# INFO NOTE

## DERBY-NOTTINGHAM TRANSFORMING CITIES

TRANSPORT ECONOMIC (TUBA) ASSESSMENT

| IDENTIFICATION TABLE | |
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## TABLE OF CONTENTS


| | | |
|---|---|---|
| **1.** | **INTRODUCTION** | **2** |
| **1.1** | **REPORT BACKGROUND** | **2** |
| **1.2** | **EAST MIDLANDS GATEWAY MODEL** | **2** |
| **1.3** | **EAST MIDLANDS GATEWAY MODEL - VALIDATION** | **3** |
| **2.** | **PROPOSED INVESTMENT PACKAGES** | **4** |
| **2.1** | **LOW/MEDIUM/HIGH PACKAGE DEFINITION** | **4** |
| **3.** | **ECONOMIC APPRAISAL** | **9** |
| **3.1** | **GENERAL APPROACH** | **9** |
| **3.2** | **MODELLING** | **9** |
| **3.3** | **ANNUALISATION FACTORS** | **9** |
| **3.4** | **SUMMARY OF TUBA WARNINGS** | **10** |
| **3.5** | **TUBA OUTPUTS TRANSPORT ECONOMIC EFFICIENCY (TEE)** | **12** |
| **3.6** | **SPATIAL DISTRIBUTION OF BENEFITS** | **16** |
| **3.7** | **ANALYSIS OF MONETISED COSTS AND BENEFITS TABLES** | **20** |

# 1. INTRODUCTION

## 1.1 Report Background

1.1.1 Nottingham City Council has commissioned SYSTRA, on behalf of Derby City Council and Nottingham City Council, to undertake a Transport Economics Assessment (TUBA) of the Transforming Cities proposals as part of the funding bid for the schemes.

1.1.2 The TUBA assessment has been based on outputs from the East Midlands Gateway Transport Model (EMGM) model. All of highway, public transport and park and ride benefits of the schemes have been derived using TUBA v1.9.12.

1.1.3 This report describes the approach used to deriving the Transport Economic benefits, and the overall results including the final TEE/AMCB tables. The final Economic Case for the schemes has been developed by ITP using these transport benefits and is reported separately.

## 1.2 East Midlands Gateway Model

1.2.1 SYSTRA was commissioned by Nottingham City Council to develop the EMGM in order to appraise a multi-modal access strategy to connect the East Midlands to the proposed HS2 station at Toton between Derby and Nottingham.

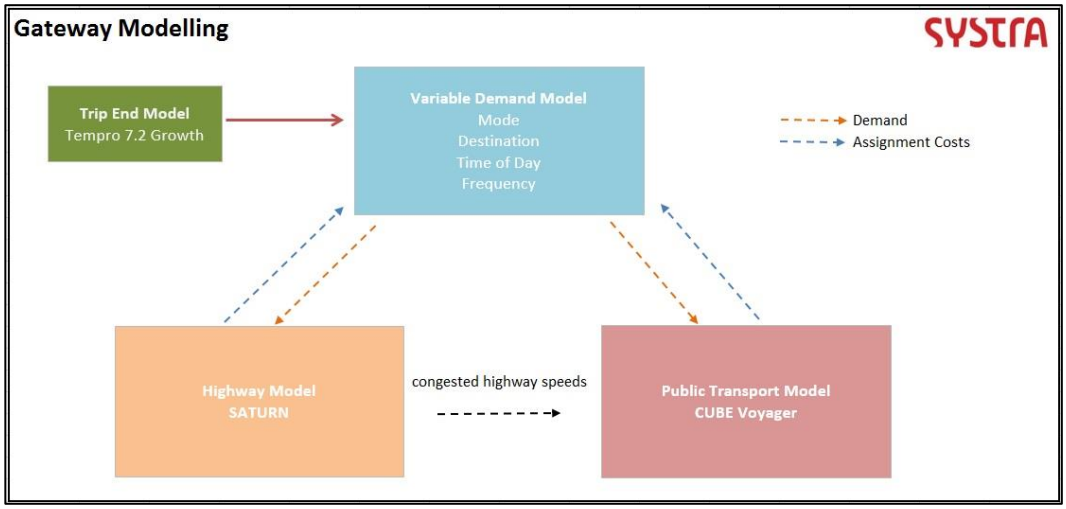
1.2.2 The structure of the EMGM was based on the Greater Nottingham Transport Model (GNTM), however it was developed using information from the existing Greater Nottingham Transport Model, Greater Derby Transport Model (GDTM) and the Leicester and Leicestershire Integrated Transport Model (LLITM). EMGM has been fully recalibrated and validated in line with the WebTAG guidance.

1.2.3 It was noted when the model was built that it is likely to be used in the future to assess a wide range of development and highway and public transport scheme applications, such as Transforming Cities, across the study area.

1.2.4 The following time periods were modelled:

- Morning Peak: 0800-0900;
- Inter Peak: 1100-1400 average hour;
- Evening Peak: 1700-1800.

Figure 1. EMGTM Overview




## 1.3 East Midlands Gateway Model - Validation

### 1.3.1 Highway Validation Summary:

- Full Model:
  - Over 96% of the LGV counts meet either the GEH or flow criteria in each peak and over 90% of the HGV counts meet either the GEH or flow criteria. These statistics far exceed the recommended target of 85% stated in WebTAG guidance.
  - Over 77% of the car counts match either the GEH or flow criteria. Whilst this is lower than the recommended 85% target specified by WebTAG it still demonstrates a strong level of model validation given the size of the model, the number of counts utilised and the complexities of route choice available within the model.
- Journey Time Validation:
  - Observed journey time data for Nottingham and Derby has been compared with modelled data. Within Nottingham 15 out of 22 (or 68%) of the journey time routes are within +/- 15% of the observed data in the morning peak. In the evening peak, 16 out of 24 (or 67%) of routes are within +/- 15% of the observed data.
  - In Derby 10 out of 18 (or 56%) morning peak journey time routes are within +/- 15% of the observed data. In the evening peak, 13 out of 22 (or 59%) of routes are within +/- 15% of the observed data.
  - The emphasis of this model validation process was on flow validation. To rectify some of these journey time would affect the flow validation and as a result the flow validation was prioritised over the journey time validation.

