

Kirklees Council  
Bradley Masterplan

## Transport and Access Appraisal

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Version 1.0  
Issue





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# 1 Introduction

Fore Consulting Ltd (Fore) was appointed by O'Neill Associates as part of a multi-disciplinary team for Kirklees Council to examine the potential to bring forward development on a site at Bradley Park Golf Course, on the northern fringes of Huddersfield.

O'Neill Associates have produced an overall delivery statement looking at the viability of the site, which is accompanied by a number of supporting documents, including a masterplan design study and this transport report. At this stage, several masterplan concepts are being explored, looking at different development scales, densities and layouts; and taking into consideration the site's constraints, one of which is transport and highways. This report contains the following:

- A review of the existing transport situation;
- A high level review of the site access options;
- Preliminary estimates of likely traffic generation and distribution for the site;
- Impacts of the proposal on the existing and future highway network;
- Possible public transport, walking and cycling improvements, including their influence on masterplan options for the site; and
- Potential for smarter choice travel initiatives.

This report collates the above into one document and includes a series of conclusions and next steps that can be explored further in the next stage of site development.

The analysis set out in this report can also be updated in due course as larger transport improvement scheme proposals (A62 Cooper Bridge and M62 Junction 24a) being pursued by Kirklees Council, are developed in greater detail.

## 2 Existing Situation

### 2.1 Existing Land Uses

The site is 77.9 hectares in size with the majority allocated as green belt within the previous Unitary Development Plan. Within the draft Local Plan, two areas within the site (H351 and H1474) are identified as potential housing allocations.

The site is predominantly formed of the Bradley Park Golf Course. The land is in the ownership of Kirklees Council except for a small portion to the west of the site which is in private ownership.

### 2.2 Existing Highway Network

The existing highway network in the vicinity of the site is identified in Figure 1.

#### 2.2.1 Strategic Highway Network

The M62 is close to the northern boundary of the site. No traffic flow data is currently available from the Highways Agency TRADS database for locations in the vicinity of the site. However, the high traffic flows on this strategic route will mean it is necessary to consider how the impact of road noise, and maybe air quality, from the M62 on the development, can be reduced.

#### 2.2.2 Local Highway Network

The **A641 Bradford Road** runs along the western boundary of the site and connects Huddersfield town centre with Brighouse within the district of Calderdale. It crosses the M62 motorway to the north west of the site. In the vicinity of the site the road is a dual carriageway with a speed limit of 40mph. There are footways either side of the carriageway.

Department for Transport (DfT) count data for 2014 indicated the section of the A641 between the Kirklees district boundary and the A6107 has an Annual Average Daily Flow (AADF) of 17,696 vehicles. The A641 intersects with the A6107 at a 4-arm uncontrolled roundabout, Bradley Bar.

The A641 has been designated as a core road and bus route under Policy DLP23 of the draft Local Plan.

The **A6107 Bradley Road** runs east-west to the south of the site and is the road from which access is currently provided to the golf course. It links the A641 and the A62 Leeds Road. The majority of the road is subject to a 40mph speed limit except for the section

close to the All Saints Catholic College which is a 30mph school zone. Most of the side road accesses are uncontrolled priority junctions, save for a traffic signal junction that provides access to the business park on Dyson Wood Way.

There are mandatory cycle lanes on either side of the carriageway between the 7.30am and 9am and 4.30pm and 6.00pm. Footways are provided along either side of the carriageway and street lighting is present along the entire length of the link.

DfT count data for 2014 indicated the section of the A6107 between the A641 and the A62 has an AADF of 18,760 vehicles. The A6107 intersects with the A62 at a signalised junction, at which there is a designated Air Quality Management Area (AQMA).

## 2.3 Public Transport

### 2.3.1 Bus Services

Bus stops in the vicinity of the site are located on the A641 Bradford Road and Alandale Road as shown in Figure 2. There are additional bus stops located on Bradley Road that are for school services only.

Table 1 summarises existing frequencies and destinations of services that operate in the vicinity of the site. The routes of these services are also illustrated on Figure 2.

**Table 1: Summary of Existing Bus Services**

Stop	Service	Route	Operator	Hourly Frequency (approx)				
				Mon-Fri		Sat		Sun
				Day	Eve	Day	Eve	
A641	360	Huddersfield - Brackenhall Huddersfield Royal Infirmary - Brackenhall	First/ Yorkshire Tiger	30	60	30	60	60
A641	363/X63	Bradford - Huddersfield	First	20	60	20	60	30
A641	X6	Leeds - Huddersfield	First	20	-	20	-	-
Alandale Road	328	Balmoral Avenue - Bradley	First	10	60	10	60	30
A641	384	Huddersfield - Asda Circular	Stotts Coaches	Every 2 hours	-	Every 2 hours	-	-
A641	385	Huddersfield - Asda Circular	Stotts Coaches	Every 2 hours	-	Every 2 hours	-	-

There will be a need to ensure the masterplan and phasing of the development is cognisant of access and internal circulation for bus services to ensure the development can be served adequately by commercial services in the long term.

### 2.3.2 Rail Services

The nearest rail stations to the proposed development site are Deighton, Brighouse and Huddersfield being 2km, 3.2km and 4.8km from the site. Table 2 provides further details on the nearest rail stations and the important train connections.

**Table 2: Nearest Rail Stations and Facilities**

Station	Rail Line	Frequency of service to ... & duration of journey				Car Parking Spaces	Cycle Parking Spaces	Walk time from centre of Bradley site
		Huddersfield	Leeds	Wakefield	Manchester			
Deighton	Huddersfield Line	2/hour 6 mins	1/hour 32 mins	1/hour 35 mins	-	0	4	23 mins
Brighouse	Calder Valley Line, Huddersfield Line	1/hour 13 mins	2/hour 33-52 mins	-	1/hour 1 hr 3mins	65	3	39 mins
Huddersfield	Trans Pennine, Huddersfield and Penistone Lines	-	7/hour 19 mins to 1hr 5 mins	4/hour 38 mins to 1 hr 1 min	6/hour 31-50 mins	28	35	59 mins

## 2.4 Pedestrian and Cycle Infrastructure

### 2.4.1 Public Rights of Way

There are several Public Rights of Way that traverse the site. These are illustrated in Figure 3. The main PRoW that crosses the site is the Kirklees Way. From the A6107 Bradley Road the Kirklees Way goes along Shepherds Thorn Lane before heading east and north across the site towards the M62 before coming back south to connect with Park Hill and Park Lea . An additional PRoW also exists along the driveway for the golf course and this intersects with the Kirklees Way.

## 2.4.2 Local Cycle Routes

There are some cycle routes in the vicinity of the site and also some that traverse the site. These are illustrated in Figure 4. A local traffic free cycle route goes along Shepherds Thorn Lane and crosses the site in a north-south direction from the M62 to Bradley Road and carries on to Tenter Hill Lane. To the east of the site a further traffic free route links Lower Quarry Road to Park Lea, across Bradley Road to St Thomas Gardens. There are also some very small sections of traffic free cycle routes that link Bradley Road and the business parks located off Dyson Wood Way. The quality of the cycle routes is variable. The one which traverses the sites (Shepherds Thorn Lane) is an unmade road which is heavily potholed.

## 2.5 Road Safety

Accident data for the last five years (January 2010 to January 2015) have been obtained from Kirklees Council. The data has been examined in order to determine whether or not there is a history of accidents that is attributable to the existing highway geometry.

The data indicates that on Bradley Road between the A641 and the A62, there have been 18 accidents in the last five years. Of these, four were serious and the remainder slight in severity. No fatal accidents were recorded. Two of the accidents involved pedestrians and four involved motorcyclists. Only one accident involved a cyclist.

The data shows there is no established pattern of accidents along Bradley Road. The accidents are not clustered in specific places along Bradley Road and occurred under a variety of differing circumstances. Six of the accidents involved rear shunt type incidents in part due to drivers not paying enough attention and in part due to traffic congestion. A further three were related to overtaking manoeuvres. Four accidents related to access to properties on Bradley Road or the side roads off it.

There is no evidence to suggest that road layout, inadequate or masked signs were contributory factors in any of the accidents. As such, it is considered unlikely that there are any common site-related causal factors.

## 2.6 Local Facilities and Services

The following local facilities and services are in reasonably close proximity to the site and are identified on Figure 5:

- All Saints Catholic College;
- St Thomas Primary School;

- Bradley Bar Private Day Nursery;
- Woodland Glade Playgroup;
- Villa Farm Shop;
- Bradley Sub Post Office;
- Asda Superstore;
- High Park Public House; and
- G.C's Coffee House - Pennine Business Park.

Many of these facilities will be used by residents of any new development, and so promoting good links from the site to and from these facilities will be an important part of the masterplanning process.

## 2.7 Constraints and Opportunities

From the review of the existing situation, a number of constraints and opportunities have been identified for transport and highways improvements associated with the site. These are summarised in Table 3.

Table 3: Identified Constraints and Opportunities

Subject	Constraints	Opportunities
Strategic Highway Network	The need to reduce the impact of road noise and air quality from the M62 on the development site.	There is a proposal to create an additional junction (24a) of the M62, which is subject to feasibility work by Highways England. If taken forward the proposals could significantly alter connectivity to the strategic highway network as well as local traffic flows in the vicinity of the site.
Local Highway Network	<p>There is only one current vehicle access to the site via Lamb Cote Road, off Bradley Road. This is unlikely to be sufficient to serve a new development of the size/scale proposed.</p> <p>Most of the site boundary is restricted by either housing or the M62 meaning access property acquisition/demolition may be required.</p> <p>Additional traffic generated by the proposed development will negatively impact the surrounding highway network which already suffers from congestion particularly in the peak periods.</p> <p>Need to consider the implications of the Air Quality Management Area at the Leeds Road/Bradley Road junction.</p>	<p>Three schemes - A62/A644 Cooper Bridge junction improvements; A641 corridor improvements; and Junction 24A of the M62- are being pursued through the West Yorkshire Plus Transport Fund and could provide the opportunity to improve transport conditions on the local highway network, assist with accommodating traffic generated by the site and provide a dedicated access road to the site to the east from the proposed new road.</p> <p>Development of the site could also provide the ability to provide some additional focused upgrades to the existing network as part of the development proposals.</p>
Bus Services	The need to ensure the masterplan and phasing of the development is cognisant of access and internal circulation for bus services.	Potential to extend public transport services through the site and for there to be sufficient demand to provide additional services over time that could also serve existing residential areas.

**Table 3: Identified Constraints and Opportunities**

Subject	Constraints	Opportunities
Rail Services	Existing rail stations, except for Deighton, are remote from the site.	Potential to extend or deliver additional public transport services that provide access to the local rail stations from the site.
Pedestrians/Cyclists	The need to maintain Public Rights of Way across the site and to the M62 footbridge.	<p>Existing good quality pedestrian access alongside A641 and A6107.</p> <p>Ability to provide high quality green links to surrounding areas using existing but upgraded Public Rights of Way and other links through the site.</p>
Road Safety	The need to minimise traffic impacts around All Saints Catholic College and existing residential areas.	Ability to upgrade existing local network to provide safety improvements at specific locations.
Other	<p>The need to consider the relationship of the development to the existing dwellings/landscape features within and outside of the site boundary.</p> <p>The position of electricity pylons and overhead power lines.</p> <p>Surface water flooding (low to high risk dependent on area of site considered).</p> <p>Potential air quality impacts of the development proposals.</p>	<p>Ability to design and deliver a mixed use development of a sufficient size and density to support local services and reduce the need to travel.</p> <p>Existing local facilities in proximity to the site could serve, and be supported by, the development.</p>



## 3 Site Access

### 3.1 Site Access Options

From the review of the existing situation and following a site visit, seven possible site access options were identified, as follows:

- Option 1 - Provision of an access off the A641 directly to the west of the site (north of the roundabout with the A6107 Bradley Road).
- Option 2 - A direct access off Bradley Road via an upgraded Shepherds Thorn Lane.
- Option 3 - A direct access off Bradley Road via an upgrade of the existing golf course access road (Lamb Cote Road).
- Option 4 - A direct access off Bradley Road via the provision of a new arm at the existing signalised junction that provides access to the business parks on Dyson Wood Way.
- Option 5 - A direct access off Bradley Road via the provision of a new link on a vacant plot between existing houses to the east of Alandale Road and west of Redwood Drive.
- Option 6 - Provision of an access off Tithe House Way, which connects to Bradley Road towards the south eastern part of the site.
- Option 7 - Provision of an access to the far east of the site, linked either to the A62 Cooper Bridge West Yorkshire plus Transport Fund (WY+TF) proposals or the existing waste site access.

