Smarter Cambridge Transport

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To: Transport Infrastructure Planning Unit, Department for Transport
Subject: Network Rail (Cambridge South Infrastructure Enhancements) Order
Date: 3 August 2021 (with minor corrections and clarifications from 2 August version)
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Objection to TWA Order Application for Cambridge South station

About Smarter Cambridge Transport

Smarter Cambridge Transport is a volunteer-run think tank and campaign group. It was formed in 2015 to advance sustainable, integrated and equitable transport for the Cambridge region. It is run by a team of around 30 people, with a wide range of expertise and interests, and led by Edward Leigh, a qualified transport economist. Its website is at www.smartertransport.uk.

Abbreviations used

- CBC: Cambridge Biomedical Campus
- CPIER: Cambridgeshire & Peterborough Independent Economic Review
- CSET: Greater Cambridge Partnership Cambridge South East Transport busway scheme
- DfT: Government Department for Transport
- GCP: Greater Cambridge Partnership, joint committee of Cambridgeshire County Council, South Cambridgeshire District Council and Cambridge City Council, delivering the City Deal
- NR07, NR13, NR16: Network Rail (Cambridge South Infrastructure Enhancements) Order application documents
- OBC: Outline Business Case for Cambridge South Station (not yet published)
- ORR: Office of Rail and Road, the statutory regulator of the rail industry
- SOBC: Strategic Outline Business Case for Cambridge South Station (Mott MacDonald 2017)
- TA: Transport Assessment (NR16 Environmental Statement Appendix 17.2)
- TNR2: Cambridge Biomedical Campus Transport Needs Review Part 2 (Atkins, October 2018, included as Appendix R in NR16 Environmental Statement Appendix 17.2)
- TNR3: Cambridge Biomedical Campus Transport Needs Review Part 3 (Atkins, December 2018, included as Appendix R in NR16 Environmental Statement Appendix 17.2)
- TWAO: Transport and Works Act Order

Objection

We strongly object to the TWAO application as presented on four critical, distinct grounds that the proposed station design:

- lacks sufficient capacity for a realistic level of usage;
- provides no room for future expansion;
- has highly conflicted access arrangements;
- and is poorly integrated with bus services.

The forecast number of station entries and exits in 2029 (three years after opening) appears to be based on incomplete and out-of-date employment data. Forecast growth beyond 2030 is also implausibly low at 1.3% per year. Two new specialist hospitals, for children and cancer treatment, are planned for the site, yet receive no mention in the application documents. Uncertainty about the quantity of car parking provision on the CBC site is mentioned, but not reflected in demand modelling. The GCP target of reducing motor traffic in Cambridge is mentioned, but not reflected in demand modelling. The CBC 2050 Vision is nowhere mentioned, even though this has huge implications for potential future growth in travel demand. There is no mention of the impact of national and local targets for decarbonising transport and improving air quality in built-up areas, even though these will necessitate a large modal shift from cars to public transport.

Given the high level of uncertainty of future growth in both population and employment, and rapidly evolving national and local transport policies, we would expect to see the business case test the proposed station design against multiple scenarios for CBC employment numbers and modal shares for first/last-mile connections. We see no evidence that TAG Unit M4 (Forecasting and Uncertainty) has been applied.

The constrained location also makes any future expansion difficult, costly and disruptive. The high degree of uncertainty about future usage translates into high financial risk in the event that the design capacity proves inadequate during the station's operational life. This risk has not been quantified in the application. A prudent approach would be to design the station with sufficient capacity at the outset for a high-end demand forecast (e.g. one standard deviation above the 2040 median forecast), and make passive provision for expansion in the future.

The principal (eastern) station entrance is highly constrained by the eastern busway abutment. The narrow access corridor creates an environment that will be highly conflicted at peak times, when there are large volumes of pedestrian, cycle and motor vehicle movements. Adjacent junctions with Francis Crick Avenue for the busway and station access road will create further conflicts and increase delays for people walking and cycling. Modelling for the TA shows that congestion on Francis Crick Avenue will delay buses travelling south from Long Rd.

The bus stops on Francis Crick Ave will be 200m from the station entrance. For someone alighting from the rearmost carriage of a northbound train, the walk to a bus stop would be 450m, taking seven minutes. This does not accord with the government's *Bus Back Better* guidance.

Commentary on key documents

Transport Assessment (TA)

The TA is focused primarily on forecasting the number of car trips to the CBC that will be replaced with rail travel to Cambridge South station, and the number of first/last-mile trips by all modes to and from the station.

- The TA is based on a forecast of 26,000 jobs on the CBC in 2031. This figure, cited in TA §5.2.2, is drawn from the TNR2 §2.3.1. However, the SOBC provides a figure of 27,000 (in SOBC §3.1.2 et al). It is not explained why the TA does not use the higher figure from the SOBC figure when that, rather than TNR2, has been signed off by DfT. The difference of 1,000 is significant, as it equates to over 1,500 daily trips (based on the 79% ratio of daily return trips to jobs, given in TNR3 §7.2.4).
- TA §5.5.9 states, *"The Future 2031 Baseline + Development (Do Something) Scenario would therefore see a 39% increase in daily car trips to the CBC, between 2017 and 2031."*

  This increase of 11,034 car trips (up from 28,475 in 2017 – stated in TA §5.2.4) is based on naïve modelling, before consideration is given to whether this growth in motor traffic can be accommodated. Capacity is constrained by the local highway network (covered in SOBC §3.1.2) and on-site car-parking provision (covered in TNR2 §3.2.1). If expected and intended growth in demand to travel to the CBC is to be met, other travel modes, including rail, will have to absorb a much larger share of trips than currently.

