

Dereham Road/Longwater Lane Traffic Signal Improvements and Widening of Dereham Road

Feasibility Study

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Prepared by:-



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1 Background

Norfolk County Council has carried out feasibility work to develop a transport strategy for the Longwater and Easton area of Norwich. The strategy will aim to address the future network performance issues that will arise from the planned significant development in the area as set out in the adopted Joint Core Strategy for greater Norwich (JCS) and the emerging South Norfolk Local Plan.

The overall strategy includes three key strategy options and a number of common strategy elements which can be progressed in the meantime. A project brief has been prepared for a feasibility study to consider two common strategies including:

- Longwater Lane Traffic Signals Improvement
- A1074 Dereham Road widening (mid/east section) - Two lanes in each direction from the recently built Lodge Farm development access to Longwater Lane

This report has been prepared in response to the revised project brief, issued by the County Council in March 2015.

A copy of the Project Brief is included in Appendix A, which lists all the strategy elements.

2 Existing Situation

2.1.1 The site is on the western fringe of Norwich, within the Costessey Parish of South Norfolk. The location of this site can be seen on Drawing No. PK5090-FEA-001, which is included in Appendix B.

2.1.2 A1074 Dereham Road is the main route between the Norwich city centre and the west. With the high traffic volume, the Longwater Lane junction has already experienced congestion for a number of years. Merge problems occur on the exits along Dereham Road in both the Norwich bound and Dereham bound directions.

With the planned significant housing development in the area, the predicted increase in traffic demand will lead to severe congestion, long queues and delays to the traffic, if no measures are made to either increase the capacity or reduce the traffic demand.

2.1.3 The planned Lodge Farm housing development is underway to the south of Dereham Road. Its associated highway works has been recently built. The main vehicular access to the proposed development is off Dereham Road in the form of a signalised junction incorporating a staggered toucan crossing. As part of the works, Dereham Road has been widened into two lanes in each direction between the main access and the Longwater Interchange.

The speed limit along the entire section of Dereham Road between Longwater Interchange and Longwater Lane has been changed to 40 mph, to improve the environment for pedestrians and cyclists crossing the road and using the shared use path along it. The new speed limit order has come into force since June 2015.

2.1.4 The study length of the section of Dereham Road is approximately 880m, including 700m long section to the west of the Longwater Lane junction and 180m long to the east of the junction. The proposed road widening will be mainly for the west section, and therefore this section will be referred to as Dereham Road main section for the purpose of this report.

2.1.5 The single carriageway currently has one lane in each direction and has an average width of 8m. Along the main section there is a 3m wide shared use footway/cycleway along the north side of the road with a large densely wooded area behind. On the south side there are residential properties screened behind tree belts with a grass verge next to the carriageway.

- 2.1.6 The main section on Dereham Road has been divided into three sections due to the different road profiles.

Section 1 is between the gas substation access and the high pressure gas main location. The road along this section has a superelevation with the low points on the south side. There is a grass verge with a ditch running in parallel with the road.

Section 2 is between the high pressure gas pipeline and a private emergency access on the north side which is 70m eastwards from the Lord Nelson Drive junction. This section is superelevated towards the south side. Kerbs are present on both sides along this section.

Between the emergency access and the Longwater Lane junction is Section 3, which has a central camber with kerbs installed on both sides.

- 2.1.7 This site is not within a Conservation Area. However the tree belts along both sides of the Dereham Road main section are well established. The trees on the south side also provide major screening to the local properties.



Photo 2.1 Looking eastwards on Dereham Road

3 Junction Improvement Options Assessment

3.1 Options Assessment by LinSig

Two options for the Longwater Lane/Dereham Road junction have been submitted by Mott MacDonald as part of the Longwater and Easton Transport Strategy.

Option 1 – Two lanes on Longwater Lane:

- Two exit lanes on Dereham Road of 100m in both the eastbound and westbound directions.
- Longwater Lane approach - two lanes of 100m with both lanes allowed to turn right.
- The length of the flare on the offside lane on Bawburgh Lane increased to 40m.
- The length of the right turn lane on Dereham Road westbound increased from 36m to 40m.

Option 2: - Three lanes on Longwater Lane:

- As Option 1 with an additional 60m flare lane added to the Longwater Lane for left and ahead traffic.

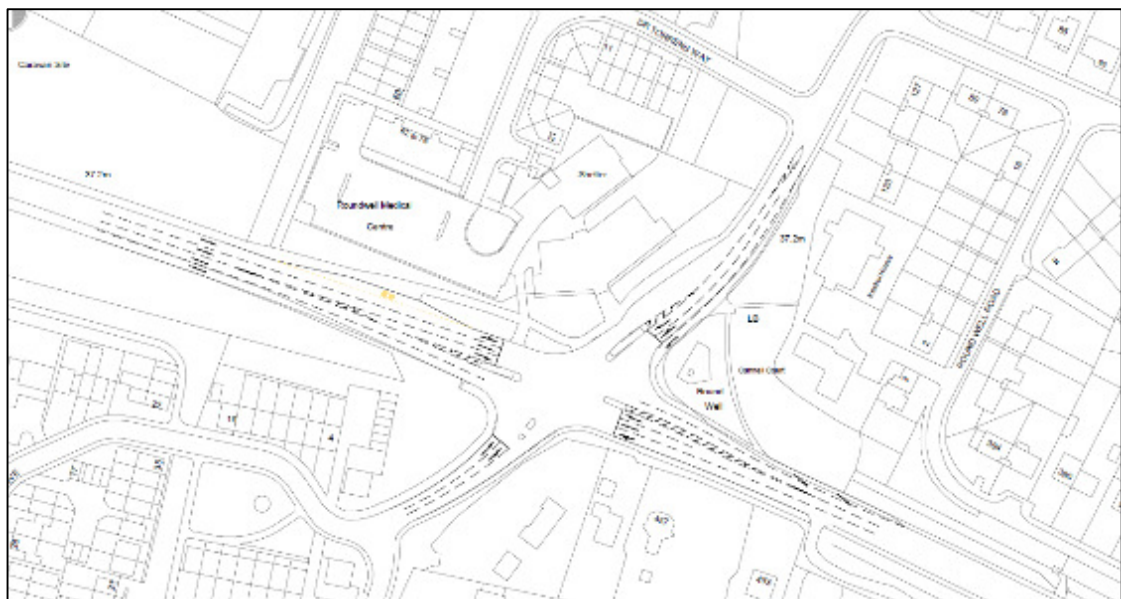


Figure 3.1 Option 2 plan from Mott MacDonald Longwater and Easton Transport Strategy
Feasibility Study

Junction modelling tool LinSig has been used to assess the current situation, the two options by Mott MacDonald and recommendation to improvements for the Longwater Lane Junction. The traffic flows used in the models were derived from a traffic count in 2011 and factored accordingly for 2013 and 2026 flows.

