Briefing Note 04

Project:	**Highways England Spatial Planning Arrangement 2016-2020**	Job No:	**60572359/DN052.003**
Subject:	**Norfolk Vanguard Wind Farm - DMRB Technical Review**		
Prepared by:	**Andrew Beard**	Date:	**20 December 2018**
Checked by:	**Andrew Cuthbert**	Date:	**24 December 2018**
Verified by:	**John Alderman**	Date:	**4 January 2019**
Approved by:	**Andrew Cuthbert**	Date:	**4 January 2019**

Executive Summary

Following a DMRB technical review of drawing TP-PB4476-DR014 Rev D0.3, which supersedes drawing PB4476-002 Rev D0.2 submitted alongside the Environmental Statement and supporting documents prepared by Royal Haskoning DHV (RHDHV), in support of the Norfolk Vanguard Wind Farm proposals, AECOM make the following recommendations.

Recommendations regarded as critical to the acceptability of this planning application:

1. Vehicular swept path plots should be provided in support of the proposed A47 Substation Access B junction layout to demonstrate the ability of an articulated vehicle and large tipper (the Design Vehicles) to negotiate all legitimate turning movements at the junction without overrunning kerb or centre lines and extended to include the passage of the design vehicle on the access road where it bends to the east immediately south of the junction (para 4.9);
2. Vehicular swept path plots should be provided for an articulated vehicle and large tipper (the Design Vehicles) to demonstrate that large vehicles which enter the site are able to turn within the site and exit the site onto the A47 in a forward facing direction (para. 4.10);
3. The proposed visibility splay should be reviewed with respect to the need to achieve an 'x' distance of 4.5m on the minor arm in all but exceptionally difficult circumstances, in accordance with TD 42 (para. 7.8) and demonstrated to be deliverable within land in the control of either the applicant or the highway authority (para 4.15);
4. The existing farm track access should be closed and alternative provision be made to access the land via the minor arm of Access B. If this is not possible, swept paths and visibility splays should be illustrated on a further revision of Drawing TP-PB4476-DR014 Rev D0.3 to demonstrate the legitimate use by agricultural vehicles of the proposed new layout. If the farm track access is to be retained then a Relaxation to design standards is likely to be required due to the spacing of the junctions. Suitable justification for this would need to be demonstrated to obtain approval from the Overseeing Organisation. In addition, due to the apparent presence of the crest curve located to the west of the farm access junction, it should be demonstrated that the required visibility can also be achieved in the vertical plane (para. 4.17); and
5. The proposed corner radii should be reviewed in the context of the guidance set out in TD 42 (para. 7.17) with respect to nearside tapers on the major and minor road exits from the junction (para 4.18).

Recommendations regarded as important but not critical to the acceptability of this planning application:

6. Traffic signs and markings in accordance with TD 42, TSM and TSRGD should be demonstrated fully at the detailed design stage (para 4.8).

AECOM recommend that the consultation response from Highways England asserts that the recommendations listed above should be addressed.

Direct Tel: +44 (0)1245 77 1200
E: andrew.beard@aecom.com
www.aecom.com

Saxon House, 27 Duke Street
Chelmsford, CM1 1HT
United Kingdom

1. Introduction

1.1. AECOM, on behalf of Highways England, have undertaken a technical review of drawing TP-PB4476-DR014 Rev D0.3, which supersedes drawing PB4476-002 Rev D0.2 submitted alongside the Environmental Statement (ES) and supporting documents prepared by Royal Haskoning DHV (RHDHV), in support of the Norfolk Vanguard Wind Farm proposals. The drawing illustrates the layout proposed for an additional direct access (Access B) off the A47 to serve the proposed Norfolk Vanguard substation at Necton, to the west of Dereham.

1.2. AECOM have previously reviewed the Environmental Impact Assessment Traffic & Transport Method Statement (TTMS), Preliminary Environmental Information Report (PEIR) and Norfolk Vanguard Substation – A47 Substation Access Review Technical Note (A47 Access TN), each produced by RHDHV. The results of the previous reviews are reported in AECOM BN01 (March 2017), BN02 (December 2017) and BN03 (May 2018).