  TA Table 6.1 lists the forecast annual patronage for each year up to 2043, reproduced here with year-on-year growth rates:

Year	Passengers	Growth rate
2026	1,006,019	
2027	1,499,804	49.1%
2028	1,753,040	16.9%
2029	1,933,681	10.3%
2030	1,998,794	3.4%
2031	2,024,779	1.3%
2032	2,051,101	1.3%
2033	2,077,765	1.3%
2034	2,104,776	1.3%
2035	2,132,138	1.3%
2036	2,159,856	1.3%
2037	2,187,934	1.3%
2038	2,216,377	1.3%
2039	2,245,190	1.3%
2040	2,274,378	1.3%
2041	2,303,945	1.3%
2042	2,333,896	1.3%
2043	2,364,236	1.3%

It can be seen from this table that the growth rate from 2030 to 2043 is assumed to be 1.3% per annum. For context, Cambridge station's patronage growth has averaged 5.1% over 2009/10 to 2018/19 (based on ORR Estimates of station usage).

There is an overwhelming case to use bespoke modelling of employment and population growth. Recent history, adopted Local Plans, the Cambridge Children's Hospital, Cambridge Cancer Hospital, CPIER report, Devolution Deal growth targets, and the emerging CBC 2050 Vision all support a reasonable expectation that growth in station patronage will be far higher than 1.3% per annum.

Furthermore, GCP targets for traffic reduction and improving air quality, and national targets on decarbonisation of transport, all require absolute reductions in motor traffic. This will support strong, non-linear growth in use of sustainable modes, including rail.

- TA §6.3.5 omits significant local inbound destinations reachable by bus, including via the CSET busway, hire cycle or e-scooter. These will include people arriving on Thameslink, Great Northern, East West Rail, and West Anglia line services not calling at Shelford or Whittlesford Parkway stations:
  - Great Shelford and Stapleford (social visits)
  - Sawston (social visits and business trips)
  - Wandlebury (leisure visits)
  - Babraham (social visits)
  - Babraham Institute (commuting and business trips)
  - Granta Park (commuting and business trips)
  - Abingtons (social visits)
  - Linton (social visits)
  - Haverhill (social and leisure visits, and business trips)
- TA §6.3.7 omits significant local outbound origins for commuting, social, leisure and business trips which are within cycling range or served by buses to Cambridge South station (including via CSET busway). These locations are the same as those listed in the previous paragraph as potential destinations in relation to §6.3.5.
- TA §8.7.3 indicates that with a 15-second inter-green time for pedestrians to cross, an 87m queue is likely to form southbound on Francis Crick Avenue in the evening peak. As this route is used by buses, this will degrade service performance. The alternative of a 5-second inter-green time would be unacceptable for the large number and mix of people walking and cycling across this junction at peak times.
- TA §9.4.10 states, "this results in demand for 800 cycle parking spaces per day." If the number of people using the station is underestimated then demand for cycle parking will also be underestimated. The absence of any space into which to extend the 500-space cycle park on the east side places a hard limit on the number of people who can conveniently cycle to or from the station's main entrance. That risk is incompatible with national and local policies that are increasingly strongly supporting more people cycling.

- TA §10.2.2 states, "three taxi bays are anticipated to provide sufficient capacity to meet average demand." If the number of people using the station is underestimated then demand for taxis will also be underestimated. The pattern of taxi movements at Cambridge station is uneven, with a queue of taxis building up before the arrival of each train at peak times.

  The number of private pick-up/drop-offs (which have use of another three bays) will also depend on the accuracy of forecasts for station usage and mode shares. The pattern of movements is also uneven.

  Any underestimation in demand or significant deviations in demand from the average will lead to congestion on the access road (see Figure 1), potentially causing blocking back onto Francis Crick Avenue. It is unclear whether this has been modelled.

- TA §11.6.2 states that the bus stops *"are located to minimise passengers' walking distances to and from … the proposed station."* This is patently untrue. The claim in the consultation report (NR07 p120) that *"the distance to Francis Crick Avenue is short and could safely be navigated by all user groups,"* is also debatable.

  The bus stops on Francis Crick Avenue (see Figure 2) will be 200m from the station entrance. If alighting from the rearmost carriage of a 12-car train, the walk will be 450m (see Figure 3), taking 7 minutes at a typical walking pace of 4km/hour. The bus stops on the busway adjacent to Royal Papworth Hospital (which are not referred to in the application) are an additional 80m away. This does not accord with the government's *Bus Back Better* guidance, which states, *"Railway stations should be hubs for connecting services with high quality stops close to station entrances"* (p32).

Strategic Outline Business Case (SOBC)

The SOBC, by Mott MacDonald, is nearly four years out of date. The Outline Business Case has not (to our knowledge) been published, even though the Secretary of State has approved it. However, since the TWAO application makes no direct reference to the OBC or to any interim work to update the SOBC, we have assumed that the OBC is not materially different to the SOBC in its demand forecasts and modelling.