A new model was produced to reflect more realistic proposed modifications. The new model includes all of the proposed measures in Option 1, with the exception that the right turn lane of Longwater Lane was retained as 60m long due to the presence of a pedestrian refuge at this location. The new model will be referred to New Option for the purpose of this report. All the recommendations have been checked and tracked with CAD drawings.

A LinSig Analysis Report is included in Appendix C, showing the full details of the models built and the modelling results for different scenarios – 2013, 2026 reduced Food Hub and 2026 full Food Hub. The Food Hub refers to a potential development in the west of Easton in line with the JCS.

3.1.1 Existing Layout and Operation

The modelling results suggested that the current junction was operating over the capacity for both peak periods, with the predicted longest queues on Dereham Road eastbound lane and Longwater Lane offside lane.

A scheme is essential to improve the overall capacity of the signal junction and Dereham Road.

3.1.2 Longwater Lane Approach - Option 1 & 2 Layout

There is currently only one lane turning right from Longwater Lane. A LinSig assessment has been carried out and showed that by allowing right turning vehicles to use two lanes would give further capacity, and the junction could perform within capacity. This will require the two westbound exit lanes are available on the Dereham Road.

Assessment on Option 2 has also been carried out to investigate the need for providing a third lane on Longwater Lane. The results predicted that the improvement gained by the additional flare lane was not significant in the AM peak period models, and was only noticeable in the PM peak for the 2026 models.

Norfolk County Council's Network Management Team do not want to attract further use of the Longwater Lane route for strategic River Wensum crossing traffic. Providing three lanes on this approach may send wrong messages to the public. In addition there will be

associated road widening works required for the additional flared lane with a potential small extent of utilities diversionary works. Therefore it is recommended that Option 2 with three lanes on Longwater Lane is not to be considered.

Meanwhile the requirement of discouraging use of Longwater Lane can be further achieved by amending the signal timings, which will relocate some queuing traffic from Dereham Road eastbound onto Longwater Lane.

3.1.3 New Option Layout

It is found that the proposed layout would only cope with the AM peak traffic in the reduced hub scenario. But it produced better results for both reduced and full hub scenarios comparing to the existing operation for the AM peak periods. For the PM peak, both scenarios modelled predicted worse results when compared to the current operation.

The predicted traffic demand indicated that the biggest increases in traffic volumes would be: Dereham Road west to east, Dereham Road east to west, and Longwater Lane to Dereham west.

Having reviewed the proposed modifications to the road network, it approved that the works proposed on Bawburgh Lane and Dereham Road westbound right turn do not provide any additional capacity to the junction.

Modifications to the Dereham Road approaches should be considered as this will give additional capacity at the junction immediately. It will require road widening works on both exit lanes on Dereham Road. The proposed modification on Longwater Lane approach can only be achieved if two full exit lanes are provided on the Dereham Road westbound exit.

3.2 Considerations on Junction Configuration

In conjunction with the proposed changes, MOVA can be adopted to allow a more responsive control method to optimise the traffic flows depending on real time traffic.

Dereham Road is the proposed Bus Rapid Transit (BRT) corridor which forms part of the Norwich Area Transportation Strategy (NATS). Priority for buses would be essential at the junction and will be included in the MOVA at the junction.

As stated above, further changes on signal timings can be made to make Longwater Lane less attractive.

3.3 Conclusion and Recommendation

Based on the modelling results, the existing junction is currently operating with negative capacity. By 2026, the traffic conditions will be worse with long queues and delays predicted at the junction.

The following changes have been recommended:

- Two exit lanes provided on Dereham Road of approximately 100m in both the eastbound and westbound directions.
- Longwater Lane approach – existing two lanes both allowed to turn right.
- Revalidation of the MOVA control strategy with bus priority at the signal junction

Though the proposed layout are still not able to cope with the future traffic demand, it will improve the current network performance with additional capacity created at the junction. A new link road/slip road as part of the key strategy options will help with the road network situation further.

4 Road Widening Options Considered

- 4.0.1 It is proposed that Dereham Road is widened into two lanes in each direction between the recently built Lodge Farm access and Longwater Lane. This is in line with the junction improvement scheme, which requires two westbound exit lanes approximately 100 metres in length on Dereham Road.

Following the road widening, Dereham Road main section will become a four-lane single carriageway road with 3m wide traffic lanes, subject to a 40mph speed limit. Three options have been considered along the main section.

Option 1 is widening into the south side of the road only; Option 2 is mainly widening into the north side; and Option 3 is widening from the south side near the Lodge Farm development and gradually tapers into the north side of the road near the Longwater Lane junction.

- 4.0.2 Road widening works will also be required to the east of the Longwater Lane junction, to provide the 100 metres long two eastbound exit lanes as part of the junction improvement scheme. Only one layout has been proposed for the east section.

- 4.0.3 The proposed four-lane single carriageway will meet the geometric requirements of the Design Manual for Roads and Bridges (DMRB) TD9/93, using 70kph as the design speed.

To avoid any civils works at the Longwater Lane junction itself, the existing alignment through the junction will be retained which has been a departure from the standard. The horizontal alignment has radii of 340m, 475m respectively for westbound and eastbound.

4.1 Option 1 – South Widening

4.1.1 Option 1 Layout

A preliminary layout has been developed for Option 1 and is shown on Drawing No. PK5090-FEA-101 (see Appendix B).

The road widening starts from where the intermediate pressure gas pipeline is located, next to the existing Lodge Farm gas substation access. The road is widening into the south by 5m in average, following a proposed alignment with a minimum radius of 1020m.

The right turn lane into the Travellers site needs to be removed, to make the road space available to the four traffic lanes.

Double white lines will be provided along the road centre, to separate opposing traffic. White studs will be installed between the lines according to the Traffic Signs Regulations and General Directions 2010 (TSRGD).

4.1.2 Lord Nelson Drive Junction

Between the recently built major access to the Lodge Farm development and Longwater Lane, there is an existing junction with Lord Nelson Drive along Dereham Road. This junction is formed with a left in left out access to/from Lord Nelson Drive and a traffic island in the road centre. An existing single stage toucan crossing is provided through the central island.

By widening the road, the left in left out access and the central island will be moved accordingly. The existing toucan crossing will be kept but changed to a staggered crossing as the carriageway will be 15m wide at this location. MOVA can be introduced at the signal crossing to optimise traffic flows.

As the junction is the major access to the housing development, there is no proposal to upgrade this junction given the anticipated traffic flows. However this access is expected to receive a wide variation in turning movements so the junction is checked to cater for a 16.5m long articulated vehicle.

4.1.3 Cross Sections

The carriageway cross section would be 12 metres wide as minimum. No changes will be made on the north side of the road.