### 1.3.2 Public Transport Validation Summary:

- Assignment Validation – Bus and NET:

- Screenline validation shows high levels of compliance between the modelled and observed flows within the identified screenlines. In the morning peak, 14 out of 16 (88%) screenlines were within 15% of the observed count. In the inter-peak and evening peaks 13 out of 16 (81%) of screenlines were considered satisfactory.
- This indicates a strong correlation between modelled and observed flows in all peaks and provides confidence that the model replicates flows in to and out of major urban areas.

- Assignment Validation – Rail:

  - In regards to rail station entries and exits the model shows high levels of compliance between against observed flows.
  - In the morning peak, 79% of stations match observed entry data and 94% of stations match observed exit data. In the inter-peak this figure is 100% and 97%. In the evening peak 97% of stations match observed entry data and 73% of stations match observed data.
  - This indicates a strong correlation between modelled and observed flows in all peaks and provides confidence that the model replicates flows in to and out of key railway stations.

- Journey Time Validation:

  - Bus journey times were extracted from the model assignments and compared against the observed data collected for the EMGM study. In the morning peak, 78% of the bus journey times were within 15% of the observed time, in the inter-peak period 89% of routes considered satisfactory and in the evening peak 72% of the routes were within 15% of the observed time. These figures indicate a good level of bus journey time validation.

1.3.3 As a result of the validation results in the EMGM model it is recommended 'Fit for Purpose' for assessing the Transforming Cities Fund.

# 2. PROPOSED INVESTMENT PACKAGES

## 2.1 Low/Medium/High Package Definition

2.1.1 The Transforming Cities Fund includes three packages which broadly reflect the following overall 'DfT capital funding requirement' bid values:

- Low: £100m;
- Med: £130m;
- High: £160m.

2.1.2 The **Low Investment** consists of the following schemes:

- Nottingham City Centre Hub and Interchange:

  - Off-road cycleway Canal Street East;
  - Off-road cycleway Station Street East;
  - Off-road cycleway Trent Street;

- Nottingham City Centre public realm (not modelled);
- Derby City Centre hubs and interchange:
    - Derby bus station vehicle exit upgrade;
    - Morledge/Bus station junction Improvement;
- Derby City Centre public realm (not modelled);
- Derby – East Midlands Airport (EMA) – Nottingham Cycle expressway:
    - A6005 corridor cycle expressway Beeston to Draycott;
    - Derby Riverside Path extension to Borrowash (to form cycle expressway);
    - Derby Canal Path extension to Swarkestone (EMA route);
- Bikeshare programme (not modelled);
- Inter-urban bus priority improvements:
    - Bus lane / signal priority (A52, A6, A609);
- EMA – Gateway DRT:
    - New DRT service EMA – Gateway – Kegworth Parkway Station;
- D2N2 EV charge point network (not modelled);
- Southern growth corridor (E-W) extension:
    - Thane Rd bus and ULEV lane and Clifton Bridge junction improvement;
    - Colwick Loop Road bus and ULEV lane (private road No. 1 to Victoria Park Way);
    - Colwick Level Crossing signal and camera upgrade (not modelled);
- Nottingham Central and Western bus priority corridors:
    - Traffic light priority A609 Ilkeston Road (Canning Circus to Woolaton Vale);
    - Traffic light priority A610 Canning Circus to Nuthall Road;
    - Traffic light priority A60 Lower Parliament Street to Queens Drive A453;
    - A60 corridor SCOOT treatment (Canal Street – Mansfield Road/Forest Road junction);
- Nottingham Northern bus priority corridors:
    - SCOOT junction installations (Hucknall Road/Bestwood Road/ Bestwood Park Drive);
    - MOVA installation (Arnold Road/Edwards Lane);
    - NUH Campus Road improvements to support larger bus capacity on the Medilink service (not modelled);
    - Carey Road/Stockhill/Davids Lane level crossing cameras and traffic signals (not modelled);
    - B6004 bus lane near Burford Primary School (Bestwood Road/ Arnold Road) and B6004 bus lane near Coleridge Close;

- Nottingham Park and Ride upgrades:
    - Expand Phoenix park and ride;
    - Expand Hucknall park and ride;
    - Leapool Park and Ride;
- Nottingham LCWIP priority cycle corridors:
    - New River Trent pedestrian/cycle crossing bridge;
    - Ring Road improvement;
    - LCWIP South: Queens Drive to Thane Road;
    - LCWIP North: Hucknall Road Greenway;
    - LCWIP North East: St Ann's Well Road;
- Nottingham Workplace capital travel grants (not modelled);
- Derby Growth Corridor Smart Park and Ride Hubs:
    - Bus lane;
    - Improved junctions;
    - Additional P&R spaces;
- Derby Growth Corridor Bus and Rapid Transit improvements:
    - Infinity Park – City Centre DRT service;
    - eRT route: Cathedral Quarter – Pride Park;
    - Improved junctions;
- Derby Growth Corridor LCWIP priority cycle corridors:
    - City Centre to Mickleover cycleway;
    - Pengtagon Island to Spondon cycleway;
    - City Centre to Raynesway cycleway;
- Derby Growth Corridor Workplace capital travel grants (not modelled).

2.1.3 In addition to the Low investment, the **Medium Investment** adds the following:

- Nottingham City Centre Hub and Interchange:
    - Cycle lane Queens Bridge Road and junction;
    - Cycle lane London Road and Station Street junction;
- Derby City Centre Hubs and Interchange:
    - Derby Cockpit bus gate;
    - Derby Derwent Bridge bus gate;
- Derby – East Midlands Airport (EMA) – Nottingham Cycle expressway:
    - Derby Riverside Path extension to Borrowash;
    - Derby Canal Path extension to Swarkestone (EMA route);
    - Additional infrastructure to link Clifton to EMA;
- Nottingham Northern bus priority corridors:

- Springfield Lane to Cross Street bus lane (Bestwood/Arnold);
- Thackereys Lane to A60 bus lane (Bestwood/Arnold);

- Nottingham Park and Ride upgrades:
  - Expand Hucknall park and ride;
- Nottingham LCWIP priority cycle corridors:
  - LCWIP East: A612 corridor;
- Derby Growth Corridor Smart Park and Ride Hubs:
  - Bus lane upgrade;
  - Additional improved junctions;
  - Additional P&R spaces;
  - Cycleway;
- Derby Growth Corridor Bus and Rapid Transit improvements:
  - Updated eRT route: Cathedral Quarter – Pride Park;
  - Additional Improved junctions;
- Derby Growth Corridor LCWIP priority cycle corridors:
  - City Centre to Mickleover cycleway upgrade.