- SOBC §3.1.3 states, *"Define Do-Minimum and Do-Something scenarios for forecasting purposes, taking account of proposed housing and employment developments in close proximity to the proposed station, background growth, rail service stopping patterns, and access/egress times to Cambridge and Cambridge South stations from surrounding areas."*

  For a scheme adjacent to a site in a state of rapid growth, and in the context of a climate emergency, it is wholly inappropriate to use just one set of growth assumptions.

- SOBC §3.1.2 states, *"Over the next four years (2017-21) approximately 3,750 additional jobs will be based at Addenbrooke's Hospital and the Cambridge Biomedical Campus, representing a growth rate of approximately 940 additional jobs per year Assuming a slightly lower job growth rate over the following ten years then between 2021 and 2031 an*

additional 5,900 jobs will be based on the Biomedical Campus. Total additional jobs estimated over the 2017-31 period is therefore 9,650, bringing the total number of employees based at the Biomedical Campus to an estimated 27,000 by 2031."

No justification is provided for the assumption of a lower growth rate post 2021 in the face of evidence that growth will continue at pace. It is also not clear which new developments will account for the additional 5,900 jobs beyond 2021. There is, for instance, no mention of Cambridge Children's Hospital or Cambridge Cancer Hospital.

- SOBC §3.1.2 states, *"20% (1,180) of the additional jobs during the 2021-2031 period are assumed to be reliant on Cambridge South station delivery. Without the new station, highway congestion is assumed to act as a limiting factor on the Biomedical Campus. The transport user benefits associated with the new station are therefore excluded from the core appraisal scenario for these 1,180 jobs, as these jobs would otherwise not exist or would exist elsewhere."*

  The implication is that the holders of at least that number of jobs will have to travel by train. Using the 79% ratio of daily trips to jobs (given in TNR3 §7.2.4), which allows for staff absences, that translates to at least 1,850 station entries and exits each weekday. The figure will be higher if "employment" in this case means full-time-equivalent posts, which may be shared by more than one person.

  SOBC §3.2 states, *"Approximately 70% of these passengers (1.3 million per year) would otherwise have used Cambridge Station."* As a proportion of the 5,800 weekday station entries and exits (TA §5.5.7), that equates to 4,200.

  The sum of the above two figures (1,850 and 4,200) is 6,050. This already exceeds the 5,800 figure used as the forecast demand in the TA. Yet it does not include new trips for other purposes: new inbound trips by patients, hospital and business visitors, and people visiting nearby family and friends; new outbound trips by local residents and employees.

  It appears therefore that the SOBC forecast should have produced a significantly higher target design capacity than the approximately 2 million passenger entries and exits per year.

- SOBC §3.2 further states, "*The number of passengers forecast to be abstracted from Cambridge station is likely to represent around 10% of Cambridge station's annual patronage. This is reasonable given that by the mid-2020s Cambridge Biomedical Campus could be home to more than 15% of all employment within the Cambridge City boundary."*

  This implies a patronage figure for Cambridge station of around 13 million entries and exits. The figure reported for the year 2018/19 was 12 million (ORR Estimates of station usage). Growth in patronage between 2009/10 and 2018/19 was 56% or 5.1% per annum. If growth in patronage were to continue at 5% per annum after returning to the 2018/19 level in 2022, patronage in 2031 would be at around 18.5 million. In that case, the abstraction of 1.3 million passenger-journeys would amount to just 7% of the 2031 patronage of Cambridge station. These figures need to be reviewed and sense-checked.

Cambridge Biomedical Campus Transport Needs Review (TNR2/3)

These reports by Atkins are dated October and December 2018, and therefore post-dates the SOBC. They are included in the TA as Appendix R.

- TNR2 makes no reference to the Cambridge Children's Hospital or the Cambridge Cancer Hospital, so it is unclear whether the figure of 26,000 employees in 2031 (TNR2 §2.3.1) includes these.

  Furthermore, it does not refer to the emerging Cambridge Biomedical Campus 2050 Vision, which states, "Over the next 20 years, this would equate to an additional workforce of between 14,000 and 20,000 – approximately double the staff presently working on campus." Starting with the 22,450 jobs stated for 2022 (i.e. with the AtraZeneca building occupied, but no other new developments), the range expected in 2050 could be between 36,450 and 42,450 jobs. This is between 40% and 63% higher than the 26,000 figure used in the Transport Assessment (TA §5.2.2). Although the envisaged expansion is not yet committed development, the TA should have tested the scenario against the currently proposed station capacity.

- TNR2 §2.3.2 extrapolates visitor numbers from historical data based on the existing hospitals and visitor patterns. There appears to have been no attempt to estimate visitor numbers for the new hospitals planned for the site. As specialist hospitals, these are likely to have a wider catchment area than the existing hospitals. The Cambridge Children's Hospital "will be the first dedicated children's hospital in the east of England". The Cambridge Cancer Hospital will be pioneering novel detection and treatment techniques, and therefore is likely to draw patients from across the country.

- TNR2 §2.3.2 states, *"This additional number does not include people accompanying patients, so the increase in trips to the site for patients and visitors combined will be considerably higher."*

  The TNR appears not to estimate what that additional number would be. Whereas people accompanying patients and visitors in a car do not add to the number of motor vehicle trips, they do increase the number of passenger-trips if arriving by public transport. Therefore, this figure should be estimated and included in the station demand.