These site access options are illustrated in Figure 6.

### 3.2 Option Assessment

Table 4 summarises the high level assessment that for has been undertaken on the each of the site access options identified, against each of the following criteria:

- Cost - The likely construction costs for each option, based upon the potential extent of the need for significant earthworks, lengths of new pavement/kerbing, new structures and utility diversions.
- Land Availability/Ownership - With reference to the land ownership and public highway boundary information supplied by Kirklees Council.

- Traffic Operation/Safety/Capacity - How the location, form and layout of each option would affect its operational and safety performance; the geometric layout, the broad level of capacity offered and provision for non-motorised users are also considered.
- Public Transport Access - How each option could help achieve routes to, from and through the site for buses and to deliver high quality public transport to future users of the site.
- Construction - How the location, form and layout of each option would affect the construction and maintenance of the scheme; the main consideration for the construction of the different options is their “buildability”.

### 3.3 Preferred Site Access Options

From the high level assessment, there is not one obvious preferred site access option, and indeed a number of site accesses will be required as the site builds out, given the total number of dwellings anticipated.

From a traffic impact perspective, dissipating the additional trips arising from the development across the existing network would be beneficial, pointing towards access locations across a number of directions and feeding into a number of routes. The fact that there is a designated AQMA at the A62 Leeds Road/Bradley Road junction is a further reason to avoid loading large amounts of additional traffic at this location.

Ensuring effective bus penetration of the site will also be crucial, and so access points that allow the diversion of existing services through the site without adding significant extra mileage would also be preferable.

Therefore, a small number of options are seen as suitable for further analysis, for the reasons described below.

- Option 1: This would provide access to the western portion of the site and would allow the frequent bus services along the A641 to divert into the site with minimum diversion. It could also provide a link (either direct or indirect) to the Highways England proposal for a new junction on the M62 (Junction 24a) that is currently being investigated.
- Either of Options 3 or 6: One of these locations would provide access to Bradley Road for local journeys and offer the opportunity for trips to be made through the proposed development from one of the other accesses (Option 1/Option 7). Option 3 would utilise the existing access to the Golf Club and be fairly central in relation to the development site. Option 6 would provide direct access to the site and would be an extension of an existing estate road. It may require upgrading of the junction of

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Tithe House Way and Bradley Road, but is close to existing bus stops so there may be opportunities to extend existing services.

- Option 7: An access at this location would reduce the impact of development traffic on Bradley Road and A641 as it is assumed a significant proportion of journeys from the site would wish to access the M62. However, the access is likely to be dependent on the A62 Cooper Bridge proposals being developed by Kirklees Council and to be taken forward via the WY+TF.

Table 4: Site Access Option Appraisal

Option / Criteria	Cost	Land Availability/ Ownership	Traffic Operation/ Safety/Capacity	Public Transport Routes	Construction
<b>Option 1</b>	Medium - a new roundabout on the existing dual carriageway would ordinarily be quite large in size.	Would require the acquisition of a small portion of land between the highway boundary and the site boundary.	A641 is a dual carriageway at this point, so either traffic signals or a roundabout would be the most likely junction form. Need to incorporate an existing residential access within any new arrangement.	Some services could be diverted from the A641 into the site, but a significant diversion within the site may not be attractive to bus operators.	Likely to cause significant disruption on the A641 during construction, although there is land available to minimise any delays.
<b>Option 2</b>	Medium/Low.	May require some property acquisition to provide an access of a suitable quality.	Any access needs to be an improved priority or traffic signal junction given adjacent properties. Need to incorporate an existing residential access within any new arrangement.	Access location is quite far from existing bus routes, requiring a significant diversion.	Could cause disruption on Bradley Road during construction, with a priority junction having reduced disruption.
<b>Option 3</b>	Low.	May require some property acquisition to provide an access of a suitable quality.	Any access needs to be an improved priority or traffic signal junction given adjacent properties.	Access location is quite far from existing bus routes, requiring a significant diversion.	Could cause disruption on Bradley Road during construction, with a priority junction having reduced disruption.
<b>Option 4</b>	Low, depending on the scale of property acquisition/demolition required for a suitable junction.	Would require some property acquisition/demolition opposite Dyson House Lane to create a four arm signalised junction.	New access could be formed by adding a fourth arm to the existing Bradley Road/Dyson Wood Way traffic signal junction.	Access location is quite far from existing bus routes, requiring a significant diversion.	Reduced disruption on Bradley Road during construction as much of junction form is already in place.

Option / Criteria	Cost	Land Availability/ Ownership	Traffic Operation/ Safety/Capacity	Public Transport Routes	Construction
<b>Option 5</b>	Medium/Low.	Would require some property acquisition/demolition.	Any access needs to be an improved priority or traffic signal junction given adjacent properties.	Access is not too far from existing bus turning circle, so may be opportunities to extend existing services.	Could cause disruption on Bradley Road during construction, with a priority junction having reduced disruption.
<b>Option 6</b>	Low.	Direct access into site area.	Access would form an extension of an existing estate road. May be a need to upgrade the junction with Tithe House Way to traffic signals to cater for extra traffic demands.	Access is not too far from existing bus turning circle, so may be opportunities to extend existing services.	Could cause disruption on Bradley Road during construction if a junction improvement is required.
<b>Option 7</b>	Medium, although could be partially offset by making passive provision for a new junction in the revised Cooper Bridge scheme.	Direct access into site area.	Access would form an extension of an existing road to waste site or a new link from the proposed Cooper Bridge link. Could reduce pressure of development traffic on A6107 Bradley Road.	Access location is quite far from existing bus routes, requiring a significant diversion.	Reduced disruption on Bradley Road/A62 Leeds Road as access would be constructed off line.

## 4 Trip Generation and Distribution

### 4.1 Trip Generation

Traffic generation for the proposed development has been estimated based on the assumption that up to 2,000 residential dwellings could be built upon the site. (Scenarios with fewer dwellings have been tested and reported later, but to explain the methodology used, only the scenario with 2,000 houses is shown in this section). The weekday AM (08:00 to 09:00) and weekday PM (17:00 to 18:00) peak hours have been considered as these periods represent the maximum traffic impact expected on the local highway network from the proposed development.

#### 4.1.1 Person Trip Rates

Weekday AM peak hour and PM peak hour average person trip rates for the land use proposed have been derived from the TRICS database, following interrogation for sites based on the criteria identified in Table 5.

**Table 5: TRICS Search Criteria**

Proposed Land Use	TRICS Land Use	TRICS Sub-Category	Location
Residential	Residential (03)	Houses Privately Owned (A)	Edge of Town / Suburban Area/Neighbourhood Centre

The resulting outputs from the TRICS database are summarised in Table 6 for the weekday AM and PM peak hours (08:00-09:00 and 17:00-18:00 respectively).

**Table 6: Weekday Peak Hour Person Trip Rates**

Land Use	Unit	Trip Rates (Person Trips/Per Unit)			
		AM Peak (08:00-09:00)		PM Peak (17:00-18:00)	
		Arrivals	Departures	Arrivals	Departures
Residential	1 Dwelling	0.231	0.805	0.609	0.368

The estimated person trip generation for the weekday AM and PM peak hours has been calculated by applying the trip rates in Table 6 to the proposed number of residential dwellings (2000). The results are summarised in Table 7.

**Table 7: Weekday Peak Hour Person Trip Generation**

Land Use	Unit	Traffic Generation (Person)			
		AM Peak (08:00-09:00)		PM Peak (17:00-18:00)	
		Arrivals	Departures	Arrivals	Departures
Residential	2,000 Dwellings	462	1610	1218	736

#### 4.1.2 Mode Share

The 2011 Census dataset ‘*QS701EW - Method of travel to work*’ was used to derive an estimate of the mode share for the residential development. The mode share for Lower Super Output Area Kirklees 022D has been used, as this is the area adjacent to the site that covers a residential area. In this way, the mode share considered accurately represents the likely travel characteristics of the site, with regards to the existing accessibility of the site by public transport and the configuration of the local highway network.

The resulting mode share is summarised in Table 8. The dataset includes all usual residents aged 16-74, whilst the categories ‘Not in employment’, ‘Work mainly at or from home’ and Other method of travel to work’ have been removed for the purpose of this assessment. In addition, the category ‘Underground, metro, light rail, tram’ has been removed, due to an absence of these types of facilities within the vicinity of the site.

**Table 8: Baseline Mode Share**

Mode	Baseline Mode Share (% of journeys by mode)
Train	2.4%
Bus, minibus or coach	8.2%
Taxi or minicab	0.4%
Motorcycle, scooter or moped	0.6%
Driving a car or van	73.3%
Passenger in a car or van	8.7%
Bicycle	1.3%
On foot	5.2%
<b>Total</b>	<b>100.0</b>

*Note: Totals may not add up to sum of components due to rounding*

Considering the mode share set out in Table 8, and the person trip generation presented in Table 7 for the development proposals, the person trip generation by mode has been estimated. This is set out in Table 9 for the weekday peak hours.

**Table 9: Baseline Person Trip Generation by Mode**

Mode	Baseline Person Trip Generation (Trips)			
	AM Peak (08:00-09:00)		PM Peak (17:00-18:00)	
	Arrivals	Departures	Arrivals	Departures
Train	11	39	29	18
Bus, minibus or coach	38	132	100	60
Taxi or minicab	2	6	5	3
Motorcycle, scooter or moped	3	9	7	4
Driving a car or van	339	1180	893	539
Passenger in a car or van	40	140	106	64
Bicycle	6	21	16	10
On foot	24	84	63	38
<b>Total</b>	<b>462</b>	<b>1610</b>	<b>1218</b>	<b>736</b>

*Note: Totals may not add up to sum of components due to rounding*

## 4.2 Trip Distribution

For this preliminary assessment, it has been assumed that trips will enter and leave the site from each direction in equal proportions. A more detailed assessment of the distribution will be undertaken during the next stage of work that will utilise the strategic transport models held by Kirklees Council to ensure a consistent approach is adopted.



## 5 Existing and Future Traffic Conditions

### 5.1 Base Traffic Flows

Baseline traffic flows have been determined by means of traffic count data supplied by Kirklees Council for two sites on Bradley Road (East of Bradley Grange Gardens and East of Bradley Road). The count data are from counts undertaken in June 2007.

It is advised that any future assessment of the development proposals will require up to date traffic counts to be commissioned.

### 5.2 Assessment Periods

Assessment periods were determined using the traffic count data supplied by Kirklees Council for two sites on Bradley Road. These traffic counts indicated the following peak periods and these have been used in the junction assessments:

- Weekday AM - 08:00 to 09:00
- Weekday PM - 17:00 to 18:00

### 5.3 Assessment Year

A future assessment year of 2020 has been used. This represents a period of five years following the start of this commission, which is considered to be appropriate at this stage of assessment.

### 5.4 Traffic Growth

To represent future traffic conditions on the local highway network, NTM/TEMPRO has been used to derive Weekday AM and PM peak local traffic growth figures for the period 2007 to 2020 (TEMPRO v6.2 / NTM AF09 Dataset - Huddersfield main). The local traffic growth factors used are set out in Table 10.

**Table 10: Local Traffic Growth Factors**

Period	Local Traffic Growth Factor 2007-2020
Weekday AM peak period	1.0656
Weekday PM peak period	1.0751

The traffic growth factors in the table have been applied to the base traffic flows to represent background traffic growth to 2020.

## 5.5 Future Year Traffic Flows

2020 Do Minimum Traffic Flows have been derived by applying the traffic growth factors set out in Table 10, to the 2007 Base Traffic Flows.