2.1.4 In addition to the Low investment and Medium Investment, the **High Investment** adds the following:

- Nottingham City Centre Hub and Interchange:
  - Tollhouse Hill to Talbot Street cycleway;
- Derby City Centre Hubs and Interchange:
  - Two-way bus lane Corporation Street/Morledge;
- Derby – East Midlands Airport (EMA) – Nottingham Cycle expressway:
  - A6005 corridor cycle expressway Beeston to Borrowash (extension);
  - Derby Canal Path extension to Swarkestone (EMA route);
  - Sutton Bonington extension;
- EMA – Gateway DRT:
  - Upgraded DRT service EMA – Gateway – Kegworth Parkway Station;
- Nottingham Central and Western bus priority corridors:
  - Bus traffic light priority at existing SCOOT/MOVA junctions;
- Nottingham Northern bus priority corridors:

- A60 Petrol Station to Arch Hill north end bus lane (Bestwood Road/Arnold Road);
- Pinch Point removal A610 Nottingham – Cinderhill;
- Pinch Point removal A60 Cross Street to Sir Robinson Way;
- Pinch Point removal B5010 Nottingham Road/Bramcote;

- Nottingham Park and Ride upgrades:
  - Deliver Wilford Lane park and ride;
- Nottingham LCWIP priority cycling routes:
  - LCWIP North West: Wigman/Beechdale;
- Derby Growth Corridor Smart Park and Ride Hubs:
  - Bus lane;
  - Improved junctions;
  - Additional P&R spaces;
- Derby Growth Corridor Smart Park and Ride Hubs:
  - Bus lane upgrade;
  - Additional improved junctions;
  - Additional P&R spaces;
  - Cycleway;
- Derby Growth Corridor Bus and Rapid Transit improvements:
  - Updated eRT route: Cathedral Quarter – Pride Park;
  - Additional Improved junctions;
- Derby Growth Corridor LCWIP priority cycle corridors:
  - City Centre to Mickleover cycleway upgrade;
  - Pengtagon Island to Spondon cycleway upgrade;
  - City Centre to Raynesway cycleway upgrade.

# 3. ECONOMIC APPRAISAL

## 3.1 General Approach

3.1.1 The appraisal has been based on an opening year of 2023 using forecast year of 2043. WebTAG requires that most transport investments including new roads are appraised over a period of 60 years so that the benefits which accrue over the long term can be compared with the investment costs.

3.1.2 Benefits arising after 2043 have been calculated based on the 2043 model outputs and assumed to remain constant until 2082, other than adjustments to parameters such as value of time and vehicle operating costs in line with WebTAG guidance.

3.1.3 Benefits have been calculated using TUBA v1.9.12 with standard parameters including discounting assumptions stated in WebTAG guidance.

## 3.2 Modelling

3.2.1 The benefits of the scheme were calculated using time, distance, demand and charge skims which came directly from the East Midlands Gateway Model (EMGM) and were only adjusted to meet the format requirements of TUBA.

3.2.2 The infrastructure contained in the 2023 and 2043 networks are identical.

3.2.3 The full EMGM suite - which includes a demand model, public transport model and highways model - was run to produce the appropriate highway, park and ride and public transport skims. These were used for the TUBA assessment.

## 3.3 Annualisation Factors

3.3.1 Annualisation factors for the TUBA assessment have been calculated assuming 260 weekdays in a year and 52 weekends. The skims generated from EMGM are for one-hour peaks with an average hour inter-peak, whereas TUBA works with the following standard time periods:

- AM peak (weekday 07:00 to 10:00);
- PM peak (weekday 16:00 to 19:00);
- Inter-peak (weekday 10:00 to 16:00).

3.3.2 Highway annualisation factors therefore need to account for demand in the first and third hours of a three-hour peak typically having lower demand than in the second hour of the peak, which is represented by the EMGM skims. The resultant highway annualisation factors are as follows:

- AM: 520
- IP: 1,560
- PM: 520

3.3.3 Annualisation factors for public transport for the Transforming Cities Fund used factors based on the Public Transport out-turn demand; weekday count data from June 2016 after the opening of the NET Phase Two extensions, and weekend relativities from September 2013 data. These factors are somewhat higher than the standard highway

factors, both in the peak periods and specifically in the interpeak reflecting out-turn Public Transport usage data, including significant travel volumes at weekends and in the weekday off-peak periods. The resultant public transport annualisation factors used are:

- AM: 563
- IP: 3,471
- PM: 674

## 3.4 Summary of TUBA Warnings

3.4.1 TUBA performs a number of checks on the input data, and produces warnings for possible anomalies in the data.

3.4.2 The total number of warnings in the 'Low', 'Medium' and 'High' runs are summarised in Table 1 by warning type.

3.4.3 All Origin-Destination pairs that generate serious warnings were manually reviewed. The improvements to travel time and travel distance were found to be the result of the improved connectivity provided by the proposed packages in the vast majority of cases. The remaining serious warnings related to O-D movements with 0.01 trips or fewer.

Table 1. TUBA Warnings

| TYPE | DESCRIPTION | TOTAL | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Low | | | Medium | | | High | | |
| | | Highway | Public Transport | Park and Ride | Highway | Public Transport | Park and Ride | Highway | Public Transport | Park and Ride |
| 1 | DM to DS travel time ratio too low (<0.67) | 30 (0 serious) | *230 (0)* | *786 (8)* | 485 (0) | 314 (0) | 2410 (96) | 189 (0) | 448 (0) | 27021 (78) |
| 2 | DM to DS travel time ratio too high (>1.5) | 126 (18) | *1400 (14)* | *142* | *759 (138)* | *1388 (14)* | *1309 (0)* | *440 (90)* | *1938 (30)* | *2852 (6)* |
| 3 | DM to DS travel distance ratio too low <0.67) | 941 (0) | | | 2176 (0) | | | 2126 (0) | | |
| 4 | DM to DS travel distance ratio too high (>1.5) | 1466 (1466) | | | *2324 (2324)* | | | 4570 (4570) | | |

## 3.5 TUBA Outputs Transport Economic Efficiency (TEE)

3.5.1 The Transport Economic Efficiency (TEE) totals for the Low, Medium and High investments can be seen below along with what mode of transport provides the most benefit for the specific users:

- **Low – £160m ;**
- **Medium – £163m ;**
- **High – £341m .**

3.5.2 The numbers above show that between the Low and Medium investments there is nearly no difference in their economic efficiency. The High investment has a TEE that is more than double that of the Medium's. Tables 3 and 4 below show that the reason for this is the additional benefit in the non-business other and the additional benefits that can be seen in the Private Sector Park and Ride. It is assumed this is due to delivering Wilford Lane Park and Ride.