- TNR2 §2.3.2 makes no mention of visitors to the research centres. These will be hosting meetings, seminars and conferences for people arriving from all over the country, and indeed the world. Whether the numbers will be significant as a proportion of total trips needs to be determined so that they may be explicitly included or discounted.

- TNR2 §3.2.1 lists the car parks completed and with outline planning consent. Although it acknowledges that "plans and strategies to develop the multi-storey may be subject to change." the TA does not test a scenario in which the unbuilt car parks are not built. For instance, two hospital multi-storey car parks with outline consent account for 1,894 parking spaces. If these are not built and the corresponding trips have to be completed by some other mode, a significant number will necessarily shift to rail. Since the TA's estimate

equates to 2,900 daily users of the station, a variance in the number of parking spaces of nearly 2,000 must have a significant impact on rail travel demand.

- TNR3 §7.2.4 states a maximum rail demand for employees, patients and hospital visitors of "6,624 one-way trips per day in 2031." Add 1,558 inbound trips where the destination is not the CBC and 1,100 outbound trips (from TNR3 §5.1), the daily total is 9,282. This is 60% higher than the figure of 5,800 given in TNR3 §5.1 (and also TA §5.5.7). This would equate to 2.9 million entries/exits per year rather than 1.8 million.
- Furthermore, TNR3 §7.3 indicates that, even this "maximum rail demand" leaves a requirement to mode-shift 5,154 daily highway trips just to restore traffic levels to 2017. To meet the GCP "stretch target" of 10–15% below 2011 traffic levels (TNR3 §7.2 et al), the number of daily highway trips would need to be reduced by 11,350 to 12,550 (TNR3 §2.2). A proportion of those would have to shift to rail.

Conclusion

Almost all future growth in travel demand to the CBC will have to be met by sustainable modes of travel. That is in part because the local highway network is saturated at peak times now. Additionally, local government targets on traffic reduction and air quality, and national targets on decarbonisation of transport will require absolute reductions in motor traffic.

Therefore, in future, a much larger proportion of trips to the CBC will have to be made by sustainable modes than is the case now. That means that naïve predict-and-provide modelling, based on historical mode shares and standard growth rates, is not appropriate.

It is also important for the business case to include an assessment of the financial risk of under-provision of capacity leading to unsafe and/or inefficient operation requiring expansion of the station on a highly constrained site.

We recommend the design capacity be determined through multiple scenario testing using bespoke estimates for growth and mode shares, and detailed risk analysis. We fully expect this approach to demonstrate the design should accommodate a multiple of the proposed capacity of around 2 million entries/exits per year, and include passive provision for future expansion.

Integration between the proposed station and bus services is poor, and does not create the high-quality hub needed to support a large modal shift from private cars to public transport. The conflicted junctions with Francis Crick Avenue and limited capacity for cycle parking (500 spaces on each side of the station) will fail to create an environment that promotes sustained, long-term growth in active travel.

All of the above leads us to conclude that Network Rail must reconsider the option of building a larger station above the railway tracks, integrated with a bus station on a rebuilt busway bridge to the north, and an expandable cycle park to the south.

Preferred design

Smarter Cambridge Transport, in its submission to the second public consultation, proposed a station design that integrates closely with bus services, provides high-capacity pedestrian and links to the east and west, and separate high-capacity cycle links to the east and west, linked directly to a large and extendable cycle park. This is achieved by building the station entrance, ticket hall and cycle parking above the platforms, integrated with a rebuilt busway bridge, also serving as a rail–bus interchange. The footprint of the station would lie almost entirely over Network Rail land, and require minimal land take from Hobson's Park.

We understand this configuration was rejected on grounds of cost, complexity and other reasons:

> *A station interface with Addenbrooke's [busway] Bridge was considered at option development stage and not taken forward as it would result in the need to rebuild the whole structure, which would incur considerable cost and disruption from closure, complexity of maintenance, and would cause safety issues related to bridge strength and the mix of pedestrian, cycle and bus traffic in a constrained area at height.*
>
> – NR07 Consultation Report p107

The additional cost would be more than offset by larger user benefits, derived from a realistic forecast of station users, plus quicker and more comfortable transfers between rail and bus. Disruption would be unavoidable, but a temporary bus and cycle diversion via Addenbrooke's Rd and Hobson Ave and, for cycles and pedestrians, Whittle Ave (see Figure 5), would be feasible and not overly burdensome for a few weeks. The supposed complexity of maintenance and safety issues are not explained, and can almost certainly be overcome with an appropriate design and budget. Any concerns about the visual impact may be addressed through the use of sympathetic architecture and landscaping.

We recommend (see Figure 4):

- Build the station ticket hall above the tracks.
- Rebuild the busway bridge connected to, and at the same level as, the station.
- Include a bus station on top of the bridge immediately in front of the main station entrance.
- As part of rebuilding the bridge, widen the non-motorised user path, segregate it for pedestrians and cycles, and separate it from the busway by a buffer strip.
- Locate the cycle park behind (south of) the ticket hall with its own entrance to the station, and connected directly to the cycleway on each side of the bridge.
- Provide parking bays at ground level only for disabled people, railway workers and deliveries.
- Do not provide a taxi rank or private pick-up/drop-off area.