2020 With Development Traffic Flows for 250 and 500 homes scenarios have been derived by adding the 2020 Do Minimum Traffic Flows to the Development Traffic Flows, the calculation of which is based upon the methodology set out in the preceding section, but using different dwelling numbers. These scenarios were selected to test the limits of capacity of the initial site access junctions on Bradley Road (Options 3 and 6).

## 5.6 Impacts on the Local Highway Network

Some preliminary junction modelling has been undertaken to test how many dwellings could be delivered from site accesses at Lamb Cote Rd (Option 3 - Golf Club access) and Tithe House Way (Option 6 - access to existing residential development) for an initial phase of development. At this stage some broad assumptions about junction design and signal timings have been made which can be refined as the proposal progresses.

### 5.6.1 Lamb Cote Road Signal Junction

The LinSig v 3.2.27.0 software has been used to test the operation of a signal junction with an indicative layout of a single lane access into the site. LinSig calculates the Degree of Saturation (DoS) to indicate the likely performance of links and the overall junction under a given set of traffic flows. The software also calculates the mean maximum queue (MMQ), representing the average position of the furthest vehicle from the stop line in each cycle.

The results from the LinSig assessment assuming 250 dwellings are summarised in Table 11.

The LinSig assessment demonstrates that the signal junction arrangement would satisfactorily accommodate increases in traffic associated with up to around 250 dwellings, with a degree of spare capacity in both peak hour scenarios. The forecast Degree of Saturation on each approach is below the normal practical capacity threshold of 90%, except for the Bradley Road eastbound approach which reaches a degree of saturation of 90.9% in the PM peak. This indicates that Bradley Road a key constraint, with delay caused by interrupting the eastbound flow to allow vehicles to turn right into the site and vehicles to exit the site.

**Table 11: 2020 Assessment Year Capacity Assessment**

Stream	2020 With Development (250 Dwellings)	
	Degree of Saturation (%)	Mean Max Queue (PCU)
<b>AM Peak Hour</b>		
Site Access Left & Right Turn to Bradley Road	67.6	3.8
Bradley Road Eastbound Ahead & Left	78.7	15.4
Bradley Road Westbound Ahead	66.5	10.4
Bradley Road Westbound Right	66.5	
<b>PM Peak Hour</b>		
Site Access Left & Right Turn to Bradley Road	31.1	1.4
Bradley Road Eastbound Ahead & Left	90.9	21.9
Bradley Road Westbound Ahead	72.6	12.4
Bradley Road Westbound Right	72.6	

### 5.6.2 Tithe House Way Junction

There is the potential to provide a link from an early phase of the Bradley site onto Tithe House Way, which would allow some additional traffic to use the existing priority junction with Bradley Road as well as the Lamb Cote Road signal junction. Without any improvements to the current junction, this could provide for some 50 additional dwellings (30 additional vehicles leaving the site in the AM peak).

If the Tithe House Way junction were to be used more extensively by development traffic, it would be necessary to signalise the junction. The LinSig v 3.2.27.0 software has been used to test the operation of a signal junction with an indicative layout. The results from the LinSig assessment assuming 250 and 500 dwellings are summarised in Tables 12 and 13. It would be feasible to widen the Tithe House Way access to 2 exit lanes with minimal landtake and this been assumed in the 500 dwelling scenario.

The Linsig model again shows that Bradley Road is a constraint in the PM peak hour, with the degree of saturation on the eastbound arm reaching 92.1%. Therefore, the modelling indicates that, broadly up to 750 dwellings in total could be accommodated with the widened Tithe House Way signal junction arrangement and the signalisation of the Lamb Cote Road access.

**Table 12: 2020 Assessment Year Capacity Assessment**

Stream	2020 With Development (250 Dwellings)	
	Degree of Saturation (%)	Mean Max Queue (PCU)
<b>AM Peak Hour</b>		
Site Access Left & Right Turn to Bradley Road	86.8	6.4
Bradley Road Eastbound Ahead & Left	61.6	9.9
Bradley Road Westbound Ahead	70.1	11.6
Bradley Road Westbound Right	70.1	
<b>PM Peak Hour</b>		
Site Access Left & Right Turn to Bradley Road	40.2	1.9
Bradley Road Eastbound Ahead & Left	87.0	19.2
Bradley Road Westbound Ahead	71.4	11.8
Bradley Road Westbound Right	71.4	

**Table 13: 2020 Assessment Year Capacity Assessment**

Stream	2020 With Development (500 Dwellings)	
	Degree of Saturation (%)	Mean Max Queue (PCU)
<b>AM Peak Hour</b>		
Site Access Left Turn to Bradley Road	77.7	4.7
Site Access Right Turn to Bradley Road	72.4	
Bradley Road Eastbound Ahead & Left	63.6	10.5
Bradley Road Westbound Ahead	71.2	11.8
Bradley Road Westbound Right	71.2	
<b>PM Peak Hour</b>		
Site Access Left Turn to Bradley Road	35.6	1.6
Site Access Right Turn to Bradley Road	33.2	
Bradley Road Eastbound Ahead & Left	92.1	23.0
Bradley Road Westbound Ahead	74.2	12.5
Bradley Road Westbound Right	74.2	



### 5.6.3 A62/Bradley Road Signal Junction

Kirklees Council have provided a TRANSYT model of the A62/Bradley Road Junction. The model had previously been adjusted to cater for lane restrictions, traffic island and actual features on site. The analysis looks at the impact of AM development peak traffic (08:00 to 09:00) on the network peak period at A62/Bradley Road Junction (07:00 to 08:00). It therefore represents a robust scenario. A cursory 30% of site traffic has been assumed to pass through the A62/Bradley Road junction.

Development traffic has been distributed at the A62/Bradley Road junction according to existing flows.

Table 14 shows the forecast queue length on the Bradley Road arm based on the various incremental site access options described in the preceding section.

**Table 14: Indicative Impact on A62/Bradley Road Junction in AM Peak**

Site Access Scenario	Number of dwellings on Bradley Road Site	Queue Length on Bradley Road Arm of Junction (PCU)
Existing Situation	0	43
Lamb Cote Road Signalised Junction	250	53
Lamb Cote Road Signalised Junction plus connection to existing Tithe House Way Junction	300	56
Lamb Cote Road Signalised Junction plus Tithe House Way Signalised Junction	500	64
Lamb Cote Road Signalised Junction plus Tithe House Way Signalised Junction widened to 2 lanes outbound	750	75

There may be potential to gain a small amount of extra capacity at the junction with some minor alterations to junction geometry and/or parking restrictions, however, given the plans for wider network changes described below, any works may be abortive and superseded by the more substantial scheme.

## 5.7 Future Highway Network Changes

Beyond the initial site access appraisals described above, it is necessary to take account of the proposed changes to the highway network that could help deliver additional dwellings beyond the numbers considered for their impact at the existing A62/Bradley Road junction.

In particular, the WY+TF Cooper Bridge scheme is designed to relieve congestion at the A62/Bradley Road junction and improve conditions associated with the current AQMA. The scheme includes:

- Amendments to the existing highway to unlock congestion on the A62
- An amendment to the existing Cooper Bridge roundabout junction
- A new length of highway to relieve and improve traffic flow in the vicinity of the Bradley Road / A62 junction

Once these improvements have been implemented, flows on Bradley Road may be relieved and conditions at the junction would be likely to change, with the likely ability to cater for more traffic.

If the Cooper Bridge scheme were implemented without any direct connection to the link road back into the site from the new link road, then the constraints on the number of dwellings related to the capacity of Bradley Road site access junctions would remain the same as described previously. However, it is recognised that implementing the Cooper Bridge scheme will provide some additional capacity at the A62/Bradley Road junction to the extent that the additional impact of even the 750 dwelling scenario at the new junction could be proven to be acceptable, subject to further detailed analysis.

Providing a connection from the site to the new link road envisaged as part of the Cooper Bridge scheme would significantly raise the number of dwellings possible as development traffic would be largely removed from the A62/Bradley Road junction. In this case, it is likely that this future highway layout would accommodate most, if not all, of the 2,000 dwellings. Clearly, this would need to be looked at in more detail as part of a Transport Assessment using a more strategic traffic model and a more detailed analysis of development traffic distribution and assignment.

Development of Junction 24a on the M62 would provide further opportunities to dissipate traffic away from Bradley Road, either through a direct connection onto the new junction, or onto the A641 as an integral part of the works. Without a new motorway junction, even a restricted moves priority junction could provide a fourth access point for the site (which would be expected anyway with 2,000 dwellings), and would also allow further bus penetration, either to/from the A641 or as a through route within the site itself.

It would also allow for a better internal road layout and would reduce internal vehicle trip lengths by allowing those residents at the western end of the site with a destination in Huddersfield to use a western access rather than heading through the site.

## 6 Internal Highway Layout and Sustainable Transport

### 6.1 Introduction

A number of masterplan options are being developed as part of the wider delivery study. This section of the report looks at the influence of transport on the development of the site's internal layout.

### 6.2 Design Principles

The design of the internal highway network should seek to minimise impacts on the external highway network, where possible, through the provision of several accesses in order to disperse traffic more effectively and to minimise travel distances. Furthermore, to ensure the long-term sustainability of the site, it is vital that the retail, leisure facilities and employment sites in Huddersfield and the wider Kirklees area are genuinely accessible from the site by modes other than the private car.

Policy DLP21 of the draft Local Plan explicitly sets out that proposals for new development shall be designed to encourage sustainable modes of travel and will be required to facilitate the needs of a user hierarchy that follows pedestrians and cyclists, public transport, and then private vehicles.

The overriding strategy for the site has therefore considered the following measures which should be explored further in the next stage of site development:

- **Internal highway layout.** Providing strong vehicular links between the different development zones/parcels will enable public transport to penetrate the site, but also gives residents a choice of (busy, well lit) walking/cycling/driving routes and fulfils emergency access requirements. Linking the accesses within the site gives greater flexibility and increases the number of dwellings that the site can deliver.
- **An extensive multi-user internal network** should be established as part of the green infrastructure provision within the site. This network will enable future residents to make journeys to key locations on-site by foot or by cycle, including the local commercial centre and the on-site primary school, whilst also providing convenient access to off-site routes and nearby locations
- **High quality walking and cycling infrastructure.** Convenient connections for walking and cycling trips to the wider networks should be a vital component of the transport strategy. The aim will be to maximise the proportion of trips to be made on foot or by cycle, thereby minimising trips by motorised modes (including private car). Accordingly, the following measures should be considered in further detail:

- Provision of high quality, safe and convenient walking and cycling routes permeating through the development site - these should be considered fully as part of the detailed master planning of the development.
- Safe, convenient and direct links to the wider network of pedestrian and cycle routes will be required and can play a role in enhancing the wider network of cycling and walking routes.
- Public Rights of Way through the site should be retained, enhanced and incorporated within the green infrastructure framework.
- **Innovative public transport solutions.** Given the scale and location of the proposed development, viable public transport connections will be essential if the proposed development is to accord with relevant policy. The development should therefore be designed to capitalise on existing bus services, ensuring that pedestrian connections to bus stops are direct and attractive, and supporting new bus stops and upgraded bus stop facilities where appropriate. In addition, a programme of service developments, addressing frequency, convenience, attractiveness and integration, may also be required. Within the site, the bus services should be supported as follows:
  - The internal road layout should be designed to accommodate buses, ensuring that roads and junctions are of a suitable standard, in terms of width and construction to accommodate full size bus services. Keeping the internal vehicular/bus routes closer to the centre of residential development is likely to be more attractive to bus operating companies as it minimises additional mileage.
  - Bus stops will be provided at regular intervals along the loop road (approximately every 400m) and should be conveniently located in relation to the development plots, local centre and pedestrian/cycle routes.
  - High-quality infrastructure (including lit shelters, seating, Kassel kerbs, real time displays, and timetabling and map information) should be provided at the bus stops to ensure that the environment where users wait and board buses is attractive, safe and accessible.
  - Bus services should be supported by promotion of sustainable travel options through implementation of travel planning measures.
- **Effective management and promotion of sustainable travel options** through comprehensive travel planning that will be implemented as part of the development, including a range of 'hard' and 'soft' measures. This will include a robust framework for identifying targets and monitoring progress to ensure that targets are achieved.