3.5.3 These values (in £'000s) and how they have been derived are presented in Tables 2, 3 and 4 in the required DfT format.

**Table 2. Economic Efficiency of the Transport System - Low (TEE)**

| USER BENEFITS | ALL MODES | ROAD<br>PRIVATE CARS AND LGVS | PUBLIC TRANSPORT<br>PASSENGERS | PARK AND RIDE<br>PASSENGERS |
|---|---|---|---|---|
| NON-BUSINESS: COMMUTING – USER BENEFITS | | | | |
| Travel time | £84,710 | £36,648 | £48,877 | -£815 |
| Vehicle operating costs | £2,160 | £2,477 | £0 | -£317 |
| User charges | -£1,477 | £0 | -£1,227 | -£250 |
| **NET NON-BUSINESS BENEFITS: COMMUTING** | **£85,393** | **£39,125** | **£47,650** | **-£1,382** |
| NON-BUSINESS: OTHER – USER BENEFITS | | | | |
| Travel time | £59,048 | £24,054 | £35,432 | -£438 |
| Vehicle operating costs | £2,211 | £2,497 | £0 | -£286 |
| User charges | £1,015 | £0 | £1,186 | -£171 |
| **NET NON-BUSINESS BENEFITS: OTHER** | **£62,274** | **£26,551** | **£36,618** | **-£895** |
| BUSINESS | | | | |
| USER BENEFITS | | | | |
| Travel time | £31,307 | £20,901 | £12,116 | -£1,710 |
| Vehicle operating costs | £2,224 | £2,968 | £0 | -£744 |
| User charges | -£1,478 | £0 | -£869 | -£609 |
| **SUBTOTAL** | **£32,052** | **£23,869** | **£11,247** | **-£3,064** |
| PRIVATE SECTOR PROVIDER IMPACTS | | | | |
| Revenue | -£19,674 | | -£27,392 | £7,718 |
| Operating Costs | £0 | | £0 | |
| Investment Costs | £0 | | | |
| Grant/Subsidy | £0 | | | |
| **SUBTOTAL** | **-£19,674** | | **-£27,392** | **£7,718** |
| OTHER BUSINESS IMPACTS | | | | |
| **NET BUSINESS IMPACT** | **£12,379** | | | |
| **TOTAL PRESENT VALUE OF TRANSPORT ECONOMIC EFFICIENCY BENEFITS (TEE)** | **£160,046** | | | |

Table 3. Economic Efficiency of the Transport System - Medium (TEE)

| USER BENEFITS | ALL MODES | ROAD | PUBLIC TRANSPORT | PARK AND RIDE |
|---|---|---|---|---|
| | | PRIVATE CARS AND LGVS | PASSENGERS | PASSENGERS |
| NON-BUSINESS: COMMUTING – USER BENEFITS | | | | |
| Travel time | £92,266 | £38,615 | £55,686 | -£2,035 |
| Vehicle operating costs | £1,661 | £2,125 | £0 | -£465 |
| User charges | -£3,324 | £0 | -£3,746 | £421 |
| **NET NON-BUSINESS BENEFITS: COMMUTING** | **£90,602** | **£40,741** | **£51,940** | **-£2,079** |
| NON-BUSINESS: OTHER – USER BENEFITS | | | | |
| Travel time | £63,080 | £23,787 | £40,835 | -£1,542 |
| Vehicle operating costs | £1,613 | £2,257 | £0 | -£644 |
| User charges | -£102 | £0 | -£1,553 | £1,451 |
| **NET NON-BUSINESS BENEFITS: OTHER** | **£64,590** | **£26,044** | **£39,282** | **-£736** |
| BUSINESS | | | | |
| User BENEFITS | | | | |
| Travel time | £34,756 | £22,341 | £14,100 | -£1,686 |
| Vehicle operating costs | £1,657 | £2,388 | £0 | -£731 |
| User charges | -£1,738 | £0 | -£1,301 | -£437 |
| **SUBTOTAL** | **£34,675** | **£24,729** | **£12,800** | **-£2,853** |
| PRIVATE SECTOR PROVIDER IMPACTS | | | | |
| Revenue | -£26.173 | | -£34,409 | £8,236 |
| Operating Costs | £0 | | £0 | |
| Investment Costs | £0 | | | |
| Grant/Subsidy | £0 | | | |
| **SUBTOTAL** | **-£26,173** | | **-£34.409** | **£8,236** |
| OTHER BUSINESS IMPACTS | | | | |
| **NET BUSINESS IMPACT** | **£8,502** | | | |
| **TOTAL PRESENT VALUE OF TRANSPORT ECONOMIC EFFICIENCY BENEFITS (TEE)** | **£163,395** | | | |

**Table 4. Economic Efficiency of the Transport System - High (TEE)**

| USER BENEFITS | ALL MODES | ROAD | PUBLIC TRANSPORT | PARK AND RIDE |
|---|---|---|---|---|
| | | PRIVATE CARS AND LGVS | PASSENGERS | PASSENGERS |
| NON-BUSINESS: COMMUTING – USER BENEFITS | | | | |
| Travel time | £113,895 | £53,799 | £67,627 | -£7,531 |
| Vehicle operating costs | £2,736 | £5,558 | £0 | -£2,822 |
| User charges | £519 | £0 | -£1,751 | £2,270 |
| **NET NON-BUSINESS BENEFITS: COMMUTING** | **£117,150** | **£59,356** | **£65,876** | **-£8,082** |
| NON-BUSINESS: OTHER – USER BENEFITS | | | | |
| Travel time | £103,934 | £37,088 | £67,920 | -£1,073 |
| Vehicle operating costs | £3,408 | £6,119 | £0 | -£2,711 |
| User charges | £4,887 | £0 | £1,347 | £3,541 |
| **NET NON-BUSINESS BENEFITS: OTHER** | **£112,230** | **£43,207** | **£69,266** | **-£243** |
| BUSINESS | | | | |
| USER BENEFITS | | | | |
| Travel time | £55,637 | £37,504 | £16,516 | £1,617 |
| Vehicle operating costs | £4,303 | £4,292 | £0 | £10 |
| User charges | -£378 | £0 | -£1,026 | £649 |
| **SUBTOTAL** | **£59,562** | **£41,796** | **£15,490** | **£2,277** |
| PRIVATE SECTOR PROVIDER IMPACTS | | | | |
| Revenue | £52,036 | | -£17,908 | £69,945 |
| Operating Costs | £0 | | £0 | |
| Investment Costs | £0 | | | |
| Grant/Subsidy | £0 | | | |
| **SUBTOTAL** | **£52,036** | | **-£17,908** | **£69,945** |
| OTHER BUSINESS IMPACTS | | | | |
| **NET BUSINESS IMPACT** | **£111,599** | | | |
| **TOTAL PRESENT VALUE OF TRANSPORT ECONOMIC EFFICIENCY BENEFITS (TEE)** | **£340,979** | | | |

