Proposed Mitigation

Phase 1 Construction

Designated Sites

7.260 None of the statutorily designated sites identified within the desktop study search area will be directly affected by the phase 1 construction works.

7.261 Those sites designated for their bat populations in the three tables above may however be indirectly affected by the proposed phase 1 construction works through potential impacts on the bats, when outside the boundary of the designated site and within the Hybrid Application Site. As such the mitigation measures detailed within the bats section below will apply. See paragraphs 7.259a – 7.259k and the phase 1 Impact table for discussion of impacts on the Severn Estuary SAC, SPA and Ramsar, Walmore Common SPA and Ramsar site and on the Speech House Oaks SSSI.

7.262 As for the policy based designated sites, both the direct (as detailed under the individual habitat features in the tables above, where possible) and indirect impacts identified on the Cinderford Linear Park Key Wildlife Site will be addressed through the mitigation measures for the individual ecological features detailed below.

Habitats

7.263 It is not possible to mitigate the loss of all habitats arising from the college / section 1 spine road construction and from creation of a mitigation area on an area for area basis, either within the footprint of the development at the Hybrid Application Site or within the wider area. Potential fragmentation of habitats along Old Engine Brook and along the eastern boundary of the Hamblett Land (as labelled on Figure 7.5) can be mitigated in the short term through the inclusion of brash corridors (as detailed in paragraph 7.298 below). No further fragementation is anticipated during this phase.

7.264 ~~However all~~All of the habitat types present and to be directly affected during phase 1 are considered to be of a medium to lower ecological value.

7.264a The principles of the phase 1 and phase 2 mitigation areas as shown on Figure 7.5 and detailed within Appendix 7.11 have been established in accordance with the requirements of the Cinderford Northern Quarter Biodiversity Strategy Technical Guidance document (Committee Draft May 2014) and in discussion with the FoDDC. It has been

agreed that the overall mitigation and enhancement measures required for the proposed development at the Hybrid Application Site (which are shown on Figure 7.5) will follow so far as possible those areas identified within the Biodiversity Strategy around the Hybrid Application Site (ie see the areas shown as new grassland creation, FC open habitat and broadleaf woodland restoration on Figures 4.1 and 4.2 entitled Biodiversity Spatial Masterplan within the Biodiversity Strategy) with the remaining areas to the south of the site (as seen as new grassland creation on Figure 4.2 within the Biodiversity Strategy) to be undertaken as enhancement works in conjunction with the phase 2 resserved matters developments (these remaining areas to the south of the site are not shown on Figure 7.5 but are shown on Figure 7.6). It has also been agreed that both the habitat creation and enhancement areas (those shown on Figure 7.5) and also the remaining areas to the south of the site are to be secured through the section 106 agreement.

7.264b Figure 7.5 shows the areas proposed for phase 1 mitigation, the detailed permission phase 2 mitigation and the outline permission phase 2 mitigation. This mitigation has been designed as a whole to ensure a coherent approach and to prevent fragmentation or isolation of mitigation areas. As a result the ratios identified for each of the phases of mitigation (ie phase 1 mitigation; phase 2 detailed mitigation; and phase 2 outline mitigation) do vary. For example the ratios for the detailed phase 2 mitigation and the outline phase 2 mitigation (as identified on Figure 7.5) vary from those for the phase 1 mitigation. The phase 1 mitigation ratios are 1.33 woodland creation and 0.52 woodland enhancement for every 1ha of woodland and scrub habitat lost to the development; and 1.36 grassland creation and 0.47 grassland enhancement for every 1ha of grassland and other open habitat lost to the development. Therefore through a combination of habitat creation and enhancement, mitigation is provided for the loss of habitat areas arising from the proposed development and associated works at the Hybrid Application Site. This is in accordance with the Biodiversity Strategy that has been agreed with a number of other consultees.

7.264c In addition to the ~~In addition there will be~~ specific habitat creation and enhancement measures proposed (as shown on Figures 7.5 and 7.6), the hectarages of loss, creation and enhancement relating to these areas are shown in Table 7.3.1b above. These areas will also deliver mitigation ~~and delivered~~ for specific protected species (see individual species sections below). ~~The~~

7.264d In summary, as regards Phase 1, these specific habitat creation and enhancement measures will ensure that habitat losses and fragmentation arising from phase 1 will be

adequately replaced. As such it is considered that the overall habitat value of the Hybrid Application Site and the wider area will be improved and, by granting planning permission in relation to the Hybrid Application Site on this basis, FoDDC's Section 40 duty is met.

7.264e The mitigation area identified for phase 1 is located on land owned by the Forestry Commission who have been consulted. Relevant permissions and agreements have been obtained to permit the use of the majority of these areas for mitigation. Any adjustments needed to the permissions / agreements will be made. Since the Phase 1 mitigation areas are consistent with Figure 4.1 of the Biodiversity Strategy (pg 88-89) (showing the Biodiversity Spatial Masterplan), there is a strong policy presumption that the phase 1 mitigation areas will be safeguarded to provide offsetting for the foreseeable future.

7.265 These habitat creation and enhancement measures will also address the section 41 habitats to be affected from this phase, although such impacts are limited to potential indirect impacts to standing and running water (s41 Ponds and Rivers Habitat). No mixed woodland (s41 Lowland Mixed Deciduous Woodland) is affected by this phase 1 of works and s41 Wet Woodland and Open Mosaic Habitats have not been identified on site therefore will not be impacted.

7.266 Indirect construction related impacts will be minimised through the use of appropriate working practices to ensure that construction activities do not extend into adjacent habitats. Appropriate pollution management plans and procedures will be put in place to minimise the risk and severity of such incidents and to ensure rapid and efficient action in the event of such an incident. Additional measures to protect watercourses and water-bodies on site are described in the ES chapters on Land Quality and Ground Conditions and on Hydrology and Flood Risk. All of these measures will be detailed within the Construction Environmental Management Plan (CEMP) for this phase 1 which will be submitted to the FoDDC prior to determination of the planning application.

Bats

College / section 1 spine road area:

7.267 All of the habitats across the college and spine road development area of the Hybrid Application Site are considered to have at least some value for bats, although this does vary with species and activity.

7.268 There are no Lesser Horseshoe bat roosts or flightlines identified from the 2011 or 2013 surveys within the Phase 1 college / section 1 spine road area. The 2011 and 2013 surveys

identified occasional recordings of Lesser Horseshoe bats within the Phase 1 college / section 1 spine road and the 2013 surveys identified three radio-tagged lesser horseshoe bats foraging around the periphery of this area. The 2013 radio-tracking surveys showed a single female Lesser Horseshoe and a single Natterer's within the phase 1 college/ section 1 spine road area and the static loggers showed significant Common Pipistrelle activity and limited Soprano Pipistrelle and Myotis spp activity along the Cinderford Brook to the north west of the college and section 1 of the spine road but this activity dropped dramatically for detectors positioned to the east of this watercourse.

7.269 Single Lesser and Greater Horseshoe bats were only occasionally recorded along Old Engine Brook (that runs north to south along the eastern boundary of the college and bisects section 1 of the spine road) throughout the 2013 survey season with only slightly higher numbers recorded along Cinderford Brook. These low levels of activity were confirmed by the transect surveys undertaken throughout the year.

7.270 However, the majority of the Lesser Horsehoe bats' roosting, commuting and foraging activity is concentrated to the north, south and south west of the Hybrid Application Site (refer to Figures 11 to 31, pages 47 to 67 Appendix 7.4 for full bat report). It can also be seen from the Lesser Horseshoe bat flyway plan (~~Figure 48, page 134 of Appendix 7.4 (also~~ shown as labelled on Figure 7.4) that no Lesser Horseshoe bat major or minor flyway will be transected by the proposed spine road from Forest Vale to the college or by the college.

7.270a In conclusion the small area of sub-optimal foraging habitat used by low numbers of Lesser Horseshoe bats which will be lost as a consequence of Phase 1 of the development will be fully mitigated through the provision of the Phase 1 mitgation areas (see below).

7.270b The development of Phase 1 will not result in the loss of any known roosts or associated flightlines of Greater Horseshoe bats, or the loss of any identified core foraging area for this species. The majority of detections for this species are recorded from areas outside the Phase 1 development and to the south of the Northern Quarter site. No Greater Horseshoe bats were identified from the transect surveys, fixed point counts or static loggers within the Phase 1 area to indicate a foraging area or flight line. No negative impacts on Greater Horseshoe bats are predicted.

7.270c The development of Phase 1 will not result in the loss of any known roosts, flightlines or any identified core foraging habitat for Bechstein's bat. Although the 2013 surveys found that the Northern Quarter is used by foraging Bechstein's, all of the captures and radio-tracking data for this species were from outside the Phase 1 development area. The foraing data

indicated that this species was resticted to foraging in broadleaf woodland within the Northern Quarter. Given this species' association with broadleaf woodland, tree lines and hedgerows, the habitats within the Phase 1 development are unlikely to provide optimal roosting, commuting or foraging habitat for Bechstein's bat. No negative impacts on Bechstein's bats are therefore predicted.

7.270d Low numbers of barbastelle bat passes were encountered throughout the site by transect activity surveys and static loggers surveys in both the 2011 and the 2013 surveys, representing less than 1% of the all the bat passes recorded throughout the site. One individual male was captured in June 2013. The development of Phase 1 will not result in the loss of any know roost, flightlines or core foraging habitat of barbastelle bat. No impacts on barabstelle bats are therefore predicted.

7.270e The development of Phase 1 will not result in the loss of any known roosting sites for any Pipistrelle species recorded at the site. Occassional detections of Nathuius pipistrelle bat was recorded in 2013 only and no flightlines or core foraging habitat was recorded. No negative impacts are therefore predicted on Nathuius pipistrelle bats. Common pipsitrelle bats were the most frequently recorded species in the Phase 1 development area. The level of common pipistrelle bat activity within the Phase 1 development area was moderate but the trapping surveys found that most of the bats using this area are male bats (apart from one breeding female captured in 2013) and, as such, the loss of habitat used by Common Pipistrelle bats within the Phase 1 development area is not predicted to result in the loss of habitat used as flightlines or core foraging habitat for breeding colonies. The loss of foraging habitat for Common pipistrelle bat will be fully mitigated through the provision of the Phase 1 mitigation areas (see below). Soprano pipistrelle bats were the second most frequently encountered species within the the Phase 1 development area and the trapping surveys found that approximately 50% of the soprano pipistrelle bats captured were female bats. However, the 2011 and 2013 surveys did not identify any flightlines for this species within the Phase 1 development area. Foraging activity for this species was concentrated around the waterbodies, which will be retained, but there may be some loss of foraging habitat associated with the removal of vegetation in close proximity to these waterbodies. Unmitigated, this would potentially result in a minor negative imapct on the foraging habitat for soprano pipistrelle species within the Phase 1 development area. This will however be fully mitigated through the phase 1 mitigation areas as described below.

7.270f The development of Phase 1 will not result in the loss of any known roosts or flightlines from *Myotis* species and Long-eared bat species. Only low numbers of encounters of species from the genus were recorded within the Phase 1 development surveys in both 2011 and 2013 and the 2013 trapping surveys confirmed that only male Brandt's, brown long-eared, Daubenton's and whiskered are present throughout the Northern Quarter site. The natterer's colony is lcoated 1.5km to the south of the Phase 1 development area. Unmitigated, the development of Phase 1 will result in the loss of sub-optimal foraging habitat for these species. Nonetheless, the provision the Phase 1 mitigation areas will mitigate fully for this loss by providing replacement optimal foraging habitat.

7.270g No species from the genus *Nyctalus* or *Eptesicus* were encountered in the Phase 1 development area and, as such, no known roosts, flightlines or foraging habitat for these species will be lost as a consequence of the Phase 1 development. No impact is on these species is predicted.

7.271 It can be concluded that direct impacts on bats during construction of the college and section 1 of the spine road from Forest Vale to the proposed college, unmitigated, will be minimal. This takes into account the potential sub-optimal habitat loss for foraging lesser horseshoe, common pipistrelle, soprano pipistelles and male *Myotis* and Long-eared species around the lakes, bearing in mind that the main waterbodies will be retained.

7.272 There also remains some potential for low level impacts on individual bats comprising permanent and temporary habitat loss, loss of potential tree roosts and risk of injury/mortality during phase 1 site clearance.

7.273 In terms of potential habitat loss, the site clearance work within the college / section 1 of the spine road development area of the Hybrid Application Site has been identified primarily as containing very infrequently used bat foraging habitat as shown within the bat survey report and as described earlier in this chapter (Figures 11 to 31, pages 47 to 67 Appendix 7.4 for full bat report). As such impacts of clearance will be minimal. Even so the habitat creation measures proposed to the south of the college / section 1 of the spine road development area in the phase 1 mitigation areas outside the Hybrid Application Site (see Figure 7.5) will adequately compensate for alll these losses / impacts. This is the case , immediately in relation to the loss (from the phase 1 development footprint) of open grassland habitats, which is a majority of the habitat to be lost to the Phase 1 development. By way of mitigation new species-rich grassland, scrub, and in addition riparian habitats (expected to be planted / created (on the current timetable) in

the phase 1 mitigation areas MP-1A, MP-1B and MP-1C in October 2014 following clearance (see Figure 7.5)) will become functional habitat for bats by spring 2015. This habitat will immediately attract a sufficent biomass of invertebrates to provide bat foraging opportunities in close proximity to sheltered newly created mature stock broadleaf woodland. This existence of new riparian habitat next to the protection of newly created mature stock broadleaf woodland will be of particular relevance, and attractive, to Lesser Horeshoe bats so that impacts on this species will be fully mitigated. This is also the case in the short to medium term in relation to the semi-mature woodland and scrub habitat losses from the phase 1 development footprint, where mature stock broad leaf woodland will be planted in the phase 1 mitigation area MP-1D in the autumn / winter of 2014 and of 2015 (see Figure 7.5). This planted mature stock broadleaved woodland will provide a foraging resource immediately which will improve over time resulting in an overall improved roosting, commuting and foraging resource for the bat popualtions using the site. The impacts from the short term loss of the semi-mature woodland and scrub habitats from the phase 1 development area will be minimal given the planting of the mature stock broadleaved woodland as described, the low levels of bat activity of soprano pipstrelle and Myotis and Long-eared bats levels described above and the small extent of the overall resource that is lost (see Table 7.3.1b above for hetarage of loss). In addition enhancement roosting provision in the form of a variety of bat roosting and hibernation boxes will be installed within retained habitats surrounding both the college / section 1 of the spine road area of the Hybrid Application Site and also within the phase 1 mitigation area outside the Hybrid Application Site so as to provide additional bat roosting opportunities.

7.274 In terms of potential tree roost loss, the college / section 1 of the spine road development area of the Hybrid Application Site also has no potential roosts within the clearance area due to the young age of trees present and lack of suitable roosting features. This area will be re-surveyed by suitably experienced ecologists prior to the clearance work and in the event that a tree roost is identified a bat licence will be required prior to felling the tree. If tree roosts are not identified, precautionary measures will still be adopted when felling the tree. Bat boxes, as noted above, will be erected in advance to provide additional bat roosting opportunities in advance of site clearance.

7.275 In terms of potential disturbance, killing or injury of bats within retained habitats during Phase 1 construction, this will be largely avoided through a combination of reasonable avoidance measures and appropriate timing of works with site clearance being undertaken as bats are moving into their hibernation roosts, reducing the likelihood of bats

being present within potential tree roosts. The reasonable avoidance measures will involve the use of appropriate working practices and restrictions during construction of the college / section of the spine road, as follows (these will be included within the phase 1 CEMP to be provided prior to determination of this application):

- Night working will not be permitted. If an exception is necessary then consultation with an ecologist will be required and a detailed method statement will be agreed following ~~unless absolutely necessary and only following~~ discussion with Natural England;, especially during the bat active season;
- Construction and security lighting will be limited to those areas where it is an absolute requirement for health and safety purposes while maintaining the maximum of 1 lux along retained habitat corridors. This will be confirmed within the CEMP and will only be exceeded if necessary for health and safety purposes although this is not anticipated;
- Light spill in such circumstances will be minimised through the use of directional lighting and light shields, with particular regard given to potential commuting and foraging areas where levels are not to exceed 1 lux;
- The use of generators overnight will be limited and consideration given to the use of acoustic barrier fencing if such use is required;
- Site compound locations to be used during phase 1 have been proposed within the Hamblett land and at the Forest Vale Junction away from the main building roosts within the Northern Quarter and are also generally located away from any potential tree roosts;
- Generators and similar equipment will also be carefully positioned to avoid potential tree roosts, particularly within the mitigation area (discussed below);
- Construction traffic associated with the college / section 1 spine road area of the Hybrid Application Site will be directed to prevent/limit use of the forestry track that runs through the Northern Quarter area to minimise potential disturbance to the maternity roosts within the buildings at Northern United from increased vehicular activity, with a majority of traffic for the purpose of the phase 1 construction entering the college/ section 1 spine road construction area from the Forest Vale Industrial Estate to the east of the Northern Quarter site.
- Dust suppression measures will be used throughout construction as detailed within the Air Quality chapter to ensure that impacts from dust pollution are negligible. The

application of strict working areas will ensure that there are no incidents of accidental damage to retained habitats and in the very unlikely event of this occurring temporary and permanent re-instatement measures will be used to ensure that this does not impact bat commuting routes.

- A CEMP will be produced and submitted to FoDDC prior to determination and will include details of the following: drawing showing the location and extent of all construction compounds (including Forest Vale); drawing showing the route that construction traffic will not take, except in exceptional circumstance, and details to define exceptional circumstance; construction lighting strategy to include: drawing showing retained habitat corridors relating to lighting strategy; protective fencing drawing for retained vegetation and dust prevention measures; specific limits to night working.

7.276 Since (as noted above) no Lesser Horseshoe bat major or minor commuting routes/flyways have been identified within the development area for the college / section 1 of the spine road, and no major or minor commuting routes/flyways for any of the other species within the bat assemblage recorded at Northern Quarter have been identified within the development area for the college / section 1 of the spine road, no specific measures to ensure maintenance of these are required.

7.277 The use of temporary brash corridors or windrows (to maintain dormouse habitat connectivity (see below) will however maintain potential commuting features for all bat species along Old Engine Brook and the eastern boundary of the Hamblett Land. This will maintain linear connectivity for bats by providing an appropriate linear structure through the phase 1 development footprint. These features will enable bats to navigate through the development footprint to disperse to roosting and foraging habitats within the wider landscape and, as such, prevent fragmentation and isolation of potential roosting, commuting and foraging habitats for the local bat populations.

7.278 No air or water pollution impacts are expected as part of the phase 1 construction given the measures detailed within the relevant chapters.

Phase 1 mitigation areas:

Mitigation area:

7.279 The 2013 radio-tracking study identified five Lesser horseshoe bats (of the fifteen bats radio-tracked bats for two nights or more) utilising the existing coniferous habitat within the Phase 1 mitigation area for foraging and to commute to foraging localities to the south and west of the proposed phase 1 mitigation areas.

7.280 The phase 1 mitigation areas MP-1A, MP-1B and MP-1C (Figures 7.5) contains blocks of conifer plantation which will ~~must~~ be removed (see Table 7.3.1b above for hectarages of loss) to create the species rich grassland, riparian and mature stock broad-leaf woodland mitigation habitat in respect of the Phase 1 development. This area, as well as providing adequate mitigation in the short term for all the relevant bat species in respect of the Phase 1 development area (see explanation above), will in the long-term provide improved roosting, commuting and foraging opportunities for the Lesser Horseshoe bat populations using the Northern Quarter site.

7.280a As noted above, this conifer plantation to be lost from phase 1 mitigation areas MP-1A, MP-1B and MP-1C has been shown to be used for foraging by male and female Lesser Horseshoe bats and Natterer's bats. Although bats will use coniferous habitat for foraging, coniferous woodland tends to support a lower biodiversity than native broadleaf woodland (partly due to the fact that the coniferous woodland is more often made up of plantations of non-native trees which do not support the same level of invertebrate diversity and biomass associated with native broadleaf woodland). The proposed removal of coniferous woodland in these Phase 1 mitigation areas, which will be replaced by species-rich grassland, riparian habitat and mature stock broad-leaf woodland, will ensure that the quality of the habitat replaced outweights the habitat lost in terms of bat foraging suitability. When fully mature, the new broad leaf woodland habitat will also ensure the availaibility of trees suitable for roosting and foraging bats. The planting will use mature stock native tree species and dead wood and coppice stools will be translocated where appropriate. Given that radio-tracking data in 2013 demonstrated that five of the fifteen Lesser Horsehsoe bats utilsied the conifer plantation for foraging and commuting, two of which were breeding females using this area as their core foraging habitat, wholesale removal of this conifer habitat would be problematic. For this reason wholesale removal of connifer habitat will be avoided, in line with best pratice recommendations for this species. Given that Lesser Horseshoe bats tend to avoid open habitats, it is proposed that a strip of conifer plantation will be retained on the western side of the Phase 1 mitigation area MP-1A to provide linear connectivity and foraging opportunities for Lesser Horseshoe bats.

7.280b As such, offset the potential impacts of fragmentation and isolation of foraging habitats through removal of conifer. In addition within the species rich grassland areas created, riparian habitats in the form of ponds buffered by vegetation will be created in proximity to the mature stock broadleaf planting and these waterbodies will attract an immediate biomass of invertebrates, in a protected environment to atract the Lesser Horseshoe bats, to offset the loss of insects associated with the coniferous habitat. The interface between the retained conifer strip (on the western side of the Phase 1 mitigation area) and grassland habitat will be planted with scrub and mature stock understorey species, such as holly and hawthorn, which will promote structural diversity within vegetation and immediately provide optimal foraging habitat for Lesser Horseshoe bats. The retention of the western conifer strip and the avoidance of wholesale block of conifer removal will ensure that Lesser Horseshoe bats have a dark corridor for commuting through in both summer and winter months and this will ensure that the colony will be able to reach foraging habitat within the wider landscape. Through this approach the risk predicted of temporary negative impacts on Lesser Horseshoe bats due to loss of conifer plantation will be fully mitigated against. Therefore, the creation of this Phase 1 mitigation area will not have a negative imapct on the roosting, commuting or foraging resources use by the Lesser Horseshoe bat and moreover, as described above, will serve as effective mitigation for Lesser Horseshoe bats from the loss of this phase 1 development area.

7.280c Overall there will be losses of 8.933ha of Lesser Horseshoe Bat habitat due to the phase 1 construction and creation of the associated mitigation areas. The mitigation areas will provide 4.61ha of ecological valuable habitat through creation and a further 1.676ha of habitat enhancements. There will also be 0.923ha of habitat re-instatement within the development area.

7.280d The provision of any of the Phase 1 mitigation areas will not result in the loss of any known roosts or associated flightlines of Greater Horseshoe bats, or the loss of any identified core foraging area for this species. No Greater Horseshoe bats were recorded present in this area during the static loggers or transect surveys. The highest number of Greater Horseshoe detections were located to the south of this area. No negative impacts are therefore predicted on Greater Horseshoe bats from the removal of the conifer and the removal of the coniferous woodland to be replaced by mature stock broadleaved woodland, species rich grassland, scrub and riparian habitats will, in the long term, provide greater foraging opportunities for Greater Horseshoe bats.

7.280e The removal of coniferous woodland to create broadleaf woodland habitat within 1this Phase 1 mitigation area MP-1A, MP-1B and MP-1C is not predicted to have an impact on the roosting, commuting or foraging requirements of Bechstein's bat. Bechstein's bat are not associated with this habitat type and the provision of the broadleaved woodland, scrub and riparian habitat within this Phase 1 mitigation area is predicted to be a positive impact for any Bechstein's bats using the Northern Quarter site. No barbastelle bats were encountered in this Phase 1 mitigation area by either the bat activity surveys, static loggers or trapping surveys and, therefore, the provision of this Phase 1 mitigation area will not result in the loss of any know roosts, flightlines or foraging habitat for barbastelle bats. The removal of coniferous habitat to provide mitigation in the form of broadleave woodland, grassland, scrub and riparian habitats is predicted to have a positive imapct on any barbastelle bats using the Northern Quarter site.

7.280f The creation of this Phase 1 mitigation area will not result in the loss of foraging habitat for Pipistrelle species recorded present at the site. The level of Pipsitrelle activity recorded during the surveys within this Phase 1 mitigation area was low and, as such, the removal of dense coniferous habitat to be replaced by broadleaved woodland, species rich grassland, scrub and riparian habitats is anticipated to have a beneficial of the roosting, commuting and foraging resources for the Pipistrelle population utilising the Northern Quarter site and will adequately offset any loss associated with low quality foraging habitat within the Phase 1 development area.

7.280g The provision of this Phase 1 mitigation area will not result in the loss of any known roost sites or severance of any known commuting routes for Myotis or Long-eared bats as a result of the removal of dense coniferous habitat. The level of foraging activity for Myotis and Long-eared bat was low. However, one radio-tracked natterer's bat from the colony identified approximately 1.5 km to the south of the Northern Quarter site did utilise the coniferous habitat as part of her overall foraging range (although not exclusively). Natterer's bat are frequently associated with broadleaved woodland, woodland edge, grassland and riparian habitats and the provision of this Phase 1 mitigation area is predicted to provide an enhanced overall foraging resource for this species in the short, medium and long-term.