- **Thoughtful master planning** to make provision for convenient and high quality walking, cycling and public transport routes within the site. This would also include careful consideration of appropriate levels of car and cycle parking to be provided, and the provision of electric vehicle charging points.

## 6.3 Masterplan Options

All the masterplan options set out in the accompanying study can be developed in line with the principles set out above, with walking and cycling at the heart of the development layout.

Figures 7 to 10 look at each of the masterplan concepts and show how the existing bus route 328 can be extended either into the development as a loop (the ‘bus loop’ option) or passing along Bradley Road and into the centre of the site, where it would turn (the ‘bus hub’ option). The figures also show how the development would be served by the existing 363/X63/X6 services which run along the western boundary of the site. Indicative bus stop locations are shown on each option, as well as approximate 400m (5 minute) walking isochrones from each stop.

Key points to note are as follows:

- The isochrones are indicative and do not take account of walking routes, street patterns or gradients. Once the development layout is determined in more detail, these isochrones may shrink in one or more directions.
- Although the isochrones encompass much of the eastern end of the site for bus hub options, the bus loop options offer the opportunity to introduce additional stops within the site, for example to serve the proposed primary school. This would improve public transport accessibility for residents on the site.
- The roads linking the development parcels/zones shown in the ‘North Park’ and ‘Urban Fingers’ masterplan concepts extend further north into the site than in the other options and would add extra mileage to a bus journey, without necessarily providing bus operators access to more potential passengers. As noted above, keeping the internal bus routes closer to the centre of residential development would probably be more attractive to bus operating companies.
- The existing western bus stops served by the 363/X63/X6 services would be accessible by residents living at the western end of the site.
- There is a strip of development towards the western end of the site which falls outside the bus stop isochrones shown on the diagrams. Unless bus services were extended beyond the routes shown in Figures 7 to 10, this strip of development would not be considered to be accessible by bus. This may have an impact on the

proposed phasing, in that, from a public transport perspective, this part of the site should be built last, at which point it may be viable to divert some of the A641 services (363/X63/X6) into the site and/or extend the 328 or provide a completely new service.

In summary, the analysis shows that for viable public transport, strong vehicular links should be provided between the different development zones. This would not only enable public transport to penetrate the site, but also gives residents a choice of (busy, well lit) walking/cycling/driving routes and fulfils emergency access requirements. Note that there is generally a limit to the number of dwellings that can be provided from a single access. Linking the accesses within the site gives greater flexibility and increases the number of dwellings deliverable.

Finally, as well as the opportunity to route bus services through the site, the increase in demand for travel and the provision of effective links to and across Bradley Road may also result in commercial bus services running along Bradley Road in the future.

## 7 Smarter Choices Initiatives

### 7.1 Introduction

In order to increase the sustainability of the site a series of smarter choice travel initiatives should be implemented through a Framework Travel Plan. The aim of the Framework Travel Plan should be to promote sustainable travel and minimise development-related congestion of the highway network predominantly by targeting residents.

The overall objectives of the Framework Travel Plan should seek to be to:

- To reduce travel by the private car, particularly single occupancy car journeys;
- To encourage a reduction in car dependency;
- To encourage multi-occupancy car usage;
- To increase awareness of the environmental and health implications of different travel choices;
- To encourage sustainable travel choices among users of the site;
- To maximise accessibility for walking, cycling and public transport as sustainable transport modes;
- To maximise transport choice through innovative measures.

### 7.2 Example Measures

The following measures could be included in the Travel Plan:

- Provision of Travel Information Packs and/or personalised travel plans for all new residents. The packs will include travel information for all modes of alternative travel, with the intention of encouraging new residents to engage in more sustainable modes of transport;
- Promotional events to encourage cycling, particularly emphasising health benefits;
- Provision of cycle training for those not sufficiently confident about cycling;
- Provision of discounts on cycling equipment, possibly agreed with a local retailer;

- Provision of Metrocards for each property for a specified period of time;
- Provision of a designated on street car club parking space.
- Promotion of a car share scheme.

### 7.3 Impact

As noted in *Making residential travel plans work: good practice guidelines for new development* (DfT, 2005) a Department for Transport study examined the achievements of travel plans from 20 UK organisations and found, on average, that these organisations experienced an 18% reduction in the proportion of commuters driving to their sites in the wake of travel plan implementation. These findings were further confirmed by the DfT's Smarter Choices report which highlighted the potential impacts of a range of 'smart' measures.

The report also notes that residential travel plans can also have a similar impact and can provide a key mechanism for ensuring that sustainable access is in place from the earliest stages of development. They are also important in clarifying how the various parties including the developer and future occupiers can work together in partnership to encourage sustainable travel patterns. Many of the factors that have been found to be important in the success of workplace travel plans apply to residential travel plans.

## 8 Summary and Next Steps

This report has summarised the transport issues considered as part of an examination of the potential to bring forward development on a site at Bradley Park Golf Course, on the northern fringes of Huddersfield. Within the draft Local Plan, two areas within the site (H351 and H1474) are identified as potential housing allocations.

Much of the site is bounded by the A6107 Bradley Road running east-west to the south of the site and from which access is currently provided to the golf course. It links the A641 and the A62 Leeds Road, and the majority of the road is subject to a 40mph speed limit. There are mandatory cycle lanes on either side of the carriageway between the 7.30am and 9am and 4.30pm and 6.00pm. Footways are provided along either side of the carriageway and street lighting is present along the entire length of the link. There is no evidence from recent accident data to suggest that road layout, inadequate or masked signs were contributory factors in any of the accidents recorded.

The A641 Bradford Road runs along the western boundary of the site and connects Huddersfield town centre with Brighouse within the district of Calderdale. In the vicinity of the site the road is a dual carriageway with a speed limit of 40mph. There are footways either side of the carriageway.

Bus stops in the vicinity of the site are located on the A641 Bradford Road and Alandale Road, with Bradford, Huddersfield and Leeds as the primary destinations. There are additional bus stops located on Bradley Road that are for school services only.

There are several Public Rights of Way that traverse the site, the main one being the Kirklees Way. There are some cycle routes in the vicinity of the site and also some that traverse the site.

An analysis of the existing conditions allowed a number of constraints and opportunities to be identified for transport associated with bringing forward the site. The principal constraint is considered to be the congestion at the signalised junction where Bradley Road intersects with the A62, at which there is a designated Air Quality Management Area (AQMA). However, future opportunities are provided by two highway improvement schemes (Cooper Bridge and M62 Junction 24a) currently being examined by Kirklees Council.

A review of possible site access options produced three that are seen as suitable for further analysis, for the reasons described below.

- An access to the western portion of the site and would allow the frequent bus services along the A641 to divert into the site with minimum diversion. It could also provide a link (either direct or indirect) to the M62 Junction 24a proposal.

- One of two locations on Bradley Road. The first would utilise the existing access to the Golf Club and be fairly central in relation to the development site. The second would provide direct access to the site and would be an extension of an existing estate road.
- An access to the east onto the new link road being developed as part of the Cooper Bridge scheme.

Having undertaken some initial estimates of trip generation and distribution, some preliminary junction modelling was also undertaken. The results indicate that:

- For a single lane entry, traffic signal-controlled site access at either access location on Bradley Road, it would be possible to deliver up to around 250 dwellings.
- A traffic signal junction at Lamb Cote Road with a connection through to Tithe House Way could allow an additional 50 dwellings to come forward.
- Providing signal-controlled junctions at both Lamb Cote Road and Tithe House Way could deliver around 500 dwellings.
- It would be feasible to widen the Tithe House Way access to 2 exit lanes, in which case, a signal-controlled junction would provide access to up to around 250 additional houses, giving 750 in total.
- However, the A62/Bradley Road junction is the main constraint on the existing local highway network, and current capacity constraints at the junction are likely to limit the extent of development deliverable on the site more than the site access junctions described in the preceding points. Each of the four scenarios would add to the existing queues at the junction, with the 300 dwelling scenario increasing the queue in the AM peak by around 13 pcus.
- Implementation of the Cooper Bridge scheme (even without a dedicated connection to the site from the new link road) would provide some relief at the A62/Bradley Road junction and could allow the 750 dwellings scenario to be acceptable, depending on the actual capacity relief at the A62/Bradley Road junction. The Cooper Bridge scheme is due for completion by 2021.
- Beyond this, a connection from the site to the link road within the Cooper Bridge scheme would reduce the impact of development traffic at the A62/Bradley Road junction and relieve the flows on Bradley Road, allowing most, if not all, of the 2,000 dwellings to be delivered in highway capacity terms.
- An additional access point to the west (which could be as part of a new M62 Junction 24a) would be desirable but not essential in capacity terms. Such an access is

desirable in design terms as it is usually recommended that at least four access points to/from the adjacent highway network are provided for a development of this size. It would also allow for a better internal road layout, provide greater opportunity for penetration by public transport vehicles and would reduce internal vehicle trip lengths by allowing those residents at the western end of the site with a destination in Huddersfield to use a western access rather than heading through the site.

It should be noted that the social infrastructure requirements of the site will also need to be met through provision of facilities and services in a phased and planned manner to avoid periods of time where residents would have to leave the site, potentially by car, to access facilities and services.

Existing public transport connections could be extended through the site and will need to be explored in more detail in future work regarding the site. The site offers the long-term prospect of supporting commercial services at a reasonable frequency, as well as potentially enhancing the existing public transport provision for neighbouring communities. This could include commercial bus services running along Bradley Road as well as through the site itself.

High quality walking and cycling infrastructure will be provided within the site and beyond the site boundary new links will need to be made with existing infrastructure, potentially including new crossings and environmental improvements on Bradley Road. In this way, the site has a role to play in enhancing the wider walking and cycling networks and encouraging greater use of these modes of transport.

Finally, effective management and promotion of sustainable travel options through a comprehensive, well-funded travel plan will be required to increase the sustainability of the site.

## 8.1 Next Steps

As Kirklees Council is developing proposals for the Cooper Bridge scheme to be taken forward via the WY+TF and Highways England is currently considering the feasibility of a new M62 Junction 24a, it would seem appropriate in the near future to assess the impact of the site using the wider strategic traffic model owned by the Council to establish the wider impacts on the highway network.

This should be undertaken when the configuration of the two schemes has been progressed to a sufficient stage of development. Undertaking this additional work using the strategic transport model will ensure a consistent approach has been taken in assessing the impact of the new infrastructure as well other large development site proposals in relation to the site.