## 3.6 Spatial Distribution of Benefits

3.6.1 Figures 2 - 7 show the spatial distribution of benefits for each of Low, Medium and High packages. The Benefits for each of the packages has been summarised below:

3.6.2 **Low –** From Figure 2 and Figure 3 the majority of the benefits seen in the Low investment are in Nottingham City Centre. Schemes such as those listed below is are the reason for this (for more detail on these schemes, please see section 2.1.2 of this note):

- Inter-urban bus priority improvements;
- Southern growth corridor (E-W) extension;
- Central and Western bus priority corridors;
- Northern bus priority corridors;
- Introduction of Leapool Park and Ride.

3.6.3 **Medium** – Figures 4 and 5 show that there is very little additional benefit in the medium investment compared to the low. These benefits that can be seen in Nottingham in this package are nearly identical to the Low investment. However, there is a slight increase in the benefits around Derby, see below for the schemes anticipated to have caused this (for more detail on these schemes, please see section 2.1.3 of this note):

- Bus and Rapid Transit improvements;
- LCWIP priority cycle improvements;
- East Midlands Airport (EMA) / Gateway DRT;
- Derby City Centre hubs and interchange.

3.6.4 **High** – Figures 6 and 7 show that the high investment adds significant benefits to the TCF; these can be seen in both Derby and Nottingham. The schemes stated in the above points of the Low and Medium investments will be adding benefits to the High investment along with the following schemes that have over doubled the benefits (for more detail on these schemes, please see section 2.1.4 of this note):

- Derby City Centre Hubs and interchange;
- Smart Park and Ride Hubs;
- Delivery of Wilford Lane Park and Ride;
- Northern Bus Priority corridors;
- Central and Western bus priority corridors.

Figure 2. Spatial Distribution of Benefits (Low - Highway)

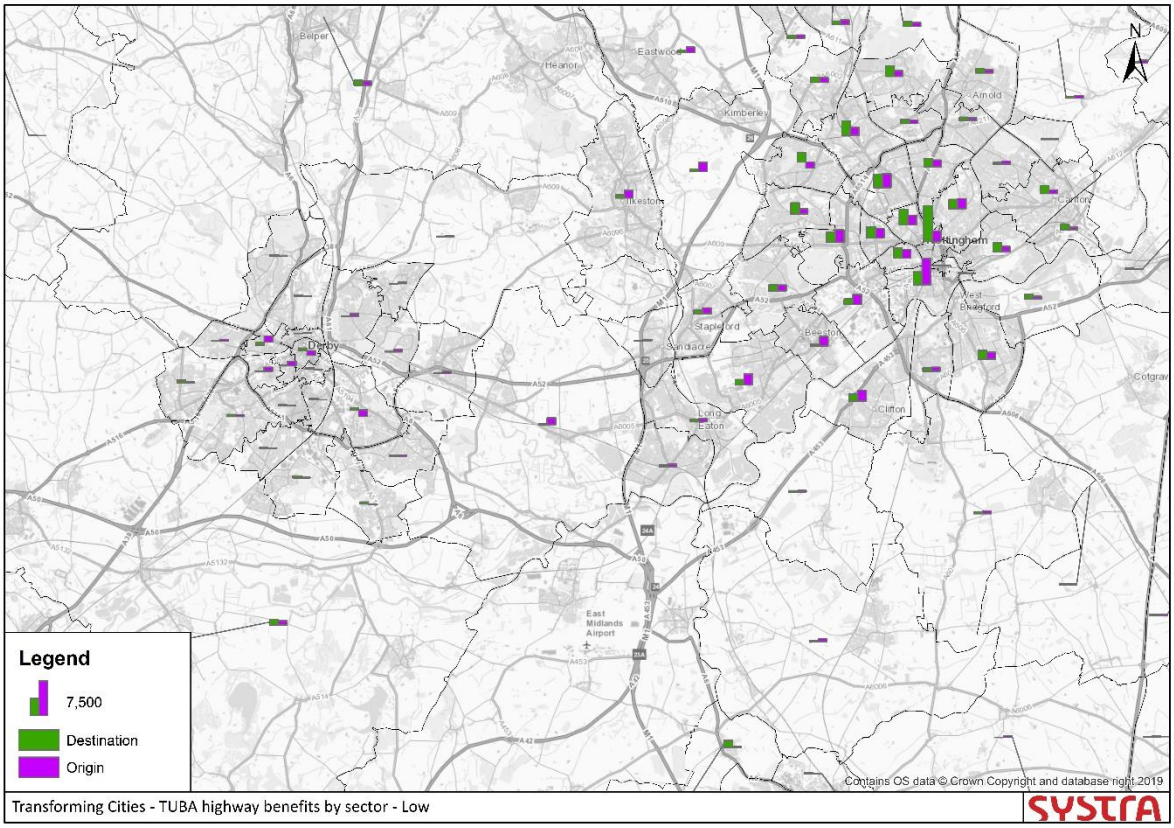



Figure 3. Spatial Distribution of Benefits (Low - Public Transport)

