HIGHWAYS AGENCY

Safe roads, reliable journeys, informed travellers

A14 Cambridge to Huntingdon improvement scheme

Environmental Statement

Appendices

Appendix 3.2: Construction information

Date: December 2014

6.3

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1 Introduction

1.1.1 This appendix provides an overview of the envisaged approach to construction for the A14 Cambridge to Huntingdon improvement scheme (the scheme).

1.1.2 The information presented in this appendix has been prepared to provide a set of assumptions for the purposes of assessing potential construction impacts as reported and committed to within chapters of the *Environmental Statement (ES)*.

1.1.3 This appendix has been written during the preliminary design stage of the scheme's development. Construction methodology would be subject to change during the continuing design process until the final design is complete and main contractors have been engaged. Sufficient contingency has been added to allow for change. Furthermore, the environmental assessment of construction impacts within the *ES* has considered this uncertainty and incorporated a precautionary approach.

1.1.4 The Rochdale Envelope (*PINS Advice Note 9: Using the Rochdale Envelope)* (Planning Inspectorate, 2011) is described as the likely worst case scenario for the purposes of environmental impact assessment. The descriptions within this construction information, along with the boundary of the scheme (*as shown on Figure 3.1*), has been set out to represent the likely worst case scenario for environmental assessment using information available at the time of writing.

1.1.5 Information is set out under the following headings:

- general site operations;
- construction programme and phasing;
- typical construction methods;
- land requirements; and
- public access, site access, and traffic management.

1.1.6 In addition, *Appendix 20.2 of the ES* (*Code of construction practice*) sets out a series of objectives and measures to be applied throughout the construction period in terms of management and operation of the works, environmental protection and limits to disturbance from construction activities. It also outlines how stakeholders, including both local authorities and statutory environmental bodies, would be engaged and consulted with during the construction phase.

2 General site operations

2.1 Site layout

2.1.1 For construction purposes, the scheme would be divided into six main areas:

- section 1: A1 Alconbury to Brampton Hut;
- section 2: A1/A14 Brampton Hut to East Coast mainline railway (ECML) (including ECML bridge);
- section 3: A14 ECML to Swavesey (not including Swavesey);
- section 4: A14 Swavesey to Girton;
- section 5: Cambridge Northern Bypass; and
- section 6: Huntingdon improvements.

2.1.2 Refer to *Figure 3.1* for a representation of these sections.

2.1.3 Sections 1 to 5 are all related to the new highway layout and are expected to be open to traffic by the end of 2019.

2.1.4 Section 6 stands alone both in geographic location and programme. It comprises the demolition of the existing Huntingdon A14 viaduct and the connecting of the remaining two ends of the existing A14 into the town's local road network.

2.1.5 Each construction section is largely self-contained, either by geographic barrier, such as the East Coast mainline railway, or by type of construction activity (on-line or off-line construction).

2.1.6 Taking the general topography of the area, the scheme would involve substantial earthworks. Where fill material would be required, it has been designed as far as is practicable to come from within the same section or from an adjacent borrow pit, ensuring a cut fill balance where local resources provide the needs of the scheme.

2.1.7 Only where required material cannot be provided from within the scheme section, either due to insufficient material or the wrong type of material, the required material would be imported onto the scheme via the existing strategic road network or potentially via the existing rail network to the Cambridge railhead and then transferred via local roads.

2.1.8 It is envisaged that there would be a need for two batching plants to supply the construction of the scheme, one each side of the scheme as divided by the East Coast mainline railway. Facilities would include:

- placement of a temporary concrete and asphalt batching plant, as well as aggregate washing facilities, situated in a compound or borrow pit within section 2 to supply sections 1 and 2; and
- use of an existing batching plant operated by Lafarge at the railhead in Cambridge to supply the eastern end of the scheme (sections 3, 4 and 5). Material for this location could be brought in by rail when imported from off-site.

2.2 Safety and security

2.2.1 *Appendix 20.2 of the ES* (*Code of construction practice*) sets out a number of safety issues that the contractor would need to consider which include but are not restricted to:

- working adjacent to built-up areas;
- working in, over or adjacent to watercourses including the river Great Ouse;
- working on or adjacent to public roads, footpaths or cycle tracks or in proximity to live traffic;
- working over or adjacent to railways;
- working at height;
- undertaking electrical works;
- working over or adjacent to, or diverting statutory undertakers' plant; and
- handling contaminated materials.

2.2.2 The construction site, compounds and storage areas would be secured from public access.

2.3 Working hours

2.3.1 Working hour constraints are specified in the *Appendix 20.2 of the ES* (*Code of construction practice*).

2.3.2 In summary, the typical core working hours for the scheme are expected to be between 08:00 and 18:00 on weekdays (excluding bank holidays) and from 08:00 to 16:00 on Saturdays. In addition there would be a start-up and close down period of one hour either side of these times to maximise efficiency of the core hours. This would include activities such as deliveries, movements to work, maintenance and general preparation works, but not include running plant and machinery that are likely to cause a disturbance to local residents or businesses.

2.3.3 It is expected that core hours of working would be followed within the scheme borrow pits and for the majority of the offline sections 2 and 3.

2.3.4 Where there are live running lanes adjacent to the site, the online sections of the new alignment (1, 4 and 5) would likely require extended night time working to facilitate traffic management moves, installation of signs and technology, bridge construction and surface tie-ins.

2.3.5 Due to the complexity of operations associated with section 6, 24 hour working would be required to maximise the short duration of railway possessions over the East Coast mainline railway.

2.3.6 Seasonal construction activities such as earthworks could be subject to an application for extended hours working to make best use of the season. The expected extended working hours would cover 07:00 to 08:00 and 18:00 to 20:00 during week days. All non-core working patterns would require consent via a section 61 agreement under the *Control of Pollution Act 1974*.

2.3.7 Repairs or maintenance of construction equipment (other than emergency repairs) would typically be carried out outside of core working hours, normally on Saturday afternoons (13:00 to 18:00) or on Sundays between 09:00 and 17:00.

2.4 Site lighting

2.4.1 Site lighting would generally be required as follows:

- provision of lighting for contractor's compounds for security and safe movement of staff during winter mornings and evenings;
- provision of road lighting along temporary access roads;
- provision of temporary road lighting to maintain at least an equivalent level of lighting where there is existing lighting in place prior to construction;
- provision of temporary road lighting where there is currently no lighting, as lighting is required as a safety measure under temporary traffic management; and
- provision of task lighting required for night time activities or winter afternoon activities, such as installation of bridge beams.

2.4.2 Maintenance of road lighting at locations where the layout is to be changed would be provided by early commissioning of permanent new lighting where feasible, powered by generators, if necessary. Where this is not feasible lighting may be provided by mobile lighting towers or by use of columns in temporary locations.

3 Construction programme and phasing

3.1 Construction programme

3.1.1 The construction of sections 1 to 5 of the scheme would be programmed to take four years to complete, with works commencing in 2016. Sections 1 to 5 are programmed to be open to traffic by late 2019. Section 6, including the demolition of the Huntingdon A14 viaduct, would be undertaken once the Huntingdon southern bypass is operational.

3.1.2 On the above basis, the envisaged construction programme is as shown in *Table 3.1*.

Table 3.1: Proposed construction programme

Scheme section	Start	Completion
1 – A1 Alconbury to Brampton Hut	2016	2017
2 – A1/A14 Brampton Hut to ECML	2017	2019
3 – A14 ECML to Swavesey	2017	2019
4 – A14 Swavesey to Girton	2016	2019
5 – A14 Cambridge northern bypass	2018	2019
6 – Huntingdon viaduct demolition	2020	2021

3.1.3 Within the construction sections of a scheme of this size, construction would be phased so to accommodate enabling works and to facilitate construction logistics such as ensuring efficient working around traffic management restrictions on the online sections. In addition, it is possible that some minor enabling works, such as habitat establishment, may be undertaken in advance of 2016. This detail would be completed during the detailed design stage of the scheme.

3.1.4 Phased construction starts within sections which would avoid environmentally sensitive locations until such time that essential mitigation had been carried out.

3.1.5 Whilst the programme in *Table 3.1* sets out the phased construction programme envisaged at the preliminary design stage, it should be noted that the *ES* topic assessments of construction impacts have generally assumed that construction would take place concurrently across the scheme in order to represent a worst case scenario. The topic specific approach to the construction assessment is set out in *Chapters 8 to 17 of the ES*.

3.2 Section 1 – Alconbury junction to Brampton Hut junction

3.2.1 The works are between Alconbury junction and Brampton Hut junction and comprise parallel widening of the A1 from two lanes to three lanes as well as the introduction of a single carriageway local access road connecting the new Ellington junction with Woolley Road (access to Huntingdon Life Sciences).

3.2.2 Cut and fill balance can be achieved within section 1 as the earthworks materials required can be wholly obtained from borrow pit 7 and local floodplain compensation areas.