On the south side, a 2m wide verge would be provided as the service strip along the road. A further strip of land would be required for the proposed drainage features next to the grass verge. The widths required would be 5m for Section 1, and 3m for both Section 2 and Section 3.

4.1.4 Pavement Proposals

There is no ground investigation carried out for the study area. At this stage it is assumed that the conditions at this location are similar to the west end of Dereham Road which is 500m away.

The proposed pavement structure for the new carriageway would be 530mm thick in total for a CBR value of 2.5%. Some extents of the existing carriageway will need to be resurfaced to adjust the road profile. High friction surfacing needs to be installed 50m prior to all stop-lines.

Pavement design can be confirmed with further ground investigation during the detailed design stage.

4.2 Option 2 – North Widening

4.2.1 Option 2 Layout

A preliminary layout has been developed for Option 2 and is shown on Drawing No. PK5090-FEA-201 (see Appendix B).

The road is widening into the north by 6m in average to the west of the Travellers site, and 3m in average to the east of the site access. The proposed alignment has a minimum radius of 750m where a superelevation occurs.

The right turn lane into the Travellers site needs to be removed. The size of the site access is to be maintained.

Though this option is mainly widening into the north side, a 50m long section on the south side near the Longwater Lane junction will have to be realigned as the current radius is only 200m. This short section needs to be widened by 0.8m to achieve an 820m radius. This is a departure in horizontal curvature from the DMRB. To avoid any further land take and associated impact on the trees and surrounding land owners, it is considered that the departure would be acceptable given it is sited in a built-up area.

4.2.2 Lord Nelson Drive Junction

The left in left out access will be maintained.

The central island will be moved accordingly with a staggered crossing to be introduced to replace the existing single stage crossing. The signal crossing will use MOVA as the control method.

4.2.3 Cross Sections

The carriageway cross section would be 12 metres wide as minimum.

The existing 3m wide shared use footway/cycleway will be moved accordingly with the road widening. An embankment is needed as there will be a level difference between the shared use facility surface and the existing ground level on the woodland side. The maximum level difference is about 2.5m. It is considered that the embankment will be formed at 1:2. Steeper side slopes maybe created if there are any difficulties to reach an agreement with the land owners. Further ground investigations are required to find out if there is any expected settlement of the embankment.

On the south side, a strip of land would be required to fit in the proposed drainage feature in Section 1. It is considered that the proposed drainage features can be installed within the existing highway boundary in Section 2 and Section 3.

4.2.4 Pavement Proposals

Arrangements are the same as Option 1.

4.3 Option 3 – Widening on both sides

4.3.1 Option 3 Layout

A preliminary layout has been developed for Option 3 and is shown on Drawing No. PK5090-FEA-301 (see Appendix B).

The right turn lane into the Travellers site also needs to be removed.

Similar to Option 2, a short section on the south side close to the Longwater Lane junction needs to be realigned to achieve an 820m radius.

4.3.2 Lord Nelson Drive Junction

Arrangements are the same as Option 1.

4.3.3 Cross Sections

The cross section details would be similar to Option 1 in Section 1 and Section 2, and similar to Option 2 in Section 3.

4.3.4 Pavement Proposals

Arrangements are the same as Option 1.

4.4 East Section Proposals

4.4.1 Proposed Layout

A preliminary layout has been developed for the east section. The layout would be the same for all different options and is shown on the option layout plans (see Appendix C).

Two exit lanes are provided for a length of 120m before merging into a single lane. The lane width starts with 3m and gradually reduces to 2.5m. As a result, the carriageway needs to be widened into the north side by 2m in average.

4.4.2 Pavement Proposals

Arrangements are the same as Option 1.

4.5 Legal Implications

The only existing Traffic Order along this section on Dereham Road is the 40mph speed limit order which has been in force since June 2015.

Following the road widening works, it is proposed to introduce a no stopping except buses clearway restriction indicated by the right signage along Dereham Road, to prohibit waiting and loading along this section.

5 Provisions for Pedestrians/Cyclists

5.1 Existing Facilities

The existing pedestrians/cyclists facilities along Dereham Road and at the Dereham Road/Longwater Lane junction will be maintained.

5.1.1 Main Section on Dereham Road

There is an existing 3m wide shared use footway/cycleway along the north side of Dereham Road between William Frost Way and the Longwater Lane junction, which should be retained.

The existing toucan crossing at the Lord Nelson Drive junction will be kept but changed into a staggered crossing due to the proposed road widening. There is a short section of shared use facility on the south side of Dereham Road, which continues along the east side of Lord Nelson Drive towards the housing development.

5.1.2 Longwater Lane Junction and Eastern Section

There are two existing toucan crossings at the junction, one at Dereham Road eastbound approach, one at Longwater Lane approach. There is a non-signalised crossing point formed by dropped kerbs, tactile pavings and a refuge island on the Bawburgh Lane approach. No crossing facilities are present on Dereham Road westbound approach.

Further shared use facility is present on the Bawburgh Lane leading to the housing development, which links the existing toucan crossing on the west arm of the junction.

The existing shared use footway/cycleway along Dereham Road main section finishes at the toucan crossing on Longwater Lane. On the east side of Longwater Lane, there is a short length of shared use facility in front of the Round Well between the toucan crossing and an informal trod leading to the Cannell Court car park (See Photo 5.1, 5.2).

The section between Longwater Lane junction and the next junction eastwards with Richmond Road is about 560m in length. There is an existing 80m long shared use footway/cycleway towards the east end of the section (See Photo 5.3). 480m long

footway/footpath is in place between the shared use facility and Longwater Lane junction, which means there is a missing link for cyclists for this distance.



Photo 5.1 End of the existing shared use facility around the Round Well



Photo 5.2 Cannell Court car park driveway linking between the informal trod and Round Well Road



Photo 5.3 Existing shared use facility close to the Richmond Road junction

From the existing cycle route available, it is felt that the original intention was to encourage cyclists to travel through the informal trod and continue on the Round Well Road. Round Well Road is an unclassified road with 30mph speed limit which only serves the local residents (See Photo 5.4). However the trod is not formalised with no proper finished surface, and no Public Right of Way is found along it (See Photo 5.5).



Photo 5.4 Round Well Road



Photo 5.5 Informal trod linking between Longwater Lane and Cannell Court

5.2 Recommended Cycling Infrastructure Scheme

A meeting was held with Jon Barnard, the County Council NDR / NATS Manager, to discuss the surrounding cycle network. It was felt that the most direct route for cyclists travelling between the Longwater area developments and the Norwich city would be via Dereham Road.

Therefore it would be beneficial if a shared use facility could be provided along the missing link to tie in to the existing shared use facility in front of Property No. 308 Dereham Road.