1.3. This Briefing Note (BN04) will review the layout proposed at the A47 Substation Access B priority junction with a view to determining whether or not the proposed layout is compliant with the requirements of the Design Manual for Roads and Bridges (DMRB).

1.4. For ease of reference, AECOM's main comments and recommendations are presented in bold and underlined text throughout the note. Recommendations regarded as critical to the acceptability of this layout are coloured **red.** Recommendations regarded as important but not critical to the acceptability in principle of this planning application are highlighted in **amber.**

2. Background

2.1. The Norfolk Vanguard Wind Farm itself will be located off the Norfolk Coast. However, electricity generated will access the National Grid at a substation adjacent to the A47 Trunk Road at Necton, to the west of Dereham. As part of the Norfolk Vanguard project, an extension to the existing substation will be required as well as construction of a new onshore substation (at the Necton site) for the Norfolk Vanguard Wind Farm. The substation will be accessed by vehicular traffic via the A47.

2.2. Highways England is the highway authority with respect to the SRN, comprising the A47. Highways England's primary interest will be the impact of traffic generated by the site on the safe and free flow of traffic using the A47.

2.3. RHDHV have previously advised that a secondary access to the Norfolk Vanguard substation site is required to the south of the A47. This is proposed to be 'Access B' which is an existing farm track just north of the Spicers Corner junction. AECOM previously recommended in BN03 that *"Highways England will require scale plans of the proposed Access A/A1 and Access B junction layouts (with dimensions and visibility splays shown) before agreeing to the proposals in principle. Any agreement would also be subject to acceptance by NCC and a Stage 1 Road Safety Audit."*

2.4. Specifically, this DMRB review considers the proposed mitigation presented by RHDHV in drawing no. TP-PB4476-DR014 Rev D0.3 with respect to the proposed A47 Substation Access B Concept Drawing.

2.5. The current access to the development area is a farm track located approximately 16m north of the existing Spicers Corner junction with the A47. The existing access location forms a substandard left-right staggered crossroad junction with Spicers Corner. The proposed Access B comprises a priority T-junction with ghost-island right-turn on the A47, located approximately 50m south-west of Spicers Corner and represents the first point of access to the Strategic Road Network (SRN) from the proposed substation.

3. DMRB Technical Review

3.1. This BN04 represents a technical review of drawing no. TP-PB4476-DR014 Rev D0.3 '*A47 Substation Access B Concept Drawing*' dated October 2018. The review does not constitute a detailed design check of all aspects of the proposals, but is intended to identify aspects of the design which are potential 'show stoppers' and/or aspects which if revised could have an impact upon the predicted junction operation. A site visit has not been undertaken.

3.2. This section provides a technical review of the proposed layout with reference to the Design Manual for Roads and Bridges (DMRB) guidance set out in:

- TD 42/95 – Geometric Design of Major/Minor Priority Junctions (DMRB Volume 6 Section 2 Part 6, January 1995); and
- TD 41/95 – Vehicular Access to All-Purpose Trunk Roads (DMRB Volume 6 Section 2 Part 7, March 1995).

3.3. Reference is also made to TD 9/93 (Highway Link Design) where applicable.

3.4. No evidence has been submitted to demonstrate whether the proposed layouts have been subject to a Stage 1 Road Safety Audit (RSA). This review does not constitute a Road Safety Audit.

3.5. AECOM has not appointed a Principal Designer or considered the associated aspects that would apply within this role. It is recommended that should this scheme proceed a Principal Designer is appointed by the client in accordance with current CDM Regulations.

4. A47 Substation Access B Junction

Introduction

4.1. The current access to the development area is a farm track located approximately 16m north of the existing Spicers Corner junction with the A47. The existing access location forms a substandard left-right staggered crossroad junction with Spicers Corner. The A47 is a two-way single carriageway road subject to the derestricted National Speed Limit of 60mph in the vicinity of the proposed junction.