7.280h The surveys identified low levels of Nyctlaus and Eptesicus activity across the Northern Quarter site and no known roosts, commuting or foraging habitat was identified within the any of the Phase 1 mitigation areas. Species from this genus are often more frequently associated with open habitat and the dense coniferous plantation within this Phase 1

mitigation area is unlikely to provide optimal foraging opportunities for these species. As such, the removal of coniferous plantation and the provision of broadleaved woodland interspersed with more structurally diverse habitat, including species rich grassland and riparian habitat is predicted to have a positive impact on Eptesicus and Nyctalus populations.

7.280i Although in the long term the removal of conifer plantation and the planting of broadleaf trees will be beneficial for roosting bats (as coniferous trees tend to provide less roosting opportunities than broadleaved trees), there is evidence to show that bats do use the existing habitat within phase 1 mitigation areas, in particular through MPA1A, to commute through to navigate to further foraging habitats within the wider landscape and for foraging. As such, in additon to the retention of the western conifer strip (as described above) to prevent fragmentation and isolation of bat foraging habitat and commuting routes, the clearance of this phase 1 mitigation area MP1A will also be has been staggered (see Figure 7.5) and, as such will be undertaken over two years at a suitable time of year (expected on the present timetable in October 2014 and October 2015) when bats are beginning to move to their hibernation roosts. Undertaking the works at this time of year will to minimise the impacts of clearance of habitats used by on foraging bats with dependent young. The habitat creation measures proposed within this phase 1 mitigation area MP1A will compensate for this loss of sub-optimal coniferous habitat with the buffered species richopen grassland habitats with associated riparian habitats (such as ponds) providing improved foraging habitat immediately and the mature stock broad-leaved woodland and scrub planting (to be undertaken (based on the current timetable) in November 2014 – March 2015 and November 2015 – March 2016 respectively) providing an increasing the diversity of suitable foraging habitats in both the short, medium and long term.

7.280j Although the newly created mature stock broadleaved woodland may take time to establish fully to provide the same level of foraging resources associated with the coniferous habitat, the retention of western conifer strip with the newly created species-rich grassland, scrub vegetation and waterbodies sheltered by native species-rich vegetation will compensate for the loss of invertebrate biomass associated within coniferous habitat. The retention of a conifer strip along the western fringe of the phase 1 mitigation area MP-1A will provide a shelter belt for bats commuting and foraging and allow bats to utilise more open habitats (such as grassland, scrub and waterbodies) in proximity to the retained habitat. The mature stock broadleaved woodland will also provide a foraging resource immediately which will improve over time resulting in an

overall improved roosting, commuting and foraging resource for the bat popualtions using the site. the medium term, although these areas would have some foraging potential immediately. The impacts from the short term loss of the conifer plantation will be minimal given the small extent of the overall resource that is lost.

7.281 As can be seen from the bat activity / flyway plans for the Lesser Horseshoe bats within the bat survey report, which are the only species for whom major flightlines/commuting routes have been identified across the Northern Quarter site (~~Figure 48, page 134 of Appendix 7.4) (also shown~~ as labelled on Figure 7.5), no major or minor bat commuting routes/flyways have been identified within all of the phase 1 mitigation areas and, as such, no specific measures to ensure maintenance of these are required.

7.282 No bat roosts have been recorded ~~confirmed~~ within the phase 1 of this mitigation area. However a small number of trees have been identified as having low potential roosting features. Due to the type of habitat (conifer plantation with no specimen trees), the lack of confirmed roosts within the mitigation areas, the timing of works and the low potential of the features identified it is considered that any risk of roost loss or disturbance / injury to bats is low. The existing roosts at Northern United will not be directly affected by the works and all construction traffic will be limited to main roads and will not use the existing forestry track that runs past the Northern United compound. Northern United will also not be used as a site compound for the construction works. These measures will be confirmed within the CEMP to be submitted to the FoDDC prior to determination.

7.283 This area will be re-surveyed by suitably experienced ecologists prior to the clearance work and in the event that a tree roost is identified a bat licence will be required prior to felling the tree. If a tree roost is not identified, precautionary measures will still be adopted when felling the tree. Bat boxes, as noted above, will be erected in advance to provide additional bat roosting opportunities.

7.284 The measures detailed above will benefit all of the bat species present at the Hybrid Application Site. The measures will mitigate fully in the short, medium and long term against potential impacts on Lesser and Greater Horseshoe bats (no negative impacts on Greater Horseshoe bats are predicted), which are the most sensitive species present given their association with nearby SACs, and by default will automatically also benefit the bat population within the Northern Quarter site. less sensitive species.

7.285 No air or water pollution impacts are expected as part of the phase 1 mitigation works given the measures detailed within the relevant chapters. Dust supression measures will

be used throughout construction as detailed within the Air Quality chapter to ensure that impacts from dust pollution are negligible. The application of strict working areas will ensure that there are no incidents of accidental damage to retained habitats and in the very unlikely event of this occuring temporary and permanent re-instatement measures will be used to ensure that this does not impact bat commuting routes.

Conclusion:

7.286 Based on the above mitigation, including planting of species rich grassland and a scrub buffer between the areas of broadleaf woodland and grassland creation and taking account of the monitoring regime to be adopted (see further below) it is considered that potential impacts on bats from phase 1 construction (of the college and section 1 of the spine road) will be fully mitigated.

Dormice

7.287 Direct impacts on dormice during construction of the college and section 1 of the spine road, comprising permanent and temporary habitat loss and risk of injury/mortality during site clearance operations both at the construction area for the college / section 1 of the spine road within the Hybrid Application Site and at the phase 1 mitigation areas MP-1A, MP-1B and MP-1C out the Hybrid Application Site (see Figure 7.~~4~~5), will be mitigated through a combination of reasonable avoidance measures and appropriate timing of works to avoid sensitive periods (such as the breeding season).

7.288 All of the woodland plantation and scrub habitats across the construction area for the college / section 1 of the spine road within the Hybrid Application Site and within the identified mitigation areas MP-1A, MP-1B and MP-1C have been surveyed and assessed as sub-optimal dormouse habitat or above and as such removal of these areas requires the appropriate European Protected Species (EPS) licence from Natural England.

7.289 Such clearance will be undertaken in accordance with the guidelines from the Dormouse Conservation Handbook with clearance work avoiding the sensitive breeding season between June and September.

7.290 As per Table 7.3.1b, the 0.82ha of semi-mature broad-leaved woodland and scrub to be permanently lost within the college / section 1 spine road construction site and the 0.06ha associated temporary accesses and compounds will be cleared in late September/October~~May~~ 2014 based on the current development timetable (this date will of course be deferred if planning permssion is delayed) following stringent searches by

suitably experienced ecologists to ensure that there are no active dormice and/or nests present. Where these are found, they will either be allowed to move from the area or will be translocated into suitable adjacent habitats in accordance with the methodology detailed within the EPS licence. During this clearance work vegetation both above and below ground will be removed.

7.291 Clearance of the conifer plantation within the mitigation areas MP-1A, MP-1B and MP-1C (Figure 7.45) is, based on the present timetable, to be undertaken in ~~two separate stages a year apart in~~ October 2014 ~~and October 2015~~, again following stringent searches by suitably experienced ecologists to ensure that there are no active dormice and/or nests present. Where these are found, they will either be allowed to move from the area or will be translocated into suitable adjacent habitats in accordance with the methodology detailed within the EPS licence. This clearance work will only remove the above ground vegetation as the remaining tree stumps are to be retained to provide additional ecological features within these areas. The guidelines from the Dormouse Conservation Handbook state that clearance work must avoid the sensitive breeding season between June and September. If the timetable were to change then another option would be to undertake clearance work during the summer months (avoiding the more sensitive periods) however this would be limited to small areas on any one day and would be done by hand, with nests searches to be undertaken by a licensed ecologist prior to removal. All such work would need to be subject to an EPS licence and would need to adhere to the methodologies agreed therein.

7.292 As detailed above the principles of the mitigation areas as shown on Figure 7.5 have been established in accordance with the requirements within the Biodiversity Strategy and in discussion with the FoDDC. This mitigation has been designed as a whole to ensure a coherent approach and to prevent fragmentation or isolation of mitigation areas. As a result the ratios identified for each of the phases of mitigation (ie phase 1 mitigation; phase 2 detailed mitigation; and phase 2 outline mitigation) do vary. The detailed phase 2 mitigation and the outline phase 2 mitigation ratios (as identified on Figure 7.5) vary from those for the phase 1 mitigation. The phase 1 mitigation ratios are 1.33 woodland creation and 0.52 woodland enhancement for every 1ha of woodland and scrub habitat lost to the development; and 1.36 grassland creation and 0.47 grassland enhancement for every 1ha of grassland and other open habitat lost to the development. Therefore through a combination of habitat creation and enhancement, mitigation is provided for the loss of habitat area due to the phase 1 development and associated works. This is in accordance with the Biodiversity Strategy that has been agreed with Natural England as

well as a number of other consultees. ~~Due to the variety of habitats affected by the development and mitigation works it has not been possible to replace all habitats on a 1:1 basis. However in discussion with Natural England it has been agreed that a ratio of 2:1, in terms of loss: gain, can be used for sub-optimal habitat, such as conifer plantation, as long as the habitat created is of a higher quality, such as species diverse broad-leaved woodland and scrub. It should be noted however that notwithstanding this, all of the habitats to be lost within the college / section 1 spine road construction site will be replaced on a 1:1 basis and those within the mitigation area, which are considered sub-optimal, will be based on the 2:1 ratio.~~

7.293 As shown on Table 7.3.1b, loss of dormouse habitat will be mitigated through a number of habitat creation measures including the creation of 1.0983ha of broad-leaved woodland and ~~0.69ha of~~ species diverse scrub within the mitigation ~~area~~areas MP-1A, MP-1B and MP-1C ~~over two planting seasons~~seasons ~~one year apart~~ following clearance in October 2014 ~~and October 2015~~ (on the present timetable, which could alter if planning permission is delayed) (Figure 7.5). A species rich hedgerow will also be planted between November 2014 and March 2015 (on the present timetable, which could alter if planning permission is delayed) along the eastern boundary of the Hamblett land (to the north of the proposed section 1 of the spine road) improving connectivity in this area and providing additional habitat replacement.

7.294 Dormouse nest boxes will also be installed within the remaining plantation woodland to the west of the mitigation area ~~in~~. Based on the present timetable (which could alter if planning permission is delayed), this is anticipated to be in October ~~May~~ 2014 at a density of approximately 20 per ha (minimum of 60 boxes). The inclusion of log, brash and rubble piles within the mitigation areas MP-1A, MP-1B and MP-1C for the purposes of Great Crested Newt habitat enhancement as part of the clearance works (which, based on the present timetable, is anticiapted to be in October 2014) will also benefit dormouse populations as they can be used as both summer and winter nest sites.

7.295 The terrestrial habitat (0.9231.033ha of mixed habitats including 0.0617ha of woodland and scrub, see Table 7.3.1b) that will be temporarily lost through the installation of the phase 1 college / section 1 spine road construction site compounds and accesses within this area will be reinstated upon completion of the phase 1 college / section 1 spine road works.

7.296 Disturbance of dormice in retained habitats will be largely avoided through appropriate construction practices that will be applied to prevent disturbance to bat populations including limiting construction site lighting and night working.

7.297 Due to the extent of woodland and scrub habitats it is not possible to avoid placing construction compounds and welfare units within proximity of retained dormouse habitats however the location of these (at the eastern edge of the site where there is less suitable habitat) will minimise dormouse habitat loss. The placement of generators and similar equipment will also be carefully considered during construction to minimise the potential for noise and vibration disturbance within retained habitats.

7.298 Habitat fragmentation during construction of the college and section 1 of the spine road ~~(Figure 7.4)~~ particularly along Old Engine Brook and the eastern boundary of the Hamblett land (as labelled on Figure 7.5), will be minimised through brash corridors or windrows that will be reinstated overnight until more permanent connectivity measures can be installed.

7.299 No air or water pollution impacts are expected as part of the phase 1 mitigation works given the measures detailed within the relevant chapters.

Conclusion:

7.300 Based on the above mitigation, it is considered that potential impacts on dormice from phase 1 construction (of the college and section 1 of the spine road) will be fully mitigated.

Otters, Water Voles and Badger

7.301 A site walkover will be conducted by a suitably experienced ecologist immediately prior to commencement of construction of the college / section 1 of the spine road to ensure no Badger setts or Otter Holts / resting up sites have been established that may be damaged or disturbed by construction.

7.302 If a Badger sett has become established inside or within a 30m of the boundary of the construction site, a licence from Natural England will be required in order to exclude Badgers from the sett prior to commencement of construction (unless reliance on a legal defence is possible). It should be noted that sett exclusions are seasonally constrained, and can only be carried out on active setts between July and November inclusive and may require the creation of a replacement sett prior to exclusion. If an Otter Holt or Water Vole burrow (in use) were discovered inside or adjacent to the boundary of the

construction site then a licence from Natural England would first be required if these were to be disturbed, damaged or destroyed.

7.303 In order to prevent Badgers, Water Voles and Otters becoming trapped in excavations during construction of the college / section 1 of the spine road, all excavations will be made safe at night by having sloped sides or providing a wooden plank or similar so that Badgers and Otters or other mammals (e.g. Hedgehog) that might fall in can escape.

7.304 Disturbance will be avoided by limiting construction site lighting to specific locations where it is absolutely necessary for public safety or security, and by avoiding light spill onto watercourses and wooded areas. Care will be taken to avoid positioning site compounds or welfare units, generators for traffic management etc., in close proximity to watercourses or wooded areas which may be used by these species.

7.305 No air or water pollution impacts are expected as part of the phase 1 mitigation works given the measures detailed within the relevant chapters.

Conclusion:

7.306 Based on the above mitigation, it is considered that potential impacts on Otters, Water Voles or Badgers from phase 1 construction (of the college and section 1 of the spine road) will be fully mitigated.

Breeding Birds

7.307 Avoiding mortality of nesting birds will be achieved through timing of works to avoid vegetation clearance during the nesting bird season. This is generally late February to early September inclusive (weather dependent), but varies between species with some, (e.g. crossbills), potentially breeding earlier in the year. Due to the present anticipated construction programme it is likely to be necessary in this case to undertake clearance during the breeding season. As such vegetation will be checked within 24 hours prior to removal by a suitably qualified ecologist, to confirm the absence of active nests. If nesting birds are found to be present then clearance / demolition works within the immediate area will stop and a buffer will be clearly demarked so that no works can take place within a minimum of 10m (species dependent) of the nest site until the young have fledged and this is confirmed by a suitable experienced ecologist. If the programme alters so that the breeding season is avoided then this will not be necessary.

7.308 Given the present anticipated timing of clearance works it is possible that the increase in activity due to construction traffic etc., could impact breeding birds within adjacent retained habitats. As such these areas will also be searched prior to commencement of clearance and construction works and appropriate buffer zones put in place, should it be considered necessary to do so by the project ecologists. Again, if the programme alters so that the breeding season is avoided then this will not be necessary.

7.309 It is not possible to mitigate against the effects of loss of nesting habitat in scrub, hedgerows and woodland in the short term during the construction period of the college / section 1 of the spine road, but planting of scrub, hedgerows and woodlands within the landscaping of the phase 1 development and in the phase 1 mitigation area will mitigate against this impact in the medium term (3-5 years for scrub and semi-mature woodland) to long term (5~~3~~-10 years for maturing and mature woodland).

7.310 The ~~first stage of the~~ planting within the mitigation area is to be undertaken (based on the present timetable, which could change if planing permission were delayed) during the winter months of 2014/2015 and is expected to provide suitable scrub and semi-mature woodland nesting habitat within three to five years and more mature woodland within five to ten years.

7.311 No air or water pollution impacts are expected as part of the phase 1 mitigation works given the measures detailed within the relevant chapters.

Conclusion:

7.312 Based on the above mitigation, it is considered that potential impacts on breeding birds from phase 1 construction (of the college and section 1 of the spine road) will be fully mitigated.

Reptiles

7.313 Reptiles, primarily Common Lizards and Slow-worms, may be killed during site clearance works, either at the college / section 1 spine road construction site within the Hybrid Application Site or at the mitigation areas MP-1A, MP-1B and MP-1C outside the Hybrid Application Site. A proportion of the habitat used by this population will be lost.

7.314 Mitigation to minimise the risk of mortality during clearance / construction will comprise relocation of animals from the clearance area / footprint of the development to adjacent retained habitat (Figure 7.~~4)~~.5 and Table 7.3.1b).

7.315 The development footprint will be subject to an exclusion and translocation exercise using herptiles exclusion fencing and artificial refuges positioned on the footprint of the development for a minimum of 60 visits in appropriate weather conditions. Following this, destructive searches will be undertaken across the relevant area before construction begins.

7.316 The mitigation areas MP-1A, MP-1B and MP-1C will be cleared following stringent searches by suitably experienced ecologists to ensure that there are no reptiles present. Where these are found, they will be translocated into suitable adjacent habitats in accordance with the methodology detailed within the non-licensable method statement. This clearance work will only remove the above ground vegetation as the remaining tree stumps are to be retained to provide additional ecological features within these areas.

7.317 The relocation of reptiles is seasonally constrained, as they are not active during the winter months, and may not need to use basking sites during warm conditions in mid-summer. The appropriate times of year to undertake this work is either spring or autumn. Clearly the relocation of reptiles will need to precede soil stripping and earthworks. However the woodland and scrub clearance works can proceed following careful finger-tip searches by a suitably qualified ecologist to confirm the absence of reptiles.

7.318 Loss of reptile habitat will be mitigated for through a number of habitat creation measures including the creation of 3.52~~2.58~~ha of open grassland, ~~1.83ha~~~~83~~1.09ha of broad-leaved woodland and ~~0.69ha of~~ species diverse scrub within the mitigation areas MP-1A, MP-1B and MP-1C (Figure 7.~~4).~~5 and Table 7.3.1b). The woodland and scrub areas are to be planted ~~in two stages a year apart due to the staggered approach taken with regard to the clearance works. On the present anticipated timetable this will take place~~ during the dormant months (November 2014 – March 2015 on the present anticipated timetable ~~and November 2015 – March 2016 respectively~~). The ~~, while the~~ open grassland areas will be seeded as soon as possible following a local hay-cut/seed collection exercise. As detailed above the principles of the mitigation areas as shown on Figure 7.5~~4~~ have been established in accordance with the requirements of the Biodiversity Strategy and in discussion with the FoDDC. The mitigation has been designed as a whole to ensure a coherent approach and prevent fragmentation or isolation of mitigation areas. Through a combination of habitat creation and enhancement, mitigation is provided for the loss of habitat area due to development and associated works in accordance with the Biodiversity Strategy. ~~Habitats lost within the construction site will be replaced on a 1:1~~

~~basis while those within the mitigation area, that are considered to be sub-optimal, will be replaced on a 2:1 basis.~~

7.319 Further habitat creation works will be undertaken as part of the landscaping works for both the college and section 1 of spine road along with additional enhancement measures, such as refugia/hibernacula, which will further benefit reptile populations impacted by Phase 1 construction. The creation of micro-topographic features within the mitigation area (see below) will also provide further benefits to reptile populations.

7.320 The terrestrial habitat (0.923~~1.033~~ha of mixed habitats, see Table 7.3.1b) that will be temporarily lost through the installation of the college / section 1 spine road construction site compounds and accesses will be reinstated upon completion of the phase 1 construction works.

7.321 Log, brash and rubble piles will be included within the mitigation ~~area~~areas MP-1A, MP-1B and MP-1C during the clearance works at a density of 5 per hectare (a minimum of 15 piles will be created) primarily for the purposes of Great Crested Newt habitat enhancement. However these will also provide refugia opportunities for reptiles. The opportunity to create further structural diversity within the mitigation ~~area~~areas MP-1A, MP-1B and MP-1C will also be taken with the aim to create a varied micro-topography through a series of small-scale hummocks, dips, furrows and mounds facing in different aspects. Stump removal will not be undertaken in these areas so the remaining stumps will create further features of value to reptiles. These features will also provide additional foraging opportunities and refugia. Once established, this area will be subject to on-going long-term management to maintain the optimum mosaic primarily for Great Crested Newts, but this will also benefit reptiles.

7.322 Where habitats are retained the management regime will be adjusted to maintain a mosaic of woodland, scrub and rough grassland. Where necessary some selective tree felling/coppicing will be undertaken as initial habitat restoration to open up grassland glades. Particular emphasis will be given to retaining connectivity between habitat areas with substantial blocks of tall vegetation (either developed naturally or through scrub planting).

7.323 No air or water pollution impacts are expected as part of the phase 1 mitigation works given the measures detailed within the relevant chapters.

Conclusion:

7.324 Based on the above mitigation, it is considered that potential impacts on reptiles from phase 1 construction (of the college and section 1 of the spine road) will be fully mitigated.

Amphibians including GCN

7.325 Direct impacts on Great Crested Newt and other amphibians during construction of the college and section 1 of the spine road, comprising permanent and temporary habitat loss and risk of injury/mortality during site clearance operations will be mitigated through a combination of exclusion and translocation, reasonable avoidance measures and appropriate timing of works to avoid sensitive periods (such as hibernation).

7.326 All of the habitats across the phase 1 college / section 1 spine road area and within all identified phase 1 mitigation areas are considered to be sub-optimal Great Crested Newt habitat or above (excluding areas of hard standing, buildings etc.) and as such removal of these areas requires the appropriate EPS licence from Natural England.

7.327 A full exclusion and translocation exercise is to be undertaken across the college and spine road section 1 construction area including temporary accesses and site compounds in accordance with the Great Crested Newt Mitigation Guidelines (English Nature, 2001); and Natural England licensing guidelines. For this phase of works this will be undertaken using the principles below:

- The design and installation of amphibian fencing, including access points, must be in accordance with Natural England guidance;
- The fencing layout will be designed to maximise capture opportunities and as such will include semi-permanent exclusion fencing around the perimeter of the construction area and standard exclusion fencing within the trapping area creating a number of internal compartments.
- Amphibian fencing can only be erected or removed during the period late April to October (inclusive) (this has been limited due to the potential for hibernating dormouse on site). In addition, trapping can only be undertaken in this period;
- The proposed fence line will be searched and cleared of amphibians and any vegetation carefully strimmed back prior to installation;
- Trapping will only be undertaken in suitable weather conditions (i.e. in frost-free mild weather with night-time air temperatures of > 5^{o}C);

- Trapping will involve the use of both pitfall traps and artificial refugia (such as carpet tiles) with all methods installed and applied in accordance with Natural England guidance;
- Trapping to exclude newts from terrestrial habitat associated with the eastern population must be undertaken for a minimum of 60 nights. In all circumstances, trapping should only cease once there have been 5 consecutive zero capture days and in consultation with Natural England;
- Once 5 consecutive zero capture days have been achieved, destructive searches will be undertaken within all of the capture areas before construction begins;
- External amphibian fencing must be retained throughout the college / section 1 spine road construction period and only removed once this phase of the development is complete. Amphibian fencing must be regularly maintained during this period to ensure it remains an effective barrier preventing newts from entering the construction site;
- Security fencing will be installed around the outside of the exclusion fencing, following the appropriate checks and vegetation clearance, to prevent damage to the herptile fencing during the construction period.

7.328 Based on the present timetable, c~~C~~aptured amphibians will be translocated immediately into receptor areas within the Linear Park (Mitigation Areas MP-2(R)H and MP-2(R)I on Figure 7.5~~4~~). This area has been identified due to the programme delays in undertaking the clearance work within the phase 1 mitigation areas MP-1A, MP-1B and MP-1C as shown on Figure 7.5. Habitat creation works will not be undertaken within the Linear Park receptor areas. However a number of enhancements will be made to increase the refugia and foraging opportunities for newts and thus increase the carrying capacity of these areas in the short term. These measures include the creation of a minimum of 20 log and brash piles using material from the college / section 1 spine road construction site clearance works, the installation of 4 linear compass heaps and the inclusion of semi-buried carrion (to be confirmed with the Forestry Commission and Environment Agency). Once the mitigation area works in areas MP-1A, MP-1B and MP-1C have been completed (see further below) the amphibians will benefit from new areas of open grassland, broad-leaved woodland and species diverse scrub within the mitigation area. If the timetable were delayed an alternative strategy would be to create the phase 1 mitigation areas MP-1A, MP-1B and MP-1C in advance of the exclusion exercise allowing amphibians to be translocated directly into the mitigation area.

7.329 Vegetation clearance at the college / section 1 spine road construction area will be undertaken in accordance with the Great Crested Newt Mitigation Guidelines whilst avoiding the sensitive periods relating to other protected species. The semi-mature broad-leaved woodland and scrub within the construction site and associated temporary accesses and compounds will be cleared under licence ~~in May 2014~~ following stringent searches by suitably experienced ecologists to ensure that there are no Great Crested Newts or other amphibians present. On the present anticipated timetable (which could alter if the planning permission is delayed), this is anticipated to be in late September/October 2014. Where these are found, they will be translocated into suitable adjacent habitats in accordance with the methodology detailed within the Great Crested Newt EPS licence discussed above and non-licensable method statement for other amphibian species. During this clearance work vegetation both above and below ground will be removed. The remaining habitat areas within the construction site will not be removed until the translocation exercise and destructive searches have been completed. This clearance work will also be supervised in the unlikely event that individual newts are still present.