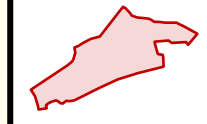
## Figures

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Key:



Site Location

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Client:  
 Kirklees Council

Project:  
 Bradley Masterplan

Figure Title:  
 Existing Highway Network

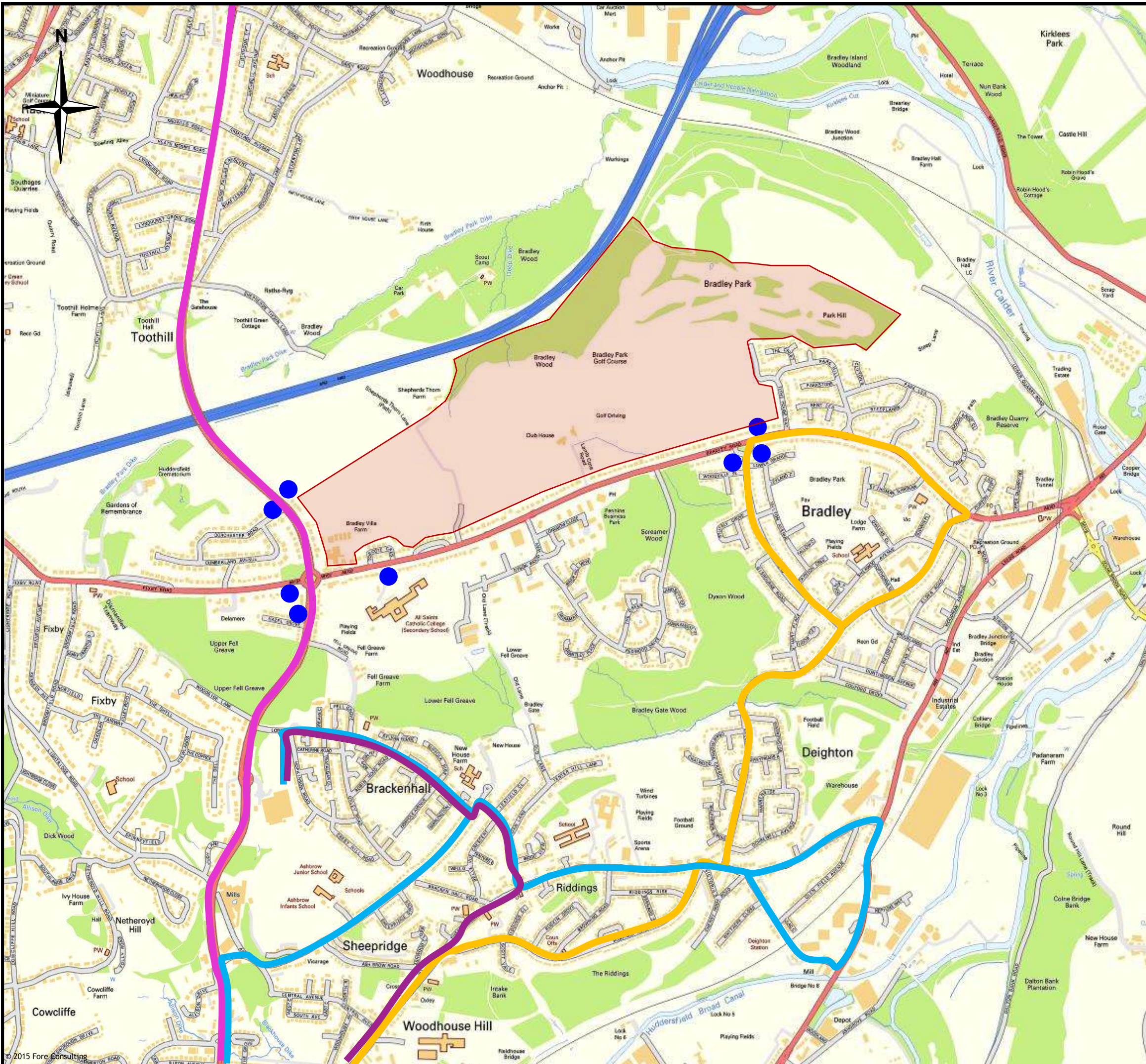
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Figure Status: Issue






Job Number: 3367

Figure Number: 1





**Key:**

-  Site Location
-  Bus Routes 363/X63/X6
-  Bus Route 328
-  Bus Route 360
-  Bus Route 384/385

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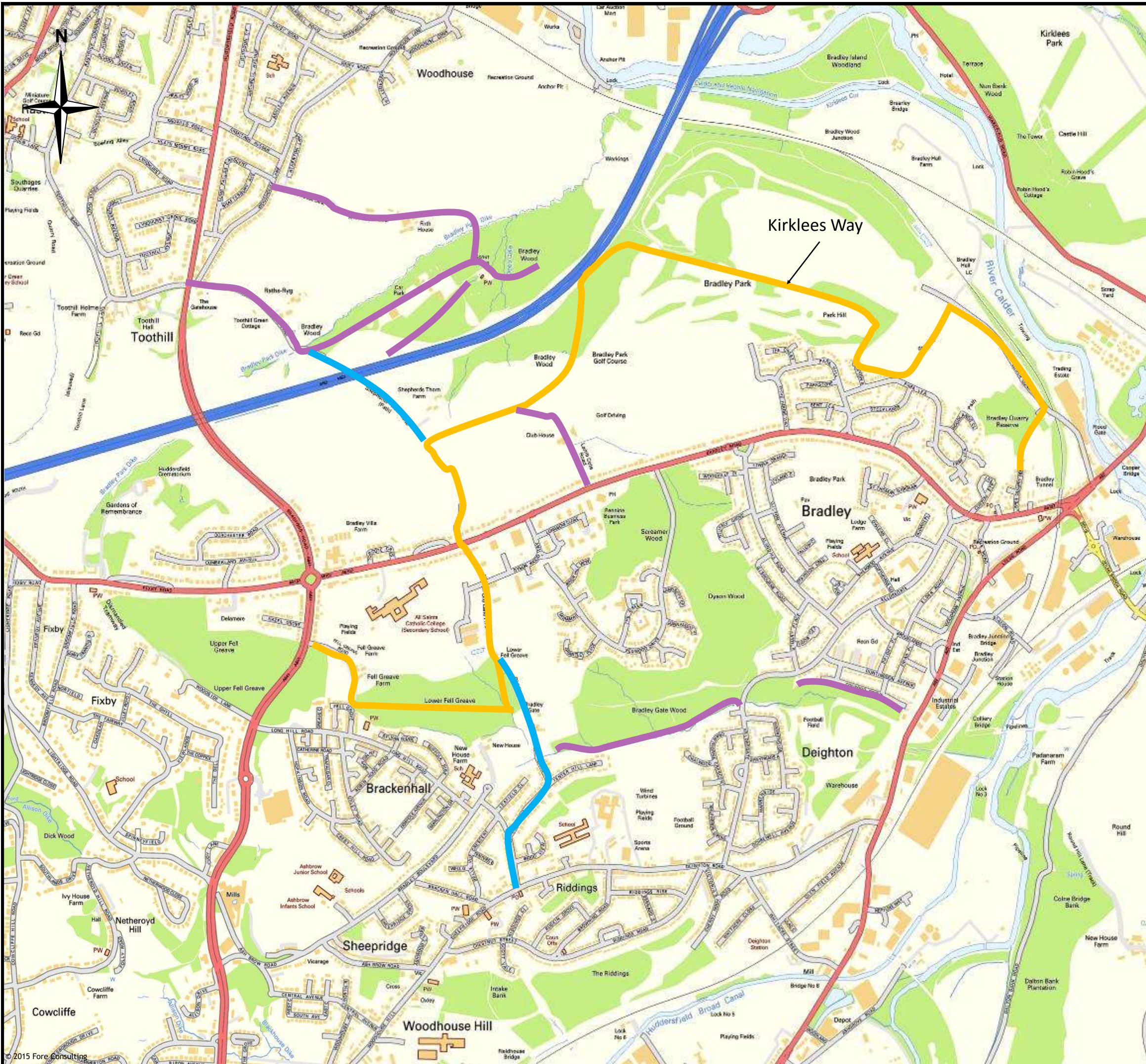
Project:  
**Bradley Masterplan**

Figure Title:  
**Public Transport**





Scale: Not to Scale | Figure Status: Issue

Job Number: 3367 | Figure Number: 2





**Key:**

-  Site Location
-  Kirklees Way
-  Other Footpath
-  Non designated footpath

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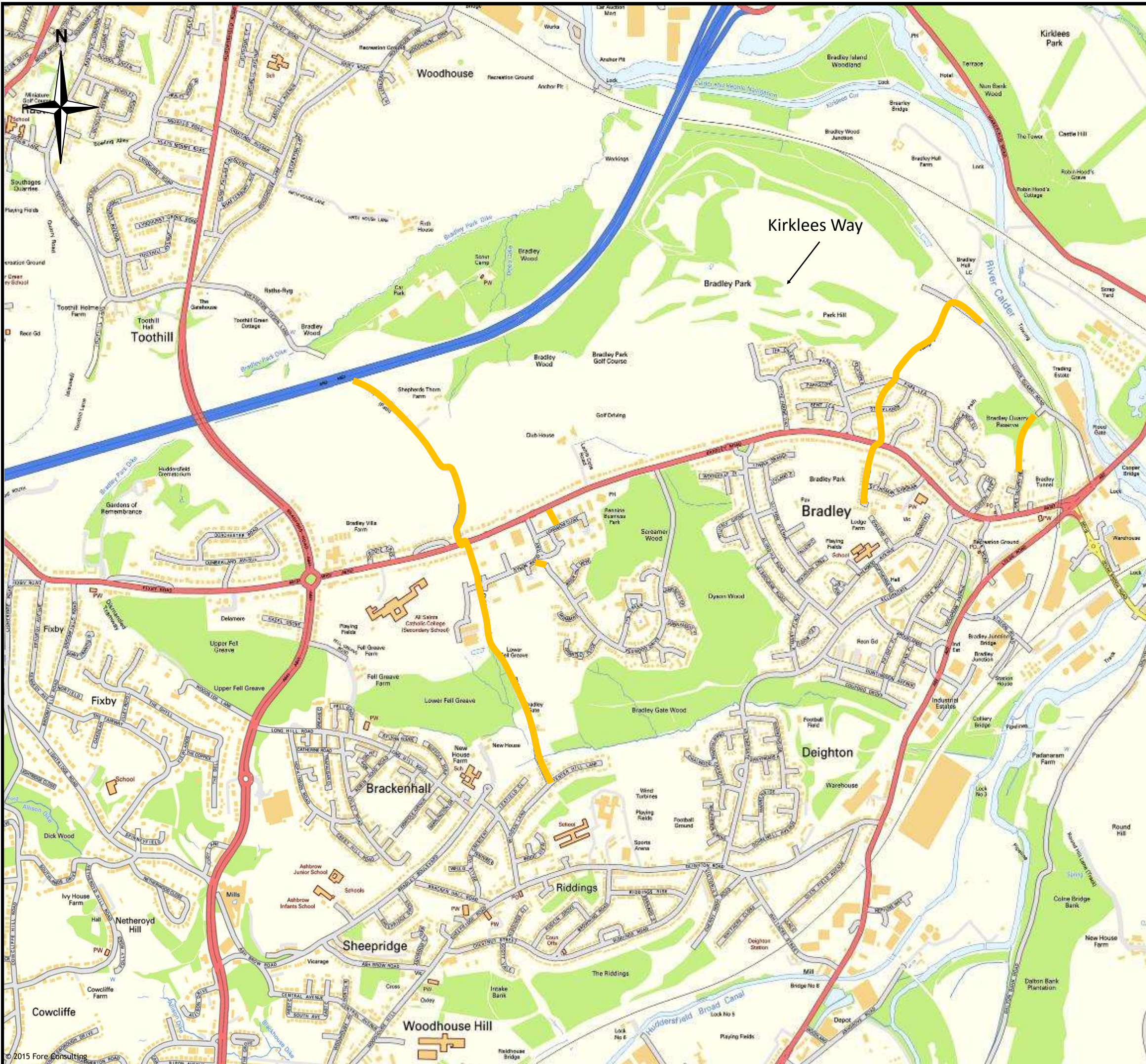
Project:  
**Bradley Masterplan**

Figure Title:  
**Public Rights of Way**

Scale: Not to Scale | Figure Status: Issue

Job Number: 3367 | Figure Number: 3





Key:



Site Location



Local Cycle Routes

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Project:  
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Figure Title:  
 Local Cycle Routes