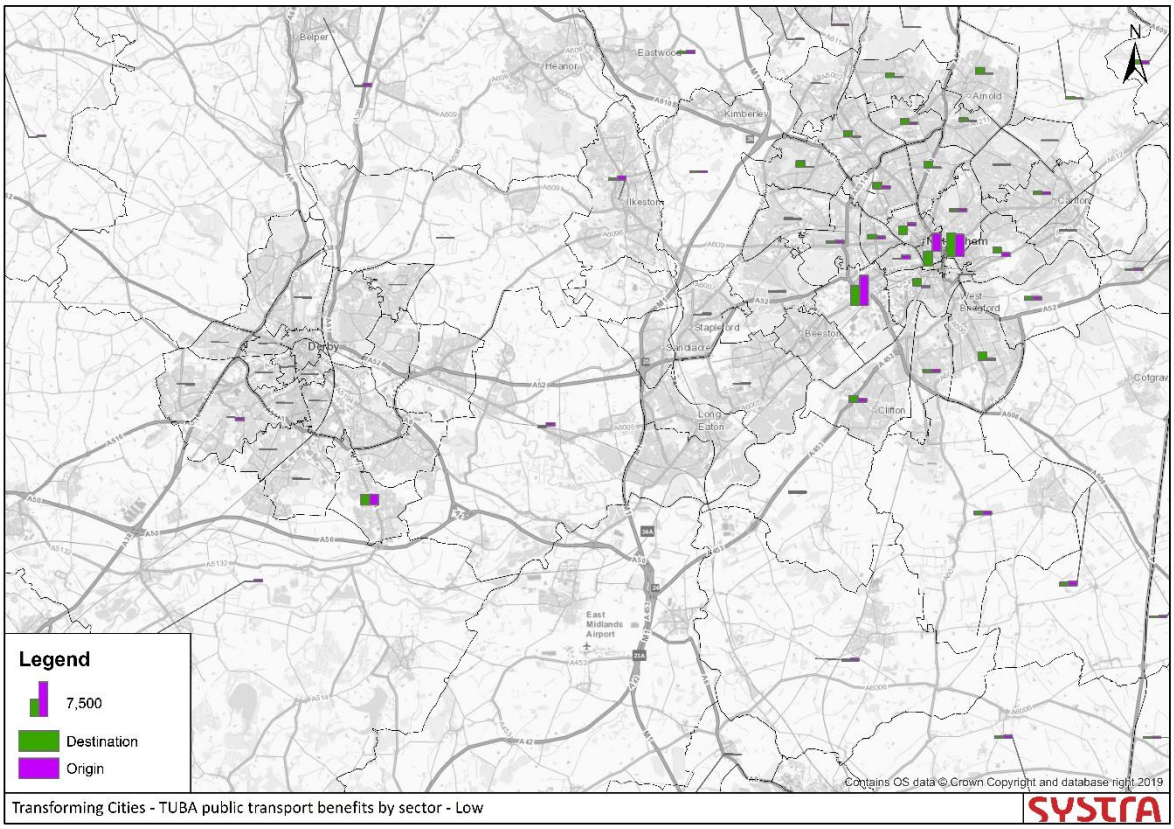


**Figure 4. Spatial Distribution of Benefits (Medium - Highway)**

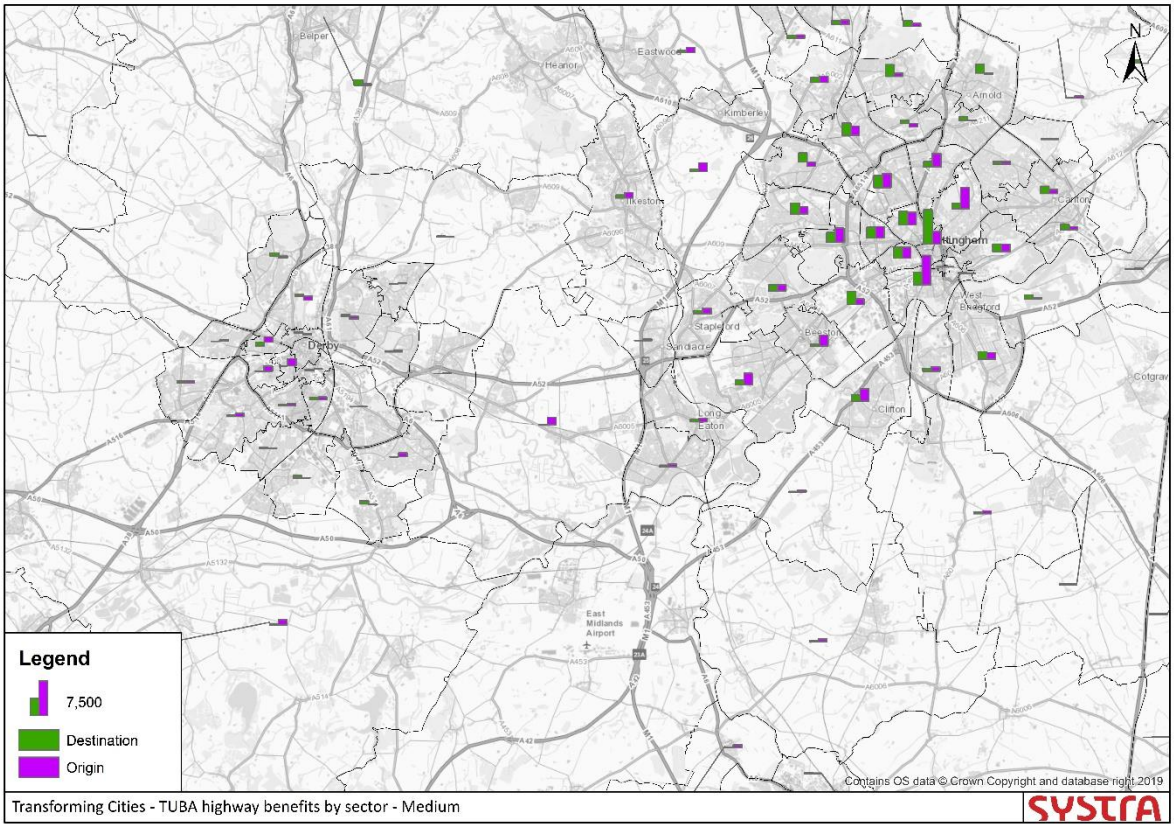


Figure 5. Spatial Distribution of Benefits (Medium – Public Transport)

