

Technical note

Project:	A428 study - Phase 2	To:	Adrian Shepherd
Subject:	Park & Ride site locations	From:	Atkins
Date:	Jun 3, 2016	cc:	Ashley Heller

1. Introduction

1.1. Purpose of Technical Note

The purpose of this technical note is to provide a summary of the analysis which underpins recommendations on potential Park and Ride locations along the A428, west of Cambridge. It forms a supporting document for the wider A428 study being undertaken by Atkins, on behalf of the Cambridgeshire County Council, as part of Greater Cambridge City Deal Partnership.

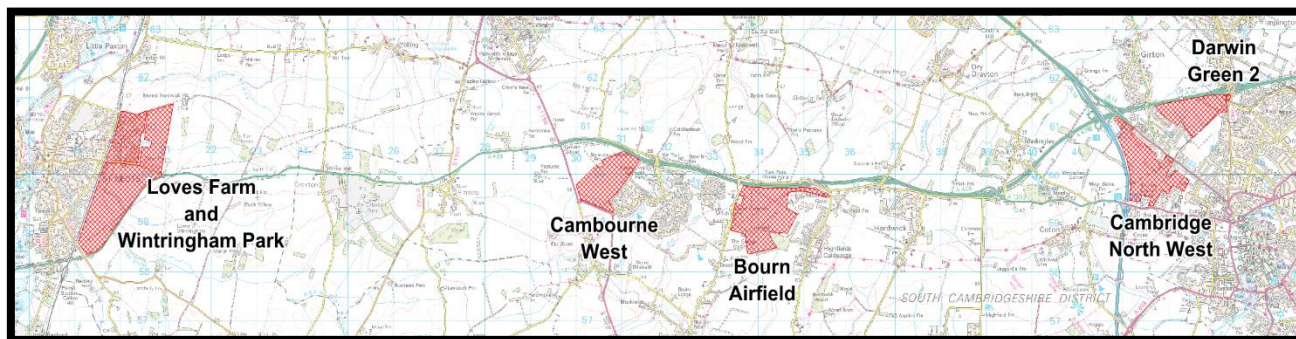
1.2. Background

The proposal for a new Park and Ride site along the A428, west of Cambridge, is part of the wider A428 study aiming to develop improvements to public transport infrastructure, and reduce congestion in the Cambridgeshire area. There are significant developments currently under consideration along the A428 corridor, as shown in Figure 1, which will generate a notable increase in travel demand in the area. This highlights the need for greater access to sustainable modes of transport, with improved service frequency, journey times, and reliability for bus routes serving Cambridge. The improvements are intended to facilitate the high levels of population and employment growth occurring within Cambridge and Cambridgeshire.

A Park and Ride facility currently exists at Madingley Road, east of the Madingley Mulch roundabout. The site being proposed as part of the A428 study is intended to be *additional* to the Madingley Road site, and would increase Park and Ride capacity in the area.

The existing facility would continue to serve traffic accessing Cambridge that would not be intercepted by the new site, such as from the M11. The proposed Park and Ride, in combination with proposed bus priority measures, would serve to reduce private car trips along the corridor, reducing congestion going into Cambridge during the AM peak and leaving the city in the PM peak.

Figure 1. Development Hubs in Along the A428 Corridor



1.3. Park and Ride Locations

Key considerations in identifying potential Park and Ride sites include:

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- Vehicle access (dedicated infrastructure / priority);
- Bus Access (segregated);
- Proximity to strategic road network;
- Ability to provide direct, fast, and reliable route options;
- Capacity;
- Associated facilities and staffing; and
- Environmental consideration.

With the above in mind, potential locations along the A428 corridor have been identified during a series of workshops with key stakeholders, and within consultation responses given as part of the A428 Phase 1 public consultation exercise. The principle locations identified include:

- Madingley Mulch roundabout;
- Scotland Farm;
- North of Cambourne; and
- Transport Hubs at
 - Cambourne;
 - Bourn;
 - Between Highfields and Caldecote.