7.330 Clearance of the conifer plantation within the mitigation areas MP-1A, MP-1B and MP-1C (Figure 7.5) is to be undertaken also under a EPS licence ~~in two separate stages one year apart, with the anticipated timetable at present being~~ in October 2014 (based on the current anticipated timetable)~~and October 2015~~, again following stringent searches by suitably experienced ecologists to ensure that there are no Great Crested Newts or other amphibians present. Where these are found, they will be translocated into suitable adjacent habitats in accordance with the methodology detailed within the EPS licence and non-licensable method statement. This clearance work will only remove the above ground vegetation as the remaining tree stumps are to be retained to provide additional ecological features within these areas.

7.331 Loss of Great Crested Newt and other amphibian habitat will be mitigated through a number of habitat creation measures including (see Table 7.3.1b) the creation of 3.52~~2.58~~ha of open grassland, 1.09~~1.83~~ha of broad-leaved woodland and ~~0.69ha of~~ species diverse scrub within the mitigation areas MP-1A, MP-1B and MP-1C. The woodland and scrub areas are to be planted during the dormant months (based on the present timetable in November 2014 – March 2015~~ and November 2015 – March 2016~~) while the open grassland areas will be seeded as soon as possible following clearance following a local hay-cut/seed collection exercise.

7.332 As detailed above the principles of the mitigation areas as shown on Figure 7.54 have been established in accordance with the requirements within the Biodiversity Strategy and in discussion with the FoDDC. This mitigation has been designed as a whole to ensure a coherent approach and prevent fragmentation or isolation of mitigation areas. As a result the ratios identified for each of the phases of mitigation (ie phase 1 mitigation; phase 2 detailed mitigation; and phase 2 outline mitigation) do vary. The detailed phase 2 mitigation and the outline phase 2 mitigation ratios (as identified on Figure 7.45) vary from those for the phase 1 mitigation. The phase 1 mitigation ratios are 1.337 woodland creation and 0.52 woodland enhancement for every 1ha of woodland and scrub habitat lost to the development; and 1.36 grassland creation and 0.4755 grassland enhancement for every 1ha of grassland and other open habitat lost to the development. Therefore through a combination of habitat creation and enhancement, mitigation is provided for the loss of habitat area due to phase 1 development and associated works. This is in accordance with the Biodiversity Strategy that has been agreed with Natural England as well as a number of other consultees.

~~7.332 Due to the variety of habitats within the development and mitigation areas, it is not possible to replace all habitats on a 1:1 however in discussion with Natural England it has been agreed that a ratio of 2:1 can be used for sub-optimal habitat, such as conifer plantation, as long as the habitat created is of a higher quality or greater value, such as open grassland or species diverse broad-leaved woodland. It should be noted however that all of the habitats to be lost within the college / section 1 spine road construction site will be replaced on a 1:1 basis.~~

7.333 Further habitat creation works will be undertaken as part of the landscaping works for both the college and section 1 of spine road along with additional enhancement measures, such as refugia/hibernacula, which will further benefit reptile populations impacted by Phase 1 construction. The creation of micro-topographic features within the mitigation area (see below) will also provide further benefits to Great Crested Newt and other amphibian populations.

7.334 The terrestrial habitat (0.9231.033ha of mixed habitats, see Table 7.3.1b) that will be temporarily lost through the installation of the construction site compounds and accesses will be reinstated upon completion of construction works.

7.335 Although ~~No aquatic habitat creation has been recommended for this phase of the proposed development works as~~ no aquatic habitat is to be lost, isolated or severed three

ponds have been proposed within mitigation area MP-1A to increase the foraging potential for bats and to provide advanced mitigation for GCN in relation to the potential severance and habitat loss identified in relation to the phase 2 detailed and outline permission developments respectively. ~~However that~~ The creation of micro-topographic features within the mitigation areas MP-1A, MP-1B and MP-1C (see below) will provide some wetter areas that could provide some additional aquatic habitat through seasonal standing water, which is a key feature of the water-bodies within the AAP area at present.

7.336 The flood attenuation area proposed on the north side of the section 1 spine road, east of the college, will also provide further seasonal semi-aquatic and aquatic habitats as the storage capacity of this area is to be increased through the provision of a flood attenuation bund along the eastern boundary of the Hamblett land.

7.337 Log, brash and rubble piles will be included within the mitigation areas MP-1A, MP-1B and MP-1C at a density of 5 per hectare (a minimum of 15 piles will be created) for the purposes of Great Crested Newt habitat enhancement. The opportunity to create further structural diversity within the mitigation area will also be taken with the aim to create a varied micro-topography through a series of small-scale hummocks, dips, furrows and mounds facing in different aspects. Stump removal will not be undertaken in these areas so the remaining stumps create further features of value to newts and other species. These features will provide additional foraging opportunities and refugia for amphibians. Once established, this area will be subject to on-going long-term management to maintain the optimum mosaic for Great Crested Newts and other amphibians.

7.338 Where habitats are retained the management regime will be adjusted to maintain a mosaic of woodland, scrub and rough grassland. Where necessary some selective tree felling/coppicing will be undertaken as initial habitat restoration to open up grassland glades. Particular emphasis will be given to retaining connectivity between habitat areas with substantial blocks of tall vegetation (either developed naturally or through scrub planting).

7.339 Disturbance of Great Crested Newts and other amphibians in retained habitats, including ponds, will be largely avoided through appropriate construction practices that will be applied to prevent disturbance to bat populations including limiting construction site lighting and night working. Due to the extent of amphibian habitat on site it has not been possible to avoid placing construction compounds and welfare units within proximity of retained habitats however these have been located to minimise the potential for indirect

disturbance and habitat loss and to the eastern edge of the site away from confirmed breeding ponds. The placement of generators and similar equipment will also be carefully considered during construction to minimise the potential for noise and vibration disturbance within retained habitats.

7.340 Habitat fragmentation during construction will be limited however this will be managed further through the careful design of temporary watercourse crossings to ensure that the stream banks and associated vegetation are maintained as far as possible.

7.341 No air or water pollution impacts are expected as part of the phase 1 mitigation works given the measures detailed within the relevant chapters.

Conclusion:

7.342 Based on the above mitigation, it is considered that potential impacts on amphibians from phase 1 construction (of the college and section 1 of the spine road) will be fully mitigated.

White Clawed Crayfish

7.343 It is assumed that ~~If~~ White Clawed Crayfish are present ~~found to be present~~ at~~on~~ the college / section 1 spine road part of the Hybrid Application Site (whether this is correct will be confirmed during the proposed July 2014 surveys~~, then~~). No direct impacts are predicted as no in watercourse workings are anticipated however ~~and~~ indirect impacts on this species during construction of the college and section 1 of the spine road will comprise temporary habitat loss and risk of injury/mortality during bankside operations within the development area only. Such impacts will be mitigated through a combination of reasonable avoidance measures and appropriate timing of works as is explained below. No impacts have been identified in relation to the species within the phase 1 mitigation areas as there are no watercourses within these areas.

7.344 No permanent and/or direct habitat loss in relation to White Clawed Crayfish is envisaged as part of the phase 1 construction works. However there may be some temporary indirect loss associated with the temporary construction access over Old Engine Brook. This loss will be avoided or kept to a minimum through careful design and appropriate

working practices during installation and removal of the access structure and during the construction period itself. These measures will focus on limiting works ~~within~~ adjacent to the watercourse to that which is absolutely necessary. The timing of works during the late summer months will be outside the sensitive period of ~~late~~ May and June when female White Clawed Crayfish have attached young.

7.345 White Clawed Crayfish are protected under Schedule 5 Wildlife and Countryside Act 1981 in respect of intentional taking and selling. Natural England recommends that all reasonable measures are put in place to prevent harm to its habitat, hence the avoidance strategy described in the paragraph above. A conservation licence would be required from Natural England in respect of intentional taking of the species in the unlikely event that a translocation exercise is required in relation to this species (ie if the July 2014 surveys identify the presence of this species and in the unlikely event that the avoidance strategy described above is not sufficient) and if this is the case the ~~The detailed avoidance and~~ mitigation strategy will be developed in discussion with Natural England and the Environment Agency ~~if the July 2014 surveys identify the presence of this species~~.

7.346 Based on the strategy presented ~~these~~ it can be seen that offences under the Wildlife and Countryside Act 1981 are not expected to be triggered through the phase 1 works. It should also be noted that no~~No~~ air or water pollution impacts are expected as part of the phase 1 construction and mitigation works given the measures detailed within the relevant chapters.

Conclusion:

7.347 Based on the above mitigation, it is considered that potential impacts on White Clawed Crayfish from phase 1 construction (of the college and section 1 of the spine road) will be fully mitigated.

Invertebrates

7.348 Direct impacts on invertebrates during the construction of the college and section 1 of the spine road will be limited to the permanent and temporary habitat loss associated with these works.

7.349 This habitat loss will be mitigated through the habitat creation measures to be provided within the mitigation areas MP-1A, MP-1B and MP-1C (Figure 7.5~~4~~), including the creation of 3.52~~2.58~~ha of open grassland, 1.09~~83~~ha of broad-leaved woodland and ~~0.69ha of~~ species diverse scrub (see Table 7.3.1b). The conifer plantation to be lost within the

mitigation ~~area~~ areas MP-1A, MP-1B and MP-1C is considered of relatively low conservation importance for invertebrates on site therefore the loss of this in favour of the open grassland, broad-leaved woodland and scrub will benefit invertebrate populations within the Northern Quarter.

7.350 The woodland and scrub areas are to be planted during the dormant months (based on the present anticipated timetable this would be November 2014 – March 2015~~ and November 2015 – March 2016~~), while the open grassland areas will be seeded as soon as possible following clearance following a local hay-cut/seed collection exercise.

7.351 As detailed above the principles of the mitigation areas as shown on Figure 7.5 have been established in accordance with the requirements within the Biodiversity Strategy and in discussion with the FoDDC. This mitigation has been designed as a whole to ensure a coherent approach and prevent fragmentation or isolation of mitigation areas. As a result the ratios identified for each of the phases of mitigation (ie phase 1 mitigation; phase 2 detailed mitigation; and phase 2 outline mitigation) do vary. The detailed phase 2 mitigation and the outline phase 2 mitigation ratios (as identified on Figure 7.5) vary from those for the phase 1 mitigation. The phase 1 mitigation ratios are 1.33~~7~~ woodland creation and 0.52 woodland enhancement for every 1ha of woodland and scrub habitat lost to the development; and 1.36 grassland creation and 0.47~~5~~ grassland enhancement for every 1ha of grassland and other open habitat lost to the development. Therefore through a combination of habitat creation and enhancement, mitigation is provided for the loss of habitat area due to phase 1 development and associated works. This is in accordance with the Biodiversity Strategy that has been agreed with Natural England as well as a number of other consultees.

~~7.351 Habitats lost within the construction site will be replaced on a 1:1 basis while those within the mitigation area that are considered to be sub-optimal will be replaced on a 2:1 basis.~~

7.352 Further habitat creation works will be undertaken as part of the landscaping works for both the college and section 1 of spine road along with additional enhancement measures, such as log pile creation (primarily for reptiles and amphibians as refugia/hibernacula), which will further benefit invertebrate populations impacted by Phase 1 construction. The creation of micro-topographic features within the mitigation areas MP-1A, MP-1B and MP-1C (see below) will also provide further benefits to invertebrate populations. The measures to reduce habitat fragmentation detailed above for other species in particular dormice (paragraph 7.298), particularly along Old Engine

Brook and the eastern boundary of the Hamblett Land, during the construction works will ensure continued connectivity between habitats across the site.

7.353 The terrestrial habitat (0.9231.033ha of mixed habitats see Table 7.3.1b) that will be temporarily lost through the installation of the construction site compounds and accesses will be reinstated upon completion of construction works.

7.354 No aquatic habitat creation has been recommended for this phase of works as no aquatic habitat is to be lost, isolated or severed. However the creation of micro-topographic features within the mitigation area (see below) will provide some wetter areas that could provide some additional aquatic habitat through seasonal standing water, which is a key feature of the water-bodies within the AAP area at present.

7.355 The flood attenuation area proposed on the north side of the section 1 spine road, east of the college, will also provide further seasonal semi-aquatic and aquatic habitats as the storage capacity of this area is to be increased through the provision of a flood attenuation bund along the eastern boundary of the Hamblett land.

7.356 Log, brash and rubble piles will be included within the mitigation areas for the purposes of Great Crested Newt habitat enhancement will also benefit invertebrate populations as will the additional structural diversity to create a varied micro-topography through a series of small-scale hummocks, dips, furrows and mounds facing in different aspects within the mitigation area. Stump removal will not be undertaken in these areas so the remaining stumps create further features of value to invertebrates. Once established, this area will be subject to on-going long-term management to maintain the optimum mosaic for Great Crested Newts and other amphibians and as such will provide long-term benefits to invertebrate populations and assemblages.

7.357 Where habitats are retained the management regime will be adjusted to maintain a mosaic of woodland, scrub and rough grassland. Where necessary some selective tree felling/coppicing will be undertaken as initial habitat restoration to open up grassland glades. Particular emphasis will be given to retaining connectivity between habitat areas with substantial blocks of tall vegetation (either developed naturally or through scrub planting).

7.358 No air or water pollution impacts are expected as part of the phase 1 mitigation works given the measures detailed within the relevant chapters.

Conclusion:

7.359 Based on the above mitigation, it is considered that potential impacts on invertebrates from phase 1 construction (of the college and section 1 of the spine road) will be fully mitigated.

Phase 1 Operation/ Phase 2 Construction

Designated Sites

7.360 None of the statutorily designated sites identified within the desktop study search area will be directly affected by the operation during phase 2 of the college and spine road (constructed in phase 1) or the construction works of the remainder of the spine road and the other plots within the Hybrid Application Site during phase 2.

7.361 Those sites designated for their bat populations in the three tables above may however be indirectly affected by the proposed construction during Phase 2 and operation of Phase 1 through potential impacts on the bats, for which they are designated, when outside the boundary of the designated site and within the Hybrid Application Site, as noted in the Tables. As such the mitigation measures detailed within the bats section below will apply. See paragraphs 7.259a – 7.259k in the phase 2 Impact table for discussion of impacts on the Severn Estuary SAC, SPA and Ramsar, Walmore Common SPA and Ramsar site and on the Speech House Oaks SSSI.

7.362 As for the policy based designated sites, both the direct (as detailed under the individual habitat features in the tables above, where possible) and indirect impacts identified on the Cinderford Linear Park Key Wildlife Site and the indirect impacts identified on the Hawkwell Inclosure Key Wildlife Site will be addressed through the mitigation measures for the individual ecological features detailed below.

Habitats

Phase 2 Construction

7.363 The principles of the mitigation areas as shown on Figure 7.54 have been described in paragraphs 7.264 above. As noted in paragraphs 7.264 the ratios identified for each phase (as identified on Figure 7.54) vary. The ratios for the phase 2 detailed permission~~application~~ mitigation are 1.51~~2.0~~ woodland creation for every 1ha of woodland and scrub habitat lost; and 1.43~~8~~ grassland creation for every 1ha of grassland and other open habitat lost to the phase 2 detailed application development. The ratios

for the the phase 2 outline permission~~application~~ mitigation are 1.44~~6~~ woodland creation and 1.74~~0.8~~ woodland enhancement for every 1ha of woodland and scrub habitat lost; and 1.56~~1~~ grassland creation ~~and 0.4 grassland enhancement~~ for every 1ha of grassland and other open habitat lost to the development. Therefore ~~I~~through a combination of habitat creation and enhancement, mitigation is provided for the loss of habitat area arising from the phase 2 development and associated works. This is in accordance with the Biodiversity Strategy Committee Draft (May 2014) that has been agreed with Natural England as well as a number of other consultees. ~~It is not possible to mitigate the loss of all habitats arising from the phase 2 construction on an area for area basis, either within the footprint of the development at the Hybrid Application Site or within the wider area. However all of the habitat types present are considered to be of a lower ecological value. In addition there will be specific habitat creation and enhancement measures proposed and delivered for specific protected species (see individual species sections below). As such the overall habitat value of the Hybrid Application Site and the wider area will be further improved through the creation of more diverse and ecologically valuable habitats and the enhancement of remaining habitats.~~

7.364 The specific habitat creation and enhancement measures (provided within the species sections) will ensure that habitat losses and fragmentation, particularly the habitat corridor along the western side of the angling pond arising from phase 2 construction will be adequately replaced and, by granting planning permission in relation to the Hybrid Application Site on this basis, FODDC's Section 40 duty is met. These habitat creation and enhancement measures will also address the Section 41 habitats to be affected from this phase although it should be noted that a small area (less than 0.002ha, refer to Table 7.3.1b) of heath (s41 Lowland Heath Habitat) will be lost completely and cannot be replaced due to the difficulty in re-creating this habitat type. It may be possible to retain this area however this cannot be determined until the detailed design for this area of phase 2 construction has been undertaken. All the mitigation areas identified for phase 2 as shown on Figure 7.4~~5~~ are located on land owned by the Forestry Commission and are largely consistent with the areas shown in the Forest of Dean District Council's Biodiversity Spatial Masterplan (page 88-89) as found in its Biodiversity Strategy Committee draft May 2014. As such there is a strong policy presumption that these areas will be safeguarded for offsetting for the foreseeable future. As noted above the Forestry Commission has already entered formal agreements to provide the majority of the land for the Phase 1 mitigation. These formal agreements also extend to the majority of the phase 2 detailed permission mitigation areas and to some parts of the phase 2 outline permission mitigation areas. The

Forestry Commission has indicated that it is generally content with the proposals for the further Phase 2 mitigation areas depending on further discussion and minor amendment particularly in relation to the phase 2 outline permission mitigation areas. The Homes and Communities Agency will be discussing with the Forestry Commission the relevant permissions necessary to permit the use of these additional phase 2 mitigation areas, which are likely to be modelled on the existing agreements in place.

7.365 Indirect construction related impacts will be minimised through the use of appropriate working practices to ensure that construction activities do not extend into adjacent habitats. Appropriate pollution management plans and procedures will be put in place to minimise the risk and severity of such incidents and to ensure rapid and efficient action in the event of such an incident. Additional measures to protect watercourses and water-bodies on site are described in the ES chapters on Land Quality and Ground Conditions and on Hydrology and Flood Risk. As such no air or water pollution impacts are expected as part of the phase 2 construction works.

Phase 1 Operation

7.366 No impacts from the operation of Phase 1, including air and water pollution effects (refer to relevant chapters for details), are expected therefore no additional mitigation measures have been recommended. It is considered that any impacts from increased human activity on the remaining habitats will be minimal during this phase given that the only operational feature will be the college and the associated first part of the spine road to the college. Therefore increased human activity is expected to be limited to these areas. The remaining areas can be expected to be subject to similar levels of human activity to which they are subject at present.

Bats

Phase 2 construction and creation of Phase 2 mitigation areas

7.367 All of the habitats across the phase 2 development area and phase 2 mitigation areas are considered to have at least some value for bats, although this does vary with species and activity.

Loss of ~~maternity~~ roosting sites in built structures during Phase 2 construction (there will be no loss of roosting sites in built structures through creation of Phase 2 mitigation areas)

7.368 The construction of Phase 2 will result in the loss of the three buildings, the Bath House building, Office building and Canteen building within the Northern United compound used

by breeding Lesser Horseshoe bats, by low numbers of non-breeding brown-long eared and common pipistrelle bats (maximum count two and seven respectively) and by a single male bechstein's bat. There is a historical record for a single Greater Horseshoe bat using the Bath House in 2007 and the 2011 surveys recorded one unknown Myotis bat emerging from the Office building. The 2013 surveys have shown that whilst these three buildings are no longer the main roosting site for the Lesser Horseshoe colony, they are now utilised by a smaller proportion of the colony as satellite roosts and, as such, the loss of these buildings have a negative impact on the roosting viability of the colony. Direct impacts on bats during construction of phase 2 will be significant given the impacts on proportion of the colony using the Office building and Bath House as a loss of maternity roosts.

7.368a Direct impacts on bats during construction of phase 2 will be significant given the impacts on the maternity roosts within the Office Building and Bath House and the day roost within the Canteen in the Northern United compound (refer to Figure 3, page 36 of Appendix 7.4 for full bat report). This will require extensive mitigation and appropriate EPS licences to be obtained from Natural England.

7.368b Work on the mitigation for the demolition of the maternity roosts within the Northern United compound has already begun with the site clearance undertaken for the construction of two artificial bat roosts, one to the south of Northern United (RR1, planning reference P1495/12/FUL) and the second to the south east (RR2b, planning reference P0153/13/FUL) (Figure 7.4). These two structures have been designed in conjunction with Lesser Horseshoe bat specialists and positioned within known commuting and foraging routes to increase the likelihood of success. The location of the roosts were selected on the basis of proximity to known flightlines and foraging habitat used by Lesser Horseshoe bats in 2011, away from any areas of high public usage (to minimise risk of vandalism), distant from any major roads to prevent any potential increase in mortality resulting from bats colliding with traffic and away from areas of larch plantation that could be potentially removed by the Foresty Commission in the near future (due to red-band needle blight). These new roosts and the existing artificial roost to the east of Northern United are located a sufficient distance from the construction works and within woodland habitats to reduce any potential disturbance to a negligible impact. As a precaution the CEMP will identify the locations of these roosts to ensure that construction staff are aware of their presence. As no works are anticipated within the vicinity of these there is no requirement to specify a no go zone around them however this will be reviewed as part of the CEMP.

7.368c The data obtained by the 2013 surveys confirms that the locations of the two new artificial roost sites are appropriate. RR1 is located within the home range for six of the fifteen Lesser Horseshoe bats radio-tracked in 2013 (with two or more nights' radio-tracking data) and was located within the core foraging area of two of these bats. RR2b, to the south-west of the proposed Phase 1 mitigation area, is located within the home range for seven of the fifteen bats radio-tracked in 2013 (with two or more nights' radio-tracking data) and is located within the core foraging area of three of these bats. As such, it would be predicted that the Lesser Horseshoe population would be likely to encounter the structures.

7.368d The existing artifical roost structure demonstrates the success that can be achieved with an artificial roost. Here the peak count of the colony using the site has increased more than threefold since the structure was completed in 2004 (peak count in 2004 of 103 bats and peak count in 2014 of 355 bats). The colony counts carried out have recorded an exponential increase in the number of bats using the aritifical roost site and an exponential decrease in the number of bats using the Bath house, office building and canteen. This adaption of the colony to the roosting habitat provides a high level of confidence that the proposed mitigation and compensation measures will be successful.

7.359 The proposed demolition works to the three buildings utilised as ~~to the~~ satellite maternity roosts and day roost(s) at Northern United will not be able to proceed until both artificial roosts RR1 and RR2b have been proven successful through monthly monitoring surveys. This requirement will should be established in discussions with Natural England, Forest of Dean District Council (FoDDC) and bat specialists prior to determination of the planning application based on current monitoring information which, as explained above, suggests that activity levels are decreasing within the existing Northern United buildings and increasing within the existing artificial roost to the east of the site. The information will be included in the CEMP. As these will be demolished prior to the start of construction works (as phase 2 detailed permission cannot progress prior to their removal and phase 2 outline permission developments cannot progress without the phase 2 detailed permission development having been completed) there is no potential for direct or indirect construction impacts on the existing Northern United bat roosts.

7.369a The demolition works will be undertaken under a bat licence. The works will proceed in the autumn or winter months to avoid disturbing Lesser Horseshoe bats and other bat species utilising the roosts associated with these buildings. Winter demolition will only be undertaken if it can be shown that the buildings are not used for hibernation purposes

(therefore the Office and Bath House buildings will be demolished in the autumn period and the Canteen building will be demolished in the winter period). Bats will be excluded from all buildings prior to the commencement of works by blocking all actual and potential access points approximately 1 hour following sunset. Boards will be removed immediately before dusk the following day with the process repeated until it is confirmed by the supervising licensed bat ecologist that the buildings are free of Lesser Horseshoe bats. All the buildings will be subject to a dawn re-entry survey and building inspections by licensed bat ecologist immediately prior to renovation works and bats captured and transferred to a suitable adjacent roost. Soft demolition or gradual deconstruction of the buildings would then proceed by hand immediately, under supervision of licensed bat ecologist.