150m long 3m wide shared use facility can be provided as part of the road widening works at the east arm of the Longwater Lane junction.

Two options have been considered beyond the road widening point. Proposed layouts are shown on Drawing No. PK5090-FEA-401 (see Appendix B).

5.2.1 Option 1

There is an existing footbridge/culvert crossing the open ditch running in parallel with the footway (See Photo 5.6). The proposed cycle route will be through the footbridge, continue on Well Round Road and join back to the existing shared use facility in front of Property No. 308 Dereham Road (See Photo 5.7). It is considered suitable to provide an on-carriageway cycle route on Round Well Road given the expected traffic volume and its speed limit. There are also existing street lighting columns along the road.

A culvert inspection has been undertaken by the NCC bridge team. It identified that both headwalls would need to be rebuilt to facilitate the shared pedestrian/cycleway use. The parapet fences will also need to be replaced along the footbridge. The upgrade works would cost approximately £5,000.

Following a site inspection and discussions with the Highway Engineer in this area, it is found that fly tipping is a regular issue around the open ditches at this location. It is optional to replace the ditches with soakaways so that the issues can be resolved and the footbridge would be no longer required.



Photo 5.6 Existing footbridge/culvert



Photo 5.7 Existing footpath linking to the shared use facility

5.2.2 Option 2

The existing footway next to the carriageway is to be widened and converted to a shared use facility for a length of 330m approximately.

Due to the presence of trees at the back of the footway, there will be pinch points along the route. Existing kerbs will be raised to 125mm upstand with a crossfall towards the road to minimise any excavation around the tree roots areas. However excavations under tree crowns are still expected at some locations.

5.2.3 Legal Implications

If the recommended cycling infrastructure scheme is taken forward, a footway to shared use footway/cycleway conversion notice needs to be made on the existing footways.



Photo 6.1 Existing bus stop on south side of Dereham Road

The Dereham bound bus stop between Lord Nelson Drive and Longwater Lane is only formed by a bus stop flag attached on a lighting column (See Photo 6.1). Neither hard standing surface nor high upstand kerbs are in place. The accessibility to the stop is also poor as there is only an informal narrow trod passing the trees leading to the footway in the housing area.

6.2 Proposed Actions/Works

The important destinations within the study area are the Roundwell Medical Centre and the housing areas to the south side of Dereham Road. For pedestrians going to the medical centre, the walking distance is shorter to use the pair of bus stops to the east side the Longwater Lane junction. As a one way terminal loop by most services is likely to be formed within the housing areas, the usage of the bus stop mentioned above (south side of

Dereham Road between Longwater Lane junction and the Lodge Farm access) is considered to be minimum with the expected service alterations. Further discussions with NCC and bus operator should be held to decide if the bus stop is still needed at the location.

Subject to the further discussions, the bus stop can be either kept in place temporarily and removed in the future, or improved to a DDA compliant bus stop.

If the bus stop is kept it would remain at its current location. It cannot be moved next to the proposed shared use facility to the east side of Lord Nelson Drive, as it would be sited on the entry side of the toucan crossing and introduce safety hazards.

A bus stop lay-by is not proposed due to the numbers of the utilities within the existing grass verge and the impact on the surrounding trees. A lay-by will also increase delays for buses leaving the stop.

Improvement works would be recommended on the bus stop which shall include installing hardstanding surface area, bar-faced paving and 150mm upstand kerbs to NCC standards.

7 Drainage Proposals

7.1 Existing situation

There is no positive drainage system within the study area. A few soakways were found during the site inspection.

The Longwater Lane junction suffered repeated flooding particularly in the bus stop area. Historical drainage issues has been found along Bawburgh Lane and Lord Nelson Drive from the junction as well. There have been several previous attempts by the developers to rectify the situation without success.

With the road widening scheme, the catchment area would be increased significantly. Therefore additional drainage features will be required accordingly.

7.2 Design Methodology and Assumptions

There is no drainage survey information available at this stage. Therefore the current drainage network cannot be assessed and a drainage design cannot be properly carried out.

The preliminary design is based on the assumption that the current system works up to its full capacity and new isolated drainage features need to be introduced for the additional catchment area. This methodology adopted in the feasibility study should give a good indication of the required provision of the drainage network, given the existing flooding issues within this area.

Initial design for both soakaways and aquacells have been carried out for a 10 years 15 minutes event rainfall according to the Digest 365. MicroDrainage has been used to inform the soakage ditch design for a 1 in 30 year event, and check against a 1 in 100 year event.

The initial design is based on the infiltration rates obtained at various locations along the south side of Dereham Road. Further infiltration tests and ground water level would be required at the detail design stage.

7.3 Initial Drainage Proposals

The choices of the drainage features will be between ditches, soakaways and aquacells. Eventually it can be a combination of the different features to minimise the land-take and the impact on the trees.

The potential drainage layouts with all available options are shown on the layout plans.

7.3.1 Section 1

Comparing to soakaways and aquacells, ditches are relevantly easier to maintain. However due to its large footprint, ditches will only be considered in Section 1 where there is an existing ditch running in parallel with the carriageway without trees adjacent to it.

There are no kerbs next to the carriageway so the water will flow free to the grass verge area and to the ditch. With the increased catchment area, the existing ditch will be relocated or reprofiled for different options.

The proposed profile of the ditch is 0.75m deep, with 1 in 2.5 side slopes and base width of 1.4m. The ditch is wider than deep to minimise any safety risks. The length of the ditch is limited due to the presence of the high pressure gas pipeline and the intermediate pressure gas main at either end.

Alternatively soakways or aquacells can be installed in this section subject to the infiltration capacity, with the complete removal of the existing ditch. A combined kerb and drainage system will need to be installed to collect the surface water.

7.3.2 Section 2

For all options further drainage features will be required on the south side of the road. Soakaways and aquacells are the available options.

7.3.3 Section 3

Additional drainage features are needed on the southern side for Option 1 and on the northern side for Option 2 and 3.

Given the maintenance issues and the larger footprint required with aquacells, soakaways would be the preferred option. The soakaway option will also free up some land and offer opportunities for tree planting comparing to the open ditch.

8 Preliminary Utilities Assessment

8.1 Existing Utility Networks

8.1.0 The extent of existing utility networks, within the study area, has been established from the following sources:

- Record drawings obtained from all Statutory Utility undertakers in the area;
- Trial holes were undertaken as part of the Lodge Farm development Phase 1 works around a High Pressure gas main within this area, which provides further detail of existing services in the vicinity of the gas main.

These sources of information have been used as a basis for the assessment of utility impacts and proposals.

There are existing BT fibre routes, electricity cables, Virgin Media ducts, Vodafone ducts and street lighting ducts under the existing shared use footway/cycleway on the north side, parallel to Dereham Road.