This technical note outlines the potential benefits of locating the Park and Ride site at the above locations, and provides a high level assessment of the comparative benefits of each of the locations. A qualitative appraisal of the potential Park and Ride sites is presented, which also makes reference to the comparative operating costs of each of the potential sites.

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2. Location Appraisal

2.1. Madingley Mulch

2.1.1. Proposal

Rationale

The potential for a Madingley Mulch Park and Ride site was identified within workshops attended by key stakeholders of the A428 project. Three potential sites have been identified at Madingley Mulch which could be utilised as a Park and Ride; the comparative benefits of these sites would require further detailed assessment to determine which is most suitable to support the A428 corridor improvements.

The site at Madingley Mulch is considered suitable based on the nature of the predicted congestion around Cambridge, and the balance between access and operating costs. It is considered that a site at Madingley Mulch would alleviate capacity constraints at an existing Madingley Road Park and Ride site.

A428 corridor congestion towards Cambridge typically begins in the area around the Madingley Mulch roundabout. In addition, this location is also suitable for connecting bus services to Cambridge City Centre and other employment hubs within Cambridge.

While there is some congestion at the roundabout at peak times, the potential for signalisation would assist in regulating traffic flow. It is considered that having visible congestion along the corridor is more likely to encourage Park and Ride usage than having the Park and Ride at an uncongested, free-flowing location.

Potential Capacity

A site at Madingley Mulch could potentially extend over 120,000 m² to 370,000 m² depending on the specific location of the Park and Ride site. The three sites identified at Madingley Mulch all have sufficient space to provide a larger Park and Ride site than at Madingley Road, which would significantly increase the Park and Ride capacity along the corridor.

A site located to the northeast of the roundabout extends over approximately 364,000 m², with space available for future expansion to the west. However it is estimated that up to 35,000m² could be required for access into the car park, leaving 329,000m² available for all required facilities.

A site situated to the east of the roundabout could extend over approximately 124,000m² with the parcel of land lending itself well to a Park and Ride style development (i.e. fan shaped car park). Whilst it is constrained by the surrounding Madingley Wood (an ancient woodland and Site of Special Scientific Interest) and both A428 to the north and A1303 to the south, it would be able to provide over 1.5 times the car capacity of the existing Park and Ride on Madingley Road. It is estimated that 9,000m² could be needed for access, leaving 113,000m² available for all required facilities.

A site located to the southeast of the roundabout could extend over approximately 369,000m² with room for future expansion. The only constraints are the A1303 to the north and the properties located along the A1303, adjacent to the site on either side. This location is the largest of the three with over 5 times the space of the existing Park and Ride on Madingley Road.

Access Arrangements

A site at Madingley Mulch roundabout would require a reconfiguration of the junction, to accommodate access into the new site. This is likely to take the form of signalisation of the roundabout, in combination with an access off a realigned A428 slip road, or utilisation of existing access tracks. The signalisation of the

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roundabout would provide additional benefits to general traffic at the junction, and facilitate any bus priority necessary for the wider A428 Phase 2 scheme.

The access arrangements would require further consideration, which would inform any potential decision on the most suitable siting of a Park and Ride facility. It will also be important to consider potential land take of any new access point, which may impact on the overall number of parking spaces provided.

2.1.2. Qualitative Appraisal

Site suitability

This location offers minimal opportunities for walk-and-ride patronage from neighbouring settlements, however a similar or greater impact on bus patronage at these settlements (e.g. Hardwick) could be achieved by locating one or more bus stops at convenient locations.

In terms of long-distance accessibility, consideration should be given to the interception point for in-coming traffic. Accessibility considerations for long-distance traffic are not dissimilar to those for short- or medium-distance traffic. If long-distance drivers observe the A428 is still uncongested, there is little evidence to suggest that they would switch modes earlier than short-distance traffic. i.e. a site is best located where there are signs of imminent corridor congestion, which would serve as a good mode switch point for in-coming traffic. The site has good accessibility for both trunk road and local road traffic in the area, such as the A428 (w), Church Lane and Long Road.