7.370 In addition to the two artificial roosts above, two new night roosts are also to be built within woodland habitats to the south of the Northern Quarter (as shown on Figure 4.2 of the Biodiversity Strategy). This is on land owned by the Forestry Commission. One of the new night roosts is located approximately 1.75km to the south-west of RR1 and the second night roost is located 0.75km to the south of RR2b. There was evidence from the 2013 data that the home range for two of the fifteen Lesser Horseshoe bats encompassed the location of the proposed night roost 0.75km to the south of RR2b. No radio-tracked Lesser Horseshoe bats were recorded within the vicinty of the proposed night roost 1.75km to the south of RR1. This is likely to be because most Lesser Horsehoe bats are known to forage within close proximity to their main roosting site (existing artifical roost) and the proposed new night roost 1.75km to the south of RR1 is over 2km away from the existing artifical roost. However, when the new artifical roosts RR1 and RR2b are built, the night roosts will be located within 2km of these roosting sites and, as such, be available for use by the bats roosting in the new artifical roosts.. These roosts are primarily aimed at Lesser Horseshoe Bats however other species will also benefit from them. The natterer's maternity tree roost, for example, was located within the vicinty of the the proposed night roost 0.75 km to the south of RR2b and may provide roosting opportunities for this species also. These roosts will provide habitat to compensate for the loss of roosting sites for a solitary roosting site for brown long-eared bats recorded in the Bath house and non-breeding roosting siite for brown long-eared bats recorded in the Office Building. They will also provide mitigation and compensation for low numbers (total of 7) of common pipistrelle bats recorded roosting in the Bath House, office and canteen buildings. The roosts will be designed to be weatherproof and will measure approximately 1m wide by 2m deep and 2.5m in height, constructed of brick and concrete blockwork (internally rendered). The roof will be

pitched and covered in roofing felt with the timbers on the underside left exposed to provide perches for bats. A ceiling will be incorporated with a hatch leading to the small roof void. The building will need to be secured due to the risk of human access therefore an open doorway is not possible. As such the roosts will be fitted with a secured door with a 20cm gap at the top to enable bats to fly into the roost. This will be managed and maintained as part of the monitoring and management works to be detailed within the Section 106 agreement.

7.371 A variety of bat roosting and hibernation boxes will be installed within retained habitats surrounding both the area of the Hybrid Application Site for Phase 2 development and within the phase 2 mitigation areas (see Figure 7.54 for ~~indicative~~ phase 2 mitigation areas) to provide additional roosting opportunities. These will provide mitigation and compensation for the single male Bechstein's bat recorded roosting in the Bath House. This species is not normally associated with built structures and the occurrence of this species roosting inside the Bath House is atypical. Nonetheless, the provision of bat boxes, such as the Schwegler 1FW, will compensate for the loss of roosting habitat for this species. These types of boxes have proven to be successful for breeding colonies in Dorset where breeding colonies have been recorded present using this type of artifical roosting provision (Poulton 2006).

Loss of tree roosts during phase 2 construction and during creation of phase 2 mitigation areas

7.372 The phase 2 development site clearance work and phase 2 mitigation areas works will result in the loss of potential tree roosts, although no tree roosts for any species recorded within the Northern Quarter site have been confirmed to date from the 2011 and 2013 surveys.

7.373 Trees to be felled as a result of the phase 2 development works and phase 2 mitigation works will be re-surveyed prior to clearance work and in the event that an actual tree roost is identified an EPS licence will be required to fell it. If no tree roost is identified the tree will be felled using a precautionary working methodology including the presence of bat specialists during the clearance works so that any trees with potential roosting features are soft felled as carefully as possible. Once grounded, the features will be checked by licensed ecologists using endoscopes if necessary to ensure that there are no bats present. In addition to this, the trunk section will be left undisturbed in an appropriate location (away from the clearance works) for a minimum of 24 hours to allow any bats

present to fly away overnight. The features will be re-checked prior to material being removed.

~~7.374 Once the phase 2 mitigation areas have been confirmed these areas will also re-surveyed prior to clearance following the same methodology above (either application for an EPS licence or use of precautionary working methodologies).~~

Severance and loss of Lesser Horseshoe bats commuting flyway routes during phase 2 construction and creation of phase 2 mitigation areas

7.374 The major and minor flyways/commuting routes for Lesser Horseshoe bats were identified within the phase 2 development area and the phase 2 mitigation areas (~~see the flyways figure within the bat survey report Figure 48, page 134, Appendix 7.4~~ (also shown as labelled on Figure 7.4). These flightways will be maintained through mitigation measures throughout the construction of Phase 2 of the development and creation of the phase 2 mitigation areas.

7.374a The severance or loss of existing landscape features, or a sudden dramatic change in such features, can be problematic for bats, especially species such as Lesser Horseshoe bats, which are particularly well adapted to flying in cluttered environments and cannot detect objects at any geat distance (Altringham 2003). Severance of a linear feature of vegetation used by Lesser Horsehoe bats will be problematic in that it can introduce increased light levels and wind exposure (Limpens 2005), which may deter the bats from continuing to use the flightline.

7.374b In relation to the phase 2 construction area, where existing vegetation is required to be removed to facilitate the construction of the spine road, or after the demolition of the Bath House (which also functions as a minor flightline for Lesser Horseshoe bats in addition to a roosting site for the Lesser Horseshoe bat species) temporary flight-lines will be constructed prior to the removal of vegetation to mitigate effectively for the distruption in the continuity of habitat and provide ecological continutity within the landscape. The use of timber frames covered in camouflage netting will provide shelter and cover for the Lesser Horseshoe bats. These can be moved easily during the daytime if access is required through the site. These types of structures have been demonstrated to be used by Lesser Horseshoe bats when crossing construction sites, for example, the A487 Porthmadog, Minffordd and Tremadog Bypass (O'Connor *et al*. 2011). However, it was acknowledged in that case that the numbers of bats appeared to have declined compared to the baseline bat activity recorded, possibly because in that case the temporary flyway zigzagged the

construction site as oppose to providing the short most direct route in proximity to the existing flightline. In the case of the Hybrid Application Site the temporary flyway will not zigzag. Alternatively, the use of debris netting and brash corridors driven into the ground in a row, where suitable, will act as replacement commuting features throughout the period of construction and creation of the phase 2 mitigation areas, if necessary during the mitigation works. These types of structures have been used successfully to create temporary hedges that link severed foraging habitat for Lesser Horseshoe bats (Schofield 2008). Such measures will ensure that linear features remain in place for bats (which utilise the flyways/commuting routes) to follow and as such ensure continued use during the construction of Phase 2. Discussion of permanent mitigation to address severence risks associated with the operation of the Phase 2 development is considered later under Phase 3.

7.374d In relation to the Phase 2 mitigation areas, there are differences in the level of use of each area which are discussed in detail below (refer also to Figure 7.5 for details of the labelled phase 2 mitigation areas and to the schedules in Appendix 7.11:

1 MP-2(R)I + MP-2(R)J + MP-2(R)K: These areas have had low numbers of Lesser Horseshoe bats recorded as present. Radio tracking in 2011 identified one Lesser Horseshoe foraging area within these mitigation areas, foraging area 11. This was used for a total of 6 minutes by one bat in 2011 representing less than 1% of this bat's activity and very minor use. The 2013 radio tracking did not identify this area as being the core foraging area of any bats radio tracked and the provision of these enhanced Phase 2 mitigation areas will fully mitigate for the loss of this occasional use by low number of foraging Lesser Horseshoe bats by providing more optimal foraging habitat at this location.

2 MP-2(F)A: This area had a low number of Lesser Horseshoe bats detected during transect surveys. The 2011 radio tracking surveys identify this area as 'about a quarter of foraging area 12'. This was the core foraging area for one bat and minor foraging area for two individuals. The 2013 radio tracking identified that this mitigation area is adjacent to or just covering part of four individuals' core foraging areas for Lesser Horseshoe bats. In this area, there will be retention of a conifer strip along the western periphery (thus continuing southwards the scheme to be provided above for area MP-1A as discussed under Phase 1 above) with mature stock broadleaved woodland planting, understorey species and ponds that are adjacent to the sheltered western belt (allowing bat foraging opportunities). This will mitigate fully for the loss of sub-

optimal coniferous habitat which provides the core feeding area for a small number of bats from the Lesser Horseshoe colony.

3 MP-2(R)G + MP-2(R)H: These are two small mitigation areas that provided a small part of the core foraging area of one individual Lesser Horseshoe bat but the small size would not on its own form any bat's core foraging area. The proposed woodland enhancement measures for this mitigation area will increase the suitability of this area for foraging bats by replacing suboptimal conifer plantation with broadleaved woodland which, in turn, will provide a greater insect diversity and biomass for foraging bats.

4 MP-2(R)A: The transect surveys recorded a low number of Lesser Horseshoe bats within this area. The 2011 radio tracking did not identify any bats foraging within this area. The 2013 radio tracking surveys identified this area covering a small part of the core foraging area for one individual Lesser Horseshoe bat. The majority of this area is open and bare but there will be provision of riparian habitat in proximity to grassland and new mature stocked broadleaf woodland habitats (as shown on Figure 7.5) which will enhance the foraging resource for Lesser Horseshoe bats within this proposed mitigation area.

5 MP-2(R)B + MP-2(R)C: These two wooded areas proposed for woodland enhancement are the closest propsoed mitigation areas in proximity to the artificial roost and, given this proximity, would be expected to be used by a number of lesser horseshoe bats as they fly to/from the roost. The 2011 radio tracking by Kestrel Wildlife Consultants identified all 8 bats present within this area at some time. This was not the most used foraging area for any individual but was one of the main foraging areas for two Lesser Horseshoe bats (more than 10% foraging time). The 2013 radio tracking identified that these areas form at least part of the core foraging area for 5 of the 18 individuals from whom data was gathered. The existing woodland area area around the artifical roost to a minimum distance to be agreed with FoDDC and Natural England, will be retained to prevent disturbance in proximity to the roost. The woodland enhancement measures proposed for this area be undertaken in a long term phased approached dividing the plots into several compartments to be felled individually. These measures will mitigate for the loss of any sub-optimal foraging habitat associated with the existing conifer plantation by replacing this with broadleaved woodland which will provide optimal foraging habitat.

6 MP-2(R)D: These three proposed mitigation areas are located within the eastern half of the Hawkwell Inclosure, the opposite end of the wood to the main Lesser Horseshoe maternity roost. Two areas are proposed for woodland creation and one for grassland enhancement. The open area of grassland enhancement is existing, and the woodland creation areas are currently conifer. The 2011 radio tracking did not identify any Lesser Horseshoe bats using these areas for foraging. The 2013 radio tracking identified this area as being used as part of the core foraging area for 3 Lesser Horseshoe bats. Bats using the periphery of the species poor grassland areas for foraging will have access to an enhanced foraging resource as a consequence of the grassland enhancement measures proposed for this area and the loss of coniferous habitat, which will be replaced gradually by broadleaved woodland, will fully mitigate for the impact at these locations.

7 MP-2(F)B: This is a small area of woodland creation covering the current hard-standing access track junction with the A4136. This proposed woodland creation improves habitat connectivity and is part of the minor flyway for Lesser Horseshoe bats. The povision of this mitigation area will be a positive enhancement for the Lesser Horseshoe colony.

7.374e In summary therefore no negative impact on flightlines of the Lesser Horseshoe bat from loss of the phase 2 development area or from creation of the phase 2 mitigation areas is predicted.

7.374f The Lesser Horseshoe bat flightline that crosses the A4136 (flightline 3 on Figure 7.4) was the most consistently used flightline identified in 2011 and 2013 surveys. The habitat to the north of the Northern Quarter comprises of mature established broadleaved woodland habitat which is likely to provide optimal foraging habitat for this species requiring the bats to cross the road. The road creates habitat severence and this is likely to present a collision risk potentially leading to injury and death of bats. The bats crossing at this point currently fly north from their roosting site up an embankment and, as a result, cross the road at low flight heights. During the 2013 fixed point count surveys, a proportion of the Lesser Horseshoe bats were observed crossing the road at heights of between one and two metres. The traffic assessment (see chapter 9 and specificaly Table 2 of its Appendix 9.2) shows that at Link 2 of the A4136 (where flightline 3 crosses north from the Northern Quarter) there is a 0% increase over baseline in traffic expected during phase 2. Therefore there is no predicted negative impact in terms of increased risk of collision with bats using this crossing point from the proposed development.

7.374g Nevetheless, as an enhancement measure which is likely to result in a significant benefit to the Lesser Horseshoe bat colony, especially for newly volant juvenile Lesser Horseshoe bats, it is proposed to enhance the existing strong flightline at this location. This is shown on Figure 7.4. The proposal is to erect the new bat bridge at the location of the existing flightline number 3 as it crosses the A4136 road. The new bat bridge is designed to encourage the Lesser Horseshoe bats to cross the road at a safe height above vehicle movement and, thus, avoid potential vehicle collision. Due to the topography of the landscape (steep sided embankment that the bats are climbing up) an underpass or green bridge is not considered to be an appropriate option for an enhancment measure as this would require additional land take of habitat used by Lesser Horseshoe bats. Therefore, the use of telegraph poles with mesh netting to guide the bats crossing the road safely (see Figure 7.12) is likely to provide a enhancement of the existing flightline at this location. There is a strong basis for concluding that, given the species' ecology, this would benefit the Lesser Horseshoe bats crossing at this location as it would encourage them to follow the structure at a safer height above moving traffic.

7.374h There were low levels of Greater Horseshoe bats recorded within the Phase 2 construction area ie five recordings in 2013, two of which were located at the Bath House track junction. In relation to the phase 2 mitigation areas there were no Greater Horsehsoe bats recorded in 2011 or 2013. Therefore, no important flightlines have been identified for this species within the Phase 2 development area or within the Phase 2 mitigation areas for Greater Horseshoe Bats. The maintenance of habitat linkages in the form of temporary flyways (as described above in relation Lesser Horseshoe bats) during the construction period during Phase 2 and during the creation of phase 2 mitigation areas from the east of the site running west will ensure that there is a continum of features that can be utilised by any Greater Horseshoe bat. No negative impact on flightlines of these species from loss of the phase 2 development area or from creation of the phase 2 mitigation areas is therefore expected.

7.374i No important flightlines for Bechstein's bat were identified in the Phase 2 development area. Although one individual male bat was recorded roosting in the Bath House, the continuity of habitat in the surrounding area of the Phase 2 development will prevent fragmentation and isolation of habitat for this species. There are no major flightlines identified for barbastelle bat in the Phase 2 development area in 2011 or in the 2013 surveys. Occasional detections of this species was recorded at the junction between the Bath House and existing Northern United access track. As regards the phase 2 mitigation areas no Bechstein's were recorded present and the creation and enhancement of

woodland will be a positive impact for this species. Continuity of habitat in the surrounding area of the Phase 2 development and the Phase 2 mitigation areas will prevent fragmentation and isolation for this species in the short term and the temporary connective features through the Northern Quarter to maintain existing flightlines for Lesser Horseshoe bats will also enable barbastelle bats to continue to navigate through the Northern United site during the construction of the Phase 2 development and delivery of phase 2 mitigation areas. No negative impact on flightlines of these species from loss of the phase 2 development area or from creation of the phase 2 mitigation areas is therefore expected.

7.374j As regards Barbestelle bats, there will be no negative impact on flightlines of these species from loss of the phase 2 development area. There are only a low number of Barbastelle recordings across Phase 2 development and this area only offers sub-optimal foraging habitat. The provision of the Phase 2 mitigation areas will full mitigate this loss. A potenital flightline for barbastelle was identified (through a cluster of ultrasound detections from the transect surveys) at the Northern United access track junction and the Bath house. The provision of phase 2 mitigation area MP-2(F)N woodland creation will strengthen any potential flightline habitat at the junction and the provision of the MP-2(F)C mitigation area adjacent to the Bath house will provide connectivity of habitat at this location and mitigate for any potential habitat severance.

7.374k The construction of Phase 2 will not result in the loss or severance of any known Pipistrelle bat flightlines. The common pipistrelle bats recorded at the site were male and/or non-breeding females and, as such, do not have a tendency to use pre-determined flightlines to and from their roost. No maternity roosts or flightlines were identified for soprano pipistrelle bats within the Phase 2 development and, as such, the soprano pipistelle bats detetcted within the Phase 2 area were likely to be foraging bats or individuals passing through the Phase 2 site. In relation to the phase 2 mitigation areas no roosts or associated flightlines will be lost. The coniferous habitat is likely to represent sub-oprtimal foraging habitat for Pipsitrelle species and, therefore, removal of this habitat to create broadleaved woodland, species rich grassland habitats and riparian habitats will fully mitigate the loss of habitats within Phase 2 mitigation area. Nathuius pipistrelle bats are exceptionally rare species and were only recorded intermittently at the site. No flightlines for this species was identified. No negative impact on flightlines of these species from loss of the phase 2 development area or from creation of the phase 2 mitigation areas is therefore expected

7.374l No flightlines were identified for *Myotis* species or brown Long-eared bats in the Phase 2 development area or in the phase 2 mitigation areas. The majority of bats captured by the trapping surveys in 2011 and 2013 were male bats and no maternity roosts were identified in close proximity to this area. No negative impact on flightlines of these species from loss of the phase 2 development area or from creation of the phase 2 mitigation areas is therefore expected.

7.374m No known flightlines were identified for *Eptesicus* or *Nyctalus* species within the Phase 2 development area or phase 2 mitigation areas. No roosts were identified in close proximtiy to the Phase 2 area and detector records and capture rates for these species was low. No negative impact on flightlines of these species from loss of the phase 2 development area or from creation of the phase 2 mitigation areas is therefore expected.

7.375 Lighting and night working will also be strictly controlled throughout phase 2 construction [and creation of phase 2 mitigation areas] to ensure that commuting routes, including those temporary flightline measures through the construction zone, are kept dark (maximum of 1 lux) and can continue to be used by bats. A full construction lighting strategy will be provided in a CEMP to be provided prior to commencement of Phase 2 construction (this will be secured through a planning condition or through the section 106 agreement). Dust supression measures will be used throughout construction as detailed within the Air Quality chapter to ensure that impacts from dust pollution are negligible. The application of strict working areas will ensure that there are no incidents of accidental damage to retained habitats and in the very unlikely event of this occuring temporary and permanent re-instatement measures will be used to ensure that this does not impact bat commuting routes.

7.376 Permanent measures will be included within the phase 2 developments to protect the bats' commuting routes/flyways in the long term (refer to the phase 3 bat mitigation section).

Loss of potential foraging habitat during the construction of phase 2 and the creation of the phase 2 mitigation areas

7.377 The loss of potential foraging habitat from the phase 2 development area and potentially from the phase 2 mitigation areas will, without mitigation, have minimal impact on bat foraging activity, in particular for Lesser Horseshoe bats. In the case of the phase 2 mitigation areas this is due to the proximity of the existing artifical roost to Phase 2 mitigation areas MP-2(R)B and MP-2(R)C where enhancement works will take place.

majority of foraging activity has been recorded within the woodland habitats to the south and south west of the Northern Quarter (refer to the bat survey report Figures 11 to 31, pages 47 to 67 Appendix 7.4).

7.378 The Phase 2 development area consists of mostly hard standing and buildings in Northern United and more open habitat in the east of the Northern Quarter and sub quality habitat for foraging bats and so the development of this area will only represent a minor loss of sub quality foraging habitat of Lesser Horseshoe bats. This will be fully mitigated by the habitat creation measures to be delivered within the ~~indicative~~ phase 2 mitigation areas. The phase 2 mitigation areas will compensate for these minor losses of sub-optimal foraging opportunities within Phase 2 development by, where necessary,with open habitat creation providing replacement foraging habitat including ~~such as~~ riparian habitats within the grassland enhancement areas in the proximity of nearby vegetation and new mature stock braadleaf woodland (to serve as protection for bats using the riparian habitats) which will immediately deliver an effective foraging resourse for Lesser Horseshoe bats to mitigate against any immediate impacts, while mature stock broad-leaved woodland and scrub habitat creation will provide good foraging habitat within the medium term, although these latter areas will have some foraging potential in the short term as well. See paragraph 7.357c above for full details.

7.379 The programme of habitat clearance and creation works within the phase 2 mitigation areas will be carefully delivered and advance created to minimise potential impacts on bat foraging activity. and to undertake Hhabitat creation works will be undertaken prior to the start of the phase 2 development site clearance for both the Phase 2 full detailed development and for the Phase 2 reserved matters. Woodland enhancement measures for example in MP-2(R)B and MP-2(R)C, will be undertaken in October of Year 4 of the current development programme outside of the critical time of bat foraging (summer maternity period) when bats are leaving the summer roosting site to disperse to hibernation sites within the wider landscape. This will mitigate against the impact described at 7.376 above.

7.379a The impacts on Lesser Horseshoe bats from the creation of the different phase 2 mitigation areas has already been covered by para 7.375c above in points 1-8. The analysis there applies equally to the issue of loss of foraging habitat for Lesser Horseshoe bats.

7.379b Overall there will be losses of 26.392ha of Lesser Horseshoe Bat habitat due to the phase 1 construction and creation of the associated mitigation areas. The mitigation areas will

provide 15.91ha of ecological valuable habitat through creation and a further 5.75ha of habitat enhancements. There will also be 0.1ha of habitat creation within the development area to block up the existing junction with the A4136.

7.379c No negative impacts on foraging of Lesser Horseshoe bats from loss of the phase 2 development area or from creation / enhancement of the phase 2 mitigation areas is therefore expected.

7.379d Low numbers of recording for Greater Horseshoe bats was recorded within the Phase 2 development area and no recordings were found in Phase 2 mitigation areas. The creation of enhanced woodland habitat within Phase 2 mitigation areas will fully mitigate any minor loss associated Phase 2 of the development. No negative impacts on foraging of Greater Horseshoe from loss of the phase 2 development area or from creation / enhancement of the phase 2 mitigation areas is therefore expected.

7.379e No foraging habitat for Bechstein's bat was recorded in Phase 2 development or in the Phase 2 mitigation areas and, as such no negative impacts on foraging of Bechstein's bats from loss of the phase 2 development area or from creation / enhancement of the phase 2 mitigation areas is therefore expected.

7.379f Low numbers of recording for barbastelle bats was recorded within the Phase 2 development area and no recordings were found in Phase 2 mitigation area. The creation of enhanced woodland habitat within Phase 2 mitigation areas will fully mitigate any minor loss associated Phase 2 of the development. No negative impacts on foraging of barbastelle bats from loss of the phase 2 development area or from the creation / enhancement of the phase 2 mitigation areas is therefore expected.

7.379g Pipistrelle species use a wide variety of habitat within the Phase 2 development area but the majority of habitats utilised are concentrated around the main water-bodies which will be retained. Low levels of foraging habitat for Pipsitrelle bats was associated with the Phase 2 mitigation area. The provision of the enhanced Phase 2 mitigation areas will fully address the loss of foraging habitat for Pipistrelle bats within the Phase 2 development and phase 2 mitigation areas and, therefore, no impacts on Pipistrelle species is expcted.

7.379h Low numbers of recordings for Myotis and Long-eared bats were recorded within the Phase 2 development area and low levels of recordings for Myotis and Long-eared bats were found in the Phase 2 mitigation areas. The creation of enhanced woodland habitat within the Phase 2 mitigation areas will fully mitigate any minor loss associated Phase 2 of

the development. No negative impacts on foraging of Myotis and Long-eared bats from loss of the phase 2 development area or from the creation / enhancement of the phase 2 mitigation areas is therefore expected.

7.379i Low numbers of recording for Eptesicus / Nyctalus bats was recorded within the Phase 2 development area and low levels of recordings for Eptesicus / nyctalus was found in Phase 2 mitigation area. The creation of enhanced woodland habitat within Phase 2 mitigation areas will fully mitigate any minor loss associated Phase 2 of the development. No negative impacts on foraging of Myotis and Long-eared bats from loss of the phase 2 development area or from creation / enhancement of the phase 2 mitigation areas is therefore expected.

Injury / mortality / disturbance from phase 2 construction or creation of phase 2 mitigation areas

7.380 The risks of injury/mortality and disturbance of bats within retained habitats during site clearance in the area for Phase 2 construction and delivery of phase 2 mitigation areas will be largely avoided through the use of the appropriate working practices and restrictions, as follows. There will be no impact on the existing bat roosts at Northern United as these are to be demolished as part of the phase 2 detailed permission development which will be undertaken prior to the construction of the phase 2 outline permission developments. This is unlikely to change as the phase 2 detailed permission development is required to facilitate the phase 2 outline permission developments. As such no negative impact on any species of bat from injury / mortality / disturbance from phase 2 construction or creation of phase 2 mitigation areas is predicted:

- Night working will not be permitted unless absolutely necessary and only following discussion with Natural England, especially during the bat active season;
- Construction and security lighting will be limited to those areas where it is an absolute requirement for health and safety purposes while maintaining the maximum of 1 lux along retained habitat corridors;
- Light spill in such circumstances will be minimised through the use of directional lighting and light shields, with particular regard given to potential commuting and foraging areas where levels are not to exceed 1 lux;
- The use of generators overnight will be limited and consideration given to the use of acoustic barrier fencing if such use is required;

- Site compounds will be located away from any potential tree roosts and with due consideration to the artificial roosts to the east of Northern United and the 2 replacement roosts which (by the time phase 2 is reached) will have been constructed to the south of the Northern Quarter, particularly the replacement roost immediately to the south of Northern United;
- Generators and similar equipment will also be carefully positioned to avoid potential tree roosts, particularly during works within the phase 2 mitigation areas;
- Where possible works that have an increased likelihood for disturbing bats, such as woodland clearance and roost removal will be limited to September/October or March/April (subject to nesting bird checks).