Existing BT fibre routes, electricity cables, Virgin Media ducts and street lighting ducts are under the existing grass verge next to the carriageway along the south side of Dereham Road.

8.1.2 There is no record of any drainage sewers in the study area from Anglian Water.

There are Anglian Water potable water mains near the Longwater Lane junction and along the north side of Dereham Road to the east of the junction.

8.1.3 A high pressure gas pipeline owned by National Grid currently passes across Dereham Road south to north.

Previous road widening works as part of the Lodge Farm development stops at the location 14m west of the high pressure gas pipe, as a proximity distance for major works near high pressure gas pipelines is required by HSE.

An intermediate pressure gas main crosses south half of the road next to the existing gas substation.

- 8.1.4 There is a government fuel pipeline running underneath Dereham Road to the west of the Longwater Lane junction.

This pipeline is in the process of being made redundant and will be completely unused. This process is likely to take approximately 6-8 weeks. Once redundant no consultation would be required. If the pipe is cut it will need to be capped off. Permission was given to use pipe for ducting if required.

8.2 Required Gas Diversion Works (National Grid)

- 8.2.0 The high pressure gas pipe is a heavy wall steel pipe. It is confirmed by National Grid that any widening would require a diversion rather than protection.

Following the widening works, the road would become a High Density Traffic Route under the code. High Pressure Gas Pipelines under a High Density Traffic Route have to be designed to a lower stress factor than pipelines which run across country or minor roads. This is also the case with population density. Hence under these sections of roads the pipeline has to be replaced with pipe of a greater wall thickness.

- 8.2.1 The high pressure gas pipeline diversion works is highlighted in the separate section as it does not fall within the standard NRSWA C3 procedure. Preliminary consultations with National Grid was held as part of the feasibility study. A suggested diversion sketch, a high level cost estimate and anticipated duration have been provided by National Grid.

To carry out feasibility/conceptual design the cost is approximately £30,000 to £40,000. This has to be paid up front of any works and takes up to 3 to 4 months.

The suggested diversion plan is shown in Figure 8.1, which is drafted by National Grid.

- 8.2.2 For all options land on the north side for at least 15m long would be needed for the diversion works. National Grid has no powers to acquire/use the land for this case therefore NCC will need to provide the land.

8.2.3 A 30m wide by 90m long tree clearing corridor on the north side of the road is required for the diversion for all options. A sketch from National Grid is shown in Figure 8.2. This corridor is required during diversionary works for the pipeline installation.

According to National Grid's tree planting restriction on pipelines, a permanent tree clearing corridor would still be required along the pipeline. Depending on the type of trees surrounding, the width of the corridor will vary from 4m up to 20m.



Figure 8.1 Suggested Diversion in red (approx. 100m). Note this will potentially include a 324mm and 114mm tee and three way stopples and bypass

- 8.2.4 The high pressure pipe will be diverted under an 18 months programme with an indicative cost of £1.2 million.
- 8.2.5 This part of the network is one-way fed from the south and therefore it cannot be isolated and back-fed. Bypasses would need to be used to maintain supplies to downstream stations at Costessey, Drayton (including an Industrial direct connect) and Lodge Farm Longwater.
- 8.2.6 There is no anticipation from National Grid that diversion of the intermediate pressure gas main would be required to facilitate the proposed road widening. Works near the IP main will require hand dig only and National Grid's site supervision.

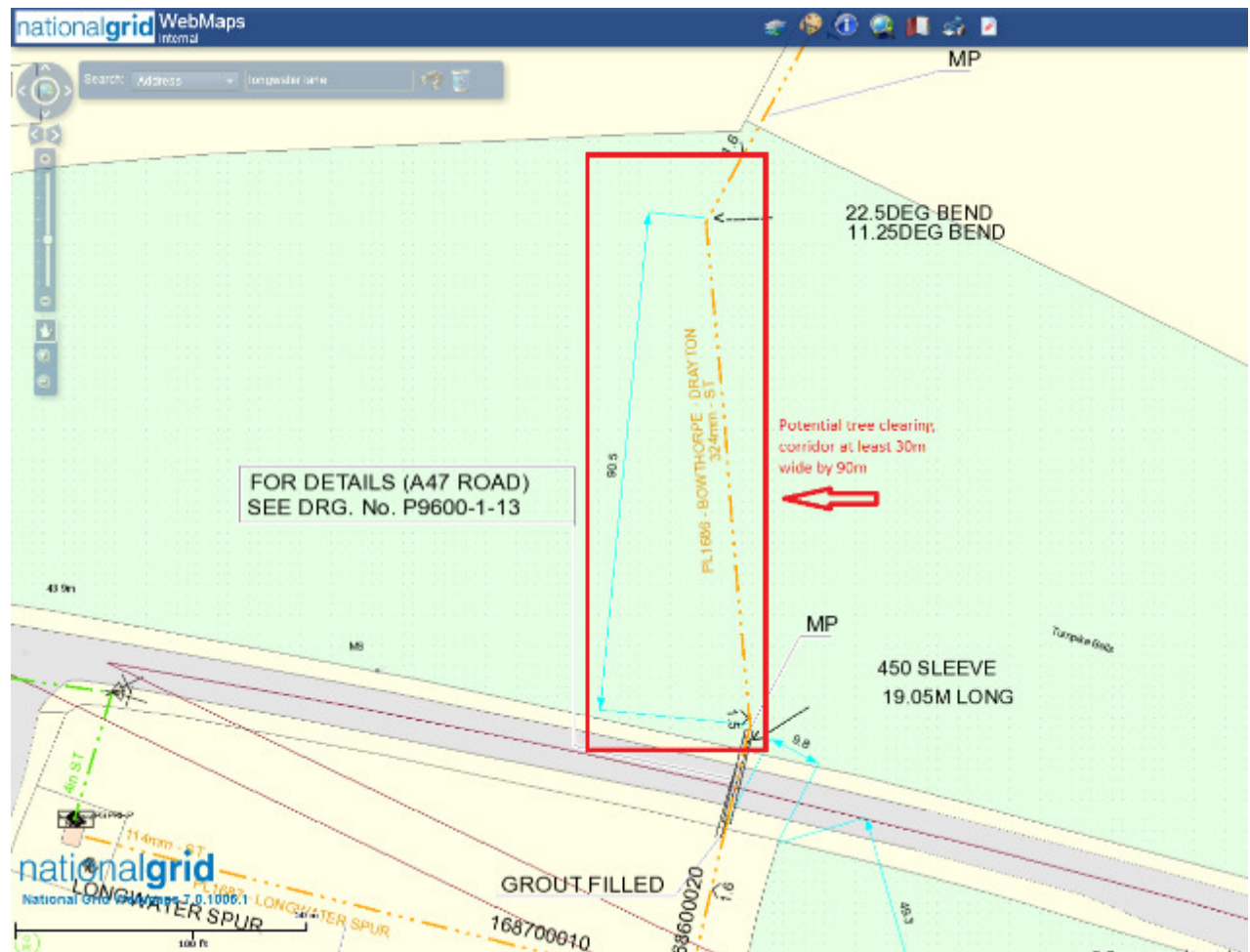


Figure 8.2 Potential 30m wide 90m long corridor of tree clearing

8.3 Other Required Utility Works

Budget estimates as the NRSWA C3 procedure have been requested and obtained from the Undertakers. The preliminary estimates for different options and the anticipated duration of works is summarised and shown in a table in Appendix D.