3.2.3 Phase 1 of section 1 construction works would entail site and route establishment comprising the following:

- borrow pit 7 (located on the western side of A1) and two-way haul route from borrow pit 7 to east side of the A1 would be established early on in the programme;
- the off-line section would be fenced as a construction site; permanent fencing would be used where possible; and
- protection works/diversions would be carried out over the Oil Pipeline Agency high pressure oil pipeline, as well as all utilities diversions and culvert construction running concurrently.

3.2.4 Phase 2 of section 1 would entail the construction of the new A1 southbound carriageway and local access road, comprising the following:

- construction of the new three lane southbound carriageway would commence offline, to the east of the existing A1. Construction of the local access road would be undertaken concurrently; and
- drainage, technology and concrete barrier works would be carried out throughout the earthworks and pavement construction.

3.2.5 Phase 3 of section 1 would be made up of widening the existing southbound carriageway, comprising the following:

- the existing southbound carriageway would be widened creating the new northbound carriageway; and
- drainage and technology works would be carried out concurrently.

3.2.6 Phase 4 of section 1 would be construction of the local access road tie in points to Woolley Road and Ellington Junction. These would be completed during the construction of Ellington junction, likely to be during the later stages of the construction programme.

3.3 Section 2 – A1/A14 Brampton Hut to East Coast mainline railway

3.3.1 Section 2 comprises a new A1 alignment to the west of the current A1, with a portion of the new A14 utilising the current A1 alignment. Two new slip roads would enable connections between the A1 and A14. The works within this section are largely offline.

3.3.2 There are four main structures which would need to be built early in the programme. These include the A14 over A1 structure, the northbound slip road over A1, the Grafham Road bridge and a temporary bridge over the river Great Ouse.

3.3.3 It is expected that a cut-and-fill balance can be achieved for section 2 as the earthworks material required can be obtained from borrow pits 1 and 2 as well as a proportion of fill from the floodplain compensation areas within section 1 and to the east of the river Great Ouse in the south of section 2.

3.3.4 Phase 1 of section 2 construction works would entail site and route establishment comprising the following:

- protection works/diversions would be carried out over the Oil Pipeline Agency high pressure oil pipeline, with all utilities diversions and culvert construction running concurrently;
- construction fencing would be installed, permanent where possible;
- the establishment of borrow pits 1 and 2, along with compounds and soil storage sites would be early activities;
- the establishment of a concrete and asphalt plant would be required in this section, probably within one of the borrow pits, to ensure material demand is met later in programme; and
- haul routes along the new A1 and offline A14 section would be created.

3.3.5 Phase 2 of section 2 would entail further concurrent construction made up of the following:

- construction of the critical structures within this section, particularly the temporary bridge over the river Great Ouse to enable construction vehicles to cross; and
- the following works would be carried out concurrently:
    - construction of the new A1 offline route (three lanes in either direction) to the west of the existing A1;
    - the realignment of Buckden Road bridge requiring the creation of an underpass;
    - A14 offline section (not including Ellington junction) to the river Great Ouse, and then to the East Coast mainline railway once the temporary bridge is constructed;
    - construction of the Great Ouse viaduct, beginning with the earthworks and foundation construction; and
    - construction of the East Coast mainline railway bridge.

3.3.6 Phase 3 of section 2 comprises construction of the new A14 and would involve the following:

- once the new A1 is constructed, traffic from the existing A1 would be switched onto the new alignment allowing works to commence on the existing A1 which would become the new A14;
- as the A14 section from Ellington junction to the northern ends of the slip roads is two lanes in each direction, mainly resurfacing works would be required (no widening); and
- concurrently, major earthworks would need to be moved from borrow pit 2 to the proposed noise bund on the east side of the existing A1.

3.3.7 Phase 4 of section 2 would involve the construction of Ellington junction, as follows.

- Ellington junction would be constructed enabling the Huntingdon Life Sciences local access road to be completed. These works would not be conducted until sections 2 and 3 of the main scheme have been completed; and
- the temporary bridge over river Great Ouse would be removed and remediation works to borrow pits 1 and 2 would begin once the A14 was open to traffic.

3.4 Section 3 – A14 East Coast mainline to Swavesey

3.4.1 Section 3 would consist of predominantly offline construction, apart from where structures meet existing local roads.

3.4.2 This section has a cut-and-fill balance as the earthworks to the west of the A1198 are predominantly in cut and those to the east of the section requiring fill, with additional fill requirements met by borrow pit 3 and three floodplain compensation areas.

3.4.3 This section is predominantly phased due to the logistics of moving engineering fill past logistical blockers such as the construction of the Ermine Street junction. Road construction itself would follow earthworks in the phases as described below.

3.4.4 Phase 1 of section 3 construction works would entail site and route establishment comprising the following:

- prioritisation of site establishments around the Ermine Street junction. Also establishment of borrow pit 3, compounds and soil storage sites across the section;
- haul routes to the west of A1198 would be established along the new highway alignment; and
- utilities diversions and culvert construction would run concurrently.

3.4.5 Phase 2 of section 3 would comprise the construction of Ermine Street junction and concurrent works made up of the following:

- construction of the Ermine Street junction would begin early, enabling a haul route along the trace of the offline section over the A1198. It is expected that the bridge making up the junction structure would be prefabricated offsite as far as practicable to increase the speed with which the construction would take place;
- concurrently, movement of fill material from borrow pit 3 and the floodplain compensation areas to the fill areas to the east of A1198 would be carried out; and
- commencement of the other structures along this section would start.

3.4.6 Phase 3 of section 3 comprises further earthworks movements, as follows.

- following the Ermine Street junction construction, a haul route would be built enabling the soil storage at Ermine Street junction to be shifted across to the east side of A1198, with the majority of fill being used for earthworks from Ermine Street junction to the approximate location of borrow pit 3; and
- landscaping in the form of planting trees/hedges on bunds and other areas would be carried out once earthworks were complete.

3.4.7 Phase 4 of section 3 would entail the construction of the tie-in points at Fen Drayton and Ellington junctions.

3.5 Section 4 - A14 Swavesey to Girton

3.5.1 Section 4 comprises asymmetric (Swavesey – Bar Hill) widening from two to three lanes, and symmetric widening (Bar Hill – Girton) from three to four lanes. The works are largely online (mainly the symmetric widening section). A complex arrangement of traffic management would be required on this section due to live traffic running; in addition, several utility diversions would be required.

3.5.2 The section also includes the reconfiguration of Girton interchange, including a new A14 westbound slip road as well as the realignment of the A428 and tie-in to the new local access road.

3.5.3 Section 4 has a shortage of fill material which it is expected would be met from the adjacent borrow pits 5 and 6.

3.5.4 Phase 1 of section 4 construction works would entail site establishment comprising the following:

- borrow pits 5 and 6 sites would be established as well as section wide haul routes;
- in terms of earthworks, in order to minimise haulage across the A14, borrow pit 5 would supply earthwork fill requirements south of the A14 and borrow pit 6 north of the A14 where possible to minimise any disruption to the running A14 traffic; and
- utilities diversions and culvert construction would run concurrently.

3.5.5 Phase 2 of section 4 would consist of online widening construction works (asymmetric and symmetric), as follows:

- There are two distinct widening configurations within section 4, asymmetric widening (Swavesey junction to the Bar Hill junction) and symmetric widening (Bar Hill junction to Girton junction). Both would be carried out with the likely implementation of section wide traffic management in order to ensure efficient traffic flows and safe working.
- Girton junction has both online and offline elements which would be carried out concurrently. A428 diversions as well as new A14 westbound slip roads can be built offline with tie-in points and resurfacing works to follow.

- asymmetric widening would involve:
    - the construction of a new offline three lane northbound carriageway and central reserve to the south of the existing A14;
    - with traffic switched to the new alignment, a new southbound carriageway would be constructed by widening the existing northbound carriageway; and
    - lastly, works would begin on the new local access road by widening and resurfacing the existing southbound carriageway where needed.
- concurrent symmetric widening works would involve:
    - construction works in the central reserve requiring traffic management to be employed, most likely in the form of narrow lane running; and
    - once complete, narrow lanes would still be utilised within the traffic management, moving running traffic towards a new central reserve in order to enable the widening works on the outer edge of both carriageways to begin.

3.6 Section 5 - Girton to A14 Cambridge Northern Bypass

3.6.1 Section 5 would comprise online widening on the north side between the Histon and Milton junctions.

3.6.2 A Highways Agency 'pinch point' scheme between Girton and Histon junctions, widening the road from two to three lanes, began construction in mid-April 2014 and is scheduled to be complete in mid-December 2014. The pinch point works are not considered part of this scheme.

3.6.3 Section 5 requires fill material from borrow pit 6.

3.6.4 Phase 1 of section 5 construction works would entail site establishment comprising the following:

- establishment of a section wide haul route with borrow pit 6 having been established within section 4;
- no utility diversions have been identified for section 5; and
- it is assumed the existing railhead in Cambridge would be commissioned prior to construction works as a means to bring in materials for the whole scheme.

