Huddersfield (north) Almondbury Mirfield		Elland	
					Batley Heckmondwike Thornhill Edge		Sowerby Bridge Bailiff Bridge	

Severity level	Average journey time change
	10-30 mins increase
	30-45 mins increase

	HW CRH		HW HRI		PT CRH		PT HRI	
	Important areas for equality	Severity level	Important areas for equality	Severity level	Important areas for equality	Severity level	Important areas for equality	Severity level
Over 60	Kirkheaton Almondbury Linthwaite Honley New Mill Skelmanthorpe Meltham Thick Hollins	Low	Todmorden Mytholmroyd/Midgley Luddenden Sowerby Bridge Halifax Heptonstall Ovenden Illingworth	Low	Shepley Holmfirth Linthwaite Huddersfield (south)	High	Illingworth Shelf Northowram Brighouse	High
					Honley Thick Hollins Netherthong Almondbury Roberttown Heckmondwike	Moderate	Walsden Todmorden Heponstall Mytholmroyd Greetland Southowram Hipperholme Cleckheaton	Moderate
					Huddersfield (north) Skelmanthorpe	Low	Elland Sowerby Bridge	Low
Over 75	Kirkheaton Almondbury Linthwaite Honley Skelmanthorpe Thick Hollins West Huddersfield Fenay Bridge	Low	Todmorden Mytholmroyd/Midgley Luddenden Sowerby Bridge Halifax Heptonstall Ovenden Illingworth	Low	Linthwaite Armitage Bridge Huddersfield (south)	High	Todmorden Mytholmroyd Halifax Halifax to Queensbury corridor Northowram Shelf	High
					Honley Thick Hollins Netherthong Almondbury Huddersfield (north) Roberttown	Moderate	Heptonstall Walsden Brighouse Hipperholme	Moderate
					Kirkheaton Upper Hopton	Low	Sowerby Bridge Elland Cleckheaton	Low
Disability	Huddersfield Honley Fenay Bridge Linthwaite Armitage Bridge Skelmanthorpe Emley Moor	Low	Sowerby Bridge Todmorden Halifax to Queensbury corridor	Low	Linthwaite	High	Todmorden Brighouse Halifax to Queensbury corridor	High
					Skelmanthorpe Honley Roberttown Mirfield Heckmondwike Huddersfield	Moderate	Halifax	Moderate
					Batley	Low	Sowerby Bridge Cleckheaton	Low
Ethnicity	Huddersfield	Low	Halifax	Low	Linthwaite	High	Halifax	High
					Huddersfield Mirfield Ravensthorpe	Moderate		
					Batley Thornhill Edge	Low		
PT reliance	N/A	N/A	N/A	N/A	Huddersfield (south)	High	Todmorden Halifax to Queensbury corridor Hebden Bridge Sowerby Bridge	Moderate
					Almondbury Huddersfield (north) Mirfield Ravensthorpe	Moderate		
					Batle Heckmondwike Thornhill Edge	Low	Halifax Elland Rastrick Brighouse	Low
Social deprivation	Almondbury Fenay Bridge Huddersfield	Low	Sowerby Bridge Todmorden Halifax to Queensbury corridor	Low	Golcar Huddersfield (south)	High	Todmorden Halifax Halifax to Queensbury corridor	High
					Huddersfield (north) Almondbury Mirfield	Moderate	Elland	Moderate
					Batley Heckmondwike Thornhill Edge	Low	Sowerby Bridge Bailiff Bridge	Low

Severity level	Average journey time change
Low	10-30 mins increase
Moderate	30-45 mins increase
High	More than 45 mins increase

Table 3-C: Summary of Equality Impacts

4 Conclusion

4.1 Car Journeys

The changes in journey times for the areas served by Calderdale Royal Hospital and Huddersfield Royal Infirmary are all likely to be between 15 and 20 minutes. Changes are of the same magnitude whether patients have to travel to Huddersfield instead of Halifax, or vice versa.

4.2 Public Transport

The impact on journey times for public transport users is likely to be more significant than that for car users. Several areas including the south of Huddersfield, the south of Halifax, the Queensbury / Ovenden area, Stainland, Hebden Bridge and Todmorden are likely to incur a significant increase in journey time in excess of 45 minutes.

Journey time changes for public transport differ greatly depending on the time of day, and whether it is a weekday or the weekend. As expected, the changes in public transport journey times are at their lowest when public transport provision is at its greatest (i.e. weekday and weekend daytimes). In the weekday early mornings and late evenings, the increases in public transport journey times are higher.

Regarding the equality impact of the journey time changes, there are many areas within the study area with a high proportion of disadvantaged or vulnerable groups who may be disproportionately affected by the proposals.

4.3 Further Work

It is recommended that the Trust combines the results of the journey time assessments with their patient data to estimate the numbers of patients affected in those areas with the most significant increases in public transport journey times. This will enable a better understanding of the numbers of people affected and enable the identification of mitigation measures to be targeted at those locations. Liaison should also take place with public transport providers to identify any potential opportunities for changes to their services.

Appendix A Journey Times – Present Situation

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Appendix B Change in Car Journey Times to Huddersfield Royal Infirmary

Appendix C Change in Public Transport Journey Times to Huddersfield Royal Infirmary

Appendix D Change in Car Journey Times to Calderdale Royal Hospital

Appendix E Change in Public Transport Journey Times to Calderdale Royal Hospital