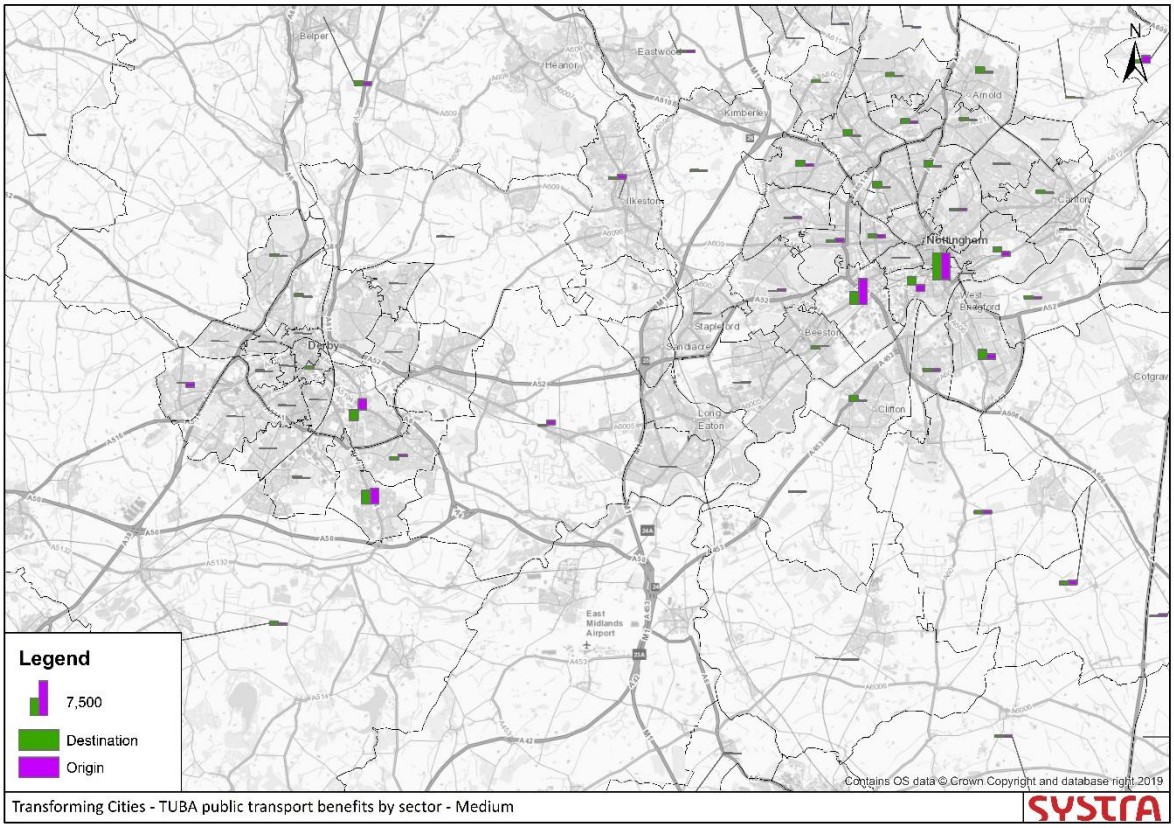



Figure 6. Spatial Distribution of Benefits (High - Highway)

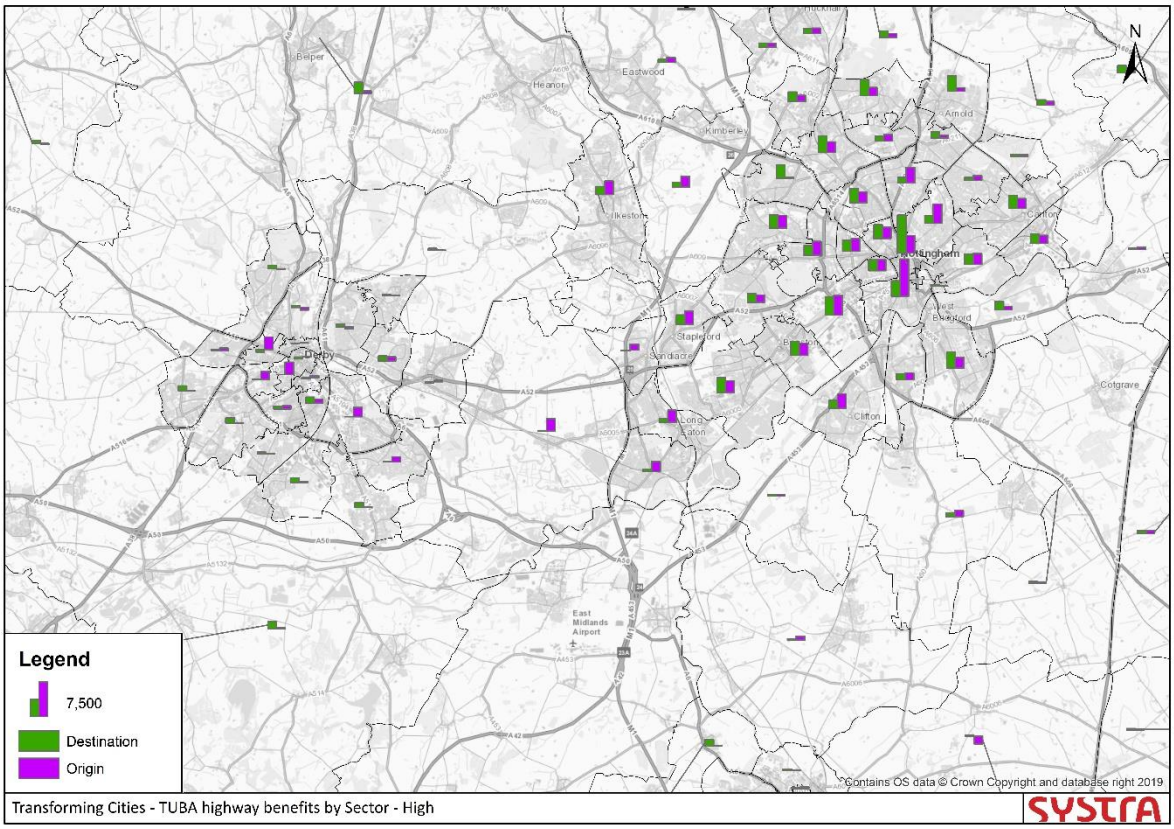
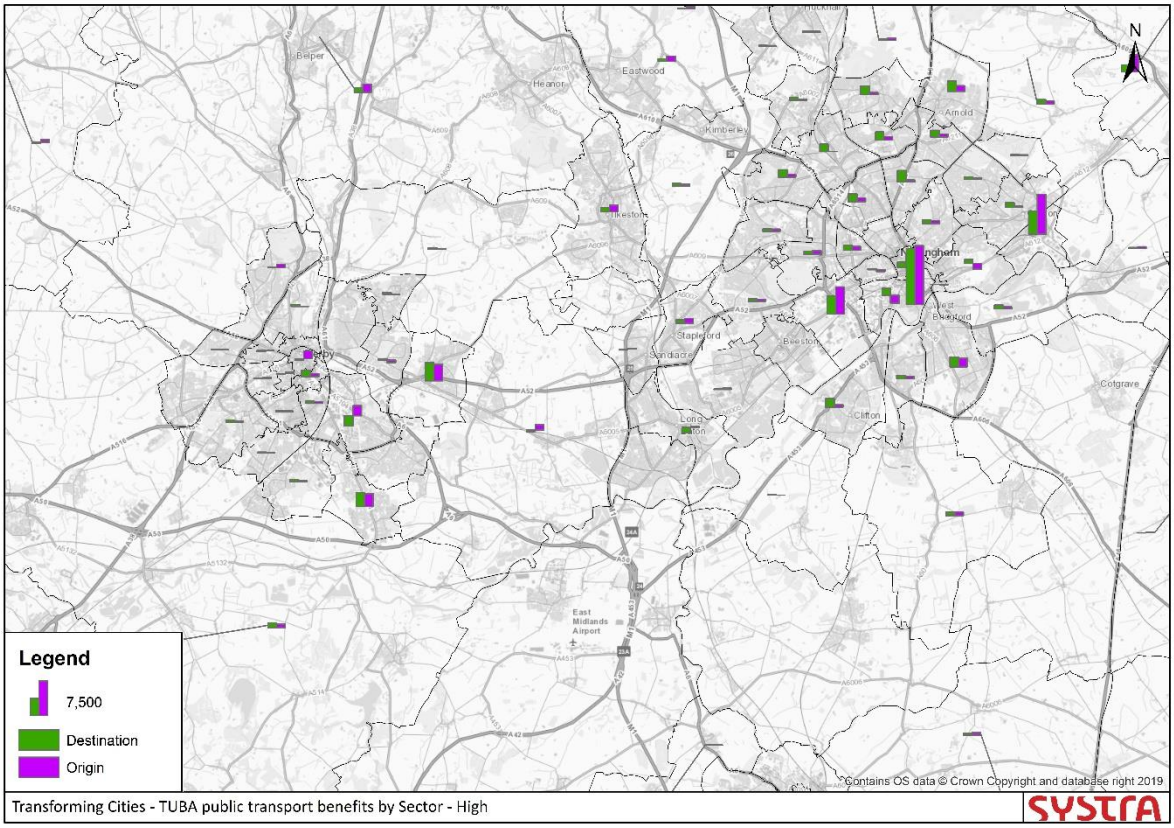