7.381 The measures detailed above will benefit all of the bat species present on at the Hybrid Application Site. The measures will mitigate against the potential impacts on Lesser and Greater Horseshoe Bats, which are the most sensitive species present given their association with nearby SACs. The woodland creation and enhancement will also benefit the assemblage of the bat population recorded at the Northern Quarter site by the provision of potential future roosting habitat and an enhanced foraging resourse and will automatically benefit the less sensitive species.

7.382 No air or water pollution impacts are expected as part of the phase construction works given the measures detailed within the relevant chapters.

Operation of phase 1

Disturbance, killing or injury resulting from the operation of phase 1 is not expected given:

1. The low levels of bat activity in the area where the phase 1 college and section 1 spine road is to be located (as explained and evidenced in the Impacts section on "Phase 1 construction" above);
2. The phase 1 mitigation habitat creation measures proposed as set out within the Impacts section on "Phase 1 construction" above;
3. The inclusion within the section 1 spine road design of a wide bridge structure within section 1 of the spine road over Old Engine Brook which will provide an enhancement measure to retain connectivity for allow use by commuting bats (if utilised by bats);

4. The lighting strategy for both the college and section 1 of the spine road which has been carefully considered to maintain dark zones of 1 lux or less along the vegetated site boundaries which will further reduce fragmentation impacts (as shown within the lighting strategy information submitted as part of the planning application for the Hybrid Application Site); and

5. The use of lighting along the spine road itself along with appropriately designed and positioned planting to guide bats to the Old Engine Brook crossing. The objectives in the Lighting Strategy submitted with the hybrid planning application (section 3 "Environmental Considerations") include the maintenance of dark zones and minimisation of light trespass at sensitive locations. It is confirmed in section 4 that all lighting will follow the principles and guidance in Bats and Lighting in the UK (Bat Conservation Trust/ILP) and that lamp output will be kept minimal with the specification of low LED luminaires.

6. Any risk is further reduced by bat behaviour as a majority of the species on site, particularly Lesser and Greater Horseshoes emerge from their roosts approximately 30-60 minutes after sunset (although this can vary depending on weather conditions, available cover etc.) and as such does not coincide with the period of peak traffic flow (approximated as 0700 to 1900) during April to September (the bats are in hibernation between October and March). Bat activity levels do overlap with traffic flow during March and October. However given the measures detailed above it is predicted that disturbance, injury or killing will be avoided.

7. The college will have glass walls facing the lake and the Lesser Horseshoe bat flightline 2 passes to the west of this. A planning condition will control lighting in this areas through the use of daylight sensing cells and time clocks, so as to avoid lighting creating an impact on this flightline.

8. The Lesser Horseshoe bat flightline that crosses the A4136 (flightline 3 on Figure 7.4) was the most consistently used flightline identified in 2011 and 2013 surveys. The habitat to the north of the Northern Quarter comprises of mature established broadleaved woodland habitat which is likely to provide optimal foraging habitat for this species requiring the bats to cross the road. The road creates habitat severance and this is likely to present a collision risk potentially leading to injury and death of bats. The bats crossing at this point currently fly north from their roosting site up an embankment and, as a result, cross the road at low flight heights. During the 2013 fixed point count surveys, a proportion of the Lesser Horseshoe bats were observed crossing the road at heights of between one and two metres. The traffic assessment (see chapter 9 and

specifically Table 2 of its Appendix 9.2) shows that at Link 2 of the A4136 (where flightline 3 crosses north from the Northern Quarter) there is a 0% increase over baseline in traffic expected during phase 2. Therefore there is no predicted negative impact in terms of increased risk of collision with bats at this crossing point from traffic relating to the proposed development. However as explained fully in paragraph 7.375f above an enhancement is nevertheless proposed in the form of a new bat bridge across the A4136.

7.383 The measures detailed above will benefit all of the bat species present in the college / section 1 spine road area of the Hybrid Application Site. The measures will mitigate against potential impacts on Lesser and Greater Horseshoe Bats, which are the most sensitive species present. They will also automatically benefit the less sensitive species.

7.384 No impacts from the operation of Phase 1, including air and water pollution effects (refer to relevant chapters for details), are expected therefore no additional mitigation measures have been recommended.

Conclusion:

7.385 Based on the above mitigation, it is considered that potential impacts on bats from phase 1 operation and phase 2 construction, taking into account the proposed monitoring (see further below) will be fully mitigated.

7.385a Monitoring of the bat assemblage at the Northern United site will provide data on the success or failure of the mitigation measures and to provide data on the use of habitats and features within the footprint of the proposed development and in habitats adjacent to the proposed development. The extent of monitoring will need to be appropriate for the mitigation provided. The key aim of the monitoring programme will be to ascertain whether the proposed mitigation and compensation has been successful, to inform future management and to ascertain that the favourable conservation status of the bat populations has been maintained to ensure compliance is achieved.

7.385b This will be accomplished by:

- Monitoring the colonisation of new roosting provisions including the artificial roosts, night roosts and bat boxes to validate their usage;

- Monitoring to validate whether bats are still using known flightlines and commuting routes or whether new routes have been adopted as a consequence of construction and operation activities;

- Assessing the use of the temporary flightlines, proposed underpasses, overpasses, bat enhancement bridge over the A4136, the use of hop-overs;

- Surveying the newly created woodland habitat for bat foraging and commuting activity; and

- Causality monitoring of the spine road to assess for bat corpses to further identify any potential collision risks.

7.385c A commitment will be made to undertaken for remedial action, should monitoring reveal issues which need to be rectified. However, the exact monitoring measures and methodologies to be used in each year will be agreed through the licencing process after further discussion with Natural England.

Dormice

Construction of Phase 2

7.386 Direct impacts on dormice during construction of phase 2 and delivery of the phase 2 mitigation areas ~~(currently indicative)~~, comprising permanent and temporary habitat loss and risk of injury/mortality during site clearance operations, will be mitigated through a combination of reasonable avoidance measures and appropriate timing of works as well as habitat creation measures.

7.387 All of the woodland plantation and scrub habitats across the area for Phase 2 construction and the ~~indicative~~ phase 2 mitigation areas (Figure 7.5~~4~~) have been surveyed and assessed as sub-optimal dormouse habitat or above and as such removal of these areas requires the appropriate EPS licence from Natural England.

7.388 Habitat clearance at the Phase 2 construction area will be undertaken in accordance with the guidelines from the Dormouse Conservation Handbook with clearance work avoiding the sensitive breeding season between June and September. Clearance work can be undertaken two ways. The first is as a two stage exercise if undertaken over winter when dormice are hibernating, with stage one consisting of vegetation removal to ground level and stage two consisting of below ground (stump) clearance. The second is to undertake clearance work during the summer months (avoiding the more sensitive

periods) however this would be limited to small areas on any one day and would be done by hand, with nests searches to be undertaken by a licensed ecologist prior to removal. All such work would need to be subject to an EPS licence and would need to adhere to the methodologies agreed therein.

7.389 It is anticipated that clearance work will be required as part of the habitat creation measures within the ~~indicative~~ phase 2 mitigation areas MP-2(F)A, MP-2(R)A, MP-2(R)B, MP-2(R)C, MP-2(R)D, MP-2(R)G, MP-2(R)H and MP-2(R)I and as such this will be undertaken in accordance with the Dormouse Conservation Handbook and under licence as detailed above. Stump removal will not be undertaken as part of clearance works associated with the phase 2 mitigation areas as these provide additional habitat features that will be of value to dormice and other species. This approach will also minimise the level of disturbance resulting from such clearance work.

7.390 Loss of dormouse habitat will be mitigated through a number of habitat creation measures including the creation of broad-leaved woodland and species diverse scrub within the phase 2 mitigation areas MP-2(F)A, MP-2(R)A, MP-2(R)B, MP-2(R)C, MP-2(R)D, MP-2(R)G, MP-2(R)H and MP-2(R)I (as shown on Figure 7.54, which shows the mitigation areas for phase 2 detailed permission development and the mitigation for the phase 2 outline permission development). ~~The exact areas of habitat creation will depend on the actual habitat losses resulting from the phase 2 developments and extent of dormouse habitat loss due to the extent of open habitat creation required for other species.~~

7.391 The principles of the mitigation areas as shown on Figure 7.~~4~~5 have been described in paragraphs 7.264 above. As noted in paragraphs 7.264 the ratios identified for each phase (as identified on Figure 7.54) vary. The ratios for the phase 2 detailed permission mitigation are 1.51 woodland creation for every 1ha of woodland and scrub habitat lost; and 1.43 grassland creation for every 1ha of grassland and other open habitat lost to the phase 2 detailed permission. The ratios for the -phase 2 outline permission mitigation are 1.44 woodland creation and 1.74 woodland enhancement for every 1ha of woodland and scrub habitat lost; and 1.56 grassland creation for every 1ha of grassland and other open habitat lost to the development. Therefore through a combination of habitat creation and enhancement, mitigation is provided for the loss of habitat area arising from the phase 2 development and associated works. This is in accordance with the Biodiversity Strategy Committee Draft (May 2014) that has been agreed with Natural England as well as a number of other consultees.

~~7.391 Due to the variety of habitats within the phase 2 development area and the indicative phase 2 mitigation areas, it is not possible to replace all habitats on a 1:1 basis. However in discussion with Natural England (as part of the phase 1 construction and mitigation proposals) it has been agreed that a ratio of 2:1 (loss: gain) can be used for sub-optimal habitat, such as conifer plantation, as long as the habitat created is of a higher quality, such as species diverse broad-leaved woodland and scrub. It should be noted however that all of the habitats to be lost within the phase 2 construction area are to be replaced on a 1:1 basis within the indicative phase 2 mitigation areas.~~

7.392 Dormouse nest boxes will be installed ~~within remaining woodland within the phase 2 mitigation areas (or~~ within ~~adjacent~~woodland areas adjacent to the identified phase 2 mitigation areas, particularly MP-2(F)A MP-2(R)G, MP-2(R)H and MP-2(R)I which are located to the south of the overall development ~~if possible)~~ at a density of approximately 20 per ha. The inclusion of log, brash and rubble piles within the phase 2 mitigation areas for the purposes of Great Crested Newt habitat enhancement will also benefit dormouse populations as they can be used as both summer and winter nest sites.

7.393 Any terrestrial habitat that is temporarily lost through the installation of the phase 2 construction site compounds, accesses or similar temporary requirements will be reinstated upon completion of the phase 2 construction.

7.394 Disturbance of dormice in retained habitats would be largely avoided through appropriate construction practices that will be applied to prevent disturbance to bat populations including limiting construction site lighting and night working. Due to the extent of woodland and scrub habitats it will not be possible to avoid placing construction compounds and welfare units within proximity of retained habitats however these will be located to minimise dormouse habitat loss and where there is less suitable habitat. The placement of generators and similar equipment will also be carefully considered during construction to minimise the potential for noise and vibration disturbance within retained habitats.

7.395 Habitat fragmentation during construction of Phase 2 (Figure 7.54), particularly along Cinderford Brook and through the woodland to the north west of the angling pond between the Hawkwell Inclosure and woodland habitats to the south, will be minimised through brash corridors or windrows that will be reinstated overnight until more permanent connectivity measures ~~can be~~are installed within the wildlife underpasses and bat culverts beneath the completed spine road (as detailed in paragraph 7.485).

Operation of Phase 1

7.396 It should be noted that evidence from previous road schemes have shown that dormice can become habituated to light pollution and road traffic disturbance and have been discovered living close to major roads and even on carriageway central reservations (as discussed in Chanin P. and Gubert L. (2012) *Common dormouse (Muscardinus avellanarius) movements in a landscape fragmented by roads*. Lutra 55 (1): 3-15). As such this, in conjunction with the following measures, mean that disturbance, killing or injury of dormouse from the operation (during phase 2) of phase 1 is not predicted:

- The habitat creation measures to be delivered in conjunction with the phase 1 construction as described in the Impacts "Phase 1 construction" section above;
- The inclusion of a wide bridge structure and associated dormouse culvert crossing over Old Engine Brook (Figure 7.45);
- The planting of a species rich hedgerow along the boundaries of the Hamblett Land to allow habitat connectivity either side of section 1 of the spine road (Figure 7.54);
- The lighting strategy designed to minimise impacts on bats will also benefit dormouse populations by maintaining vegetated dark zones along the boundaries of the college and section 1 of the spine road
- A number of schemes have discovered the presence of dormice living close to major roads and even on carriageway central reservations. It is therefore safe to conclude that they can become habituated to light pollution and road traffic disturbance. Therefore this type of disturbance is not a primary concern for conservation of dormouse populations.
- It is considered that any impacts from increased human activity on the remaining habitats relevant to this species will be minimal during this phase given that the only operational feature will be the college and the associated first part of the spine road to the college. Therefore increased human activity is expected to be limited to these areas. The remaining areas can be expected to be subject to similar levels of human activity to which they are subject at present.

Otters, Water Voles and Badger

Phase 2 construction

7.397 A site walkover will be conducted by a suitably experienced ecologist immediately prior to the commencement of construction of Phase 2 and prior to any clearance of the

phase 2 mitigation areas to ensure no Badger setts or Otter Holts / resting up sites have been established that may be damaged or disturbed by construction or clearance.

7.398 If a badger sett has become established inside or within 30m of the Phase 2 construction clearance boundary, a licence from Natural England will be required in order to exclude Badgers from the sett prior to construction unless reliance on a legal defence is possible. Sett exclusions are seasonally constrained, and can only be carried out on active setts between July and November inclusive and may require the creation of a replacement sett prior to exclusion.

7.399 If an Otter Holt or Water Vole burrow were discovered inside or adjacent to the site boundary for the Phase 2 construction or for a phase 2 mitigation area then a licence from Natural England would be required if these were to be disturbed, damaged or destroyed.

7.400 In order to prevent Badgers, Water Voles and Otters becoming trapped in excavations during construction, all excavations will be made safe at night by having slopped sides or providing a wooden plank or similar so that Badgers and Otters or other mammals (e.g. Hedgehog) that might fall in can escape.

7.401 Disturbance will be largely avoided by limiting construction site lighting to specific locations where it is absolutely necessary for public safety or security, and by avoiding light spill onto watercourses and wooded areas. Care will be taken to avoid positioning site compounds or welfare units, generators for traffic management etc, in close proximity to watercourses or wooded areas which may be used by these species.

7.402 No air or water pollution impacts are expected as part of the phase 2 construction works given the measures detailed within the relevant chapters.

Operation of phase 1

7.403 Potential disturbance, killing or injury impacts associated with the operation of phase 1 are not predicted in relation to Otter, Water Vole and Badger for the following reasons:

1. There are very low levels of Otter and Badger and Water Vole activity in the college and section 1 spine road area
2. The mitigation measures proposed for other protected species
3. Lighting levels will be managed to a maximum of 1 lux

4. The inclusion of a wide bridge structure crossing over Old Engine Brook and maintenance of vegetation along this brook ~~A habitat corridor~~ will provide habitat connectivity ~~be provided~~ beneath the spine road and to areas to the north and south~~along Old Engine Brook and will be maintained~~

5. These species are nocturnal in nature and as such will be active outside the peak period of use, particularly with regard to the spine road where peak activity is approximated as 0700 to 1900.

6. It is considered that any impacts from increased human activity on the remaining habitats relevant to these species will be minimal during this phase given that the only operational feature will be the college and the associated first part of the spine road to the college. Therefore increased human activity is expected to be limited to these specific areas. The remaining areas can be expected to be subject to similar levels of human activity to which they are subject at present.

7.404 No impacts from the operation of Phase 1, including air and water pollution effects (refer to relevant chapters for details), are expected therefore no additional mitigation measures have been recommended.

Conclusion

7.405 Based on the above mitigation, it is considered that potential impacts on Otters, Water Vole and Badgers from phase 1 operation and phase 2 construction will be fully mitigated.

Breeding Birds

Phase 2 construction

7.406 Avoiding mortality of nesting birds will be achieved through timing of works to avoid vegetation clearance at the Phase 2 construction area or within the phase 2 mitigation areas during the nesting bird season. This is generally late February to early September inclusive (weather dependent), but varies between species with some, (e.g. crossbills), potentially breeding earlier in the year. If clearance works are required during the breeding season vegetation will be checked within 24 hours prior to removal by a suitably qualified ecologist, to confirm the absence of active nests. If nesting birds are found to be present then clearance / demolition works within the immediate area will stop and a buffer will be clearly demarked so that no works can take place within ~~10m~~a minimum of 10m (species dependent) of the nest site until the young have fledged and this is confirmed by a suitable experienced ecologist.

7.407 Depending on the timing of phase 2 clearance and construction works it is possible that the increase in activity due to construction traffic etc. could impact breeding birds within adjacent retained habitats if they coincide with the breeding season. If this is the case it is recommended that adjacent habitat areas will also be searched prior to phase 2 clearance and construction works and appropriate buffer zones put in place, should it be considered necessary by the project ecologists.

7.408 It is not possible to mitigate the effects of loss of nesting habitat in scrub, hedgerows and woodland in the short term during the construction period, but planting of scrub, hedgerows and woodlands within the landscaping of the phase 2 developments where possible and the ~~indicative~~ phase 2 mitigation areas will mitigate this impact in the medium to long term.

7.409 No air or water pollution impacts are expected as part of the phase 2 construction works given the measures detailed within the relevant chapters.

Operation of Phase 1

7.410 Disturbance, killing or injury of birds from the operation of phase 1 is not predicted as the phase 1 habitat creation measures will replace the potential nesting and foraging habitats lost as well as encouraging breeding activity away from the college / spine road development area reducing the potential for light, noise and other indirect impacts.

7.411 No impacts from the operation of Phase 1, including air and water pollution effects (refer to relevant chapters for details), are expected therefore no additional mitigation measures have been recommended. It is considered that any impacts from increased human activity on the remaining habitats relevant to birds will be minimal during this phase given that the only operational feature will be the college and the associated first part of the spine road to the college. Therefore increased human activity is expected to be limited to these specific areas. The remaining areas can be expected to be subject to similar levels of human activity to which they are subject at present.

Conclusion:

7.412 Based on the above mitigation, it is considered that potential impacts on breeding birds from phase 1 operation and phase 2 construction (of the college and section 1 of the spine road) will be fully mitigated.

Reptiles

Phase 2 construction

7.413 Reptiles, primarily Common Lizards and Slow-worms, may be killed during phase 2 development site and phase 2 mitigation area clearance and construction works and it is currently expected that a majority of the habitat used by these populations within the development areas would be lost.

7.414 Mitigation to minimise the risk of mortality during clearance / construction would comprise relocation of animals from the clearance area / footprint of the development to adjacent retained habitat (Figure 7.54).

7.415 The development footprint will be subject to an exclusion and translocation exercise using herptile exclusion fencing and artificial refuges positioned on the footprint of the development for a minimum of 60 visits in appropriate weather conditions. Following this, destructive searches will be undertaken across the relevant area before construction begins.

7.416 The phase 2 mitigation areas MP-2(F)A, MP-2(R)A, MP-2(R)B, MP-2(R)C, MP-2(R)D, MP-2(R)G, MP-2(R)H and MP-2(R)I will be cleared following stringent searches by suitably experienced ecologists to ensure that there are no reptiles present. Where these are found, they will be translocated into suitable adjacent habitats in accordance with the methodology detailed within the non-licensable method statement. This clearance work will only remove the above ground vegetation as the remaining tree stumps are to be retained to provide additional ecological features within these areas.

7.417 The relocation of reptiles is seasonally constrained, as they are not active during the winter months, and may not need to use basking sites during warm conditions in mid-summer. The appropriate times of year to undertake this work will be either spring or autumn. Clearly the relocation of reptiles will need to precede soil stripping and earthworks. However woodland and scrub clearance works which are expected to be required within the phase 2 development area can proceed following careful finger-tip searches by a suitably qualified ecologist to confirm the absence of reptiles if the construction programme does not allow completion of the relocation exercise prior to this clearance.

7.418 Loss of reptile habitat under Phase 2 construction will be mitigated for through a number of habitat creation measures including the creation of open grassland, broad-leaved

woodland and species diverse scrub within the ~~indicative~~ phase 2 mitigation areas MP-2(F)A, MP-2(R)A, MP-2(R)B, MP-2(R)C, MP-2(R)D, MP-2(R)G, MP-2(R)H and MP-2(R)I.

7.419 Woodland and scrub areas will be planted during the dormant months (between November to March) while open grassland areas will be seeded following a local hay-cut/seed collection exercise.

7.420 The principles of the mitigation areas as shown on Figure 7.5~~4~~ have been described in paragraphs 7.264 above. The mitigation has been designed as a whole to ensure a coherent approach and prevent fragmentation or isolation of mitigation areas. Through a combination of habitat creation and enhancement, phase 2 mitigation is provided for the loss of habitat area due to development and associated works during phase 2 in accordance with the Biodiversity Strategy.

~~7.420 Habitats lost within the construction site will be replaced on a 1:1 basis while those within the indicative phase 2 mitigation areas, that are considered to be sub-optimal, will be replaced on a 2:1 basis.~~

7.421 Further habitat creation works will be undertaken as part of the phase 2 landscaping along with additional enhancement measures, such as refugia/hibernacula creation, which will further benefit reptile populations on site. The creation of micro-topographic features within the mitigation area (see below) will also provide further benefits to reptile populations.

7.422 Any terrestrial habitat that is temporarily lost through the installation of the construction site compounds, accesses or similar temporary requirements will be reinstated upon completion of the phase 2 development.

7.423 Log, brash and rubble piles will be included within the ~~indicative~~ phase 2 mitigation areas at a density of 5 per hectare primarily for the purposes of Great Crested Newt habitat enhancement (see the Amphibians section below); however these will also provide refugia opportunities for reptiles. The opportunity to create further structural diversity within the phase 2 mitigation areas will also be taken with the aim to create a varied micro-topography through a series of small-scale hummocks, dips, furrows and mounds facing in different aspects. Stump removal will not be undertaken in these areas so the remaining stumps create further features of value to reptiles. These features will also provide additional foraging opportunities and refugia. Once established, this area will be subject

to on-going long-term management to maintain the optimum mosaic primarily for Great Crested Newts but this will also benefit reptiles.

7.424 Where habitats are retained the management regime will be adjusted to maintain a mosaic of woodland, scrub and rough grassland. Where necessary some selective tree felling/coppicing could be undertaken as initial habitat restoration to open up grassland glades. Particular emphasis will be given to retaining connectivity between habitat areas with substantial blocks of tall vegetation (either developed naturally or through scrub planting).

7.425 No air or water pollution impacts are expected as part of the phase 2 construction works given the measures detailed within the relevant chapters.

Operation of Phase 1

7.426 Disturbance, killing or injury of reptiles from the operation of phase 1 is not predicted as the habitat creation measures will replace the habitats lost as well as encouraging reptile populations away from the development areas reducing the potential for light, noise and other indirect impacts. Connectivity between habitats will be maintained through the habitat corridors to be retained around the boundaries of the phase 1 developments and beneath the spine road along Old Engine Brook (as labelled on Figure 7.54).

7.427 No impacts from the operation of Phase 1, including air and water pollution effects (refer to relevant chapters for details), are expected therefore no additional mitigation measures have been recommended. It is considered that any impacts from increased human activity on the remaining habitats relevant to reptiles will be minimal during this phase given that the only operational feature will be the college and the associated first part of the spine road to the college. Therefore increased human activity is expected to be limited to these specific areas. The remaining areas can be expected to be subject to similar levels of human activity to which they are subject at present.

Conclusion:

Based on the above mitigation, it is considered that potential impacts on reptiles from phase 1 operation and phase 2 construction will be fully mitigated.

Amphibians including GCN

Phase 2 construction

7.428 Direct impacts on Great Crested Newt and other amphibians during phase 2 construction and delivery of phase 2 mitigation areas, comprising permanent and temporary habitat loss and risk of injury/mortality during site clearance operations will be mitigated through a combination of exclusion and translocation, reasonable avoidance measures and appropriate timing of works as well as habitat creation measures.

7.429 All of the habitats within the phase 2 development site and within the ~~indicative~~ phase 2 mitigation areas are considered to be sub-optimal Great Crested Newt habitat or above (excluding areas of hard standing, buildings etc.) and as such removal of these areas requires the appropriate EPS licence from Natural England.

7.430 A full exclusion and translocation exercise is to be undertaken across the phase 2 construction area including temporary accesses and site compounds ~~and phase 2 mitigation area~~ in accordance with the Great Crested Newt Mitigation Guidelines (English Nature, 2001); and Natural England licensing guidelines. This will be undertaken using the principles established within the "Amphibians including GCN" mitigation section under Phase 1 Construction above. The mitigation areas MP-2(F)A, MP-2(R)A, MP-2(R)B, MP-2(R)C, MP-2(R)D, MP-2(R)G, MP-2(R)H and MP-2(R)I will also be subject to a full exclusion and translocation exercise prior to the habitat creation works in accordance with the principles established within the "Amphibians including GCN" mitigation section under Phase 1 Construction above.

7.431 ~~Captured amphibians~~A~~a~~mphibians captured within the construction area will be translocated immediately into suitable habitats within pre-prepared phase 2 mitigation areas MP-2(F)A, MP-2(R)A, MP-2(R)G, MP-2(R)H and MP-2(R)I (Figure 7.54). Those captured within the mitigation areas will be translocated to suitable adjacent habitats outside the exclusion fencing. This is the approach that has been established in relation to Phase 1, as detailed within the "Amphibians including GCN" mitigation section under Phase 1 Construction above, and has been agreed with Natural England.