This has the following advantages over the proposed station configuration:

- It accommodates a much high flow of people into and out of the station, and onto and off the platforms.
- The walking distance between bus stops and the station entrance are under 20 metres.
- The furthest walking distance from one end of a 12- or 10-car train to the ticket hall would be half that of the proposed station design, or approximately 120 metres less.
- There is minimal conflict between people walking and cycling to or from the station, as the approach routes are fully segregated from Francis Crick Avenue and the Trumpington busway.
- The junction of the busway and Francis Crick Avenue can be engineered optimally for buses without creating additional conflicts or inconvenience to people walking and cycling.
- The footprint of the station is mostly within the boundary of land owned by Network Rail, with minimal incursion into Hobson's Park.
- The cycle park may be extended relatively inexpensively in the future, entirely above land owned by Network Rail.
- As vehicle access from Francis Crick Avenue would be used only by disabled station users, railway workers and delivery vehicles, there would be minimal conflict with people walking or cycling, and with bus services.
- The single-entrance design requires fewer staff than the proposed two-entrance design.

For all the reasons given above, we believe this option needs to be given serious reconsideration.

Illustrations

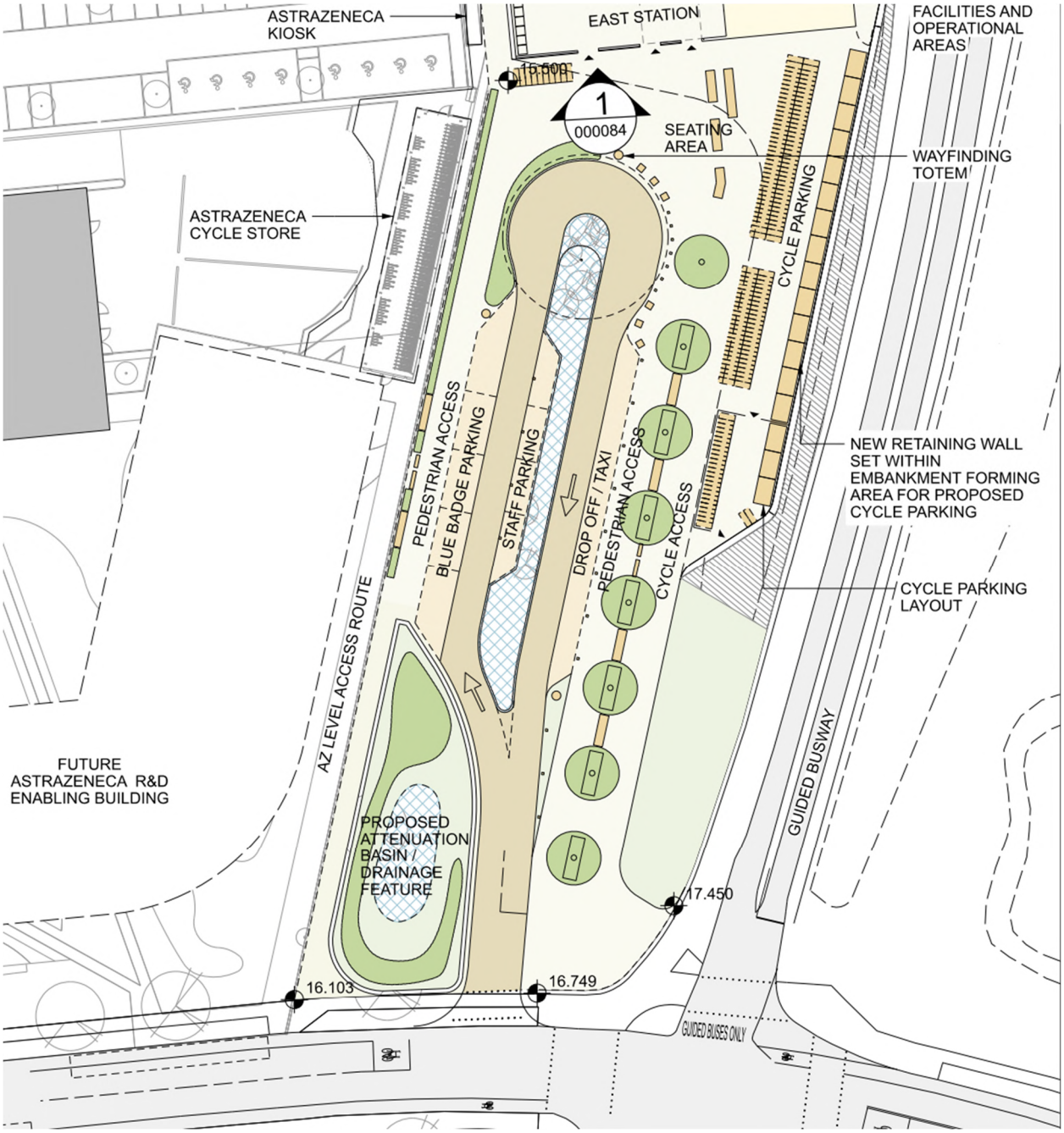

Figure 1: Proposed design for station access junction with Francis Crick Avenue (from NR13 Deemed Planning Drawings)