3.6.5 Phase 2 of section 5 would entail further concurrent construction made up of the following:

- carriageway widening from two lanes to three lanes on the northern side from Histon to Milton junctions; and
- road wagons with a carrying capacity of approximately $12m^3$ (20 tonnes) would be utilised for fill material movements to the required areas between Histon and Milton junctions.

3.7 Section 6 – Huntingdon improvements

3.7.1 Once the new A14 is constructed and open to traffic, the process of de-trunking the works within Huntingdon would begin.

3.7.2 Decommissioning of the viaduct over the East Coast mainline railway would not begin until new infrastructure is in operation and certain remodelling works within Huntingdon have been completed.

3.7.3 The works would involve a number of railway possessions being booked in advance which is likely to be over the Christmas/New Year period. These possessions would facilitate the installation and removal of a temporary access/protection deck for Brampton bridge.

3.7.4 The dismantling of the viaduct is complex and would require specialist contractors with specific large plant for lifting, processing and transporting.

3.7.5 Below is the general phasing for removal of the viaduct over the East Coast mainline railway and remodelling works in Huntingdon. Activities would be concurrent with a focus on maintaining all accesses and the continued use of Brampton bridge.

Demolition of viaduct over East Coast mainline railway

3.7.6 Phase 1 on the section 6 demolition works would comprise the installation of a temporary protection deck under the A14 viaduct. This would require a rail blockade and a series of possessions on the East Coast mainline prior to construction.

3.7.7 Phase 2 works would consist of temporary works and demolition as per the following:

- a temporary bridge would be installed across the section span;
- construction of temporary supports, followed by the removal of the viaduct surfacing, concrete topping and abutments for the section directly over the railway;
- removal of box beams and the central section of the viaduct, as well as the removal of ramps and temporary bridge; and
- demolition of the outer approach spans leaving two unconnected sections still standing in isolation for phase 3.

3.7.8 Phase 3 works would consist of the installation of temporary slide platforms:

- erection of temporary slide platforms and load collars adjacent to the still standing viaduct supports;
- transfer of the load onto the collars, then demolition of the supporting piers; and
- sliding of the remaining viaduct sections away.

3.7.9 Phase 4 would involve the removal of the temporary access/protection deck structure.

Town centre remodelling works

3.7.10 Phase 1 of the town centre remodelling works would involve construction of the Pathfinder Link. This would be in advance of the demolition works on the viaduct. Construction of the Pathfinder Link from the ring road to the old A14 embankment would be completed initially.

3.7.11 Phase 2 would be construction of the temporary station access to involve the following:

- Once the central section of the viaduct is removed, a temporary access into Huntingdon railway station would be formed from excavated material from the south-east approach (not to be the finished road level as the demolition programme at this stage does not allow enough time for excavation and paving to be completed to finished level). This would require some temporary earthworks on the southern station approach.
- Access to the station would need to be in place before work over the existing station access road from Brampton Road is carried out.

3.7.12 Phase 3 works would incorporate construction of the Views Common link road, as follows:

- whilst the eastern demolition works are underway, work would begin on the Views Common link road; and
- the roundabout at the western end of the section would be completed when the removal of the western elements of the viaduct are complete, however the earthworks could be completed in advance of this.

3.7.13 Phase 4 works would incorporate the Mill Common link road, as follows:

- The excavation of the Mill Common link road from the northern station junction to the temporary station access would be undertaken concurrently with the demolition of the eastern abutment. It would be during this phase that the Brampton Road junction could also be completed.
- Once space is opened out and the bridge piers have been removed, the northern end of Mill Common link road could be completed and opened to allow access into the station. At this point, the temporary access would be closed and works completed to bring the rest of the Mill Common link road to the finished road level, along with the southern Station junction. This section would be the last to be completed and opened.

4 Typical construction methods

4.1 Utility diversions

4.1.1 There are a number of utility diversions that would form part of enabling works in advance of, or are integrated into, the construction of the scheme. These include diversion or protection work upon the assets of:

- Oil Pipeline Agency high pressure oil pipeline;
- Fibre-optic cables operated by British Telecom and Virgin Media;
- UK Power Networks infrastructure;
- Cambridge Water and Anglian Water infrastructure; and
- National Grid gas networks.

4.1.2 For the purposes of this assessment, all utility diversions are considered as part of the scheme.

4.1.3 The makeup of the utility diversion works are of a similar nature to those of initial elements of the road construction in that they would involve localised site clearance, excavations and back fill for underground services and standard civil engineering practices for overhead lines.

4.1.4 The exception to the standard utility diversions would be the high pressure pipelines within the scheme footprint that require licenced and specialised contractors to work with high pressure apparatus.

4.1.5 The works diverting underground services would involve either directional drilling apparatus or open trench work as appropriate within the programme of construction works at any one particular location.

4.1.6 Overhead services would be either diverted but retained overhead, or diverted by burying underground.

4.2 Environmental mitigation

4.2.1 The environmental mitigation measures for the scheme are detailed throughout the *ES* and summarised within *Appendix 20.1* and *Appendix 20.2 of the ES*.

4.2.2 Environmental mitigation would be carried out in advance of construction sites being established in sensitive areas of the scheme. The construction programme would be phased to accommodate mitigation within sensitive areas before construction commenced in those places.

4.2.3 Some environmental mitigation would run concurrently with the construction of the scheme where practicable and within the constraints of applicable licences and permit consents.

4.3 Site clearance and demolition

4.3.1 *Annex A* shows the worst case plant and machinery that would be used for site clearance.

4.3.2 Off-line sections would be cleared of vegetation during daytime working hours. On-line sections would be cleared during night time with traffic management if required, according to Highways Agency network occupancy guidelines.

4.3.3 All arisings would be taken off-site. No fires would be permitted within the scheme footprint.

4.3.4 Properties for demolition within the scheme footprint would be stripped of recyclable material before being flattened using heavy plant machinery with waste being transported off-site.

4.4 Establishment of construction compounds

4.4.1 An indicative location of the scheme construction compounds are shown on *Figure 3.1*.

4.4.2 After environmental mitigation and site clearance, typically the establishment of construction compounds would involve the following activities:

- defining the boundary using fencing or temporary noise bunding;
- soil stripping, placing and compacting stone for compound base;
- setting up drainage as required, including perimeter drainage;
- creating access tracks with bound material surfacing if required;
- setting up power requirements including generators;
- setting up offices, welfare facilities and wheel washing; and
- installation of security/access gates.

4.4.3 The plant used for this operation would be typical of that for road construction as described in *Annex A*.

4.4.4 Compounds are expected to accommodate office and welfare facilities, plant and machinery parking, storage facilities, maintenance areas and workshops, and on-site temporary residential premises.

4.4.5 It is anticipated that, where practicable, compounds would be returned to the previous land use after decommissioning.

4.5 Enabling earthworks and soil storage areas

4.5.1 To meet with the construction programme for the scheme, it is anticipated that enabling earthworks would commence in the spring of 2016 on sections 1 and 4.

4.5.2 Topsoil would be stripped from all surfaces subject to construction. Topsoil would be stored in designated soil storage areas according to a soil management plan to be referred to in *Appendix 12.2 of the ES*. Locations of indicative soil storage areas are shown on *Figure 3.1*.

4.5.3 The type of earth moving plant to be used within the scheme is listed in *Annex A*.

4.5.4 It is anticipated that soil storage areas would be returned to the previous land use once the storage is no longer required.

4.6 Borrow pits

4.6.1 The various borrow pits within the scheme would be established in a similar way as the construction compounds described above.

4.6.2 Following site clearance, the site boundary would be fenced and security gates installed at the site entrance to prevent unauthorised access. Topsoil and subsoil layers would be stripped and stored around the perimeter of the site to buffer local receptors from the operations within the borrow pits and minimise the transportation of material around the scheme. In general, topsoil stored closest to boundary would be up to 2m high and subsoil/overburden behind this would be up to maximum of 3m high.

4.6.3 Access tracks would be constructed, along with any infrastructure to be sited within the boundary as per the construction compounds.

4.6.4 Interception drains would be installed to prevent excessive ingress of surface water into the workings. Suitable surface water settlement ponds would be created to prevent the contamination of nearby surface watercourses with sediments and suspended solids.

4.6.5 It is anticipated that the borrow pits in gravel strata (particularly in section 1) would require a form of active de-watering when extracting material below the standing water level. The precise method of de-watering would depend upon the contractor, but it is anticipated that the contractor would create well points, install a vertical barrier around excavations and directly install pumps at the bottom of the excavation.

4.6.6 Borrow pit 5 would be expected to return to agriculture across the majority of the footprint. Part of borrow pit 6 would also return to agriculture. Re-use of the available topsoil from the soil storage areas would be used to enable this.

4.6.7 The remaining borrow pits would be restored to create a variety of ecological habitats, wetland areas, mixed grasslands, woodland planting and for informal recreation purposes. Refer to *Appendix 3.3 of the ES* for further detail on borrow pit restoration.