7.432 Vegetation clearance will be undertaken in accordance with the Great Crested Newt Mitigation Guidelines whilst avoiding the sensitive periods relating to other protected species. Clearance work can either be undertaken as a two stage exercise if undertaken over winter, with stage one consisting of vegetation removal to ground level and stage two consisting of below ground (stump) clearance depending on the restriction posed by other protected species, dormice in particular. All such work would need to be reviewed in relation to EPS licence requirements and would need to adhere to the methodologies

agreed either within such licences or within non-licensable method statements. Stump removal will not be undertaken as part of clearance works associated with the phase 2 mitigation areas as these provide additional habitat features that will be of value to amphibians and other species. This approach will also minimise the level of disturbance resulting from such clearance work.

7.433 Loss of Great Crested Newt and other amphibian habitat will be mitigated through a number of habitat creation measures including the creation of open grassland, broad-leaved woodland and species diverse scrub within the phase 2 mitigation areas MP-2(F)A, MP-2(R)A, MP-2(R)B, MP-2(R)C, MP-2(R)D, MP-2(R)G, MP-2(R)H and MP-2(R)I.

7.434 Woodland and scrub areas will be planted during the dormant months (between November and March) while the open grassland areas will be seeded following a local hay-cut/seed collection exercise. ~~Due to the variety of habitats within the phase 2 development site and the indicative mitigation areas it will not been possible to replace all habitats on a 1:1 basis. However previous discussions with Natural England (in relation to the phase 1 construction works) agreed that a ratio of 2:1 can be used for sub-optimal habitat, such as conifer plantation, as long as the habitat created is of a higher quality or greater value, such as open grassland or species diverse broad-leaved woodland. It should be noted that all of the habitats to be lost within the phase 2 development area will be replaced on a 1:1 basis.~~ The principles of the mitigation areas as shown on Figure 7.5~~4~~ have been described in paragraphs 7.264 above. As noted in paragraphs 7.264 the ratios identified for each phase (as identified on Figure 7.5~~4~~) vary. The ratios for the phase 2 detailed permission mitigation are 1.51 woodland creation for every 1ha of woodland and scrub habitat lost; and 1.43~~8~~ grassland creation for every 1ha of grassland and other open habitat lost to the phase 2 detailed permission development. The ratios for the the phase 2 outline permission mitigation are 1.44~~6~~ woodland creation and 1.74 woodland enhancement for every 1ha of woodland and scrub habitat lost; and 1.56 grassland creation for every 1ha of grassland and other open habitat lost to the development. Therefore through a combination of habitat creation and enhancement, mitigation is provided for the loss of habitat area arising from the phase 2 development and associated works. This is in accordance with the Biodiversity Strategy Committee Draft (May 2014) that has been agreed with Natural England as well as a number of other consultees.

7.435 Further habitat creation works will be undertaken as part of the landscaping works for the phase 2 developments, along with additional enhancement measures, which will further benefit amphibian populations on site.

7.436 Any terrestrial habitat that is temporarily lost through the installation of the construction site compounds, accesses or similar temporary requirements will be reinstated upon completion of the phase 2 developments.

7.437 The aspects of Phase 2 for which outline permission only is sought (and so where reserved matters applications will be required) will result in the loss of 1 unconfirmed Great Crested Newt pond (Pond 33) while the aspects of Phase 2 for which full planning permission is sought will result in the ~~and~~ severance and isolation of breeding pond 22. Ponds 33 and 22 are shown on page 29 of the GCN report at Appendix 7.6. As such, aquatic habitat replacement and enhancement will be undertaken as detailed below, before work ~~development~~ begins on the full permission (or "detailed development") aspect of phase 2.

7.438 ~~Replacement~~A number of ~~Two~~ ~~R~~replacement ponds will be created within the ~~indicative~~ phase 1 and phase 2 mitigation areas in the south of the Northern Quarter site to serve as mitigation for both the full permission and outline permission aspects of ~~the~~ Phase 2 ~~to the south or west of the Northern Quarter~~. These ponds ~~and~~ have been~~will be~~ designed and located to improve the breeding habitat available and to improve the habitat connectivity between the eastern and western Great Crested Newt populations therefore improving opportunities for dispersal and genetic exchange. ~~All ponds~~The ~~two~~ ponds to be created are marked on Figure 7.5~~4~~. ~~Both All ponds~~and will incorporate the following design features to maximise their value for breeding Great Crested Newts:

- The surface area of each pond will be between approximately 100 to 300m^2 (measured at the point when water levels are highest – but excluding flood events);
- Designed as permanent ponds that hold water throughout the summer. It is anticipated that this can be achieved by locating new ponds where the water table is high, however, consideration would be given to using a clay liner where necessary;
- Designed as separate features to any proposed drainage system or SuDS associated with the development proposals to ensure that they do not receive silt-laden or polluted runoff from areas of hard-standing;

- Designed with a varied cross-sectional profile with shallow areas (to facilitate macrophyte development for egg-laying); shallow banks (for ease of access); and areas > 1m deep (to provide open water areas for courtship);
- No tree planting proposed and trees cleared from around each pond to ensure levels of shade are retained at less than 40%;
- No features (e.g. islands) that could be used preferentially by nesting water birds;
- Ideally macrophytes will be allowed to establish in new ponds by natural re-colonisation. However, plug plants will be used wherever necessary to establish marginal and emergent vegetation cover quickly.

7.439 In addition to the new pond creation, the following ~~consideration will be given to the~~ restoration and enhancement ~~of~~works will be undertaken in relation to ~~of~~ the existing ponds ~~including the following~~:

- Ponds 13a and 20 (Pond Location Figure, page 28 within Appendix 7.6) which have HSI scores of 0.56 (below average) and 0.52 (below average) respectively. These ponds will be subject to restoration including slubbing out in the winter to remove choking vegetation and silt build-up; and removal of trees to reduce shading;
- Although Ponds 14, 15 and 16 (Pond Location Figure, page 28 within Appendix 7.6) score 0.77 (good), 0.77 (good) and 0.75 (good) respectively on the HSI, they are 100% shaded by adjacent trees. Selective coppicing and thinning will be undertaken around these ponds during the winter to allow more light to penetrate;
- Pond 10 (the large lake) (Pond Location Figure page 29 within Appendix 7.6) extends out as a small spur to the east. This small spur will be isolated from the large lake and electrofishing undertaken to remove fish. This will create a new pond suitable for breeding Great Crested Newts.

7.440 Once initial restoration and enhancement works have been completed, ponds will be entered into the long-term management regime that will be implemented for nature conservation purposes across the Northern Quarter site and all associated mitigation areas. This will comprise sensitive clearance of macrophyte vegetation and coppicing of trees and shrubs around ponds on rotation during the winter period.

7.441 Log, brash and rubble piles will be included within the phase 2 mitigation areas MP-2(F)A, MP-2(R)A, MP-2(R)B, MP-2(R)C, MP-2(R)D, MP-2(R)G, MP-2(R)H and MP-2(R)I at a density of

5 per hectare for the purposes of Great Crested Newt habitat enhancement. The opportunity to create further structural diversity within the phase 2 mitigation areas MP-2(F)A, MP-2(R)A, MP-2(R)B, MP-2(R)C, MP-2(R)D, MP-2(R)G, MP-2(R)H and MP-2(R)I will also be taken with the aim to create a varied micro-topography through a series of small-scale hummocks, dips, furrows and mounds facing in different aspects. Stump removal will not be undertaken in the phase 2 mitigation areas MP-2(F)A, MP-2(R)A, MP-2(R)B, MP-2(R)C, MP-2(R)D, MP-2(R)G, MP-2(R)H and MP-2(R)I so the remaining stumps create further features of value to newts and other species. These features will provide additional foraging opportunities and refugia for amphibians. Once established, these areas will be subject to on-going long-term management to maintain the optimum mosaic for Great Crested Newts and other amphibians.

7.442 Where habitats are retained the management regime will be adjusted to maintain a mosaic of woodland, scrub and rough grassland. Where necessary some selective tree felling/coppicing will be undertaken as initial habitat restoration to open up grassland glades. Particular emphasis will be given to retaining connectivity between habitat areas with substantial blocks of tall vegetation (either developed naturally or through scrub planting).

7.443 Disturbance, of Great Crested Newts and other amphibians in retained habitats, including ponds, is not predicted due to the adoption of appropriate construction practices that will be applied to prevent disturbance to bat populations including limiting construction site lighting and night working. Due to the extent of amphibian habitat on site it will not be possible to avoid placing construction compounds and welfare units within proximity of retained habitats however these will be located to minimise the potential for indirect disturbance and habitat loss and away from confirmed breeding ponds. The placement of generators and similar equipment will also be carefully considered during phase 2 construction to minimise the potential for noise and vibration disturbance within retained habitats.

7.444 Habitat fragmentation during construction will be limited however this will be managed further through the careful design of temporary watercourse crossings to ensure that the stream banks and associated vegetation are maintained as far as possible.

7.445 No air or water pollution impacts are expected as part of the phase 2 construction works given the measures detailed within the relevant chapters.

Phase 1 Operation

7.446 Disturbance, killing or injury from the operation (during phase 2) of phase 1 is not predicted as the habitat creation measures will replace the habitats lost as well as encouraging amphibian populations away from the development areas reducing the potential for light, noise and other indirect impacts.

7.447 Connectivity between habitats will be maintained through the habitat corridors to be retained around the boundaries of the phase 1 developments and beneath the spine road along Old Engine Brook (as shown on Figure 7.54).

7.448 Lighting levels around the remaining ponds on site will be managed through the measures implemented as part of the bat mitigation measures designed to ensure maximum levels of 1 lux in habitats adjacent to the phase 1 developments.

7.449 The drainage design will be carefully considered in order to avoid newt mortality from gully pots and/ or sumps. Drainage schemes will be designed without sumps, wherever possible. Sustainable Drainages Systems (SuDS) such as porous surfaces, swales, buffer strips and filter beds will be used in these areas in preference to 'trap'-type drains such as gully pots. Where use of gully pots or "trap"-type drains is unavoidable (e.g. due to high water table), the use of permanent amphibian fencing to exclude newts from areas will be avoided wherever possible due to the high costs of installation and on-going maintenance requirements. Other mechanisms to prevent newts falling into gully pots will be deployed in preference (for example the wildlife kerb produced by ACO Technologies that includes a ledge for amphibians to bypass the gully pot).

7.450 Additional measures may be required in relation to the ponds closest to the college site to ensure that these remain undisturbed, particularly during the breeding season. Such measures include signage and education of college staff and students to ensure that the sensitivity of the habitats and species is identified. Fencing of these ponds will be provided if disturbance levels do increase during the operation of phase 1.

7.451 No impacts from the operation of Phase 1, including air and water pollution effects (refer to relevant chapters for details), are expected therefore no additional mitigation measures have been recommended. It is considered that any impacts from increased human activity on the remaining habitats relevant to amphibians (including GCN) will be minimal during this phase given that the only operational feature will be the college and the associated first part of the spine road to the college. Therefore increased human activity is expected to be limited to these specific areas. The remaining areas can be

expected to be subject to similar levels of human activity to which they are subject at present.

Conclusion:

7.452 Based on the above mitigation, it is considered that potential impacts on amphibians from phase 1 operation and phase 2 construction will be fully mitigated.

White Clawed Crayfish

Phase 2 construction

7.453 On the assumption that low numbers of ~~If~~ White Clawed Crayfish are ~~found to be~~ present within the Hybrid Application Site (whether this is correct will be confimed during the proposed July 2014 surveys), then ~~direct and~~ indirect impacts on this species during construction of the phase 2 could comprise temporary habitat loss and risk of injury/mortality during bankside operations, particularly along Cinderford Brook. Such impacts will be mitigated through a combination of reasonable avoidance measures and appropriate timing of works as explained below. No direct impacts are anticipated as no works are expected to be required within the watercourses present.

7.454 No permanent and/or direct habitat loss is predicted in relation to White Clawed Crayfish as part of the phase 2 construction works, however there may be some temporary loss associated with the temporary construction access over Cinderford Brook. This loss will be avoided or kept to a minimum through careful design and appropriate working practices during installation and removal of the access structure and during the construction period itself. These measures will focus on limiting works ~~within~~ adjacent to the watercourse to that which is absolutely necessary and careful timing of works to avoid the sensitive period of late May and June when females have attached young.

7.455 ~~A detailed avoidance and mitigation strategy will be developed in discussion with Natural England and the Environment Agency if the July 2014 surveys identify the presence of this species on site and this would need to be agreed within either a Natural England Conservation Licence or a non-licensable method statement.~~White Clawed Crayfish are protected under Schedule 5 Wildlife and Countryside Act 1981 in respect of intentional taking and selling. Natural England recommends that all reasonable measures are put in place to prevent harm to its habitat, hence the avoidance strategy described in the paragraph above. A conservation licence would be required from Natural England in respect of intentional taking of the species in the unlikely event that a translocation

exercise is required in relation to this species (ie if the July 2014 surveys identify the presence of this species and in the unlikely event that the avoidance strategy described above is not sufficient).

7.456 Based on the strategy presented it can be seen that offences under the Wildlife and Countryside Act 1981 are not expected to be triggered through the phase 2 constuction works. It should also be noted that no ~~No~~ air or water pollution impacts are expected as part of the phase 2 construction or mitigation works given the measures detailed within the relevant chapters.

Phase 1 operation

7.457 No impacts from the operation of Phase 1, including air and water pollution effects (refer to relevant chapters for details), are expected therefore no additional mitigation measures have been recommended. It is considered that any impacts from increased human activity on the remaining habitats relevant to white clawed crayfish will be minimal during this phase given that the only operational feature will be the college and the associated first part of the spine road to the college. Therefore increased human activity is expected to be limited to these specific areas. The remaining areas can be expected to be subject to similar levels of human activity to which they are subject at present.

Conclusion:

7.458 Based on the above mitigation, it is considered that potential impacts on White Clawed Crayfish from phase 1 operation and phase 2 construction will be fully mitigated.

Invertebrate

Phase 2 construction

7.459 Direct impacts on invertebrates during the construction of phase 2 will be limited to the permanent and temporary habitat loss associated with these works and any clearance required within the ~~indicative~~ phase 2 mitigation areas.

7.460 This habitat loss will be mitigated through the habitat creation measures recommended within the phase 2 mitigation areas ~~(Figure 7.~~MP-2(F)A, MP-2(R)A, MP-2(R)B, MP-2(R)C, MP-2(R)D, MP-2(R)G, MP-2(R)H and MP-2(R)I (Figure 7.5~~4~~), including the creation of open grassland, broad-leaved woodland and species diverse scrub. Woodland and scrub areas will be planted during the dormant months (between November and March) while open grassland areas will be seeded following a local hay-cut/seed collection exercise.

7.461 The principles of the mitigation areas as shown on Figure 7.54 have been described in paragraphs 7.264 above. The mitigation has been designed as a whole to ensure a coherent approach and prevent fragmentation or isolation of mitigation areas. Through a combination of habitat creation and enhancement, phase 2 mitigation is provided for the loss of habitat area due to development and associated works during phase 2 in accordance with the Biodiversity Strategy (May 2014). ~~Habitats lost within the phase 2 construction site will be replaced on a 1:1 basis while those within the phase 2 mitigation areas, that are considered to be sub-optimal, will be replaced on a 2:1 basis.~~

7.462 Further habitat creation works will be undertaken as part of the phase 2 landscaping along with additional enhancement measures, such as log pile creation (primarily for reptiles and amphibians as refugia/hibernacula), which will further benefit invertebrate populations on site.

7.463 Any terrestrial habitat that is temporarily lost through the installation of the construction site compounds, accesses or similar temporary requirements will be reinstated upon completion of the phase 2 developments.

7.464 Aquatic habitat replacement and enhancement will be delivered as part of phase 2 (as detailed above) and will benefit invertebrate populations on site along with the creation of micro-topographic features within the phase 2 mitigation areas (see below)

7.465 Log, brash and rubble piles to be included within the phase 2 mitigation areas MP-2(F)A, MP-2(R)A, MP-2(R)B, MP-2(R)C, MP-2(R)D, MP-2(R)G, MP-2(R)H and MP-2(R)I for the purposes of Great Crested Newt habitat enhancement will also benefit invertebrate populations as will the additional structural diversity to create a varied micro-topography through a series of small-scale hummocks, dips, furrows and mounds facing in different aspects within the phase 2 mitigation areas. Stump removal will not be undertaken in these areas so the remaining stumps create further features of value to invertebrates. Once established, these areas will be subject to on-going long-term management to maintain the optimum mosaic for Great Crested Newts and other amphibians and as such will provide long-term benefits to invertebrate populations and assemblages.

7.466 Where habitats are retained the management regime will be adjusted to maintain a mosaic of woodland, scrub and rough grassland. Where necessary some selective tree felling/coppicing will be undertaken as initial habitat restoration to open up grassland glades. Particular emphasis will be given to retaining connectivity between habitat areas

with substantial blocks of tall vegetation (either developed naturally or through scrub planting).

7.467 No air or water pollution impacts are expected as part of the phase 2 construction works given the measures detailed within the relevant chapters. The measures to reduce habitat fragmentation detailed above for other species (paragraph 7.395), particularly along Cinderford Brook and through the woodland to the north west of the angling pond, during phase 2 the construction works will ensure continued connectivity between habitats across the site.

Phase 1 operation

7.468 Disturbance, killing or injury from the operation (during phase 2) of phase 1 is not predicted as the habitat creation measures will replace the habitats lost as well as encouraging invertebrate populations away from the development areas reducing the potential indirect impacts.

7.469 No impacts from the operation of Phase 1, including air and water pollution effects (refer to relevant chapters for details), are expected therefore no additional mitigation measures have been recommended. The measures to reduce habitat fragmentation detailed above for other species, particularly along Old Engine Brook and the eastern boundary of the Hamblett Land, during the Phase 1 operation (see para 7.396 above) will ensure continued connectivity between habitats across the site. It is considered that any impacts from increased human activity on the remaining habitats relevant to invertebrates will be minimal during this phase given that the only operational feature will be the college and the associated first part of the spine road to the college. Therefore increased human activity is expected to be limited to these specific areas. The remaining areas can be expected to be subject to similar levels of human activity to which they are subject at present.

Conclusion:

7.470 Based on the above mitigation, it is considered that potential impacts on invertebrates from phase 1 operation and phase 2 will be fully mitigated.

Phase 3

Designated Sites

7.471 None of the statutorily designated sites identified within the desktop study search area will be directly affected by the operation of phase 3.

7.472 Those sites designated for their bat populations in the three Tables above may however be indirectly affected by Phase 3 through potential impacts on the bats, for which they are designated, when outside the boundary of the designated site and within the Hybrid Application Site, as noted in the Tables. As such the mitigation measures detailed within the bats section below will apply. There are no appreciable effects predicted from phase 3 to the Severn Estuary SAC, SPA and Ramsar, Walmore Common SPA and Ramsar site and on the Speech House Oaks SSSI. This is explained above in paragraphs 7.259a – 7.259k, and in the phase 3 Impact table.

7.473 As for the policy based designated sites, the indirect impacts identified on the Hawkwell Inclosure and Cinderford Linear Park Key Wildlife Sites will be addressed through the mitigation measures for the individual ecological habitat and species features detailed below.

7.474 No impacts from the operation of phases 1 and 2, including air and water pollution effects (refer to relevant chapters for details), are expected therefore no additional mitigation measures have been recommended.

Habitats

7.475 No operational impacts are predicted from phase 3 therefore no additional mitigation measures are required.

7.476 No impacts from the operation of phases 1 and 2, including air and water pollution effects (refer to relevant chapters for details), are expected therefore no additional mitigation measures have been recommended. It is considered that there is some potential for an increased impact on remaining habitats due to increased human activity in the area during the operational phases of Phase 3, however the site is already well used with numerous worn footpaths and tracks. Additional signage will be used to inform people of the sensitivity of the area to disturbance. The increased presence of pets due to the residential developments is not considered to pose a risk to the habitats present.

Bats

Severance and loss of commuting routes from Phase 3

7.477 Disturbance, killing or injury of bats during phase 3 resulting from the operation of the entire development to be delivered under phases 1 and 2 is not predicted.

7.478 The commuting major and minor routes/flyways identified in the baseline data and detailed in the bat survey report (~~Figure 48, page 134, Appendix~~and shown on Figure 7.4) for Lesser Horseshoe bats will be maintained following construction of the entire spine road~~, through the inclusion of two purpose built bat/wildlife underpasses (ie a bat culvert east and a bat culvert west) beneath the spine road on the line of the two major flyways for Lesser Horseshoe bats identified within the bat survey report (Appendix 7.4), with potential routes maintained through the use of the Cinderford Brook Crossing and the Old Engine Brook Crossing (refer to Figure 7.4). These bat culvert east and bat culvert west underpasses will measure 2.5m wide and 2.0m high and will not be lit to ensure continued use by bats (as per the lighting strategy details included within the planning application documents). In addition to this woodland and scrub planting will be positioned to guide bats to these points and discourage flight over the carriageway. Lighting will also be carefully controlled to ensure a maximum of 1 lux in these areas (as shown within the lighting strategy information submitted as part of the hybrid planning application)~~.

7.478a The creation of the spine road will have an impact on three of the five identified commuting routes (2 major and 1 minor) used by Lesser Horseshoe bats dispersing from the Artificial Roost to foraging areas. These flightlines have been identified through the Kestrel Wildlife Consultants 2011 survey data with higher numbers of bats recorded in this area from transects, static loggers and observations of bats and from the AEWC 2013 surveys from transects, fixed point counts and radio tracking.

7.478b The first two major Lesser Horseshoe bat flightlines fragmented by the spine road, flight lines 1 and 2, are shown on Figure 7.4 and have been consistently used by Lesser Horseshoe bats in 2011 and 2013.

7.478c Flight line 1 runs down south from the Artificial Roost through to the south west corner of Hawkwell inclosure where, when it meets a gap in the vegetation at the junction with the Bath House, it splits into three main directions as bats disperse to foraging areas: sub route 1A, which travels west through the Bath House, sub route 1B which travels in a south-westerly direction and sub route 1C which travels in a south-easterly direction. The construction of the spine road will result in loss flightline 1A, forcing the bats to cross further south, or use flightline 1B. The construction of the spine road will result in the removal of vegetation and habitat features associated with flightlines 1B and 1C. Although the bats

using these flightlines 1B and 1C cross the open gap of the Northern United access track, the spine road will result in a gap that is wider and, therefore, unless mitigated may result in a barrier to dispersal for these species.

7.478d Flightline 2 runs from the Hawkwell inclosure south through a wide woodland strip running south between the lake and the Brickworks. This was identified as a high area of activity for Lesser Horseshoe bats from static loggers, fixed point counts and transects by both the 2011 and 2013 surveys, but most notably from radio tracking in 2011 where seven of the eight radio-tagged bats used this route 'at some time during the study'. In 2013 eight bats were recorded commuting through this location during one fixed point count survey. The severance of this woodland strip with the creation of the spine road will, if unmitigated, have a negative impact on the Lesser Horseshoe bats as a proportion of the colony recorded have been recorded using this flighline at some time.

7.478e Flight line 3 runs from the artifical roost north and crosses the A4136 road where it splits and bats disperse to associated foraging habitats within the Ruardean Plantation. Phase 3 of the development will not impact on this flightline, except to the extent that an overall 7% decrease in traffic (as compared with baseline) along the section of the B4136 where flightline 3 crosses is expected in Phase 3 as a result of the proposed development (see Appendix 9.2 of chapter 9 on transport assessment). As such there will be a reduction during Phase 3, as compared with baseline, in collision risk with bats using flightline 3 as a result of this project. In addition the proposed bat bridge at this location (described above) will strenghten and enhance this existing flightline.

7.478f Minor flight line 4, which will also be fragmented by the construction of the spine road, runs directly west from the Artificial Roost. This was identified by observations of bats crossing by Kestrel Wildlife Consultants (Key flyway B) and by bats observed crossing during 2013 but with notably lower numbers observed in 2013. However the radio tracking did not identify any bats using this commuting route in the 2011 survey work. In addition the 2013 radio tracking did not identify any bats using this flight line to disperse from the Artificial Roost, but one individual was identified returning to the roost along this flight line. Bats are already crossing the Northern United access track but the creation of the new spine road further west of the track will result in the removal of vegetation at the junction resulting in severance of the commuting route and having a potential negative impact on any individuals using this route.