The Cambridgeshire Sub-Regional Model (CSRM) indicates that congestion into Cambridge begins to build up on the A428/ A1303 corridor east of the Madingley Mulch roundabout, on the approach to the M11 overbridge. Flow data from the model indicates that there would be 585 PCUs/hour travelling eastbound towards Cambridge on the A1303 just east of the Madingley Mulch roundabout during the AM peak. This number increases to 838 PCUs/hour just east of the M11 on slip. By 2031, in a do-minimum scenario (whereby no interventions or transport improvements are implemented), the A1303 could see a significant rise in traffic, and therefore delay, with 762 PCUs/hour just east of the Madingley Mulch Roundabout and 1022 PCUs/hour just east of the M11 on slip during the AM peak.

Since Congestion towards Cambridge typically begins in the area around the Madingley Mulch roundabout, the site is a good location for a new Park and Ride facility. In addition, this location is optimal for connecting bus services to Cambridge City Centre and other employment hubs within Cambridge.

It is also pertinent to note that whilst a Park and Ride at Madingley Mulch has limited accessibility from the east, it could serve as a potential option for traffic from the north of Cambridge.

Environment and transport impacts

The landscape character of the area would need to be considered when assessing the potential locations of a Park and Ride at Madingley Mulch roundabout. Should visual character be affected, mitigation measures such as screening would be considered.

Traffic impacts on the surrounding area from the introduction of a Park and Ride at Madingley Mulch roundabout would be assessed in full as part of the ongoing analysis. Initial considerations suggest that there could be some changes in traffic flows in Church Lane to the north, the north of the villages of Barton and Comberton and the slip from the M11 onto the A1303, as traffic may transfer from the existing Park and Ride to a new site at Madingley Mulch.

If direct access to the site from the A428 is possible, there could be a potential benefit to the Madingley Mulch junction in the AM peak as it would intercept cars upstream from the center of Cambridge congestion. Whilst there could be a localised increase in traffic and delay immediately adjacent to the roundabout, the impact of the Park and Ride on existing flows on the network on the whole would be positive as traffic going into Cambridge and beyond is reduced in the AM peak, and traffic leaving the city is reduced in the PM peak. All

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proposed A428 Phase 2 options include the signalisation of Madingley Mulch roundabout to ease congestion, and regulate flow on the roundabout itself.

It is acknowledged that any new Park and Ride has the potential to attract vehicle trips from other radial routes, as any new site in this location combined with bus priority measures would provide a strong alternative to the existing site in the corridor. However, it is anticipated that the majority of trips would be undertaken by those already utilising the corridor. Whilst those who may switch to using this corridor over another may cause some localised dis-benefits in the immediate surrounding area, it is likely that there would be consequential improvements elsewhere across the network.

Potential operating costs

The operating costs of a Park and Ride site at Madingley Mulch would perform better than sites further west, due to the reduced distance that buses would be required to operate over. This location is the eastern-most location which effectively balances congestion free access, high capture of patronage, and lower operating costs.

Summary

Madingley Mulch roundabout appears a reasonable location for a Park and Ride site, although the specific siting of the facility would require further consideration. The location is situated at a point on the network where corridor congestion begins, and therefore is well placed to encourage car users to switch travel modes. It is also relatively close to the center of Cambridge, and therefore would likely benefit from reasonable operating costs.

2.2. Scotland Farm

2.2.1. Proposal

Rationale

The proposal of a Park & Ride facility at Scotland Farm was put forward by stakeholders as part of the A428 Phase 1 consultation. The proposal involves locating a Park and Ride site at the Hardwick junction of the A428. The site was put forward due to the potential to result in earlier interception of traffic on the A428. It also has potential to have better connectivity with the immediate area in terms of walking and cycling, and provides an option for buses to serve Cambridge by continuing on the A428.

Potential capacity

A site at Scotland Farm, located to the northeast of the Hardwick junction, could potentially extend over 85,000m². The site would be constrained to the south and west by the A428 and Scotland Road respectively. Due to other land uses at the Hardwick junction, there is limited scope to explore alternative sites at this location off the Hardwick junction.