4.2. The proposed Access B comprises a priority T-junction with ghost-island right-turn on the A47, located approximately 50m south-west of Spicers Corner and forming a right-left staggered junction arrangement.

4.3. This section considers the proposed mitigation measures illustrated on the RHDHV drawing no. TP-PB4476-DR014 Rev D0.3, described by AECOM as follows:

- A47 Substation Access B – A new priority junction on the A47 located approximately 50m south of and forming a staggered arrangement with the existing priority junction with Spicers Corner. Localised kerb and carriageway realignment to accommodate the provision of a ghost-island right-turn lane, central hatching and associated arrow head carriageway markings on the A47.

4.4. Additionally, AECOM have cognisance to the RHDHV tracking drawings TP-PB4476-DR021 Rev D0.1 and TP-PB4476-DR022 Rev D0.1 each dated August 2018.

4.5. This technical review does not consider the question as to whether the proposed mitigation is sufficient to accommodate the predicted increases in traffic flows at the A47 Substation Access B

junction attributed to the Norfolk Vanguard Wind Farm project, but confines itself to the question of whether the layout proposed meets the requirements of the DMRB.

General Principles

4.6. Geometric measurements referenced within this technical note have been obtained from an electronic copy of drawing no. TP-PB4476-DR014 Rev D0.3, which was provided to AECOM by RHDHV on 13 December 2018. Additionally, AECOM have cognisance to the RHDHV tracking drawings TP-PB4476-DR021 Rev D0.1 and TP-PB4476-DR022 Rev D0.1 which were provided to AECOM in .pdf format by RHDHV on 19 December 2019.

4.7. It should be noted that the information presented on drawing no. TP-PB4476-DR014 Rev D0.3 is in two-dimensional form only and therefore a review of the vertical aspects of the proposal has not been undertaken. The vertical aspects could have implications in terms of alignment in both vertical and horizontal planes and also the perceived visibility available and should be provided in due course.

4.8. TD 42 (para. 7.78) identifies that guidance for the appropriate use of traffic signs and road markings at priority junctions is contained in the Traffic Signs Manual (TSM). Additionally the Traffic Signs Regulations and General Directions (TSRGD) should be consulted. Indicative signing and lining illustrated on drawing no. TP-PB4476-DR014 Rev D0.3 appears to be broadly consistent with the guidance set out in TD42, TSM and TSRGD. **AECOM recommend that traffic signs and markings in accordance with TD 42, TSM and TSRGD are demonstrated fully at the detailed design stage.**

4.9. Vehicular swept paths for an 'articulated vehicle' and 'large tipper' are provided in drawing TP-PB4476-DR021 Rev D0.1 and TP-PB4476-DR022 Rev D0.1 respectively. Whilst AECOM note that the swept paths of each of the design vehicles appear to be broadly accommodated within the proposed junction layout, some overrunning of centre lines is shown and the swept paths do not extend along the access road beyond the immediate junction where the carriageway indicatively bends to the east. It is therefore unclear whether the indicated start/end positions for the design vehicle on the minor arm are practicable in consideration of the preceding/onward path of the vehicle on the access road and/or whether any conflicts are likely to occur where two design vehicles seek to access/egress the minor arm of the junction simultaneously. **AECOM recommend that vehicular swept path plots are provided in support of the proposed A47 Substation Access B junction layout to demonstrate the ability of an articulated vehicle and large tipper (the Design Vehicles) to negotiate all legitimate turning movements at the junction without overrunning kerb or centre lines and extended to include the passage of the design vehicle on the access road where it bends to the east immediately south of the junction.**

4.10. An internal layout for the site has not been provided. In order to ensure that vehicles are able to safety exit the site in a forward facing direction such that vehicular traffic is not forced to reverse from the site back onto the A47, **AECOM recommend that vehicular swept path plots are provided for an articulated vehicle and large tipper (the Design Vehicles) to demonstrate that large vehicles which enter the site are able to turn within the site and exit the site onto the A47 in a forward facing direction.**