Figure 7. Spatial Distribution of Benefits (High – Public Transport)




## 3.7 Analysis of Monetised Costs and Benefits Tables

3.7.1 Tables 5 - 7 present the Analysis of Monetised Costs and Benefits (AMCB) tables. The full economic assessment has been undertaken by ITP and as a result only the benefits and costs (wider public finances) calculated by TUBA are included in these tables.

3.7.2 The Net Present Values (NPV) for each of the investments can be seen below:

- **Low - £161m ;**
- **Medium - £166m ;**
- **High - £334m .**

3.7.3 As can be seen from the figures above the difference between the low and medium investments are very little. However, the NPV is more than doubled when the high package is introduced.

Table 5. Analysis of Monetised Costs and Benefits (Low - AMCB)

| | £'000 (2010 PRICES) |
|---|---|
| Noise | £0 |
| Local Air Quality | £0 |
| Greenhouse Gases | £2,533 |
| Journey Quality | £0 |
| Physical Activity | £0 |
| Accidents | £0 |
| Economic Efficiency: Consumers Users (Commuting) | £85,393 |
| Economic Efficiency: Consumers Users (Other) | £62,274 |
| Economic Efficiency: Business Users and Providers | £12,379 |
| Wider Public Finances (Indirect Taxation Revenues) | -£1,512 |
| Present Value of Benefits (see notes) (PVB) | £161,067 |
| Broad Transport Budget | £0 |
| Present Value of Costs (see notes) (PVC) | £0 |
| OVERALL IMPACTS | |
| **Net Present Value (NPV)** | **£161,067** |
| **Benefit to Cost Ratio (BCR)** | **n/a** |

Table 6. Analysis of Monetised Costs and Benefits (Medium - AMCB)

| | £'000 (2010 PRICES) |
|---|---|
| Noise | £0 |
| Local Air Quality | £0 |
| Greenhouse Gases | £2,415 |
| Journey Quality | £0 |
| Physical Activity | £0 |
| Accidents | £0 |
| Economic Efficiency: Consumers Users (Commuting) | £90,602 |
| Economic Efficiency: Consumers Users (Other) | £64,590 |
| Economic Efficiency: Business Users and Providers | £8,502 |
| Wider Public Finances (Indirect Taxation Revenues) | -£73 |
| Present Value of Benefits (see notes) (PVB) | £166,037 |
| Broad Transport Budget | £0 |
| Present Value of Costs (see notes) (PVC) | £0 |
| OVERALL IMPACTS | |
| **Net Present Value (NPV)** | **£166,037** |
| **Benefit to Cost Ratio (BCR)** | **n/a** |

Table 7. Analysis of Monetised Costs and Benefits (High - AMCB)

| | £'000 (2010 PRICES) |
|---|---|
| Noise | £0 |
| Local Air Quality | £0 |
| Greenhouse Gases | £3,884 |
| Journey Quality | £0 |
| Physical Activity | £0 |
| Accidents | £0 |
| Economic Efficiency: Consumers Users (Commuting) | £117,150 |
| Economic Efficiency: Consumers Users (Other) | £112,230 |
| Economic Efficiency: Business Users and Providers | £111,599 |
| Wider Public Finances (Indirect Taxation Revenues) | -£11,201 |
| Present Value of Benefits (see notes) (PVB) | £333,662 |
| Broad Transport Budget | £0 |
| Present Value of Costs (see notes) (PVC) | £0 |
| OVERALL IMPACTS | |
| **Net Present Value (NPV)** | **£333,662** |
| **Benefit to Cost Ratio (BCR)** | **n/a** |

| APPROVAL | | | | | |
|---|---|---|---|---|---|
| **Version** | **Name** | | **Position** | **Date** | **Modifications** |
| **1** | Author | James Homer | Senior Technician | 20/11/2019 | |
| | Checked by | Mitesh Patel | Senior Consultant | 26/11/2019 | |
| | Approved by | Duncan Irons | Director | 26/11/2019 | |