Access arrangements

A site at Scotland Farm would likely require the northern roundabout of the Hardwick junction to be reconfigured to accommodate an additional arm, which would serve as a dedicated entry/ exit for the Park and Ride site. It would also be important to consider potential land take of any new access point, which may impact on the overall number of parking spaces provided.

2.2.2. Qualitative Appraisal

Site suitability

The site is located close to local settlements such as Hardwick, and would therefore be accessible for some walking and cycling users. However a proportion of these settlements (e.g. southern part of Hardwick) would be outside of the recommended walk/ cycle catchment, and users would still therefore need the private car to

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access the site. This would make it less likely that they would switch from their current mode of transport to utilise the Park and Ride site. The overall volume of potential walking/ cycling trips to the site is therefore considered to be relatively small.

Locating the site further west than Madingley Mulch, at a location such as Scotland Farm, reduces the accessibility from the road network compared to a site further east. This is on the basis that users travelling along Long Road and Church Lane to access Cambridge are unlikely to travel away from the center, in order to park and get a bus back. It is more likely that potential Park and Ride users from Long Road and Church Lane would use the existing site at Madingley Road, therefore continuing to exacerbate congestion observed on Madingley Hill.

Whilst a Park and Ride site at Scotland Farm would provide the flexibility to use either the A428 or A1303, in the longer term this may not provide the greatest benefit to the area. An orbital route via the A428 would only allow buses to link housing and employment locations on the fringe of the City. However providing an orbital route east of the M11 (as is being proposed by the separate City Deal Western Orbital study) would have the advantage of linking developments at West Cambridge, North West Cambridge and Darwin Green, which could not be achieved by using the A428/A14. It is likely that any future bus services would need to serve such developments, and therefore use of the 'fringe' orbital route would not be suitable.

Environmental and transport impacts

The landscape character of the area would need to be considered when assessing the potential locations of a Park and Ride at Scotland Farm. The location of the facility on the edge of the Green Belt may perceptually be more desirable than a site further east, however this will not affect the planning process.

While the location of the proposal further west along the A428 does offer the possibility of reducing congestion through earlier interception of vehicles, taking account driver behavior would suggest fewer vehicles would not choose to use the facility if they cannot see a queue or congestion on the A428 corridor. Locating the Park & Ride in a location where the congestion is visible would offer greater incentives for modal switch.

Survey Data from June 2014 and TrafficMaster data, as well as modelled traffic flows indicates that queueing typically starts at or just beyond the Madingley Mulch roundabout. All proposed A428 options include the signalisation of Madingley Mulch roundabout to ease congestion, and regulate flow on the roundabout itself.

The potential of increased patronage of residents from Hardwick could be better achieved by placing local bus stops closer to the village as opposed to a Park & Ride site north of the A428. Users from the southern section of Hardwick would need to cycle or drive to the proposed location and may therefore be less likely to switch from their current mode of transport. Additionally users from Dry Drayton are unlikely to travel by foot as the distance to the site is prohibitive. A facility at Madingley Mulch coupled with local bus services to Hardwick and Dry Dayton could serve more users in the area and be better suited to capture users further east

In considering a site at Scotland Farm, it is worth considering future development in the area. As shown in Figure 1, there is a large development proposed at the Bourn Airfield. Once this development is complete, there could be an increase in junction specific congestion and delays at the Scotland Farm junction, which buses would need to interact with to access a Park & Ride facility at this location. The CSR model does not indicate that corridor congestion would extend beyond Madingley Mulch in the future year 2031, and therefore any congestion at Scotland Farm would be specific to the Bourn Airfield development. There would still be a free-flowing corridor beyond Scotland Farm (eastbound) and therefore, with driver behavior in mind, users are unlikely to choose to stop at Scotland Farm if there is no sight of congestion on the A428.