7.478g Mitigation in respect of flightlines 1 and 2 will be delivered through the inclusion of two purpose-built bat/wildlife underpasses (ie a bat culvert east and a bat culvert west) beneath the spine road on the line of the two major flyways 1 and 2 for Lesser Horseshoe bats. These bat culvert east and bat culvert west underpasses will measure 2.5m wide and 2.0m high and will be 22 metres in length as they pass under the spine road. The location of these culverts are shown on Figure XX. The design of the culverts is included within the planning application documents. The culvert design has been optimised to incorporate the observed flight heights of Lesser Horseshoe bats within the Northern Quarter site. A number of Lesser Horseshoe bats were observed during the 2013 surveys and the majority of these bats were flying low (i.e. less than 1.5 metres from the ground and most were flying very low – less than one metre from the gound as is typical for Lesser Horseshoe bats). Any Lesser Horseshoe bats that were observed flying higher than this were either within woodland, where they were under canopy or moving between canopies. As such, the proposed bat culverts provide safe commuting routes underneath the spine road and are specifically designed to be appropriate for Lesser Horsheoe commuting behaviour.

7.478h Wray et al (2005) recorded the use of culverts by Lesser Horseshoe bats on the A477 Sageston to Redberth Bypass. These culverts measured 2.2 m in diameter and 1.8 m in height. This study provides assurance that the size of the culverts proposed to mitigate for the severence of Lesser Horseshoe bat habitat will be utilised by the Lesser Horseshoe bat population at the Hybrid Application Site. The underpasses will not be lit to ensure continued use by bats as per the lighting strategy details (see paragraph 7.383). In addition, woodland and scrub planting will be positioned to guide bats to these safe crossing points and discourage flight over the carriageway, see Figure 7.11. Where construction allows, advance planting will take place, but temporary flightlines will also be deployed in the interim (as described above in relation to phase 2 construction) to ensure that there is no loss of habitat connectivity. Lighting will also be carefully controlled to ensure a maximum of 1 lux in these areas (as shown within the lighting strategy information submitted as part of the hybrid planning application).

7.478i The positions of the proposed culverts to cross the new spine road are not strictly in the same location as the existing flightlines. The position of bat culvert 1 (western culvert) is slightly to the east of the existing flightline (but within 20 metres) and the position of bat culvert 2 (eastern culvert) is slightly to the east of the existing flightline (but within 33 metres). It is not possible to locate the culverts on precisley the footprint of the existing flightlines due to the topography of the landscape. The spine road will be below grade

along the existing flightline 1 and if a culvert were to be installed at this location then it would be much lower and bats would have to drop down to use it putting the success of the culvert mitigation in doubt. Similary, at flightline location 2 the proposed spine road is at grade and construction of a bat culvert would mean it would low down resulting in the bats have to drop into it. The proposed locations of the bat culverts, with the appropriate landscape planting, in proximity to the existing flightlines and cohesive with the surrounding landscape, is a significantly better design for the bats than a scheme forcing the bats to drop down.

7.478j Flightline 1 splits at the junction with the Bath House where there is a gap in the road and the bats disperse south-west, south-east and west to foraging areas. The provision of a large bat culvert with the appropriate landscaping to funnel the bats to the safe crossing point will provide the colony using these flightlines with the ability to cross the spine safely and disperse to their foraging locations to the south of culvert 1. The flightline splits at this location due to a gap in the vegetation where bats cross the existing track and then disperse to different foraging localities. Landscaping to funnel the bats into the culvert will prevent bats crossing at 'unsafe locations' and this continuation of vegetation management will prevent the flightlines splitting prior to the culvert entrance.

7.478k There is an access track in existence which runs above the spine road to the rear of plots A2 and B and is close to the bat culvert west. At present the road is used to serve 2 private residences and 2 small businesses (one of the residential properties is contained within the site of one of the businesses (Woodward Autospares)). The proposal is to close the existing road and instead to provide two new accesses to the residents/businesses from the spine road. The first new access would be from the spine road at a position 135 metres to the east of the bat culvert west. This first access will be used to serve Plot B, Brickworks Bungalow and Overbrook Services. A second access from the spine road, located 120 metres further to the east, will be used to serve Woodward Autospares. The relevant businesses and residents have been consulted on this proposal and have provided their agreement in principle. The existing access track will be landscaped at the junction with the A4136 up to the new access for the proposed new residences/business and between this acesss point and the existing junction for Woodward Autospares. This proposed landscaping will provide a continuity of habitat which will dissuade flightline 1 from breaking up into three sub flightlines 1A, 1B and 1C prior to the western culvert entrance by ensuring that the bats do not have to cross open ground. This landscaping through the existing track will funnel the bats to the safe crossing point at the culvert underneath the spine road (see Figure 7.10) and allow flightline 1 to split into the three sub

flightlines, 1A, 1B and 1C, after the bats have commuted through the western culvert to the south. The western culvert will therefore serve as effective mitigation for the sub route flightlines 1A, 1B and 1C. Therefore, no cumulative impacts in relation to this current access track together with the proposed development at the Hybrid Application site will arise.

7.479 The minor Lesser Horseshoe bat flightline 4 that crosses east-west at the Northern United Junction (see Figure 7.4) will be maintained through advanced mature broadleaved woodland planting of the existing Northern United access track to strengthen and improve the existing connectivity and appropriate lighting (see paragraph below) to create a dark corridor over the proposed spine road, which remains at the existing road level in this location preventing the installation of an underpass. The existing flightline will cross at the proposed junction with the A4136 which will be a wider gap than the existing track. As such it is proposed to create a safe hop over through vegetation just to the south of the junction (to prevent collision with cars turning into the spine road from the A4136). This will enable bats to continue to cross the spine road in an east – west direction from the artificial roost and a dark corridor will be maintained at this location. Vegetation management at the junction of the spine road and A4136 will be in place to ensure that the vegetation around the existing flightline is removed and the junction is lit to deter bats crossing at this unsafe location. Once artificial roosts RR1 and RR2b become established, this will reduce the need for bats travelling to the south of the site for foraging to travel back north to their aritifcal roost for roosting, as appropriate roosting locations will be available for the colony members that subsequently forage south of the spine road. It is likely that colony members that utilise the existing arrtifical roost in Hawkwell enclosure and travel north for foraging across the A4136 will continue to do so as this foraging location is the closest in proximity to their roosting site. ~~The minor flyway that crosses east-west at the Northern United Junction will be maintained through planting and appropriate lighting to create a dark corridor approximately 10m wide over the proposed spine road, which remains at the existing level in this location preventing the installation of an underpass. The lighting strategy for the second phase of the spine road (as shown within the lighting strategy information submitted as part of the hybrid planning application) reflects this dark corridor and the detailed design stages of the developments within this area will incorporate these measures into their lighting and landscape strategies.~~

7.480 The lighting strategy for the second phase of the spine road (as shown within the lighting strategy information submitted as part of the hybrid planning application) reflects this dark corridor and the detailed design stages of the developments within this area will incorporate these measures into their lighting and landscape strategies. The Lighting

Strategy states (section 4) that the width of the dark corridor will be a minimum 2 metres at ground level at full lantern output, increasing to 9 – 10metres when dimmed and that there will be a further increase in width above ground level. The dark corridor is shown at full lantern output on the spine road lighting map (1301 Spine Road Street Lighting 1 of 5). At A1 size, the dark corridor scales at approximately 2.7 metres at carriageway level. The Lighting Strategy indicates the luminance levels at full output and dimmed output at 1:250 scale, with the perpendicular dark corridor measured at approximately 2.5 metres and 9.5 metres respectively at carriageway level. These dark zones will provide commuting routes and foraging opportunities throughout the site for all bat species and prevent fragmentation or isolation of these. The careful use of lighting along the completed spine road along with appropriate planting to guide bats to the 2 bat culverts (east and west) (see Figure XXX), the dark corridor, Cinderford and Old Engine Brook structures and to act as barriers to prevent bats crossing over the carriageway will further minimise the risk of road mortality.

7.480a The Lighting Strategy have been provided by Capita who also explain that luminance levels have been calculated by lighting design software based on lantern output data provided by the manufacturers. The spine road lighting maps states that the lights will be dimmed to 50% power between 10pm and 5.30am. In compliance with the GCC Street Lighting Manual, lighting units will be dimmed using Phillips Xitanium electronic drivers installed in the lanterns that are pre-set to dim at the specified times with automatic adjustments for daylight saving time. This can also be dealt with by planning condition. The spine road lighting maps and associated figures show a worst case scenario. They do not account for the blocking effect of rear shields on street lighting as photometric data is not available for the proposed lanterns with shields fitted.

7.480b The proposed landscaping design will ensure that bats can continue to cross the spine road at appropriate locations to prevent fragmentation of bat roosting, foraging and commuting habitats. In addition to the two bat culverts (where the spine road is on an embankment) there will be a number of safe crossing points where the road is at grade and hop-overs will be used (vegetative planting at an appropriate height to achieve connectivity either side of the spine road) to encourage bats to cross at a safe height, and these will be provided as shown in Figure 7.11. At locations where there is a potential collision risk ie where the road is on an embankment and bats flying within the canopy could cross the road at a low height (which would potentially result in a collision risk), appropriate vegetation management will be undertaken to remove vegetation to create unsuitable habitat for bats to commute through. These open areas adjacent to the spine

road will deter bats from crossing at these unsafe lcoations (see Figure 7.11). These areas of vegetation management will be maintained throughout the operation of Phase 3 of the development (and secured through a planning condition). ~~As stated above, the lighting strategy for the phase 1 works (college and section 1 of the spine road) has been carefully considered to maintain dark zones of 1 lux or less along the vegetated site boundaries. This approach will also be applied to the lighting required for phase 2 (second section of spine road and remaining development areas) as shown within the lighting strategy information submitted as part of the hybrid planning application. These dark zones will provide commuting routes and foraging opportunities throughout the site for all bat species and prevent fragmentation or isolation of these. The careful use of lighting along the completed spine road along with appropriate planting to guide bats to the 2 bat culverts (east and west), the dark corridor, Cinderford and Old Engine Brook structures and to act as barriers to prevent bats crossing over the carriageway will further minimise the risk of road mortality.~~

7.481 Any risk of disturbance, kiling or injury is further reduced by bat behaviour as a majority of the species on site, particularly Lesser and Greater Horseshoes emerge from their roosts approximately 30-60 minutes after sunset (although this can vary depending on weather conditions, available cover etc.) and as such does not coincide with the period of peak traffic flow (approximated as 0700 to 1900) during April to September (the bats are in hibernation between November and March). Bat activity levels do overlap with traffic flow during March and October. However given the measures detailed above it is predicted that disturbance, injury or killing will be avoided.~~Any risk is further reduced by bat behaviour as a majority of the species on site, particularly Lesser and Greater Horseshoes emerge from their roosts approximately 30-60 minutes after sunset (although this can vary depending on weather conditions, available cover etc.) and as such does not coincide with the period of peak traffic flow (approximated as 0700 to 1900) during April to September (the bats are in hibernation between November and March). Bat activity levels do overlap with traffic flow during March and October. However given the measures detailed above it is predicted that disturbance, injury or killing will be avoided.~~

7.481a In addition, as explained above, there will in phase 3 be a 7% reduced flow in traffic, by reference to baseline, as a result of the Spine Road operation in phase 3 on the section of the A4136 where flightline 3 crosses the road northwards. This will have a beneficial impact on Lesser Horseshoe (and other) bats that cross this road to commute to Ruardean Plantation in the north, particularly bearing in mind that the A4136 has no mitigation built into it at all to address the collision risk that its traffic poses to bats. The new spine road,

however, is to have full mitigation measures in place to prevent bat collisions with traffic so that no risk of collision along the spine road is predicted. This, together with the reduced risk of traffic on the flightline 3 section of the A4136 means there will be an overall positive benefit to the Lesser Horseshoe bats (and the other species of bat) in terms of traffic collision risk. In addition to this, there is the enhancement measure proposed (i.e. the bat bridge) to encourage the bats to cross safely at the A4136.

7.482 In conclusion, providing that the above mitigation measures are implemented and maintained as described, together with monitoring as described below, no negative impact is predicted on Lesser Horseshoe bats relating to severence or their flightlines through the proposed development at the Hybrid Application Site and indeed the risk of traffic collision for Lesser Horseshoe bats will be reduced as a result of the proposed operation in phase 3 of development at the Hybrid Application Site.~~The measures detailed above will benefit all of the bat species present. The measures will mitigate against any potential impacts on Lesser and Greater Horseshoe Bats, which are the most sensitive species present given their association with nearby SACs. They will also benefit the less sensitive species.~~

7.483 No other major or minor flightlines of other species of the bat assemblage present at the Northern Quarter were identified in the extensive data obtained for the Northern Quarter. This is the case for barbastelle, Bechstein's, pipistrelle spp, Myotis and Long-eared and Eptesicus / Serotinus. Therefore, no impacts in relation to habitat severance of commuting routes and/or flight lines is predicted. The provision of safe crossing points including culverts, overbridges and hop-overs, as described above, will prevent any barrier to dispersal occuring as a result of the spine road and will allow the continuance of movements of the bat assemblage between roosts and foraging sites by allowing bats to move through the land. Based on the mitigation provided and described above, no further consideration needs to be given to additional road crossing mitiagtion such as further passes at unmitigated points and/or addtional culverts, overbridges or hop-overs~~No air or water pollution impacts are expected as part of phase 3 given the measures detailed within the relevant chapters~~.

Loss of Roosting Sites in Built Structures and Trees during Phase 3

7.483a There will be no loss of built structures during Phase 3 of the development and, therefore, no impact is predicted in relation to the loss of bat roosting sites. Moreover the new roosts RR1 and RR2b will be in operation, provding suitable and purpose built maternity roosts in place of the existing and ever-deteriorating maternity roosts at Northern United. Together

with the continued operation of the artificial roost (whose future these proposals will secure), it is predicted that there will overall be a positive benefit to Lesser Horseshoe bats and other species of bat in terms of provision of maternity roosts arising from the proposed development at the Hybrid Application Site.

7.483b In addition, the provision of the two night roosts NR1 and NR2 will also be in operation providing additional locations for the bat assemblage at Northern United to utilise for night roosting (and also day roosting) opportunities. It is predicted that there will be a positive benefit to the bat assemblage in terms of provision of artifical roosting structures arising from the proposed development at the Hybrid Application Site.

7.483c There will be no loss of tree roosts during Phase 3 of the development and, therefore, no negative impact is predicted on any bat species in relation to the loss of bat roosting sites. In the long-term the newly planted broadleaved woodland will provide new roosting opportunities for tree roosting bats as the broadleaved trees mature and decay (thereby creating crevices/cracks and holes which, in turn, provides roosting habitat for bats).

Loss of Foraging Habitat during Phase 3

7.483d There will be no loss of foraging habitat during Phase 3 of the development. Moreover the significantly increased foraging habitat provision through the proposed mitigation to be provided in Phases 1 and 2, such as the broadleaved woodland creation and enhancement, will have further matured by the time Phase 3 commences and will further mature as time goes on thereafter. Therefore, there will be an overall significant positive impact on Lesser Horseshoe bats and the other species of bats in relation of the quality of resources available for bat foraging as a result of the proposed development into the long term future.

7.483e The final overall foraging habitat losses across all phases and both development and mitigation is 35.325ha. The overall areas of habitat creation are 20.52ha with an additional 7.426ha of habitat enhancement, 0.1ha of in development habitat creation and 0.923ha of habitat re-instatement.

Recreational/Human Impacts during Phase 3

7.483f It is considered that there is some potential for an increased impact on remaining populations due to increased human activity in the area during the operational phases, however the site is already well used and the placement of mitigation areas away from the main areas of development will avoid or minimise this risk. Any impact will be further

mitigated if necessary by signage to inform people of the sensitivity of the area and this species to disturbance. The increased presence of pets due to the residential developments also poses some risk but this has again been minimised through the location of habitat creation and enhancement measures away from residential areas as far as possible.

7.483g In conclusion, the measures detailed above will benefit all of the bat species present. The measures will mitigate against any potential impacts on Lesser and Greater Horseshoe Bats, which are the most sensitive species present given their association with nearby SACs. They will also benefit the less sensitive species.

7.483h No air or water pollution impacts are expected as part of phase 3 given the measures detailed within the relevant chapters.

Conclusion:

7.484 Based on the above mitigation, together with the comprehensive ecological monitoring to be undertaken in relation to bats (see further below), it is considered that potential impacts on bats from phase 3 will be fully mitigated~~Based on the above mitigation, it is considered that potential impacts on bats from phase 3 will be fully mitigated~~.

Dormice

7.485 The habitat fragmentation associated with phase 2 will be mitigated through the inclusion of a wide bridge structure and associated dormouse culvert crossing over Cinderford Brook and through the inclusion of a dormouse culvert or similar installation through the bat culvert east and bat culvert west to be installed to the centre of the Northern Quarter and in the vicinity of Northern United (Figure 7.54). These measures will be supported through the use of native woodland planting around the entrance to the bat culverts and along the carriageway embankment to encourage use of these crossings and reduce the width of the vegetation gap as far as possible, particularly through the central woodland habitat between the eastern bat culvert and the bridge over Cinderford Brook.

7.486 As stated above the habitat fragmentation associated with phase 1 will be addressed through the inclusion of a wide bridge structure and associated dormouse culvert crossing associated with the bridge over Old Engine Brook and the planting of a species rich hedgerow along the boundaries of the Hamblett Land (Figure 7.54).

7.487 As noted previously, evidence from previous road schemes have shown that dormice can become habituated to light pollution and road traffic disturbance and have been discovered living close to major roads and even on carriageway central reservations (Chanin P. and Gubert L. (2012) *Common dormouse (Muscardinus avellanarius) movements in a landscape fragmented by roads*. Lutra 55 (1): 3-15). As such this, in conjunction with the measures detailed within the previous phase 1 operation mitigation section and the measures detailed above means that disturbance, killing or injury of dormouse during phase 3 is not expected.

7.488 There is a risk of increased predation on dormouse associated with the residential areas due to domestic cats. All of the mitigation measures, particularly the habitat creation measures for both phases 1 and 2, have been located away from these areas as far as possible to reduce the potential for this. In addition no nest boxes or refugia will be erected/installed within the habitats immediately adjacent to the residential areas to reduce the likelihood of dormice utilising these areas.

7.489 No air or water pollution impacts are expected as part of phase 3 given the measures detailed within the relevant chapters. It is considered that there is some potential for an increased impact on remaining dormouse populations due to increased human activity in the area during the phase 3 operational phases, however the site is already well used and the placement of mitigation areas away from the main areas of development will avoid / minimise any impacts. Additional signage will be used to inform people of the sensitivity of the area and this species to disturbance. The increased presence of pets due to the residential developments also poses some risk which has been avoided / minimised through the careful consideration of the location of mitigation areas.

Conclusion:

7.490 Based on the above mitigation, it is considered that potential impacts on dormice from phase 3 will be fully mitigated.

Otters, Water Voles and Badger

7.491 Potential disturbance, killing or injury impacts associated with the operation of phase 3 are not predicted in relation to Otter, Water Vole and Badger for the following reasons:

1. There are very low levels of Otter and Badger and Water Vole activity in the area of the Hybrid Application Site;
2. The mitigation measures proposed for other protected species;

3. Lighting levels will be managed to a maximum of 1 lux;

4. The inclusion of a wide bridge structure crossing over Old Engine Brook and Cinderford Brook and maintenance of vegetation along thesethis brook A habitat corridor will be provided habitat connectivity beneath the spine road and to areas to the north and southalong Old Engine and Cinderford Brooks and will be maintained;

5. The two bat culverts to be installed beneath the spine road may also be used by these species providing further habitat connectivity and safe crossing points although this use may be limited, particularly for otter and Water Vole which prefer aquatic habitats;

4.6. These species are nocturnal in nature and as such will be active outside the peak period of use, particularly with regard to the spine road where peak activity is approximated as 0700 to 1900.

7.492 No air or water pollution impacts are expected as part of phase 3 given the measures detailed within the relevant chapters. It is considered that there is some potential for an increased impact on remaining populations due to increased human activity in the area during the operational phases, however the site is already well used and the placement of mitigation areas away from the main areas of development will avoid or minimise this risk. Any impact will be further mitigated if necessary by signage to inform people of the sensitivity of the area and this species to disturbance. The increased presence of pets due to the residential developments also poses some risk but this has again been minimised through the location of habitat creation and enhancement measures away from residential areas as far as possible.

Conclusion:

7.493 Based on the above mitigation, it is considered that potential impacts on Otters, Water Voles and Badgers from phase 3 will be fully mitigated.

Breeding Birds

7.494 Disturbance, killing or injury of breeding birds during phase 3 is not predicted as the habitat creation measures associated with phases 1 and 2 will replace the potential nesting and foraging habitats lost as well as encouraging breeding activity away from the development areas reducing the potential for light, noise and other indirect impacts.

7.495 There is a risk of increased predation associated with the residential areas due to domestic cats. All of the mitigation measures, particularly the habitat creation measures for both

phases 1 and 2, have been located away from these areas as far as possible to reduce the potential for this. In addition no nest boxes will be erected/installed within the habitats immediately adjacent to the residential areas to reduce the likelihood of breeding birds utilising these areas.

7.496 No air or water pollution impacts are expected as part of phase 3 given the measures detailed within the relevant chapters. It is considered that there is some potential for an increased impact on breeding bird populations due to increased human activity in the area during the operational phases, however the site is already well used and the placement of mitigation areas away from the main areas of development will avoid or minimise this risk. Any impact will be further mitigated if necessary by signage to inform people of the sensitivity of the area and this species to disturbance.

Conclusion:

7.497 Based on the above mitigation, it is considered that potential impacts on breeding birds from phase 3 will be fully mitigated.

Reptiles

7.498 Disturbance, killing or injury of reptiles during phase 3 is NOT predicted as the habitat creation measures associated with phases 1 and 2 will replace the habitats lost as well as encouraging reptile populations away from the development areas reducing the potential for light, noise and other indirect impacts.

7.499 Connectivity between habitats will be maintained through the habitat corridors to be retained around the boundaries of all the phase 1 and 2 developments and beneath the spine road along Old Engine Brook, Cinderford Brook and the bat culvert east and bat culvert west as shown on Figure 7.5~~4~~.

7.500 No air or water pollution impacts are expected as part of phase 3 given the measures detailed within the relevant chapters. It is considered that there is some potential for an increased impact on reptile populations due to increased human activity in the area during the operational phases, however the site is already well used and the placement of mitigation areas away from the main areas of development will avoid or minimse this risk. Any impact will be further mitigated if necessary by signage to inform people of the sensitivity of the area and this species to disturbance. The increased presence of pets due to the residential developments also poses some risk but this has again been minimised

through the location of habitat creation and enhancement measures away from residential areas as far as possible.

Conclusion:

7.501 Based on the above mitigation, it is considered that potential impacts on reptiles from phase 3 will be fully mitigated.

Amphibians including GCN

7.502 Disturbance, killing or injury during phase 3 is not predicted as the habitat creation measures associated with phases 1 and 2 will replace the habitats lost as well as encouraging amphibian populations away from the development areas reducing the potential for light, noise and other indirect impacts.

7.503 Connectivity between habitats will be maintained through the habitat corridors to be retained around the boundaries of all the phase 1 and 2 developments and beneath the spine road along Old Engine Brook, Cinderford Brook and the bat culvert east and bat culvert west as shown on Figure 7.54.

7.504 Lighting levels around the remaining ponds on site will be managed through the measures implemented as part of the bat mitigation measures designed to ensure maximum levels of 1 lux in habitats adjacent to the phase 1 and 2 developments.

7.505 The drainage design for the second section of the spine road and all of the phase 2 developments will be to avoid newt mortality from gully pots and/ or sumps. Drainage schemes will be designed without sumps, wherever possible and Sustainable ~~Drainages~~Drainage Systems (SuDS) such as porous surfaces, swales, buffer strips and filter beds will be used in preference to 'trap'-type drains such as gully pots.

7.506 Where use of gully pots or "trap"-type drains is unavoidable (e.g. due to high water table), the use of permanent amphibian fencing to exclude newts from areas will be avoided wherever possible due to the high costs of installation and on-going maintenance requirements. Other mechanisms to prevent newts falling into gully pots will be deployed in preference (for example the wildlife kerb produced by ACO Technologies that includes a ledge for amphibians to bypass the gully pot).

7.507 As stated above additional measures may be required in relation to the ponds closest to the college site to ensure that these remain undisturbed, particularly during the breeding season. Such measures include signage and education of college staff and students to

ensure that the sensitivity of the habitats and species is identified. Fencing of these ponds will also be considered if disturbance levels do increase. Similar measures could also be applied to other areas within the Northern Quarter site, particularly with regard to the ponds within the Linear Park, which are already subject to a degree of human disturbance.

7.508 No air or water pollution impacts are expected as part of phase 3 given the measures detailed within the relevant chapters. It is considered that there is some potential for an increased impact on amphibian populations due to increased human activity in the area during the operational phases. However the site is already well used and the placement of mitigation areas away from the main areas of development will avoid or minimise any impacts. Additional signage will be used to inform people of the sensitivity of the area and this species to disturbance. The increased presence of pets due to the residential developments also poses some risk which has again been minimised through the location of habitat creation and enhancement measures away from residential areas as far as possible.

Conclusion:

7.509 Based on the above mitigation, it is considered that potential impacts on amphibians from phase 3 will be fully mitigated.

White Clawed Crayfish

7.510 As phase 3 (operation of phases 1 and 2) is not expected to impact on the watercourses on site, no operational impacts are expected.