The cost for the utility diversions are similar for Option 1 and Option 3. Option 3 is more expensive as it involves both sides of the road. The major difference between Option 1 and Option 2 is due to the cost of the BT route diversion.

Below paragraphs would explain the impacts of the proposed development on existing utility networks, and the requirement for diversion or protection works that are identified at this stage. Further exploratory trial holes need to be carried out to check the existing utility details at the detail design stage.

8.3.1 BT (Openreach)

The BT fibre route will need to be diverted to enable the road widening works for all three options.

Due to the larger numbers of ducts present along the south side, widening into the south side would be significantly more expensive for the diversionary works.

Alterations are also required to the east of the Longwater Lane junction including lowering the existing duct routes and rebuilding a manhole outside property No. 380.

8.3.2 Electricity (UK Power Networks)

Modifications to the existing underground cables need to be made as part of the road widening works.

4 numbers of HV and one LV cables would be diverted if the road is widened into the south side.

3 numbers of HV cables need to be diverted if the road widening is along the north side. Therefore the cost estimates for Option 2 (northern widening) would be relevantly cheaper than Option 1 (southern widening).

8.3.3 Potable Water (Anglian Water)

Some of the existing valves and hydrants which are currently in the footpath will be in the new carriageway and the chambers and covers will need to be adjusted.

There is also an existing Fire Hydrant which is currently in the footpath which will become in the carriageway, Norfolk Fire Service normally will require these to be relocated out of the carriageway, and a budget estimate for this would be £5,000.

8.3.4 Telecoms and Media

Virgin media ducted cables need to be diverted for all the options.

A full diversion of the existing Vodafone ducts and fibre optic cables is required – approximately 160m long for Option 1 and 640m long for Option 2.

8.3.5 Street Lighting

Major alterations need to be carried out for all the options as a result of the road widening works.

8.3.6 Positioning of the Diverted Utilities

If the road is widened into the north side, all the utilities (BT, Virgin Media, Vodafone, UKPN electricity cables and street lighting ducts) will be diverted under the 3m wide shared use footway.

If the road is widened into the south side, all the diverted utilities (BT, Virgin Media, UKPN electricity cables and street lighting ducts) would fit in a 2m wide grass verge as a utility strip next to the carriageway. A typical cross section plan drawing numbered PK5090-FEA-007 has been produced, which shows all the diverted utilities within the 2m wide utility strip and is included in Appendix B.

9 Preliminary Environment Impact Assessment

- 9.0.0 The proposed road widening works will inevitably lead to tree loss within the study area. Therefore an assessment needs to be made on the likely impact that the proposals will have on wildlife, woodland, trees that will be lost and adjacent retained trees.
- 9.0.1 A consultation with Angelina Lambert, the County Council Principal Planner has been carried out. It is confirmed that an Environmental Impact Assessment or a planning application is not required for this scheme.

9.1 Arboricultural Impact

- 9.1.0 A site meeting took place with Robin Taylor, the Landscape Officer from South Norfolk District Council and Tom Russell-Grant, the County Council Arboricultural and Woodland Officer in July 2015. It is agreed that a topographical survey and a tree survey would be essential at the planning stage to inform the options appraisal.

A topographical survey was carried out, which is the basis of further specialist surveys. A preliminary arboricultural assessment with tree surveys have been undertaken by James Blake Associates (JBA) in line with BS 5837:2012 Trees in relation to design demolition and construction. The tree survey plans and schedule are included in Appendix E.

- 9.1.1 The tree surveys revealed that there are Category B, C and U trees including oaks, beeches, hornbeams, sycamores, sweet chestnuts, etc.

Following comments were also made by JBA:

The widening to the south will involve a significant amount of tree removals, particularly at the eastern end closest to the Longwater Lane junction. The residents in the adjacent development will be opened up to increased traffic noise without the sufficient screening from the road. Some widening is possible limiting the impact but this will require the ditch and verge being reorganised or reduced in size.

Option 2 widening to the north is arboriculturally the preferred option as there is a deeper woodland with many trees of lesser quality so losing the frontage would be visually less impact.

Widening to the east of the junction should not be a big issue and will possibly require the removal of some low quality trees. These may be able to be coppiced and retained allowing them to regrow or removed and new planting considered.

- 9.1.2 Further consultations with the Council Tree Officer took place following the receipt of the tree survey details.

Option 2 and Option 3 are the preferred options in terms of the impact on the tree belts. Soakaways are better than other drainage features as these will occupy a smaller footprint, particularly for the location between Lodge Farm and the high pressure gas pipeline.

9.2 Ecological Impact

- 9.2.0 There may be ecological impacts from the extent of tree removal as many of the trees in the woodland are mature with potential for bats. The tree survey schedule has highlighted the mature trees that may have bat roost sites potential.

- 9.2.1 Option 2 and Option 3 are the preferred option in terms of limiting the number of larger trees being removed.

The woodland on the north side of the road would be wide enough to remove a sacrificial strip and still maintain a wide area of trees as a wildlife habitat.

There are some larger beech trees on the northern side, which although are not mature enough to provide permanent bat roosting habitat, could potentially accommodate individual bats in summer within rot holes and hollow limbs in the trees. As European Protected Species (EPS) bats will need to be a material consideration for the scheme.

9.3 Mitigation Measures and Recommended Actions

- 9.3.0 Any option will require new planting on the south side to screen and lessen the impact of the road on residential areas.

Increase tree and shrub cover along the Dereham road corridor need to be considered. Further investigation would be needed to identify the re-planting and management possibilities to improve ecological value and resilience of the green infrastructure.

Possibilities for re-planting may be limited within the footprint of the works. There may be tree planting opportunities on other NCC, SNDC, parish or private land within the local areas that could be considered, if landowners are in agreement.

Producing and implementing a woodland management plan for the woodland to the north could also be considered, to improve woodland structure/wildlife habitat.

- 9.3.1 Once a preferred option for the road widening is chosen, the trees will need to be surveyed by an ecologist and their recommendations for either further survey or mitigation will need to be followed.

If bats are thought to be roosting in any of the trees, emergent surveys would be required (May to September) and if bats are present mitigation will need to be adopted under a licence from Natural England before any tree removal can commence. This may include the need for artificial roost sites such as bat boxes to be installed in advance of the trees being felled.