Potential operating costs

The operating cost of bus services serving the site would be increased compared with a location further east. Servicing the proposed location would take buses an additional 10 minutes when compared with the proposed location at Madingley Mulch roundabout (five minutes each way). Assuming buses keep their current frequency of one bus every 10 minutes, this would require at least one additional vehicle. However, the

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additional time and distance travelled by the bus would also require an increase in layover time, indicating a realistic estimate would be for two additional vehicles required to serve the proposed site at Scotland Farm compared with a site at the Madingley Mulch Roundabout. The increased operating costs are a significant limitation of a Park and Ride site at Scotland Farm.

Summary

Whilst a Park and Ride site has some benefits in terms of local patronage capture and early interception of traffic, it is not considered the most suitable location for a Park and Ride site in the context of Cambridge. Concerns relating to the nature of network congestion in the area and bus operating costs may limit the feasibility of a Park and Ride site at Scotland Farm.

2.3. North of Cambourne

2.3.1. Proposal

Rationale

The proposal of a Park & Ride facility north of Cambourne was put forward by stakeholders as part of the A428 Phase 1 consultation. As part of the proposal, two potential locations have been considered, namely between the two roundabouts south of the A428 access and north of the junction with the A428. The site was put forward due to the potential to result in earlier interception of traffic on the A428, and proximity to the settlement of Cambourne.

Potential capacity

It is assumed that the two sites located north of Cambourne could provide a Park and Ride site extending between 10,300m² and 94,000m². The smaller of the sites is constrained by the junction itself, and therefore has limited scope for expansion. The larger of the two sites is currently open fields, with room for expansion further north, away from the junction itself.

Access arrangements

No specific access arrangements have been proposed as part of a 'North of Cambourne' Park and Ride, but it is likely that the Cambourne Road junction with the A428 would require reconfiguration to accommodate dedicated accesses. It would be important to consider potential land take of any new access point, which may impact on the overall number of parking spaces provided.

2.3.2. Qualitative Appraisal

Site suitability

Both sites are located close to Camborne, and therefore could be accessible for walking and cycling trips. However a mode shift towards public bus services could also be achieved through better placement of bus stops in Cambourne and other bus priority measures.

Locating the site further west than Madingley Mulch (or Scotland Farm), would further reduce the accessibility from the road network compared to a site further east. This is on the basis that users travelling towards Cambridge via roads such as Long Road and Church Lane are unlikely to travel away from the center, in order to park and get a bus back in. This could potentially put additional strain on the existing Park and Ride site at Madingley.

Environmental and transport impacts

The landscape character of the area would need to be considered when assessing the potential locations of a Park and Ride north of Cambourne.

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While the location of the proposal further west along the A428 does offer the possibility of reducing congestion through earlier interception of vehicles, as with Scotland Farm the consideration of driver behavior suggests that fewer vehicles would choose to use the facility if they cannot see a queue or congestion on the A428. Locating the Park & Ride in a location where the congestion is visible would offer greater incentives for modal switch.

Potential operating costs

The operating cost of bus services serving the site would be increased compared with a location further east; it would be greater than that estimated for Scotland Farm. There may be potential demand for additional vehicles, on top of those estimated for Scotland Farm which would greatly increase the operating costs, and could lead to the service being commercially unfeasible.

Summary

The considerations above indicate that locating a Park and Ride at Cambourne would be less beneficial than locating it further east at locations such as Madingley Mulch or Scotland Farm, where congestion on the corridor is greater, there is higher potential patronage and where operating costs would be lower.

2.4. Transport Hubs at Cambourne, Bourn, and between Highfield and Caldecote

2.4.1. Proposal

Rationale

The proposal is for the creation of transport hubs at Cambourne, Bourn, and between Highfields and Caldecote. The creation of transport hubs was put forward by consultees as part of the A428 Phase 1 consultation. It is understood that the proposals would provide 'facilities similar to a train station'. It has been put forward that a series of smaller Park and Ride sites would provide earlier interception of traffic on the A428, and the additional facilities would provide further incentive for users to switch modes to access the center of Cambridge.

Potential capacity

There have been no specific sites identified for the potential transport hubs. However it is envisaged that some of the sites already discussed within this technical note could provide suitable locations. It is considered that the location constrained by the junction at Cambourne would be too small, and therefore it is estimated that the capacity of the transport hubs could vary between 85,000m² and 95,000m². All sites would likely provide a lower level of capacity than the location identified at Madingley Mulch.