A47 Substation Access – Ghost Island Priority Junction

4.11. The current access to the development area is an existing farm track located approximately 16m north of and forming a sub-standard left-right staggered junction on the A47 with Spicers Corner. BN03 (para.15) identifies that *"RHDHV recognise that Access B would need to be upgraded to make it DMRB compliant. This would involve creating a new access point to the south of the*

existing farm track to ensure adequate spacing between the Spicer's Corner junction (to the north of the A47) and the new Access B junction". BN03 (para. 16) goes on to state that *"Access B would require widening of the A47 carriageway to accommodate a right turn lane and ghost island and construction of a new bellmouth"*.

4.12. The proposed access illustrated by drawing no. TP-PB4476-DR014 Rev D0.3 comprises a priority T-junction with ghost-island right-turn on the A47, located approximately 50m south-west of Spicers Corner and forming a right-left staggered junction arrangement.

4.13. AECOM are satisfied that a right-left stagger as proposed is preferable to the existing access location left-right stagger and is consistent with the advice set out in TD 42 (para. 2.30). AECOM are also satisfied that the proposed stagger distance of 50m is consistent with the mandatory minimum stagger distance for a right-left stagger ghost island junction as set out in TD 42 (par. 7.64).

4.14. Drawing no. TP-PB4476-DR014 Rev D0.3 illustrates the extent of land required to provide visibility splays of 2.4m x 215m in each direction from the centre line on the minor road. AECOM are satisfied that a DMSSD of 215m is appropriate in this location and is consistent, in principle, with the requirements of TD 9 (Table 3) with respect to forward visibility for the major road right-turn and TD 42 (Table 7/1) with respect to 'y' distance from the Minor Road.

4.15. Drawing no. TP-PB4476-DR014 Rev D0.3 illustrates an 'x' distance of 2.4m on the minor road. TD 42 (para. 7.8) states that *"In difficult circumstances, the 'x' distance may be taken as a relaxation from 9.0m to 4.5m for lightly trafficked simple junctions, and in exceptionally difficult circumstances, to 2.4m back from the nearer edge of the major road running carriageway"*. RHDHV do not appear to justify the 'exceptionally difficult circumstances' warranting a relaxation of 'x' distance to 2.4m. AECOM also note that the illustrated kerb realignment and visibility splays require the removal of a significant length of mature trees and hedgerow vegetation adjacent to the highway. It is unclear whether the land required is currently within the control of the applicant and/or whether the required permissions have been obtained for removal of the hedgerow and trees. **AECOM recommend that the proposed visibility splay is reviewed with respect to the need to achieve an 'x' distance of 4.5m on the minor arm in all but exceptionally difficult circumstances, in accordance with TD 42 (para. 7.8) and demonstrated to be deliverable within land in the control of either the applicant or the highway authority.**

4.16. Whilst not illustrated on drawing no. TP-PB4476-DR014 Rev D0.3, AECOM are satisfied that a Desirable Minimum Stopping Sight Distance (DMSSD) visibility splay of 215m is achievable for right-turning vehicles on the Major Road, subject to the clearance of vegetation from the identified area.

4.17. AECOM note that the existing farm track giving access into the land to be served by proposed Access B is shown as remaining open on Drawing TP-PB4476-DR014 Rev D0.3. Whilst it is evident that this access point is little used (Google streetview shows it as being blocked by a piece of agricultural machinery), the drawing indicates the provision of new kerb lines for the junction. This equates to modification of the existing junction, the modified layout is then required to meet the appropriate design standards. AECOM regard it as undesirable to retain an access point within the overall footprint of the new junction and note that emerging vehicles waiting at the farm track access junction will effectively reduce the visibility to the right for vehicles emerging from the proposed access. TD41 (para. 2.12) states that *"…New direct accesses shall only be sited where they do not encroach on the visibility requirements of adjoining direct accesses or junctions in regular use…"*. **AECOM recommend that the existing farm track access should be closed and alternative provision be made to access the land via the minor arm of Access B. If this is not possible, AECOM recommend that swept paths and visibility splays be illustrated on a further revision of Drawing TP-PB4476-DR014 Rev D0.3 to demonstrate**