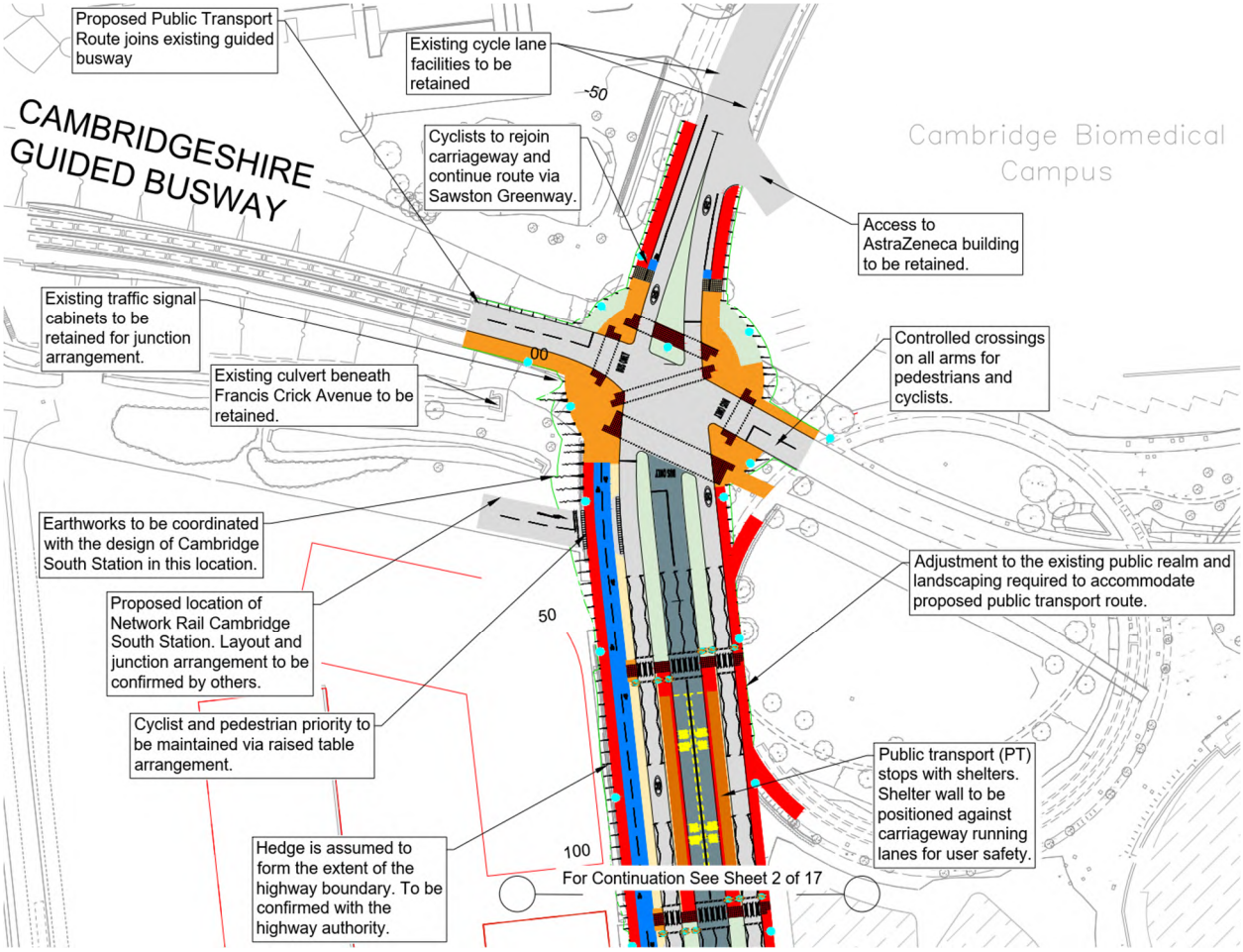

Figure 2: Diagram of busway junction with Francis Crick Avenue (from CSET plan dated 12 Feb 2021)