4.7 Haul routes

4.7.1 Dedicated haul routes are identified on the scheme and can be seen within *Figure 3.1*. As well as the new haul routes shown, the route alignment on the off-line sections would be used as a main haul route during the construction phase.

4.7.2 Where on new alignments, temporary haul routes would be created by stripping the topsoil and replacing with capping material to create a hard standing surface suitable for heavy goods and off-road vehicles.

4.8 Earthworks and vehicle movements

4.8.1 It is not anticipated there would be any requirement for blasting on this scheme.

4.8.2 The phased construction programme described above has been cross-referred with the material requirements of the scheme to provide a monthly programme of predicted earthworks quantities and main scheme construction activities (road construction, structures and demolition). Vehicle movements throughout the programme and across the phases of the six construction sections of the scheme have been calculated accordingly. To represent the likely worst case scenario, vehicle movements have all been qualified as heavy goods vehicle (HGV) movements

4.8.3 At this preliminary design stage, a contingency of 10% additional fill material has been incorporated across the programme to account for unknown factors associated with earthworks. Also, a contingency of between 10% and 35% additional HGV movements has been incorporated to account for deliveries (such as gantries, communications equipment, bridge beams). The level of contingency applied was determined on the basis of professional judgement having regard for the section of the works and the uncertainty in number of vehicle movements to deliver specific components.

4.8.4 The expected daily and monthly HGV movements across the scheme are presented within *Annexes B and C*.

4.8.5 For the earthworks aspect of the scheme, typical earth moving vehicles would be either articulated dump trucks for site movements, capable of carrying 20m^3 of material (approximately 35 tonnes), or tipper trucks for both site and on-road movements of material, capable of carrying 12m^3 (approximately 20 tonnes). The appropriate type of vehicle has been accounted for in calculating the estimated vehicle movements associated with each section of the scheme.

4.9 Staff accommodation and welfare

4.9.1 It is anticipated that a likely worst case peak labour force of between 2,000 and 2,750 could be employed on the scheme during the busiest three years of construction. It is estimated that a peak of 500 employees would live on site during the second, third and fourth years of construction.

4.9.2 Accommodation, offices, welfare (canteen and washing facilities), fleet parking and storage depots are expected to be located within compounds already described. Temporary buildings would make up the infrastructure of the compounds during operation. Typically these would be made up of portable modular units typical of large construction sites. Some buildings would be stacked one on top of the other for efficiency of space within the sites. The maximum stack would be expected to be two modular units high.

4.9.3 It is expected that all soil storage areas would have welfare facilities within them. Where the distance between soil storage areas is too great for the number of workforce in a particular location, mobile welfare vans would be on site to minimise journeys by the workforce.

4.9.4 All proposed compounds and soil storage areas are located within close proximity of the scheme alignment, which would help to lower traffic to and from site once depot plant and personnel are installed within compounds.

4.9.5 It is expected that the majority of the workforce would arrive on site via the strategic road network, avoiding local access roads where practicable.

4.10 Road construction

4.10.1 Pavement construction involves building the pavement up in layers. A typical road construction would be:

- 35mm thin surfacing;
- 55mm binder course;
- 85mm upper base;
- 200mm lower base; and
- 280mm stabilised sub base.

4.10.2 The bottom layer (sub-base) is a crushed rock aggregate which would be delivered to the site via the strategic road network or by rail and then transferred from the Cambridge railhead using the local road network. The material is deposited and then pushed into place and compacted.

4.10.3 The upper pavement layers would be made up of bituminous material. All of these would require the transport of bituminous material to the site either from the local batching plant at the Cambridge railhead or from a temporary batching plant on site.

4.11 Roadwork finishes

4.11.1 Following pavement construction, vehicle restraint systems (VRS) or safety barriers would be installed. There are various types of Highway Agency approved VRS models available. In the central reserve, vehicle restraint barriers would predominately be constructed of extruded concrete on site. Steel vehicle restraint systems would be employed along the verge lengths, parapets and bridge connections. Steel barrier installation would involve driving steel posts into the ground or excavating small footings and placing concrete into which the posts are set. The barriers are either bolted or strung to the posts and fixed to small concrete anchorages.

4.11.2 Sign installation would involve excavation for the foundations, poured concrete and then setting the posts. The sign faces are then fixed to the sign posts. Some signs may be lit and would require cabling to be passed through service ducts.

4.11.3 Road markings would be sprayed onto the road surface using specialist lorry mounted equipment. This is a mobile operation with zero waste material from the thermoplastic paint mixture used.

4.12 Structures

4.12.1 The scheme would involve construction of 30 new bridges (*Appendix 3.1 of the ES*), adding to the 31 existing bridges of which 14 are being adapted, 13 are being retained as unaffected and four being demolished (including the Huntingdon A14 viaduct in section 6).

4.12.2 Structure locations are available on *Figure 3.1*. Structure visualisations are part of the cross sections found within *Figure 3.3*.

4.12.3 A standard pattern of work for an A14 bridge would include:

- bored piling;
- pouring concrete foundations;
- formwork and pouring concrete to form piers and abutments to hold up the bridge deck;
- laying down prefabricated bridge beams by crane;
- building the bridge deck, waterproofing; and
- dressing the bridge with parapets, barriers and a blacktop bituminous layer.

4.12.4 All bridge beams would be precast or prefabricated offsite and brought in by road. There is a potential exception for the A14/A1 Link overbridge which has an option to be built by poured concrete in situ.

4.12.5 It should be assumed there would be up to an average of one month of bored piling work at each new structure. Exceptions to this are at the river Great Ouse viaduct and the wide structures at Girton and the A14/A1 interchange. At these locations, it is assumed four months of bored piling for the former and two months bored piling for the latter are realistic.

4.12.6 Bridge deck beams would all be either pre-cast concrete or pre-fabricated steel and would be transported to site by road. For the largest structures, some of these would be significant vehicles carrying 30-40m concrete bridge beam sections. Steel sections would be likely to be shorter and bolted together to meet wider spans in situ. There would be careful planning with regards the routing of these loads, avoiding sensitive routes where practicable.

4.12.7 Specific to the bridge over the East Coast mainline railway, works would include the accommodation and modification of existing overhead line equipment including localised portal gantry installation either side of the bridge to facilitate the construction of the new structure over the railway line.

4.13 Drainage

4.13.1 Culverts (*Appendix 3.1 of the ES*), headwalls, outfalls, pipes, ironworks and manhole rings would be precast offsite and brought in by road.

4.13.2 It is envisaged that numerous sheet piling operations would take place for temporary works/ground support for excavations during drainage installation. Modern sheet piling techniques do not necessarily require percussive plant use, although this might remain an option in open spaces with no sensitive receptors close by and where the ground conditions do not permit alternatives.

4.13.3 Extruded concrete lined drainage channels would be set down either side of the highway and poured on site with concrete coming from batching plants at either end of the scheme to minimise concrete import onto the scheme.

4.13.4 Balancing ponds and swales would make up part of the earthworks element.

4.14 Intelligent Transport Systems (ITS)

4.14.1 Amongst the assets within the ITS criteria for the scheme are superspan gantries, motorway signal mark 3 (MS3) and motorway signal mark 4 (MS4) type gantries (all gantries may either carry variable message signs or standard highway signs, but a similar gantry structure would be used regardless), closed circuit television (CCTV) masts, communications cabinets, traffic detection loops within the road surface, and the required ducting to carry cables between assets.

4.14.2 The larger sign structures typically involve the installation of portal or cantilever gantries/message signs. The construction sequence normally starts with construction of concrete foundations, followed by installation of the gantry legs. The gantries themselves would be fabricated off-site and lifted in by crane. The electrical equipment is then connected and commissioned. A full gantries schedule is provided in *Appendix 3.1 of the ES*.

4.14.3 The assumed weight of steel within the prefabricated structures are taken as:

- MS3: 10 tonnes (cantilever message signs);
- MS4: 5 tonnes (cantilever message signs); and
- Superspan of 20m: 30 tonnes (portal gantry).

4.14.4 Longitudinal cabling involves minor engineering work for trenching, installation of cables and construction of drawpits and cabinets. Cross carriageway ducts are installed for connection of equipment in the central reserve. Traffic detection loops are cut into the completed carriageway surface.

4.15 Lighting

4.15.1 Lighting would be restricted to junctions. Lighting columns would be of highways standard. Columns would be transported via the road, expecting to use the existing strategic road network to arrive on site and then navigate via the haul routes to in-situ locations.

4.15.2 Cabling can be assumed to be as with ITS services.

4.16 Materials

4.16.1 The raw materials required for the scheme include primary aggregates, particularly sand and clay. The scheme is located over existing areas of gravel, sand and clay and as such, material from the existing area would be used where practicable.