Trees that have suitable cavities but are found not to contain bats can be 'soft felled' under the supervision of a licensed bat ecologist.

- 9.3.2 Nesting birds:

Tree/vegetation removal cannot take place during the bird nesting period (March-August) without a prior check for nesting birds. If nesting birds are found, work must stop and the nest sites avoided until the birds have fledged.

- 9.3.3 Appropriate mitigation/compensation for any loss of wildlife habitat, landscaping and trees should be carried out and factored in as a cost within the scheme at the planning stage.

10 Land Implications

10.1 The existing highway boundary and the land ownership extents are shown in drawing number PK5090-FEA-004 – Land Ownership Plan in Appendix B.

- Land to the south of Dereham Road is wholly owned by Wilson Connelly (Taylor Wimpey);
- Land to the west of the Travellers site on the north side of Dereham Road is owned by TUD Developments;
- The land for the Travellers site is owned by Norfolk County Council and leased for the use of Travellers, further details available from Traveller Liaison Team (01603 222573);
- The land on the northeast corner of the Longwater Lane junction is owned by South Norfolk District Council.

10.2 Land will be required for some sections along Dereham Road due to the road widening works. Land is also needed on the north east of the Longwater Lane junction for the Norwich bound exit lanes.

The estimated areas required for each options are summarised in the below table:

Table 10.1: Estimated Land Required

Landowners	Option 1	Option 2	Option 3
Taylor Wimpey	1,500 m ²	100 m ²	1,120 m ²
Tud Developments		2100 m ²	85 m ²
Norfolk County Council (leased Travellers Site)		405 m ²	330 m ²
Roundwell Medical Centre		60 m ²	95 m ²
South Norfolk District Council	55 m ²	55 m ²	55 m ²
Total	1,555 m²	2,720 m²	1,685 m²

10.3 Accommodation works are not known at this stage, and can be confirmed following consultations with landowners.

11 Consultations

11.1 Previous Roundtable Meeting:

A roundtable meeting was held previously on 16 March 2015 at the early stage of the feasibility study. It has been agreed that two elements of the improvement should be delivered together as the most economic way of undertaking the diversions required at the same time. The potential high pressure gas pipeline and the BT fibre routes diversion works have been highlighted. Only one option, widening into the south, has been presented.

11.2 Road Safety Audit Stage 0

The County Council Safety Audit team has been consulted with the proposals. There have been no major concerns on the concept of the proposals for all the options.

Option 1 offers the best alignment through the Longwater Lane junction and is the preferred option.

If Option 2 and 3 are pursued, the Lord Nelson Drive junction is recommended to be revised and standardised as in Option 1.

11.3 No statutory consultations have been carried out at this stage. The following consultations with relevant departments have taken place:

11.3.1 Discussions with Jon Barnard, the County Council NDR / NATS Manager were held regarding the cycling routes and facilities and bus priorities. A potential cycling link has been recommended and bus priorities at the Longwater Lane junction would be an essential element of the scheme.

11.3.2 The County Council Bridge team has been approached to discuss the potential upgrade of the existing culvert/footbridge to facilitate cycling route.

11.3.3 Liaison with Helen Martin, the previous Infrastructure Officer took place to discuss the bus stop facilities. It is identified that improvement needs to be made on the existing bus stop between the Longwater Lane junction and the Lodge Farm access if it is still required in place. A potential fund of £5,000 can be contributed to the project if the bus stop improvement works go ahead.

- 11.3.4 The Highway Engineer in this area, Paul Sellick has been consulted regarding the existing issues within the area of interest.

There might be funding available from the Norwich Fringe drainage if the open ditch is to be converted to soakaways as part of the recommended cycling infrastructure scheme.

However this money will have to be spent within the next two years.

- 11.3.5 The County Council Environmental Team and South Norfolk District Council planners have been consulted on the arboricultural and ecological impacts of the proposals. Details of the comments have been included in Chapter 9.

- 11.4** An email was received from the Costessey Councillor Tim East before the commencement of the feasibility study. The flooding issues adjacent to the Longwater Lane junction and Bawburgh Lane were highlighted. He has also expressed the safety concerns over the merge point at the junction.

11.5 Second Roundtable Meeting:

A second roundtable meeting was held on 21st September 2015. All the options have been presented with the designer's recommendations. Following comments and concerns have been raised for further actions during detailed design study:

- The pockets of clay may cause problems with placement of aquacells.
- Possible positive system on Bawburgh Lane.
- Easy access for drainage cleaning needs to be investigated, such as large size of soakaways.
- Possible issues with the removal of the access to traveller site to be considered. Frequency of the right turn traffic into the traveller's site needs to be reviewed and potential solution to be investigated.

12 Preliminary Cost Estimates and Funding

12.1 Preliminary Cost Estimates

12.1.0 Preliminary cost estimates have been developed for all the options, and are summarised in Table 12.1. The total costs of Option 1, 2 and 3 shown included the eastern side road widening works.

The total scheme works cost without any allowance of risks would be £4.06 million, £3.60 million and £4.32 million respectively for Option 1, 2 and 3. With the estimated design fees together, the total scheme cost would be £4.39 million, £3.89 million and £4.67 million respectively.

It is agreed to build in 20% contingency in the final total cost of the scheme to inform options appraisal and funding. The total costs are £5.27 million for Option 1, £4.67 million for Option 2 and £5.60 million for Option 3.

The cost of the eastern section road widening is estimated as £263,736, and has been listed separately to assist the programme of the project in a phased approach.

12.1.1 The costs listed in the table do not include the recommend cycling infrastructure improvement scheme. As a decision needs to be made if the cycling scheme should go ahead and be included as part of the overall scheme.

The cycling scheme cost would be:

- Option 1 - £21,500 (£17,000 for works cost and £4,500 for fees)
- Option 2 - £61,310 (£55,310 for works cost and £6,000 for fees)

12.2 Available Funding

A S106 contribution of £220,348.84 from the Lodge Farm developer is available for the Longwater Interchange improvement. This funding will need to be repaid to the developer if the improvement works are not started by 1st January 2018.

£2.0 million of funding from the LEP growth fund has been indicated for the Longwater and Easton area and some of this can be used to deliver the identified transport improvements from the strategy work.

12.3 Potential Funding Opportunities

- 12.3.0 Some money from the Norwich Fringe drainage may be available to convert the existing open ditches to soakaways. This would save the footbridge upgrading works and future maintenance for Option 1 for the proposed cycling route along the east side of Dereham Road. This money will have to be spent within 2 years.
- 12.3.1 There might be opportunities to seek some funding from NATS to improve the cycling facilities, particularly if Option 2 is taken forward.
- 12.3.2 A potential contribution from the Infrastructure Service is available to the bus stop improvement works.
- 12.3.3 There have been historical flooding issues along Bawburgh Lane and Lord Nelson Drive from the Longwater Lane junction. Several previous attempts by the developers were made to rectify the situation but without success. Additional assessment of the existing drainage networks can be carried out and developers may consider to make a contribution towards this.