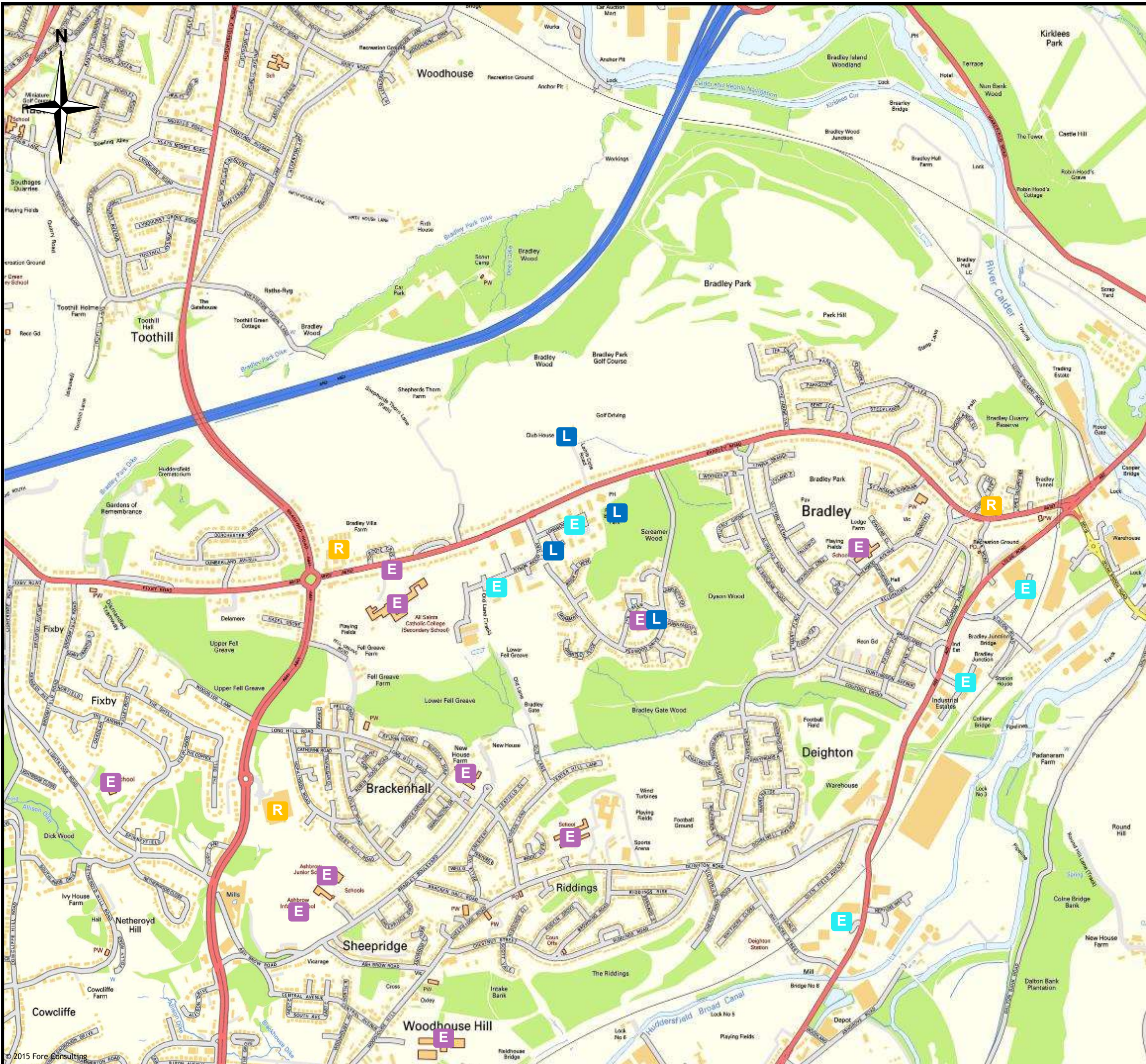
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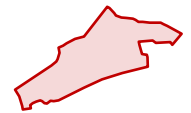
Job Number: 3367

Figure Number: 4





Key:



Site Location



Leisure - Pub/Coffee Shop/Bar



Retail



Education - Schools/Nursery



Employment

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Figure Title:  
 Local Facilities and Services

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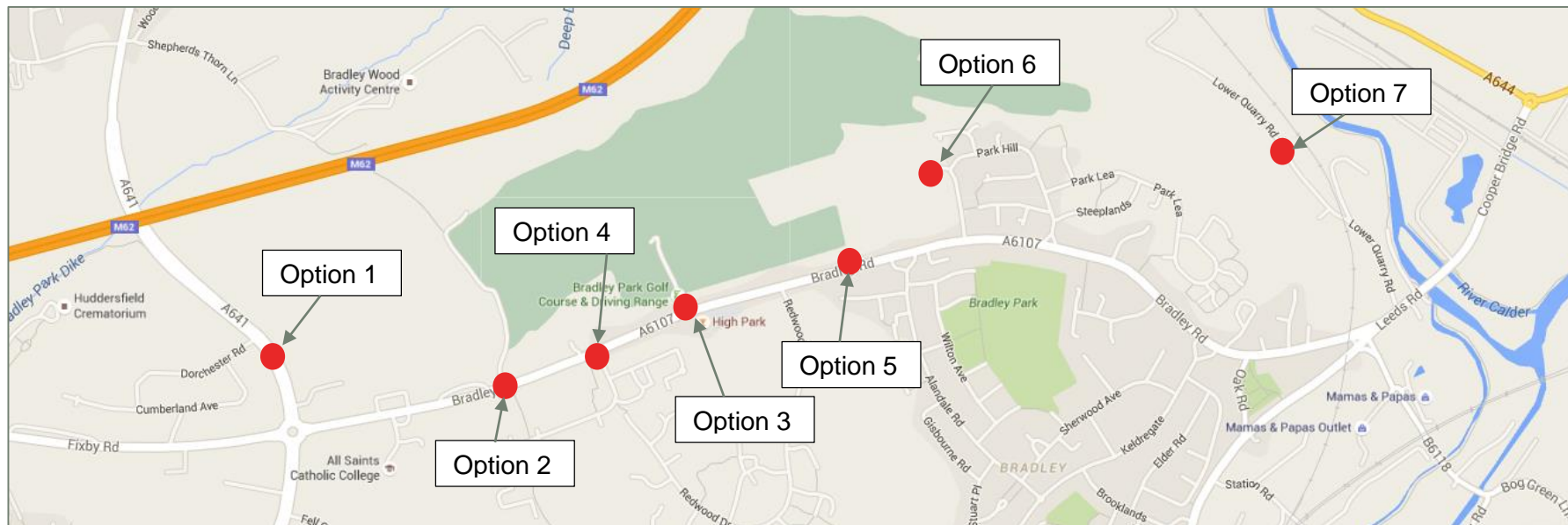
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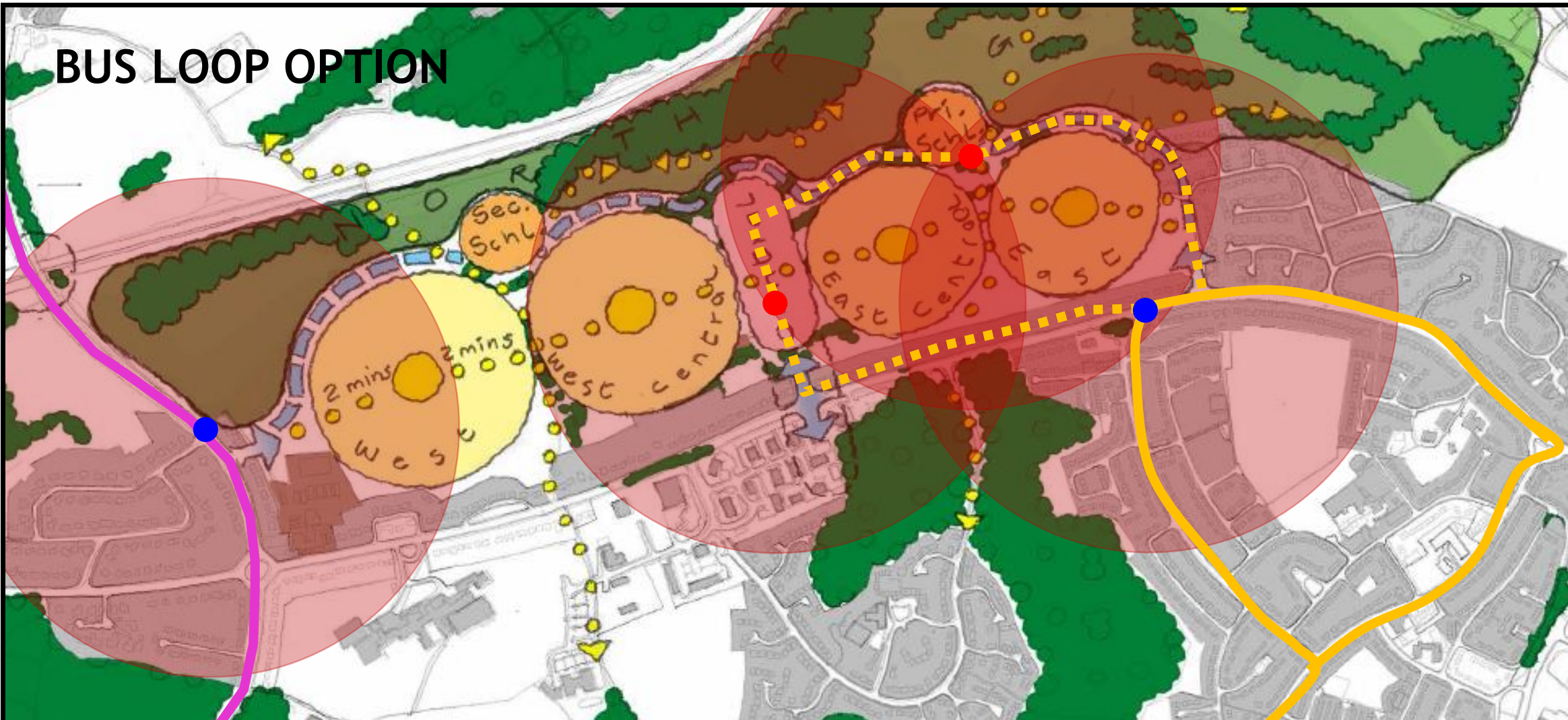


Figure 6: Site Access Options

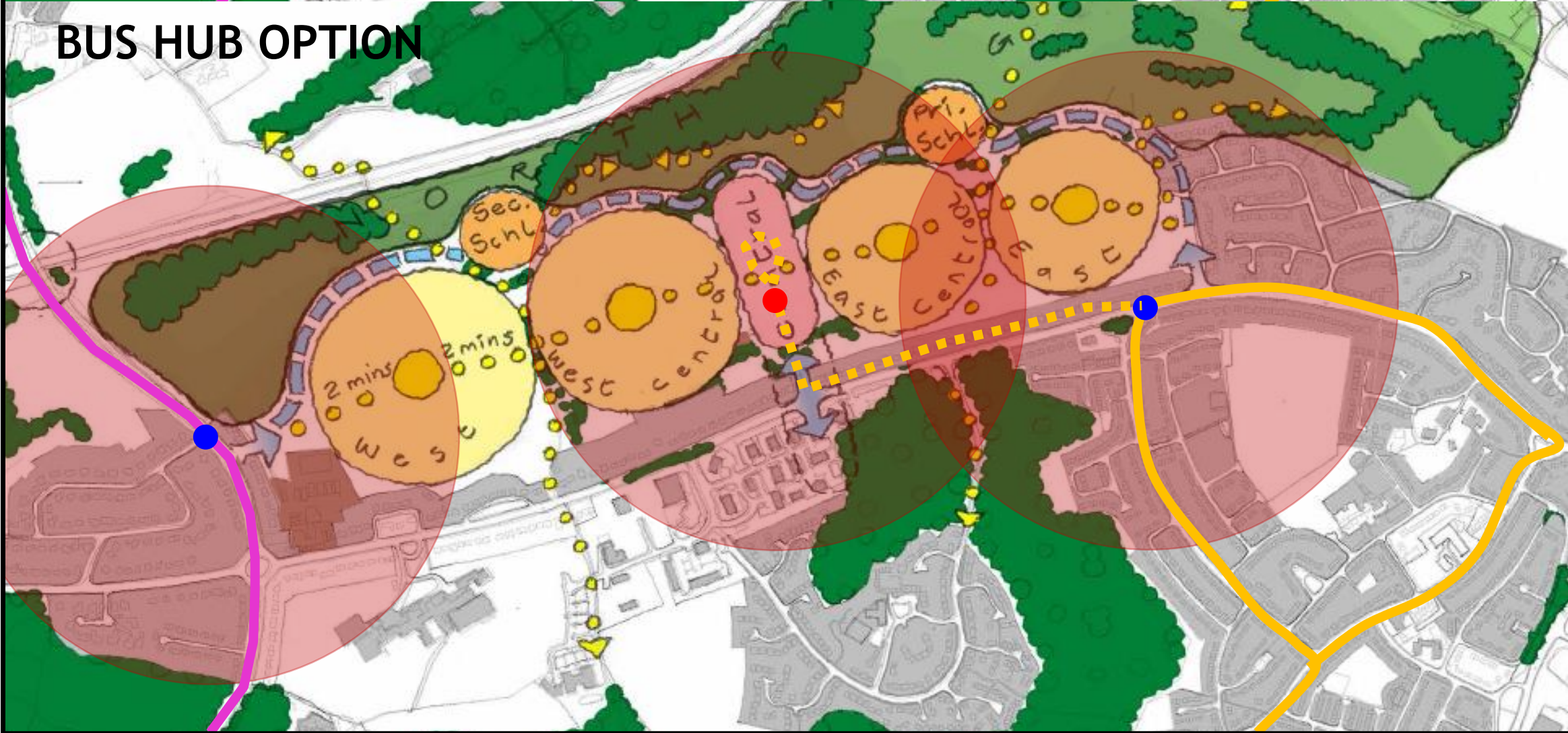









# BUS LOOP OPTION



# BUS HUB OPTION



**Key:**

-  Existing Bus Routes 363/X63/X6
-  Existing/Proposed Bus Route 328
-  Existing Bus Stop
-  Proposed Bus Stop
-  Proposed Approximate 400m/5-minute Walking Isochrone