4.16.2 Construction, demolition and excavation wastes would also be considered as an alternative to primary aggregates.

4.16.3 The appropriate quantities of particular materials that would be required by the scheme are identified in *Table 4.1*.

4.16.4 At this preliminary design stage, there is a degree of uncertainty about material volumes and their sources. In order to ensure the assessment of likely significant effects from the likely worst case scenario during construction, all material volumes quoted include a contingency of 10%.

4.16.5 The likely worst case comprises of imported major material types being blacktop, concrete and steel. Aggregates would be sourced from borrow pits and cuttings within the scheme boundary.

4.16.6 To cover uncertainty in the source locations of imported materials, it is assumed that up to 14% of the total materials required for the scheme would be imported (incorporating the contingency of 10%) in respect of construction vehicle movements accessing the scheme from offsite.

Table 4.1: Estimated material quantities

Construction material required	Estimated quantities of materials (m^3)
Blacktop	516,700
Sub base	273,040
Capping	383,700
Concrete	606,370
Steel	12,360
Plastics	2,765

4.17 Clearance of site on completion

4.17.1 Clearance of the soil storage and compound sites upon completion of the works would normally involve small dumpers, excavator/loaders and lorries to gather up and dispose of surplus material and return the ground to the condition in which it was found.

5 Land requirements

5.1 Land required during construction

5.1.1 Land required during construction may be in addition to that required for the footprint of the permanent works. The main requirements are described below. All land required for temporary use within the construction of the scheme is within the DCO boundary submitted as part of the DCO application.

Site compounds

5.1.2 Where possible site compounds would be located close to the proposed works where there is suitable access. Site compounds would be used to accommodate offices for the contractors as well as workshops, stores, welfare facilities, worker accommodation and parking for vehicles and plant machinery. Refer to *Figure 3.1* for indicative locations of site compounds.

Haul routes

5.1.3 Although the majority of the scheme's haul routes would utilise either existing highway due to the proximity of the borrow pits to the scheme, or existing tracks, some land would be required to enable access to the permanent works. Haul routes and access arrangements are shown on *Figure 3.1*.

Borrow pits

5.1.4 Owing to the requirement for fill within the scheme, six borrow pits have been identified for providing a combination of aggregate and capping as required by the scheme. The borrow pits have been allocated per scheme section limiting the need to transfer material from one end of the scheme to the other.

Floodplain compensation areas

5.1.5 Areas have been identified within the flood risk assessment modelling to provide lower ground to compensate for areas of the floodplain lost to the scheme. Floodplain compensation areas for the scheme are represented on *Figure 3.2*.

Soil storage areas

5.1.6 Soil storage areas have been identified on *Figure 3.1*. It is envisaged the majority of these areas would return to previous use.

Temporary diversions

5.1.7 In order to maintain traffic flows when undertaking works on the existing highway such as a new bridge or carriageway tie-ins, it may be necessary to provide a temporary diversion.

5.2 Permanent land

5.2.1 The main requirements for permanent land are as follows:

- land taken by the earthworks required to accommodate the permanent new highway alignments, i.e. land required to build embankments or excavate cuttings;
- land required to allow adequate drainage of the road and the area through which it passes. This includes land required for diversion of watercourses, drainage outfalls and mitigation features such as attenuation ponds and pollution control units, including arrangements for maintenance access; and
- land required for other environmental mitigation such as landscaping, planting and screening.

5.2.2 Other land not required for the permanent works may be permanently acquired by the Highways Agency due to it becoming unusable or impractical to use as a direct result of the works or because of commitments given in the planning of the scheme.

5.2.3 For greater detail on land requirements, refer to the *Statement of Reasons, DCO document reference 4.1*.

6 Public access, site access and traffic management

6.1 Access routes for construction traffic

6.1.1 The construction works are generally accessible from the strategic road network so most construction vehicle movements would be able to use these main routes. The contractor would be restricted as to the extent and purpose of using other roads for construction purposes. While it is desirable for all construction related access to be via the major routes it would be necessary to provide some other access for isolated construction areas. These additional routes would be determined in consultation with the relevant local roads authority. Where necessary signage would be provided on roads to indicate that the route is not to be used by the contractor.

6.2 Traffic management requirements

6.2.1 During construction, temporary traffic management would be required to undertake the works whilst minimising disruption to users of both the existing mainline and the local side road network.

6.2.2 In general, construction phasing and temporary traffic management proposals would be prepared on the basis of keeping the same number of lanes in use as existing during the peak periods of traffic flow. Lane closures would be employed during off-peak times for the facilitation of changes to traffic management, surfacing tie-ins and gantry or bridge construction.

6.2.3 For the main routes, it is expected that traffic would be kept on the normal carriageways wherever possible, if necessary using narrow lanes and restricted temporary speed limits through the main works areas.

6.2.4 It is expected that other routes including slip roads at major junctions would be kept open during construction of the new works. This would, in some cases require construction of extensive temporary alignments. The proposals would be prepared on the basis of keeping all routes and accesses open throughout the works.

6.2.5 As well as planning the traffic management proposals to limit wherever practicable road-user delays, the safety of vulnerable road-user groups such as pedestrians and cyclists would be a particular consideration.

Works restrictions

6.2.6 It is generally proposed that the network connection works would be constructed within the typical working hours as set out in this appendix with no requirement or intention for prolonged late night or 24 hour working. The only exceptions to this would be for the installation of gantries and beams on new bridges which could only be carried out during an overnight closure of any live carriageways being spanned, along with some surfacing activities. Alternative diversion routes would be set up during such night time closures, together with advance warning and publicity to help drivers to avoid these locations/dates if possible.

6.2.7 Some further restrictions such as reducing through traffic to one lane may be applied in order to carry out critical tie-in works between existing and new carriageways and gantry erection. This would minimise the number of road closures and diversions required. Weekend or night time road closures would be programmed to avoid significant local or national events that might generate substantial increases in traffic. All closures and diversions would require a temporary traffic order and be subject to approval by the Highways Agency, Police and maintaining authority.

6.2.8 If contra-flows were to be adopted for certain sections of the online construction, additional temporary lighting would, if necessary, be provided at cross-over points. Temporary lighting would also be required where construction would be undertaken during night time periods, for example during tie-in surfacing work.

Temporary or permanent road closures or diversions

6.2.9 Temporary road closures and diversions would be arranged following discussions with the relevant highways authority, police and the maintaining agents. A temporary traffic order giving the requisite notice would be prepared and a statutory notice placed in local newspapers.

6.2.10 Temporary road closures that occur as a consequence of the phasing for the construction of new alignments would be implemented following discussions with relevant parties and agreement of temporary traffic arrangements for the next phase of the works.

6.2.11 The traffic management for the scheme would follow the guidance in the *Road Works and Temporary Situations Chapter (Chapter 8)* of the *Traffic Signs Manual* (Department for Transport, 2009), adopting the following standards as applicable:

- where heavy vehicles, including public service vehicles are expected, the lane width may be reduced to 3.25m (desirable) or 3.0m (absolute minimum). Lane widths of 3.25m and 3.0m would therefore be used with an appropriate reduction in the speed limit where two narrow lanes have to be maintained. A minimum lane width of 3.5m would be adopted where possible; and
- a minimum lateral clearance of 1.2m between two-way traffic where temporary steel safety barrier is used, particularly, when the speed limit is 50mph and a minimum lateral clearance of 0.5m between two-way traffic when the speed is 40mph or below.

Signage

6.2.12 Provision of signage at junctions in the vicinity of contra-flow arrangements should allow drivers to determine the lane destinations prior to entering the contra-flow, thus reducing the amount of late lane changes.

Approvals

6.2.13 The main contractor's detailed proposals for traffic management would only be confirmed after discussions with the Highways Agency, Police, maintaining authorities and the appropriate local authorities, where relevant.

6.2.14 The main contractor would be required to appoint a full time traffic safety officer who would be responsible for tasks such as submitting traffic management layout drawings and method statements within the requisite notice period for discussion at regular traffic management meetings. The traffic safety officer would be responsible for ensuring that the temporary traffic management operations are continually monitored and maintained.

7 Bibliography

British Standards Institute (2014). *BS5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – noise*. British Standards Institution

Department for Transport (2009). *Traffic Signs Manual Chapter 8: Traffic Safety Measures and Signs for Road Works and Temporary Situations* (Department for Transport/Highways Agency, Department for Regional Development (Northern Ireland) Transport Scotland, Welsh Assembly Government

Planning Inspectorate (2011). *PINS Advice Note 9: Using the Rochdale Envelope*

Annex A: Typical plant and machinery – worst case from a noise and vibration perspective

Sound power levels for plant items provided in the tables within this annex are taken from *BS5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites (noise)* (*British Standards Institute, 2014*) and supplemented with measured data where levels are unavailable in the standard.