Access arrangements

No specific access arrangements have been proposed as part of 'transport hubs' scheme, but it is likely that there would be a requirement to reconfigure a number of junctions in the area. A new arm would likely be required off the Scotland Farm roundabout, and at Cambourne the grade separated junction would need to be revised so as to provide a dedicated access. It would be important to consider potential land take of any new access point, which may impact on the overall number of parking spaces provided, particularly with the requirement for additional facilities on site.

2.4.2. Qualitative Appraisal

Site suitability

The transport hub sites could be accessible for walking and cycling trips. However a mode shift towards public bus services could also be achieved through better placement of bus stops in local settlements, accompanied by other bus priority measures.

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As has been discussed above, locating the site further west than Madingley Mulch, at locations such as Scotland Farm and Cambourne, would reduce the accessibility from the road network compared to a site further east. This would also be the case with a hub between Caldecote and Highfields, which also has the detrimental factor being situated away from the main A428 corridor.

Environmental and transport impacts

The landscape character of the areas would need to be considered when assessing the potential locations of the transport hubs.

While the locations further west along the A428 do offer the possibility of reducing congestion through earlier interception of vehicles, driver behavior suggests that fewer vehicles would choose to use the facility if they cannot see a queue or congestion on the A428.

In addition to this, it is considered that the impact of the hubs would be further limited due to the requirement for users to use the old A428 (St Neots Road), which would reduce the incentive to divert off the A428 prior to the existing Park and Ride at Madingley.

Potential operating costs

The operating cost of bus services would be higher than that of a site at Madingley Mulch. Depending on the frequency and number of transport hubs, a number of additional dedicated bus services may be required. The increased operating costs could lead to the provision of a number of transport hubs being commercially unfeasible.

Summary

The considerations above indicate that a number of transport hubs would be less beneficial than locating a larger Park and Ride site further east at locations such as Madingley Mulch. The benefits likely to arise from the provision of transport hubs could more suitably be achieved by providing better placement of bus stops in local settlements and other bus priority measures.

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3. Summary

This Technical Note has summarised the analysis undertaken as part of the A428 Phase 2 study which relates to the provision of a new Park and Ride site along the corridor. It has focussed on the following key locations:

- Madingley Mulch roundabout;
- Scotland Farm;
- North of Cambourne; and
- Transport Hubs at
 - Cambourne;
 - Bourn;
 - Between Highfields and Caldecote.

The analysis indicates that a Park and Ride site situated close to Madingley Mulch roundabout would be the most suitable location, as it would offer a good balance between congestion free access, high capture of patronage, and lower operating costs.

Whilst sites at Scotland Farm, Cambourne and a series of transport hubs could offer some benefits in terms of local accessibility from walking and cycling, they are unlikely to encourage drivers on the main A428 corridor to switch modes. This is due to the nature of congestion along the corridor, which does not typically begin until after the Madingley Mulch roundabout. If drivers observe the A428 is still uncongested, there is little evidence to suggest that they would switch modes earlier than where there are signs of imminent corridor congestion.

A key limitation of these alternative sites is operating costs of a bus services provision, due to the distance away from Cambridge. The increased operating costs from these sites may mean that they are commercially unviable. Sites west of this Madingley Mulch would hence offer fewer benefits and are thus viewed as less feasible. A site close to Madingley Mulch has potential to allow for bus services to pass through the facility without requiring a separate service for the Park and Ride from the city center.

The principle benefits of a site at Madingley Mulch include:

- Being located as far east as possible making it accessible to the greatest number of users;
- Having good accessibility from the trunk road and local road network;
- Achieving interception of car users at the point where congestion starts;
- Having the lowest likely operating costs of bus services compared to sites further west; and
- Having the potential for the largest land capacity for the provision of a Park and Ride site.

With the above in mind, it is therefore considered that a site at Madingley Mulch is the most suitable for further consideration as part of the A428 Phase 2 project.