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Project:  
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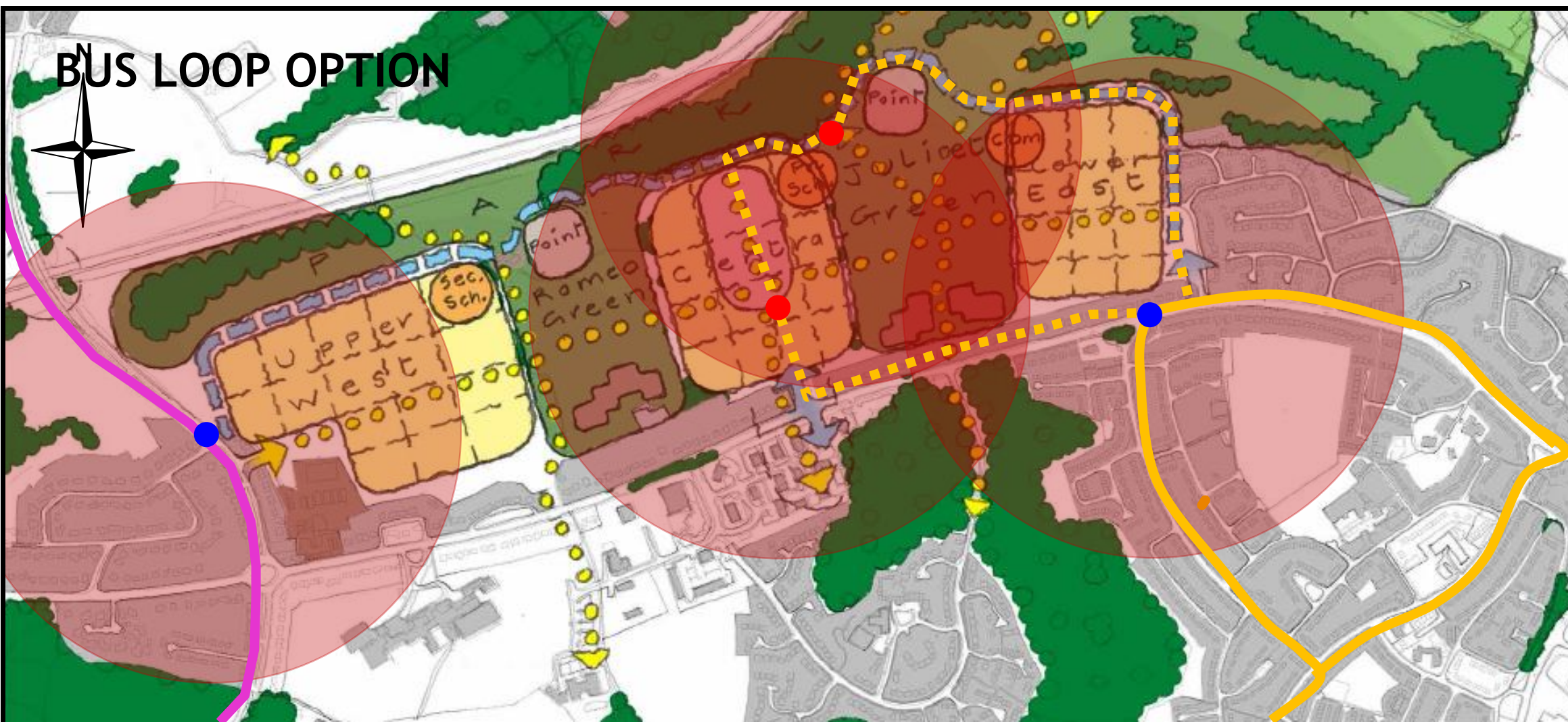
Figure Title:  
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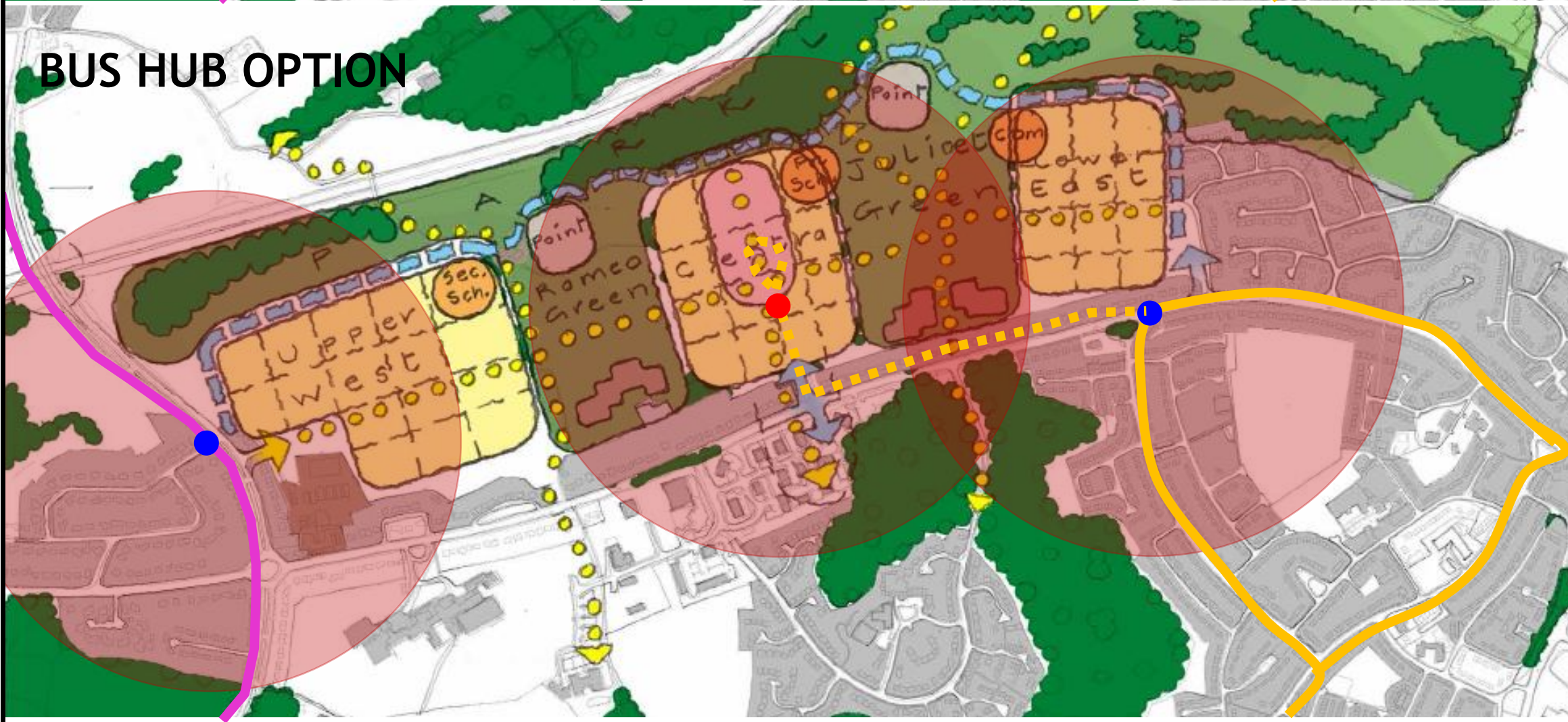
Job Number: 3367 | Figure Number: 7








# BUS LOOP OPTION



# BUS HUB OPTION



**Key:**

-  Existing Bus Routes 363/X63/X6
-  Existing/Proposed Bus Route 328
-  Existing Bus Stop
-  Proposed Bus Stop
-  Proposed Approximate 400m/5-minute Walking Isochrone

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Project:  
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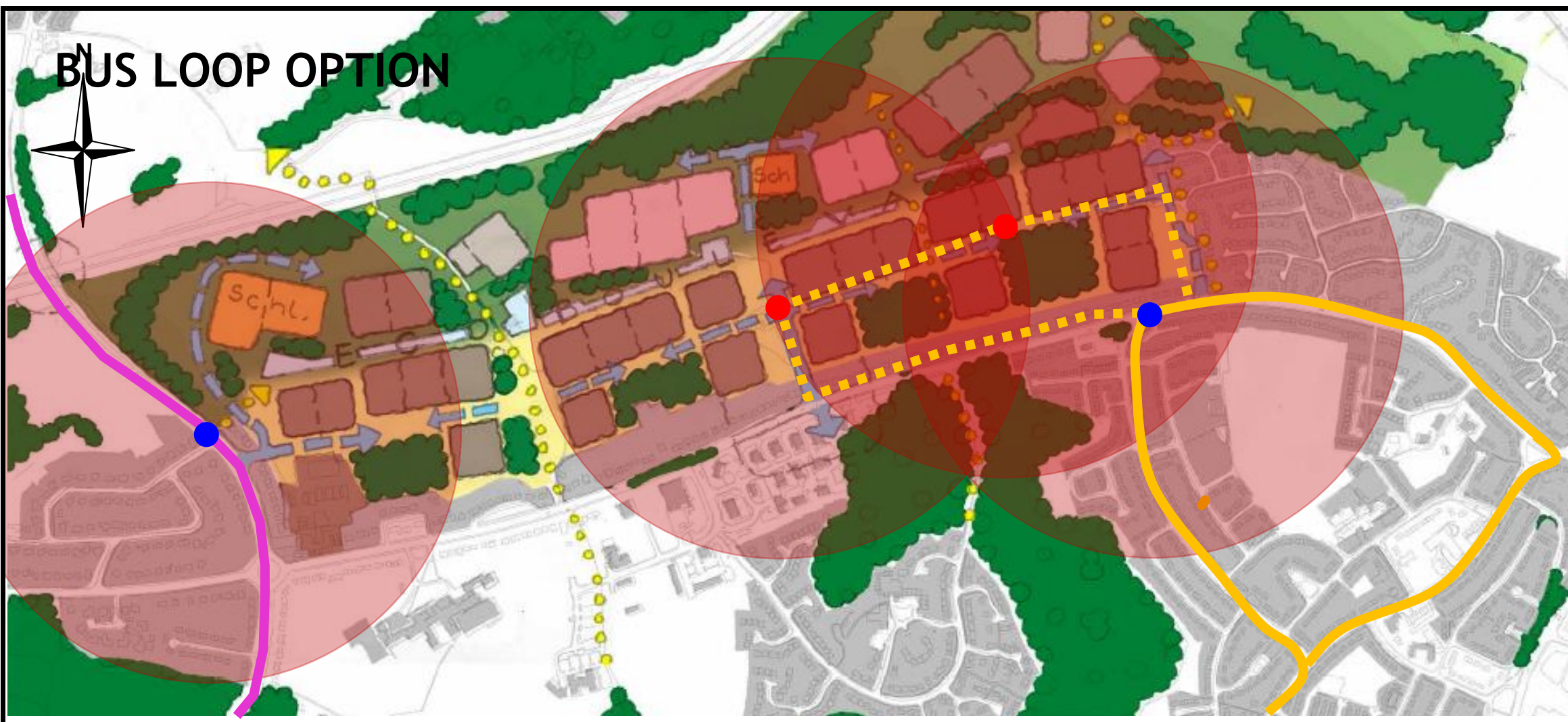
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 Proposed Public Transport Options  
 Urban Finger Masterplan Concept