Road widening

Stage	Plant	Sound power level (dBA)	Number (per work gang)	On time % (daily average over one month)
Site clearance	Excavator (30t)	103	1	60%
	Chainsaw	114	2	100%
	Chipper	116	2	100%
Earthworks	Excavator (35t)	108	2	70%
	Bulldozer (24t)	111	1	70%
	Articulated dump truck (23t)	109	2	70%
	Roller - static	108	1	70%
	Vibratory roller	108	1	70%
	Haulage dump truck being loaded	110	1	70%
Drainage	Excavator (5t)	102	2	70%
	Excavator (8t)	99	1	70%
	Wheeled dumper 6t	101	1	25%
	Compressor	102	1	5%
Pavement	Paver and tipper lorry	105	1	80%
	Roller - static	108	2	80%
	Dump truck	107	2	80%
	Haulage dump truck being loaded	110	1	50%

New road construction

Stage	Plant	Sound power level (dBA)	Number (per work gang)	On time % (daily average over one month)
Site clearance	Excavator (30t)	103	1	60%
	Chainsaw	114	2	100%
	Chipper	118	2	100%
Earthworks	Excavator (35t)	108	2	90%
	Bulldozer (24t)	111	2	50%
	Articulated dump truck (23t)	109	2	50%
	Roller - static	108	1	50%
	Vibratory roller	108	1	90%
	Haulage dump truck being loaded	110	6	50%
Drainage	Excavator (5t)	102	2	70%
	Excavator (8t)	99	1	70%
	Wheeled dumper (6t)	101	1	25%
	Compressor	102	1	5%
Pavement	Paver and tipper lorry	105	1	80%
	Roller - static	108	2	80%
	Dump truck	107	2	80%
	Haulage dump truck being loaded	110	1	50%

Bridge construction

Stage	Plant	Sound power level (dBA)	Number (per work gang)	On time % (daily average over one month)
Site clearance	Excavator (30t)	103	1	60%
	Chainsaw	114	1	25%
	Chipper	116	1	25%
Earthworks	Excavator (35t)	108	2	90%
	Bulldozer (24t)	111	2	90%
	Articulated dump truck (23t)	109	2	90%
Structures	CFA crawler mounted rig	108	1	50%
	Concrete pump	106	2	20%
	Tracked crane (55t)	98	1	50%
	Large lorry concrete mixer	105	10	5%
	Tracked excavator	96	2	25%
	Dumper (9t)	104	2	25%
Surfacing	Paver and tipper lorry	105	1	80%
	Roller - static	108	2	80%
	Dump truck	107	2	80%

River Great Ouse viaduct

Stage	Plant	Sound power level (dBA)	Number (per work gang)	On time % (daily average over one month)
Site clearance	Excavator (30t)	103	1	60%
	Chainsaw	114	1	25%
	Chipper	116	1	--
Earthworks	Excavator (35t)	108	3	90%
	Bulldozer (24t)	111	3	90%
	Articulated dump truck (23t)	109	2	90%
Structures	CFA crawler mounted rig	108	2	50%
	Concrete pump	106	4	20%
	Tracked crane (110t)	95	1	50%
	Large lorry concrete mixer	105	10	5%
	Tracked excavator	96	2	25%
	Dumper (9t)	104	2	25%
Surfacing	Paver and tipper lorry	105	1	80%
	Roller - static	108	2	80%
	Dump truck	107	2	80%

East Coast mainline railway bridge

Stage	Plant	Sound power level (dBA)	Number (per work gang)	On time % (daily average over one month)
Piers construction	Hiab	116	1	30%
	Pick up	102	2	25%
	Tracked mobile crane (55t)	98	1	50%
	Pick up	102	3	25%
	Concrete mixer truck	108	2	20%
	Circular saw/cut off saw/disc cutter	115	1	5%
	Compressor	102	1	5%
	Scabbling concrete	111	1	5%
	Compaction of concrete - compressor and poker vibrator	105	2	10%
Installation of beams and concreting of in situ concrete bridge deck	Tracked mobile crane (600t)	99	1	75%
	MEWP	95	2	30%
	Compressor	102	1	5%
	Compaction of concrete - compressor and poker vibrator	105	2	10%
	Lorry delivery	109	2	20%
	Hiab	116	1	25%
	Pick up	102	2	30%
	Circular saw/cut off saw/disc cutter	115	1	5%
	Concrete pump	103	1	30%
	Concrete mixer truck	108	4	10%

Borrow pits

Stage	Plant	Sound power level (dBA)	Number (per work gang)	On time % (daily average over one month)
Earthworks	Excavator (35t)	108	3	90%
	Articulated dump truck (23t)	109	6	90%
Batching plant	Batching plant	95	3	90%
Distributing materials	Dump truck (29t)	107	2	50%
	Telescopic handler	99	2	50%

Compounds, soil storage areas and floodplain compensation areas

Stage	Plant	Sound power level (dBA)	Number (per work gang)	On time % (daily average over one month)
Earthworks	Excavator (35t)	108	3	90%
	Articulated dump truck (23t)	109	6	90%
Distributing materials	Dump truck (29t)	107	2	50%
	Telescopic handler	99	2	50%

Utility diversions

Stage	Plant	Sound power level (dBA)	Number (per work gang)	On time % (daily average over one month)
Utilities	Vibrating roller (small)	103	1	25%
	360 excavator (15t)	101	1	50%
	Dumper (2t)	102	1	50%
	Pick up	102	1	25%
	Disc cutter	112	1	5%
	Hydraulic sheet piling	106	1	25%

Temporary bridge over the river Great Ouse

Stage	Plant	Sound power level (dBA)	Number (per work gang)	On time % (daily average over one month)
Erecting and dismantling temporary bridge	Dismantling scaffolding	108	2	50%
	Tracked mobile crane	103	1	25%
	Scissor lift	106	1	5%
	Scissor lift (idling)	98	1	60%
	Diesel generator	89	1	100%
	Compressor (general)	91	1	60%
	Air impact wrenches	>90	2	40%

Huntingdon viaduct demolition including bridge slide and crash deck

Stage	Plant	Sound power level (dBA)	Number (per work gang)	On time % (daily average over one month)
Demolition	Tracked crane (600t)	99	1	50%
	Dumper (2t)	105	1	50%
	Excavator (JCB)	97	1	50%
	Tracked loader (CAT)	112	1	50%
	Excavated material lorries (8 wheeled)	109	3/hr	50%
	Pneumatic breaker	111	1	50%
	Compressor	102	1	50%
	Excavator mounted breaker	120	1	50%
Bridge slide	Bespoke sliding equipment	91.0	1	90%
	360 degree excavator (20t)	99.0	2	50%
	Hiab	116.0	3	25%
	Lorry delivery	109.0	3	20%
	Pick up	102.0	5	25%
	Dismantling scaffolding	108	2	50%
	Scissor lift	106	2	5%
Erecting and dismantling crash deck	Scissor lift (idling)	98	2	60%
	Core drilling	113	1	10%
	Hand-held pneumatic breaker	111	1	10%

Drainage

Stage	Plant	Sound power level (dBA)	Number (per work gang)	On time % (daily average over one month)
Drainage installation	Excavator (5t)	102	2	70%
	Excavator (8t)	99	1	70%
	Wheeled dumper (6t)	101	1	25%
	Generator	89	1	5%
	Compressor	102	1	5%

ITS – gantry installation

Stage	Plant	Sound power level (dBA)	Number (per work gang)	On time % (daily average over one month)
Sign installation	Mobile crane (100t)	103	1	50%
	MEWP	106	2	25%
	Air wrench	106	2	5%
	Generator	89	1	5%
	Compressor	102	1	5%

ITS – ducting

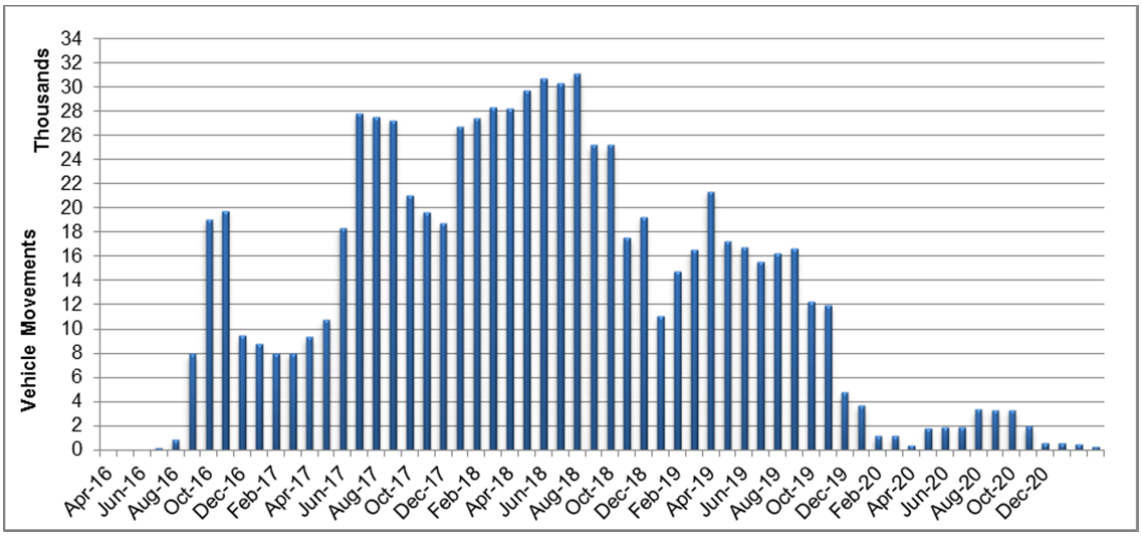
Stage	Plant	Sound power level (dBA)	Number (per work gang)	On time % (daily average over one month)
Ducting	Excavator (5t)	102	2	70%
	Excavator (8t)	99	1	70%
	Wheeled dumper (6t)	101	1	25%
	Trench rammer/upright wacker	108	1	25%
	Generator	89	1	5%
	Compressor	102	1	5%