the legitimate use by agricultural vehicles of the proposed new layout. If the access is to be retained then a Relaxation to design standards is likely to be required due to the spacing of the junctions. Suitable justification for this would need to be demonstrated to obtain approval from the Overseeing Organisation. In addition, due to the apparent presence of the crest curve located to the west of the farm access junction, it is recommended that it is demonstrated that the required visibility can also be achieved in the vertical plane.

4.18. Drawing no. TP-PB4476-DR014 Rev D0.3 illustrates entry/exit corner radii of 15m on the minor road, with tapers over a distance of circa 30m at a ratio of approximately 1:15 to the major road kerb. AECOM consider that the proposed corner radii fall short of the provision recommended by TD 42 (para. 7.17) which advises that *"Where provision is to be made for large goods vehicles, the recommended circular corner radius is:- c. 15m at ghost island junctions, with tapers of 1:6 over a distance of 30m"*. The standard requires an exit taper into both the major and minor road arms, however an approach taper from the major road is not required. The layout illustrated on Drawing TP-PB4476-DR014 Rev D0.3, does not provide an exit taper into the minor arm and the exit taper illustrated into the major road, whilst of the correct length, is of too narrow an angle. This may be the reason for the over running of centre lines shown on the swept paths referred to above. **AECOM recommend that the proposed corner radii are reviewed in the context of the guidance set out in TD 42 (para. 7.17) with respect to nearside tapers on the major and minor road exits from the junction.**

4.19. AECOM are satisfied that the major road through lane widths proposed are consistent with the guidance set out in TD 42 (para. 7.20) in that they are illustrated to be within the mandatory threshold of between 3.0m and 3.65m wide.

4.20. AECOM are satisfied that the central island taper proposed for the development of the ghost island on the major road is broadly consistent with the guidance contained in TD 42 (para. 7.30, Figure 7/8 and Table 7/3), providing a taper over 104m at a ratio of approximately 1:30 consistent with a design speed of 100kph.

4.21. AECOM are satisfied that the turning length, inclusive of reservoir queuing length, illustrated by drawing no. TP-PB4476-DR014 Rev D0.3 for the ghost island right-turn at 49.5m exceeds the minimum requirement of 10m set out in TD 42 (para. 7.32 and 7.33). AECOM are also satisfied that the direct taper length of 25m (TD 42 para.7.34 and Table 7/4), deceleration length of 80m (TD 42 para. 7.40 and Table 7/5a) and ghost island turning lane width of 3.5m (TD 42 para. 7.40) illustrated by drawing no. TP-PB4476-DR014 Rev D0.3 are each consistent with the guidance set out in TD 42.

4.22. AECOM consider that, in principle, a DMRB compliant junction is likely to be deliverable at this location subject to resolution of the recommendations set out in this BN04.

5. Conclusion

5.1. This Briefing Note (BN04) has been prepared by AECOM, on behalf of Highways England, to provide a DMRB technical review of the mitigation proposed at the A47 Substation Access B junction, illustrated by drawing TP-PB4476-DR014 Rev D0.3 submitted by RHDHV in support of the Norfolk Vanguard Wind Farm proposal.

5.2. This review has identified several issues relating to DMRB compliance. AECOMs recommendations regarding these concerns are highlighted by the use of bold underlined text throughout this document. Recommendations regarded as critical to the acceptability of this layout are coloured **red.** Recommendations regarded as important but not critical to the acceptability of this planning application in principle are highlighted in **amber.**

5.3. AECOM recommend that the consultation response from Highways England asserts that the recommendations listed above should be addressed.