Table 12.2: Preliminary Cost Estimates

Road widening +Junction improvement	Option 1	Option 2	Option 3	Eastern Section
Civils Works – including traffic signals ¹	£882,579	£942,107	£934,936	£85,000
Utility diversions ²	£2,936,463	£2,395,463	£3,123,830	£105,000 indicative only
Land purchase ³	£60,000	£105,00	£65,000	£4,000
Accommodation works/compensations ⁴	TBC	TBC	TBC	TBC
Environment mitigations/surveys and Landscaping ⁵	£174,880	£150,807	£186,866	£9,500
Sub Total	£4,069,994	£3,609,448	£4,326,704	£203,500
Design/Supervision fee estimate (8% of the scheme cost) ⁶	£325,600	£288,755	£346,136	£16,280
Total Cost ⁷	£4,395,593	£3,898,204	£4,672,840	£219,780
Total Cost with 20% Contingency ⁸	£5,274,712	£4,677,845	£5,607,408	£263,736

Notes:

1. The cost estimate of civils works is based on the County Council Partnership Contract Rates for the 2014/15 financial year.

No drainage survey has been carried out at this stage. The cost shown includes using soakaways within the entire study area based on the design assumptions.

No ground investigation has been carried out for the study area. The proposed pavement structure is based on assumption that the conditions within the study area are similar to the west end of Dereham Road which is 500m away.

2. The utility diversions cost estimates are based on the C3 quotations and an initial high level budget estimate from National Grid. The cost of the high pressure gas main diversion may be reduced by £450k if a full pipeline outage is available.

3. Land acquisition costs are estimated following a discussion with Geoff Newman from NPS and the figures are commercially sensitive.
4. Accommodation works and compensations are not known at this stage. Consultations should take place before land acquisition plans are finalised.
5. A 5% of total cost of civils works and utility diversions is used to indicate the cost of environment mitigations/surveys, compensation and landscaping works. This percentage is recommended by the County Council Environment Team.
6. An 8% of the total scheme cost as the professional fees has been allowed for the detail design and construction stage, which includes the core project team fees, lab fees and NCC supervision fees.
7. This cost estimate does not include uplifts generated from a Quantified Risk Assessment (QRA) and/or Stage 1 optimism bias of 44% (ref DfT's TAG Unit 3.5.9 'The Estimation and Treatment of Scheme Costs').
8. It is recommended that 20% contingency should be built in the total scheme cost to inform the funding and option selection decisions.

13 Discussions and Recommendations

13.1 Junction Improvement

The proposed changes on the Longwater Lane junction needs to be made to improve the capacity of the junction. The junction improvement cannot be completed without the provision of the two exit lanes in both the eastbound and westbound directions along Dereham Road. Therefore the schemes will need to be implemented together.

13.2 Dereham Road Widening

Three options have been developed and assessed as part of the feasibility study.

Option 1 requires the smallest area of land purchase between the three options and its cost estimates of the civils works are also the lowest. However due to the anticipated utility diversions, the total scheme costs of Option 1 and Option 3 are much higher than Option 2.

Option 2 and Option 3 are the preferred options in terms of the disturbance to the environment and visual impact. These two options would also be the favourable proposals to the local residents as the screening trees will be maintained on the south side of the road.

Therefore Option 2 widening into north is recommended to be taken forward weighing all aspects.

13.3 Cycling Infrastructure Improvement

It is felt that the cycling route between Longwater Lane junction and Richmond Road junction should be formalised. Two options have been prepared as part of the feasibility study.

Option 1 via Round Well Road has a much lower budget estimate and a minimum impact on the adjacent trees. It only adds additional 20 metres onto the cycling journey comparing to Option 2.

Option 2 serves the most direct cycling route along Dereham Road. It is anticipated that some cyclists would still travel on the footway though they have no right to do so.

It is recommended that further discussions need to be held with Jon Barnard regarding the option selection and funding opportunities.

13.4 Bus Stop Improvement

Further discussions will be required to agree the proposals for the bus stop improvement. The existing bus stop to the east of the Lodge Farm access can be either retained temporarily and removed in the future, or improved to a DDA compliant bus stop.

14 Programme Considerations

14.0 The timetable for improvements is largely dependent on mobilising the utility diversions to enable the construction to take place. An indicative programme is provided in Appendix F.

14.1 The high pressure gas pipeline diversion will have the biggest impact on the programme. The diversion work will take about 18 months with 6 months design time required in advance.

The diversionary works need to be completed during summer months to reduce the effect on the network. Therefore the earliest possible time to start the diversion works would be the beginning of 2017 with an expected completion during summer time in 2018.

The National Grid pipeline diversion would ideally complete prior to the commencement of the main construction works. However if there are no impacts from other works on the diversion, National Grid may agree to concurrent with other works on site for a certain period.

14.2 It is anticipated that the majority of the construction works will be in the financial year 2018/19.

Due to the time constraint for the S106 funding, it is considered that the works will be phased to deliver some of the improvements as soon as possible in accordance with the utility requirements.

As mentioned in Chapter 13, the junction improvement cannot be completed without the provision of the two exit lanes along Dereham Road, especially for the westbound exit with the both lanes on Longwater Lane allowing vehicles turning right. However the road widening works to the east of the Longwater Lane junction can be implemented without any changes made on the junction, with the S106 money.

It is recommended that the eastern side road widening works can start either during year 2016, or in late 2017 just before the main section road widening works.

14.3 The identified land required outside the highway boundary will need to be acquired before the road widening works.

14. 4 Tree/vegetation removal cannot take place during the bird nesting period (March-August) without a prior check for nesting birds. If nesting birds are found, work must stop and the nest site avoided until the birds have fledged. Ideally therefore the work should avoid the nesting seasons.

It would be best if (where possible and practicable) re-planting is carried out in advance of the road works.

14. 5 Bat surveys are time critical (May - end of September). Following the feasibility study, an ecological survey with the recommendations from the ecologist will need to be followed.

If bats are present a licence from Natural England will need to be obtained before any tree removal can commence.

14. 6 Once a preferred option is decided, following actions are recommended to take place as soon as possible:

- Funding review;
- Discussions with Undertakers will need to take place to assist the programme planning with some exploratory trial holes;
- Landscaping design;
- Necessary tree/bat surveys;
- Land purchase negotiation.

15 Preliminary Risk Register

15.0 Preliminary risk assessment has been prepared and included in Appendix G.