General road paving including tie-ins

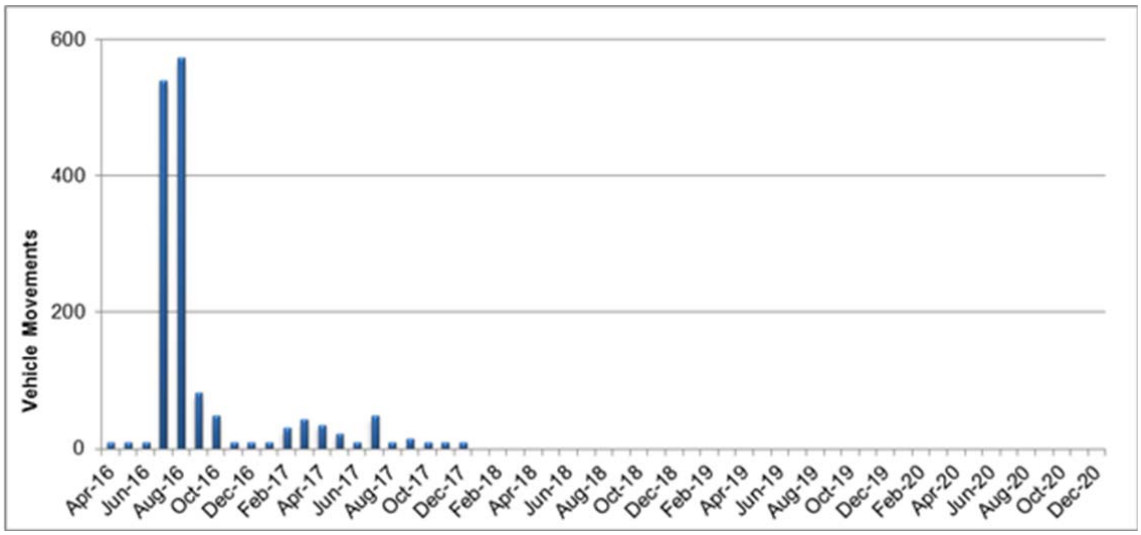
Stage	Plant	Sound Power Level (dBA)	Number (per work gang)	On time % (per night)
Pavement	Paver and tipper lorry	105	1	80%
	Roller - static	108	2	80%
	Dump truck	107	2	80%

Annex B: HGV movements (construction)

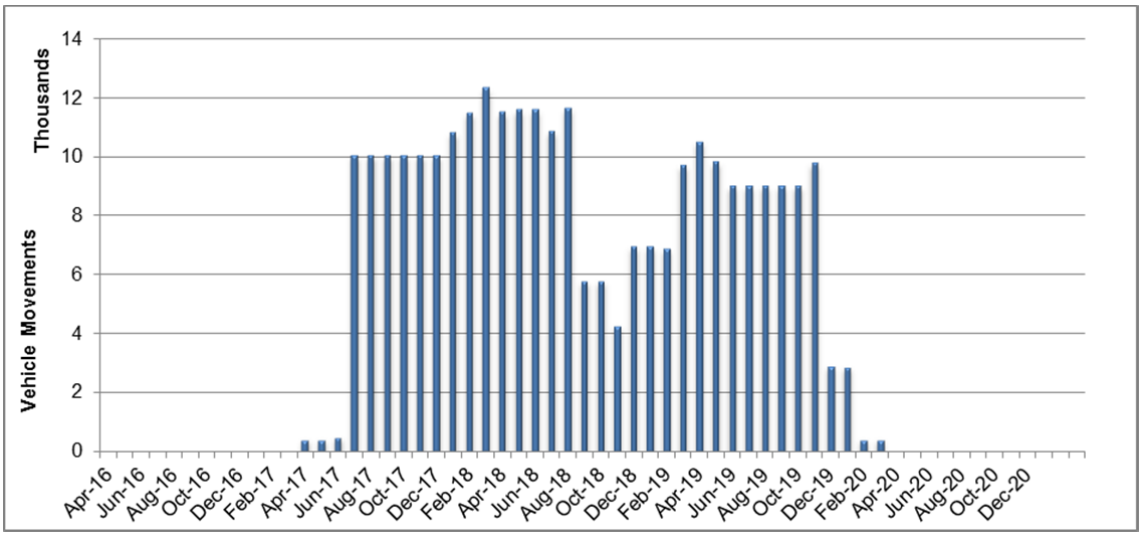
Total monthly vehicle movements across the scheme