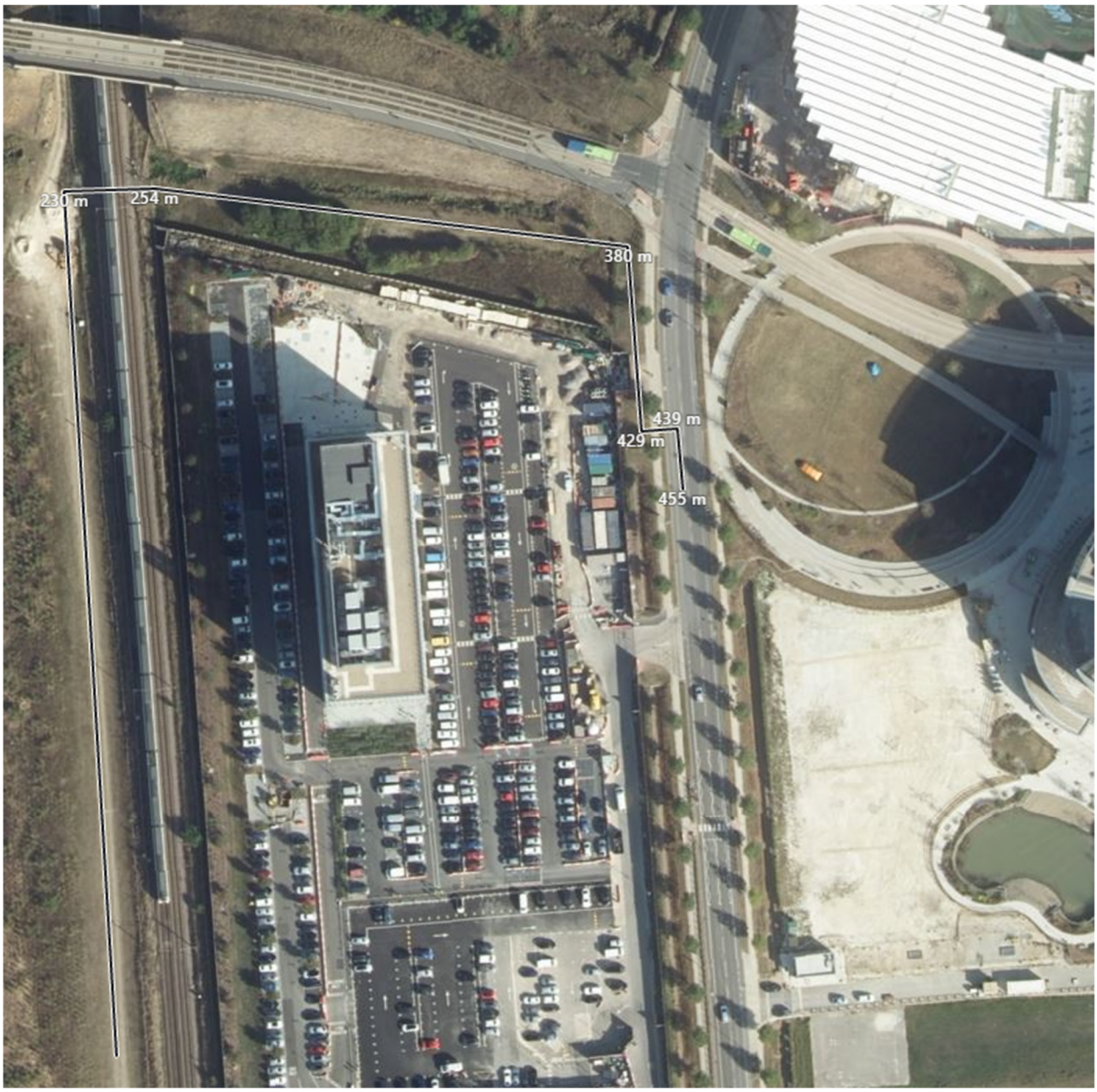

Figure 3: Path showing 450m distance from back end of 12-car train to bus stops on Francis Crick Avenue (aerial image courtesy of Ordnance Survey)