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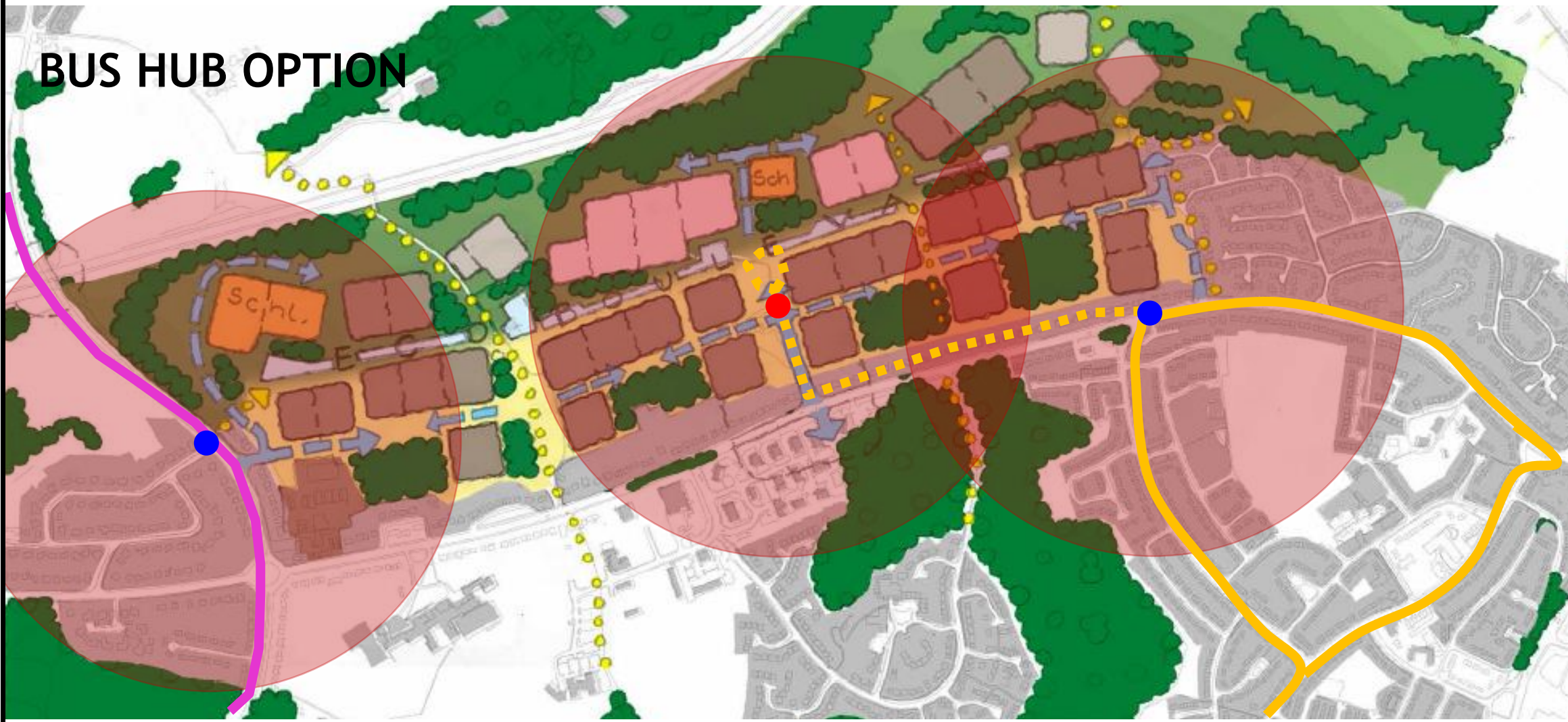
Job Number: 3367 | Figure Number: 8








# BUS LOOP OPTION



# BUS HUB OPTION



**Key:**

-  Existing Bus Routes 363/X63/X6
-  Existing/Proposed Bus Route 328
-  Existing Bus Stop
-  Proposed Bus Stop
-  Proposed Approximate 400m/5-minute Walking Isochrone

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Project:  
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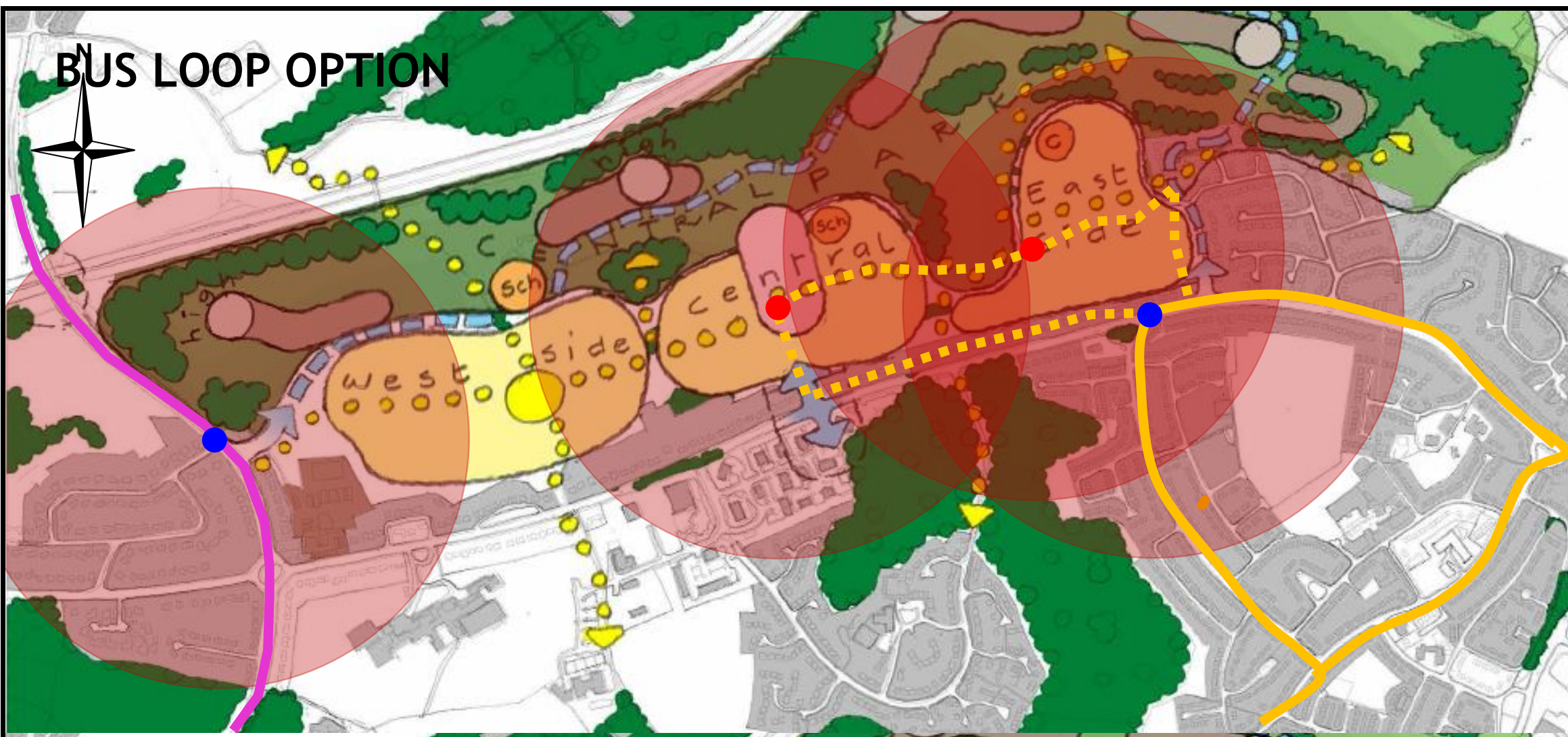
Figure Title:  
 Proposed Public Transport Options  
 Eco Boulevard Masterplan Concept

Scale: Not to Scale | Figure Status: Issue

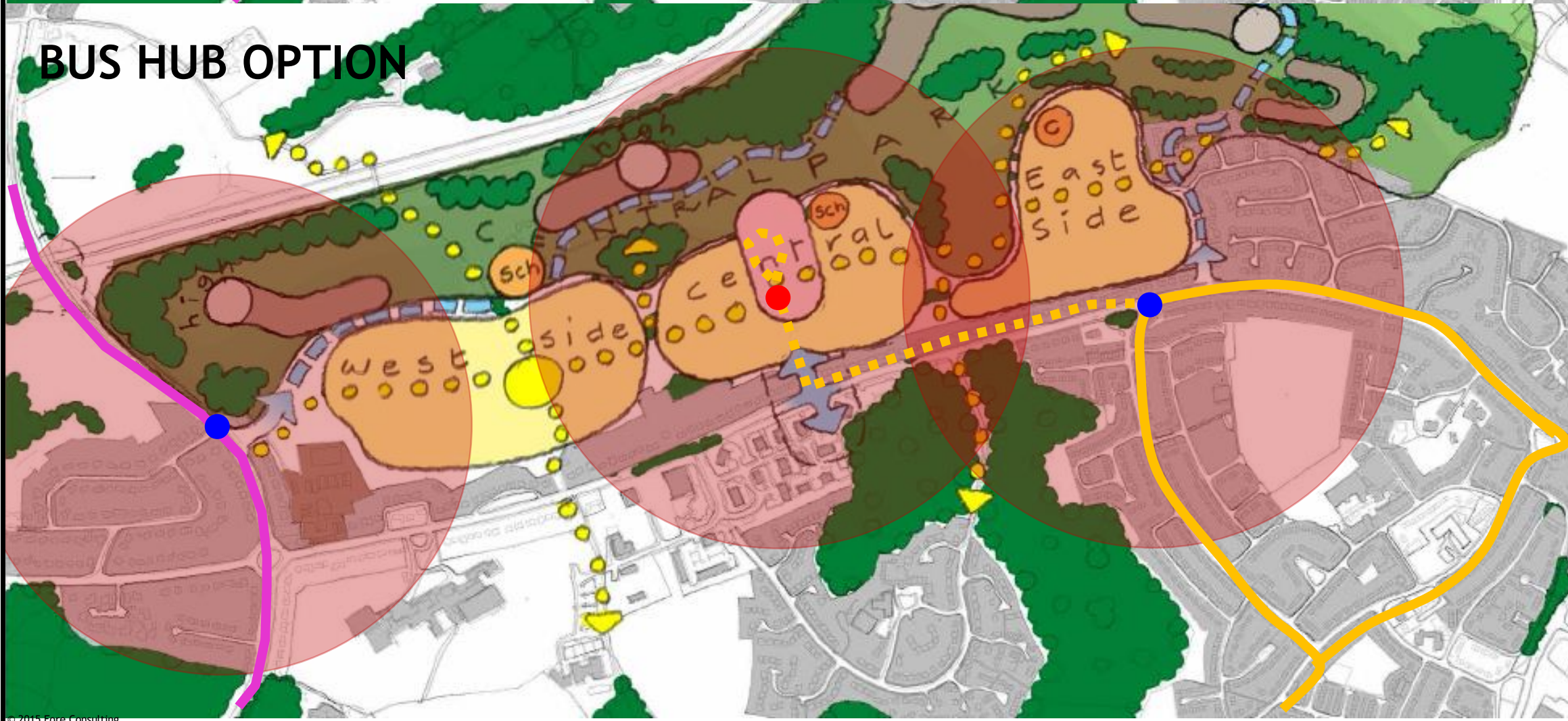
Job Number: 3367 | Figure Number: 9








# BUS LOOP OPTION



# BUS HUB OPTION



**Key:**

-  Existing Bus Routes 363/X63/X6
-  Existing/Proposed Bus Route 328
-  Existing Bus Stop
-  Proposed Bus Stop
-  Proposed Approximate 400m/5-minute Walking Isochrone

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Client:  
 Kirklees Council

Project:  
 Bradley Masterplan

Figure Title:  
 Proposed Public Transport Options  
 Central Park Masterplan Concept

Scale: Not to Scale | Figure Status: Issue

Job Number: 3367 | Figure Number: 10



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