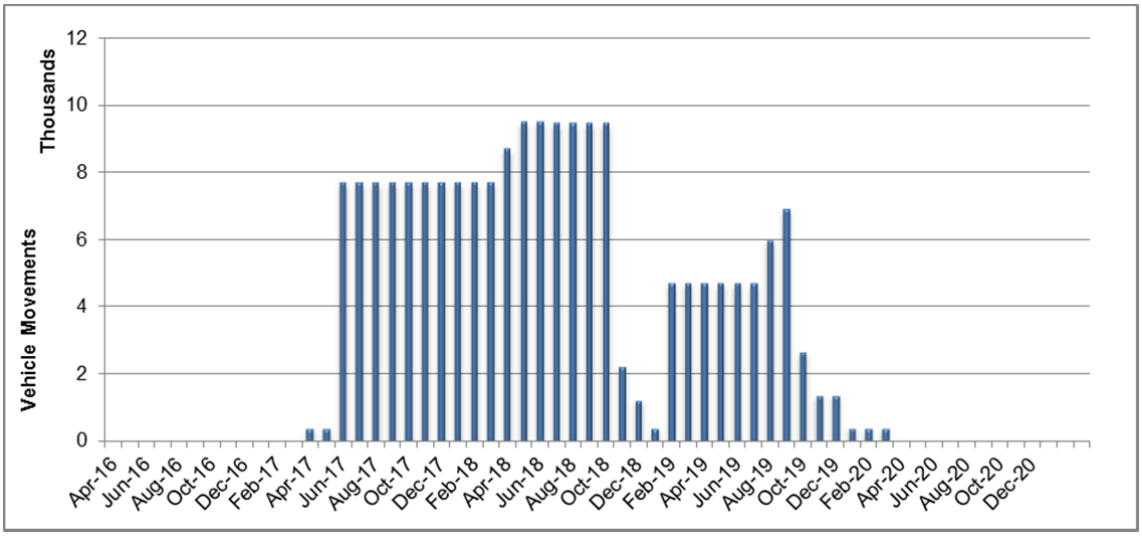
Section 1 monthly vehicle movements



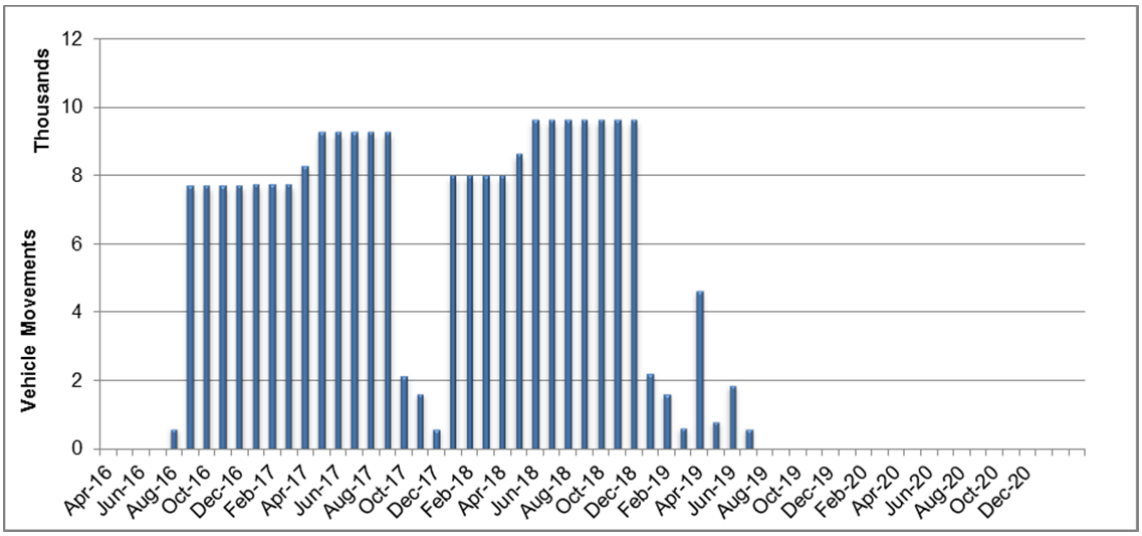
Section 2 monthly vehicle movements



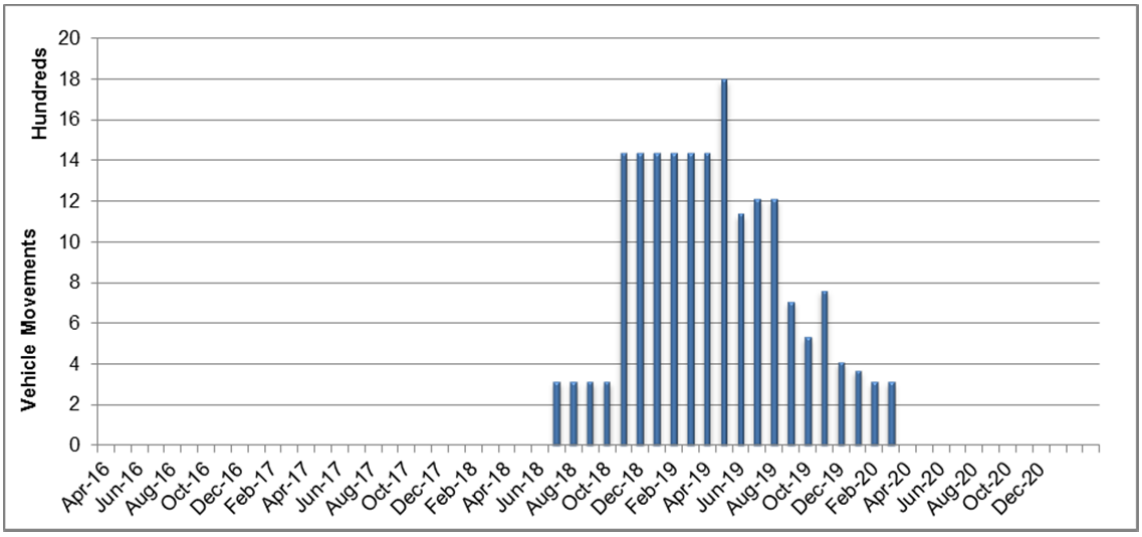
Section 3 monthly vehicle movements



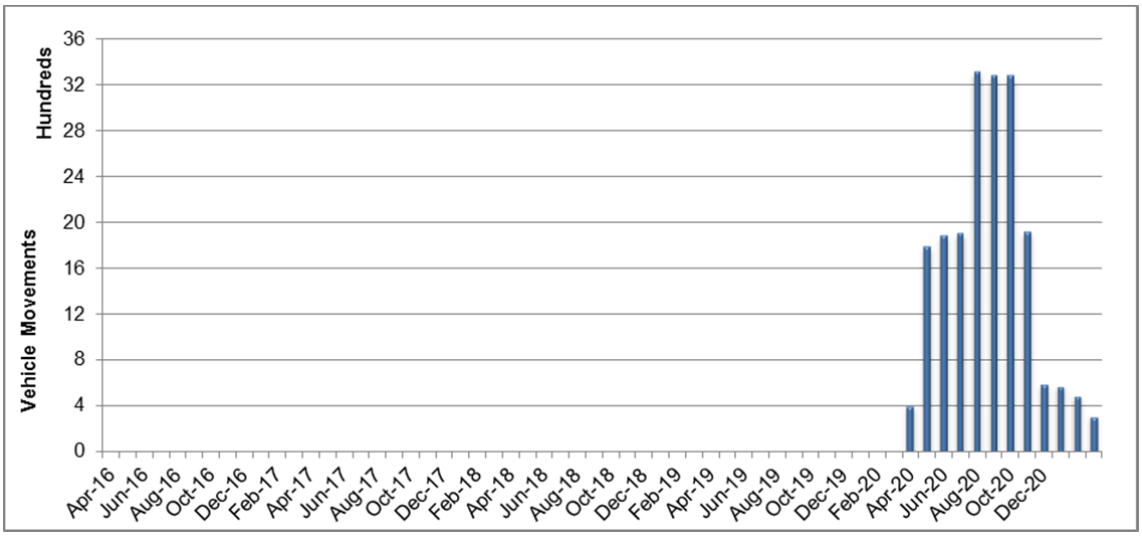
Section 4 monthly vehicle movements



Section 5 monthly vehicle movements



Section 6 monthly vehicle movements



Annex C: Estimated maximum daily vehicle movements across the scheme

HGV vehicle source and direction	Basis for vehicle movement estimation	Maximum estimated daily HGV	Average estimated daily HGV
Borrow pit 7 (BP7) and floodplain compensation (FPC) west of A1 – vehicles moving north to A1 online widening section	100% of BP7 and FPC HGV movements travel south to section 2	189	25
FPCs on eastern side of A1 – vehicles moving south section 2	70% HGV movements adjacent to section 1 to provide fill where required	265	36
FPCs on eastern side of A1 – vehicles moving south section 2	30% HGV movements travel south along A1 to provide 5% of section 2 fill requirements	132	18
Borrow pit 1 and associated FPCs – vehicles moving north towards Ellington junction area	BP1 provides 45% HGV movements for section 2; 20% movements going north	53	34
Borrow pit 1 and associated FPCs – vehicles moving to areas of section 2 immediately adjacent to the borrow pit	BP1 provides 45% HGV movements for section 2; 40% movements going adjacent to borrow pit	106	69
Borrow pit 1 and associated FPCs – vehicles moving south towards the new A1 and A14 cross over	BP1 provides 45% HGV movements for section 2; 40% movements going south	106	69
FPCs on eastern side of Grafham Road bridge. All local movements adjacent to FPCs	FPC provides 2.5% HGV movements for section 2; local	15	4
FPCs on western side of Grafham Road bridge. All local movements adjacent to FPCs	FPC provides 2.5% HGV movements for section 2; local	15	4
Borrow pit 2 – vehicles moving east towards the river Great Ouse crossing	BP2 provides 30% HGV movements for section 2; 100% movements going east	176	115
FPCs south of Great Ouse viaduct provide fill material going north to western embankment of viaduct	FPCs provide 5% of HGV movements for section 2	29	19
Cutting fill coming from the western end of section 3 moving towards the East Coast Mainline bridge embankment	Cutting excavation provides 60% HGV movements for section 3; 20% movements going west	54	32

HGV vehicle source and direction	Basis for vehicle movement estimation	Maximum estimated daily HGV	Average estimated daily HGV
Cutting fill coming from the western end of section 3 moving east towards Ermine Street junction	Cutting excavation provides 60% HGV movements for section 3; 80% movements going east	218	127
FPCs west of borrow pit 3. All local movements adjacent to FPAs	FPCs provide 4% of HGV movements for section 3; local	5	3
Borrow pit 3 – vehicles moving west towards Ermine Street junction	BP3 provides 28% HGV movements for section 3; 30% movements going west	38	22
Borrow pit 3 – vehicles moving east towards Swavesey	BP3 provides 28% HGV movements for section 3; 70% movements going east	89	52
FPCs east of borrow pit 3. All local movements adjacent to FPAs	FPCs provide 4% of HGV movements for section 3; local	5	3
FPC near New Barns bridge moving west towards BP3	FPCs provide 4% of HGV movements for section 3; local	5	3
Borrow pit 5 – vehicles moving east through section 4 towards borrow pit 6	BP5 provides 47.5% HGV movements for section 4; 100% movements going east	218	151
FPCs near Robins Lane bridge	FPCs provide 2.5% of HGV movements for section 4; local	11	8
FPCs near Bar Hill	FPCs provide 2.5% of HGV movements for section 4; local	11	8
Borrow pit 6 – vehicles moving west up section 4	BP6 provides 47.5% HGV movements for section 4; 20% movements going west	44	30
Borrow pit 6 – vehicles providing fill to Girton Interchange	BP6 provides 47.5% HGV movements for section 4; 80% movements going east towards Girton junction	174	121
Borrow pit 6 – vehicles travelling east into section 5	BP6 provides 100% HGV movements for section 5	86	44
Huntingdon town centre improvements	100% HGV movements from section 6	158	84

Vehicle movements have been calculated from the construction materials and activities envisaged at the time of the scheme's preliminary design. These have been spread across the phased programme of works for each individual construction section. A contingency of 10% has been built into the figures for HGV movements for earthworks and a contingency

of between 10-35% was used for movements of other components (such as gantries, communications equipment, bridge beams) to cover unforeseen eventualities.