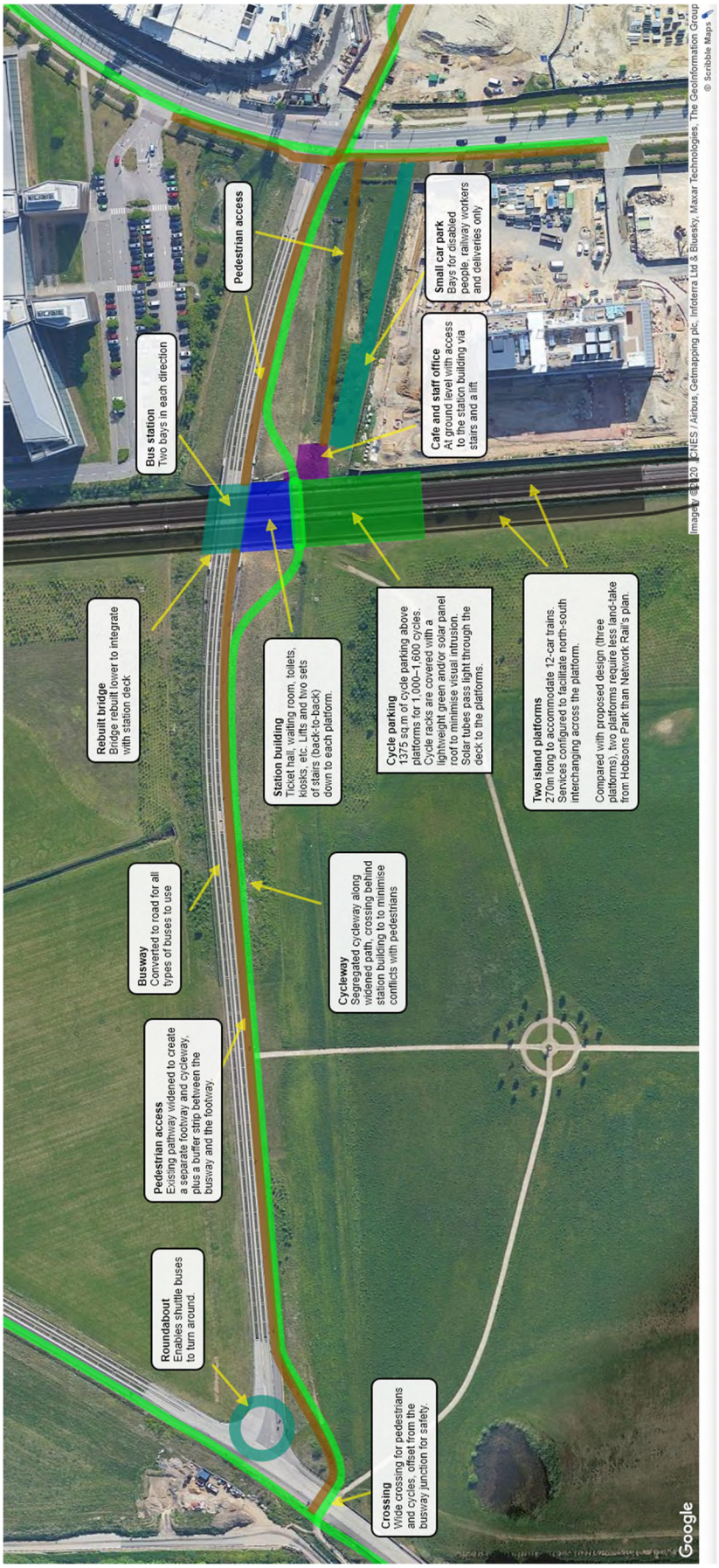

Figure 4: Schematic representation of alternative station configuration and access arrangements

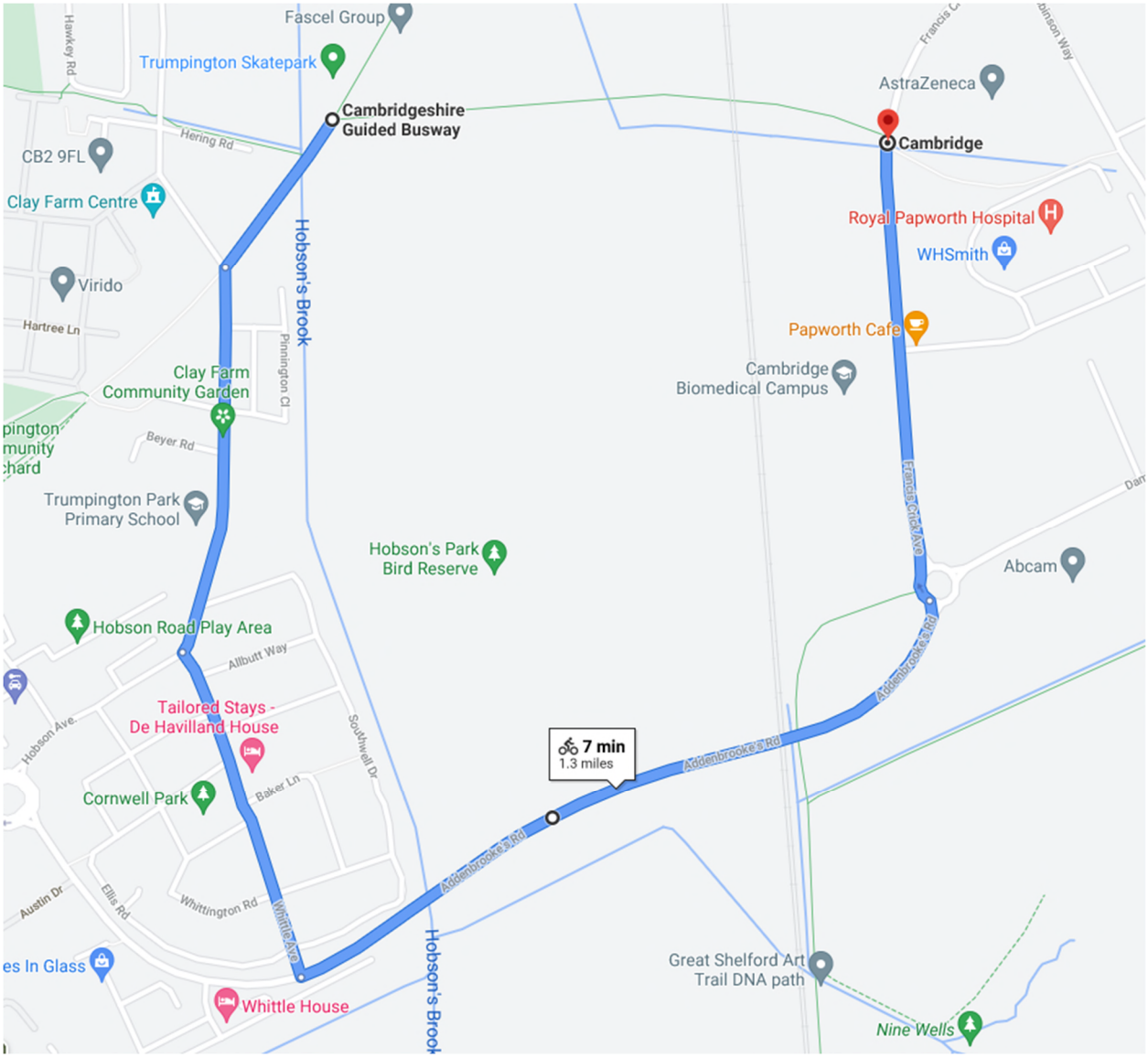

Figure 5: Diversionary route for cycles and pedestrians while the busway bridge is closed. Buses would travel via the Addenbrooke's Rd–Hobson Ave roundabout.