7.511 No air or water pollution impacts are expected as part of phase 3 given the measures detailed within the relevant chapters. It is considered that there is some potential for an increased impact on White Clawed Crayfish populations due to increased human activity in the area during the operational phases, however the site is already well used and the placement of mitigation areas away from the main areas of development will avoid or minimse any such imapct. Any impact will be further mitigated if necessary by signage to inform people of the sensitivity of the area and this species to disturbance. The increased presence of pets due to the residential developments poses minimal risk to this species due to their aquatic nature.

Conclusion:

7.512 Based on the above mitigation, it is considered that potential impacts on White Clawed Crayfish from phase 3 will be fully mitigated.

Invertebrates

7.513 Disturbance, killing or injury during phase 3 is not predicted as the habitat creation measures will replace the habitats lost as well as encouraging invertebrate populations away from the development areas reducing the potential indirect impacts.

7.514 No air or water pollution impacts are expected as part of phase 3 given the measures detailed within the relevant chapters. The measures to reduce habitat fragmentation detailed above for other species, particularly along Old Engine and Cinderford Brooks, the eastern boundary of the Hamblett Land and through the two bat culverts (see paras 7.485 and 7.486 above), during operation will ensure continued connectivity between habitats across the site.

Conclusion:

7.515 Based on the above mitigation, it is considered that potential impacts on invertebrates from phase 3 will be fully mitigated.

Relationship to the Biodiversity Strategy (Committee Draft May 2014)

7.516 The mitigation measures proposed above have been primarily designed to ensure that there are no adverse impacts on protected sites, habitats and species as a result of the construction and operation phases of the proposed development at the Hybrid ~~Planning~~ Application Site. However consideration has also been given to the FoDDC Biodiversity Strategy Committee Draft May 2014~~(consultation edition)~~ and this can be summarised under the relevant headings as follows:

Principle 1: Ensuring Development Proposals are Informed by Appropriate Information

- Standards for ecological survey, impact assessment and mitigation – the surveys and assessment methodologies including timing and frequency have been agreed with the FoDDC, Natural England and other consultees through the submission of the Environmental Statement Scoping Report. The surveys have also been undertaken in

accordance with the relevant survey best practice and Natural England Standing Advice, while the assessment has been undertaken in accordance with the Design Manual for Roads and Bridges and the Guidelines for Ecological Impact Assessment in the United Kingdom (as detailed within the Survey and Assessment Methodology Sections above). Mitigation measures are also based on Natural England Standing Advice and best practice guidance. Natural England has confirmed that the bat data provided is adequate (see letter from Natural England dated 1 May 2014) (Appendix 7.8);

- Site safeguard and long-term management – the mitigation and enhancement areas identified have been drafted in consultation with landowners and relevant conservation bodies, in particular the Forestry Commission as a principal landowner, as well as in accordance with the Biodiversity Strategy. These measures will be safeguarded through the Section 106 agreement to be drafted for the hybrid application. The management requirements for these areas will also be safeguarded through this agreement. Management, maintenance and monitoring obligations in relation to certain habitats are also secured by an agreement under ss7 and 13 of the Natural Environment and Rural Communities Act 2006 between Natural England, the Forestry Commission and the Homes and Communities Agency;
- European Sites – a shadow Habitat Regulations Assessment (HRA) screening assessment is enclosed in Appendix 7.9. This, which refers back to the information included within the ES, ensures that any impacts, direct or indirect, with regard to European Designated Sites are identified and addressed appropriately. Traffic movements on the A48 and any potential impact on the Severn Estuary SAC, SPA and Ramsar site and the Walmore Common SPA and Ramsar site are included in this assessment and refer to other chapters of the ES (e.g. transport). Detailed information in relation to lesser horseshoe bats in particular is provided in this chapter 7 to enable the LPA to undertake the HRA;
- European Protected Species – Appendix 7.10 provides information regarding the derogation tests in relation to the European Protected Species present on site;
- Environmental Impact Assessment – a full Environmental Impact Assessment has been undertaken in relation to the ecological features on site and in the immediate area and is detailed within this ES chapter. The assessment of impact on ecological features has been carried out in accordance with the Guidelines for Ecological Impact Assessment in the United Kingdom (as detailed within the Survey and Assessment Methodology Sections above);

- Monitoring – details of the proposed monitoring requirements both before, during and post construction are detailed within the Monitoring Section below and the monitoring schedule included in Appendix 7.11 relation to each individual mitigation plot.

Principle 2: Ensuring Development Proposals do not Adversley Affect European Sites and Conserve Other Key Ecological Components

- Development Design Scheme – the retention of dark zones around the development plots through lighting and development design, particularly along woodland boundaries and banks of open water, reflect the need to maintain key flyways and habitat corridors (referred to as 'green fingers' within the Biodiversity Strategy);
- Road Design Scheme – the inclusion of 4 underpasses/wide span bridges beneath the spine road will maintain the key bat flyways identified during the 2013 surveys as well as providing connectivity for other protected species including dormice and Great Crested Newt; these underpasses/wide span bridges have been designed as per the minimum requirements of the Biodiversity Strategy in mind and have been increased in size where possible due to site constraints (e.g. height of road embankments, adjacent topography etc.). Monitoring of these locations has also been detailed (see section ~~7.6.5~~ below);
- Construction Environmental Management Plan (CEMP) – the mitigation measures detailed within the phase 1 and 2 construction sections above will be incorporated into a Register of Commitments within the CEMP (to be submitted, in respect of Phase 1, to the FoDDC prior to determination of this application. Note that it is not a requirement under the Forest of Dean District Council's Biodiversity Strategy or under environmental impact assessment requirements for the phase 1 CEMP to be provided with this Environmental Statement, particularly since this ES has explained the matters which this CEMP will cover);
- Traffic Strategy – the Traffic, Noise and Air Quality chapters have not identified the need for additional measures to manage or mitigate impacts on ecological features in the wider area;
- Lighting Strategy – the detailed lighting strategy for phase 1 (the college and first section of the spine road) and the second section of the spine road to be constructed in phase 2 has been designed to minimise the lighting requirements for these developments and to maintain the identified dark zones at 1 lux or less. Lighting has also been used to discourage bats from areas that pose a mortality risk (i.e. the Northern United junction) and an absence of lighting used to encourage use of

identified crossing points and underpasses. This has been supported further by the landscape proposals and development layouts which have been designed to provide additional screening along habitat corridors, flyways etc. These same principles will be applied to the phase 2 outline permission developments;

- Roost Retention/Replacement Strategy – this has been addressed through the creation of two new artificial bat roosts (RR1 and RR2b) being progressed by the FoDDC and the identification of two new night roosts to be constructed within woodland habitats to the south of the Northern Quarter. A variety of bat roosting and hibernation boxes will also be installed within retained habitats surrounding the Hybrid Application Site and associated mitigation areas.

- Biodiversity Management Plans - the mitigation measures detailed within the sections above along with the monitoring proposals detailed below will be incorporated into the biodiversity management plans required for each ~~development along with any additional requirements arising from protected species licences;~~aspect of the development (to be secured through the s106 agreement) along with any additional requirements arising from protected species licences. The plans will include detailed management for the first 5 years and outline long term management requirements. Note that it is not a requirement under the Forest of Dean District Council's Biodiversity Strategy Committee Draft May 2014 (pg. 83-84) or under environmental impact assessment requirements for a Biodiversity Management Plan to be provided with this Environmental Statement however an outline of the management and monitoring requirements for each of the mitigation areas has been included within the schedules in Appendix 7.11 and a Biodiversity Management Plan for Phase 1 will be submitted prior to determination of this application;

- Biodiversity Spatial Masterplan – the mitigation measures detailed above will protect the Key Ecological Components identified within the ~~strategy~~Biodiversity Strategy for retention and protection through development and road design including lighting and landscape planting. The measures have also included the principle of habitat recreation and enhancement through the ~~1:1~~ratios identified above ~~1:1 (loss : gain) replacement ratio of optimal habitats, particularly broad-leaved woodland and open grassland, and the 2:1 replacement ratio of sub-optimal habitats. The habitat enhancement measures also contribute to this;~~as agreed with FoDDC. The habitat enhancement measures also contribute to this. This is shown in Table 7.3.1c above and explained in the accompanying text that confirms the basic principles of the Biodiversity Strategy have been met with more habitat creation and enhancement

than habitat losses for broadleaved woodland, semi-improved grassland and ponds. The approach is also consistent with the approach (pg. 85 (par 4.62) of the Forest of Dean District Council's Biodiversity Strategy Committee Draft May 2014) to convert coniferous woodland to Lowland Mixed Deciduous Woodland in order to improve habitat quality;

- Species Translocation Schemes – the measures detailed above identify the need for translocation or habitat manipulation to encourage dispersal for a number of species to include Great Crested Newt, dormice and reptiles. These have been based on best practice guidelines where possible and will be undertaken only after the relevant protected species licences have been obtained (where applicable). These have also been based on discussions had with Natural England through project meetings and on-going licence applications. There will be no net loss of habitat. Long term management of receptor sites will be secured by the section 106 agreement to be drafted for the hybrid application and by the agreement between Natural England, the Forestry Commission and the Homes and Communities Agency made under ss7 and 13 of the Natural Environment and Rural Communities Act 2006;
- Sustainable Drainage Systems – the mitigation measures recommend the use of Sustainable Drainage Systems (SuDS) wherever possible to provide additional habitats for protected species on site as well as reducing the likely impact from more traditional drainage design;
- Recreational Strategy – the designated mitigation measures have been located away from high use development areas and proposals made for signage and education to highlight the sensitivity of these areas as well as consideration of fencing if disturbance impacts increase within these areas. Recreational areas associated with the phase 2 developments have been proposed within the development area itself or within the remaining Hamblett land, which has limited ecological value and as such will encourage activity away from more sensitive areas.

Principle 3: Ensuring Development Proposals Contribute to Biodiversity Enhancement

- The phase 1 and phase 2 mitigation areas identified provide more habitat creation than is required for the habitats lost and have focused on replacing ecologically poor conifer plantation with more ecologically valuable habitats such as broad-leaved woodland and species rich grassland;

- Some of the phase 1 and phase 2 mitigation areas (namely MP-1D and MP-1E, MP-2(R)B, MP-2(R)C, MP-2(R)E and MP-2(R)F) have also been identified for habitat enhancement where a variety of measures will be used to increase the structural and/or floral species diversity of the habitats, to increase their ecological and biodiversity value;
- The habitat creation measures identified within the Biodiversity Strategy to the south of Birch Wood will also be brought forward in relation to the phase 2 reserved matters developments to further increase the biodiversity of the area. These areas would be considered as biodiversity enhancements and not as part of the mitigation to offset the impacts of the phase 2 reserved matters developments.

Principle 4: Opportunities for Partnership Working and Community Engagement

- Local Environmental Groups – consultations have been and continue to be undertaken through the formal consultation process as part of the planning process and through presentations to and discussions with the Environmental Forum which includes representatives from local groups including Gloucestershire Wildlife Trust and RSPB. Additional meetings are also held where requested by interested parties. This has led to a more strategic approach to the mitigation identified and a greater consistency with the Biodiversity Strategy;
- Government Organisations – consultations have been and continue to be undertaken through the formal consultation process as part of the planning process as well as through monthly delivery group meetings and individual meetings as and when required. This has led to a more strategic approach to the mitigation identified and a greater consistency with the Biodiversity Strategy. Additional consultations are on-going with the Forestry Commission given the placement of the mitigation areas within their land holdings however formal agreements have already been signed between the Forestry Commission and HCA to provide the majority of the land for the phase 1 and phase 2 detailed permission mitigation and some parts of the phase 2 outline permission mitigation areas. The Forestry Commission is also party to the agreement made with Natural England and the HCA under ss7 and 13 of the Natural Environment and Rural Communities Act 2006 which secures long term management, maintenance and monitoring of certain habitats with certain of the mitigation areas.

Monitoring

7.517 Ecological monitoring during and post construction will be required in order to confirm the effectiveness of the mitigation measures described above. For some receptors the necessary ecological monitoring will be a requirement of protected species licences obtained for the proposed development. It is anticipated that FoDDC will take on a central co-ordinating role to ensure that monitoring across all phases is co-ordinated. This monitoring will be secured through the the section 106 to be entered into and through planning conditions in respect of this hybrid planning application. Throughout the construction period monitoring will be reported on annually to the planning authority and any potential issues discussed with the relevent bodies as soon as they are identified, with appropriate avoidance and/or mitigation taken. This will provide the 'early warning' mechanism requried by the FoDDC to ensure the success of the mitigation measures, landscape and lighting strategies detailed within this and other relevent chapters.

7.518 As a minimum, ecological monitoring will comprise the following (refer to the monitoring schedule in Appendix 7.11 for further details):

- Annual monitoring of the establishment of the habitat creation and enhancement measures shown on Figures 7.54 and 7.6~~5~~ for each phase for a minimum of 5 years post creation;
- ~~Monthly monitoring~~Monthly monitoring (primarily internal inspections however these will be replaced by dusk emergence surveys during the active period when internal inspections could cause disturbance) of the new replacement bat roosts beginning with the first full survey period following construction and to continue for a minimum of 10 years following confirmation of use;
- Continued monthly monitoring (primarily internal inspections however these will be replaced by dusk and dawn emergence surveys during the active period when internal inspections could cause disturbance) of the existing artificial roost to the east of Northern United during and following construction of each phase and to continue in conjunction with the monitoring of the replacement bat roosts;
- Continued monthly monitoring (primarily internal inspections however these will be replaced by dusk and dawn emergence surveys during the active period when internal inspections could cause disturbance) of the bat roosts at Northern United up until the point of demolition;
- Monitoring of temperature and humidity within all bat roost buildings included in the above monitoring throughout the monitoring periods as applicable to each;

- Regular checks of the replacement and night roosts to monitor for vandalism etc. for a minimum of 10 years;
- Twice yearly monitoring for use and maintenance checks of all bat, dormouse and bird boxes to continue for a minimum of 5 years post installation;
- Continued monitoring of the bat flyways across the entire Northern Quarter using static and transect detector surveys and radio tracking, before, during and ~~following~~ post construction of each phase and to continue for 10 years ~~a minimum of 5 years~~ post construction, to be reviewed annually (after the first year that the road is fully operational). Natural England has commented that longer monitoring periods have been agreed as between the HCA, Defra and Natural England in the NERC Agreement referred to above. However this agreement relates to monitoring of certain habitats, not of any protected species themselves and in any event it is not directed to bats (it relates to dormouse and to Great Crested Newts). Therefore this agreement is not directly relevant to the issue of bat monitoring as presented within this chapter of the ES;
- Monitoring the effectiveness of the 4 bat/wildlife underpasses and bridges, the new crossing enhancement over the A4136 and the "dark corridor" across the Hybrid Application Site through night-time activity surveys to continue for 10 years post construction and should be reviewed annually (after the first year that the road is fully operational). ~~and daytime carriageway inspections to monitor for any road kill from the opening of the entire spine road and to continue for a minimum of 5 years post construction at a frequency agreed with Natural England (monthly activity surveys and biannual carriageway inspections expected as a minimum~~The methodology will be agreed with the Forest of Dean District Council, which will consult on the methodology and results with Natural England;
- The 4 bat/wildlife underpasses and bridges will also be monitored for use by Great Crested Newt and dormice. The methodology will be agreed with the Forest of Dean District Council, which will consult on the methodology and results with Natural England;
- Monitoring of Great Crested Newt populations, specifically population class assessments, of all 33 ponds identified as well as new ponds. This will also provide information on the populations of other amphibians on site. This must continue annually for a minimum of 5 years post construction and every other year following to 25~~10~~ years post construction;

- Monitoring of translocated reptile populations to continue for a minimum of 3 years post construction;
- Where this monitoring identifies that any mitigation measure is not successful, only partially successful or where impacts are greater than predicted, additional measures will be put in place in consultation with FoDDC, Natural England and other relevant bodies and specialists. These measures will also be subject to ecological monitoring and the results used to determine and ensure success (or detail further measures required if necessary).

7.519 Given the staggered construction programme for phases 1 and 2 "post construction" will be taken to refer to the period following completion of all development at the Hybrid Application Site. Although this will extend the monitoring period it will have the benefit of ensuring that any unforeseen cumulative impacts are highlighted and addressed as well as those relating to the individual development phases.

Residual Effects

Phase 1 Construction

Ecological Receptor	Nature Conservation Value	Description of Impact	Magnitude of Impact Prior to Mitigation	Magnitude of Residual Impact	Significance of Residual Impact
Wye Valley and Forest of Dean Bat Sites SAC	Very high	Impacts on Lesser Horseshoe Bat populations (refer to the 'bats' section below for details)	Moderate negative	Negligible	Neutral
		Impacts on Greater Horseshoe Bat populations (refer to the 'bats' section below for details)	Moderate negative	Negligible	Neutral
River Wye SAC	Very high	No direct or indirect impacts are predicted. Site located 3.77km to the northwest	N/A	N/A	N/A
Wye Valley Woodlands SAC	Very high	No direct or indirect impacts are predicted. Site located 5.84km to the west.	N/A	N/A	N/A
		Impacts on Lesser Horseshoe Bat populations (refer to the 'bats' section below for details)	Moderate negative	Negligible	Neutral
Severn Estuary SAC	Very high	No direct or indirect impacts are predicted. Site located 9.29km to the southeast	N/A	N/A	N/A
Walmore Common SPA and Ramsar Site	Very high	No direct or indirect impacts are predicted. Site located 9.12km to the east.	N/A	N/A	N/A
Severn Estuary SPA and Ramsar Site	Very high	No direct or indirect impacts are predicted. Site located 9.64km to the southeast.	N/A	N/A	N/A
Westbury Brook Ironstone Mine SSSI	High	No direct impacts are predicted as site is located 1.46km to the northeast.	N/A	N/A	N/A
		Impacts on Lesser Horseshoe Bat populations (refer to the 'bats' section below for details)	Moderate negative	Negligible	Neutral
		Impacts on Greater Horseshoe Bat populations (refer to the 'bats' section below for details)	Moderate negative	Negligible	Neutral

Ecological Receptor	Nature Conservation Value	Description of Impact	Magnitude of Impact Prior to Mitigation	Magnitude of Residual Impact	Significance of Residual Impact
Edgehills Quarry SSSI	High	No direct or indirect impacts are predicted. Site located 1.66km to the northeast	N/A	N/A	N/A
Puddlebrook Quarry SSSI	High	No direct or indirect impacts are predicted. Site located 2.08km to the north	N/A	N/A	N/A
Stenders Quarry SSSI	High	No direct or indirect impacts are predicted. Site located 2.43km to the northeast	N/A	N/A	N/A
Speech House Oaks SSSI	High	No direct or indirect impacts are predicted. Site located 2.68km to the southwest	N/A	N/A	N/A
Scully Grove Quarry SSSI	High	No direct or indirect impacts are predicted. Site located 2.69km to the north	N/A	N/A	N/A
Buckshaft Mine and Bradley Hill SSSI	High	Impacts on Lesser Horseshoe Bat populations (refer to the 'bats' section below for details)	Moderate negative	Negligible	Neutral
		Impacts on Greater Horseshoe Bat populations (refer to the 'bats' section below for details)	Moderate negative	Negligible	Neutral
Dean Hall Coach House and Cellar SSSI	High	Impacts on Greater Horseshoe Bat populations (refer to the 'bats' section below for details)	Moderate negative	Negligible	Neutral
Wigpool Ironstone Mine SSSI	High	Impacts on Lesser Horseshoe Bat populations (refer to the 'bats' section below for details)	Moderate negative	Negligible	Neutral
		Impacts on Greater Horseshoe Bat populations (refer to the 'bats' section below for details)	Moderate negative	Negligible	Neutral
Soudley Ponds SSSI	High	No direct or indirect impacts are predicted. Site located 3.43km to the southeast	N/A	N/A	N/A
Land Grove Quarry, Micheldean SSSI	High	No direct or indirect impacts are predicted. Site located 3.44km to the northeast	N/A	N/A	N/A
Wood Green Quarry and Railway Cut	High	No direct or indirect impacts are predicted. Site located 4.62km to the east	N/A	N/A	N/A
Laymoor Quag GWT	Lower	No direct or indirect impacts are predicted	N/A	N/A	N/A

Ecological Receptor	Nature Conservation Value	Description of Impact	Magnitude of Impact Prior to Mitigation	Magnitude of Residual Impact	Significance of Residual Impact
Nature Reserve		as the site is located to the south of Linear Park and has been designated for its habitats and floral interests.			
Woorgreens Lake and Marsh, Crabtree Hill & Foxes Bridge GWT Nature Reserve and KWS	Lower	No direct or indirect impacts are predicted. Site located 1km to the south	N/A	N/A	N/A
Edgehills Bog GWT Nature Reserve and KWS	Lower	No direct or indirect impacts are predicted. Site located 1km to the east	N/A	N/A	N/A
Plump Hill Dolomite Quarry GWT Nature Reserve and KWS	Lower	No direct or indirect impacts are predicted. Site located 1.85km to the northeast	N/A	N/A	N/A
Hawkwell Inclosure KWS	Lower	No direct or indirect impacts are predicted in association with phase 1 construction	N/A	N/A	N/A
Cinderford Linear Park KWS	Lower	Site will be directly impacted by the footprint of the development	Moderate/large negative	Slight negative decreasing to neutral within 10-15 years of planting	Slight adverse in the short term, neutral in the long term
Serridge Green KWS	Lower	No direct or indirect impacts are predicted. Site located 275m to the west	N/A	N/A	N/A
Heywood Inclosure KWS	Lower	No direct or indirect impacts are predicted. Site located 935m to the east	N/A	N/A	N/A
Ruardean Hill KWS	Lower	No direct or indirect impacts are predicted. Site located 1.14km to the north	N/A	N/A	N/A
Fairplay Iron Mine Reservoir KWS	Lower	No direct or indirect impacts are predicted. Site located 1.36km to the east	N/A	N/A	N/A
Merring Meend KWS	Lower	No direct or indirect impacts are predicted. Site located 1.43km to the northeast	N/A	N/A	N/A
Westbury Brook Mine Reservoir KWS	Lower	No direct or indirect impacts are predicted. Site located 1.43km to the northeast	N/A	N/A	N/A
Plump Hill Picnic Site KWS	Lower	No direct or indirect impacts are predicted. Site located 1.45km to the	N/A	N/A	N/A

Ecological Receptor	Nature Conservation Value	Description of Impact	Magnitude of Impact Prior to Mitigation	Magnitude of Residual Impact	Significance of Residual Impact
		northeast			
Cinderford Roughs KWS	Lower	No direct or indirect impacts are predicted. Site located 1.65km to the southeast	N/A	N/A	N/A
Dilke Pond KWS	Lower	No direct or indirect impacts are predicted. Site located 1.89km to the south	N/A	N/A	N/A
Serridge Inclosure KWS	Lower	No direct or indirect impacts are predicted. Site located 1.95km to the west	N/A	N/A	N/A
Wilderness Field Centre KWS	Lower	No direct or indirect impacts are predicted. Site located 1.95km to the northeast	N/A	N/A	N/A
Micheldean Meend Marsh KWS	Lower	No direct or indirect impacts are predicted. Site located 1.95km to the north	N/A	N/A	N/A
Buildings and hard standing	Negligible	Loss of habitat area 8.	Negligible 9.	Negligible	Neutral
Coniferous plantation woodland	Lower	No direct or indirect impacts are predicted as part of the phase 1 construction	N/A	N/A	N/A
Broad-leaved plantation woodland	Lower	Loss of habitat area	Negligible	Negligible	Neutral
		Damage to retained habitats	Negligible	Negligible	Neutral
Mixed plantation woodland (s41 Lowland Mixed Deciduous Woodland Habitat)	Lower	No direct or indirect impacts are predicted as part of the phase 1 construction	N/A	N/A	N/A

Ecological Receptor	Nature Conservation Value	Description of Impact	Magnitude of Impact Prior to Mitigation	Magnitude of Residual Impact	Significance of Residual Impact
Scattered Broad-leaved Trees	Lower	Loss of habitat area	Slight negative	Slight negative decreasing to neutral within 10-15 years of planting	Slight adverse in the short term, neutral in the long term
		Damage to retained habitats	Negligible	Negligible	Neutral
Dense and scattered scrub	Lower	Loss of habitat area	Slight negative	Slight negative decreasing to neutral within 10 years of planting	Slight adverse in the short term, neutral in the long term
		Damage to retained habitats	Negligible	Negligible	Neutral
Semi-improved neutral grassland	~~Lower~~Medium	Loss of habitat area	Slight negative	Slight negative decreasing to neutral within 1-2 years	Slight adverse in the short term, neutral in the medium term
		Damage to retained habitats	Slight negative	Negligible	Neutral
Poor semi-improved grassland	Negligible	Loss of habitat area	Moderate negative	Slight negative decreasing to neutral within 1-2 years	Neutral
		Damage to retained habitats	Slight negative	Negligible	Neutral
Bare Ground	Negligible	No direct or indirect impacts are predicted as part of the phase 1 construction	N/A 10.	11. N/A	N/A
Spoil	Negligible	No direct or indirect impacts are predicted as part of the phase 1 construction	N/A	N/A	N/A
Heath (s41 Lowland Heath Habitat)	Lower	No direct or indirect impacts are predicted as part of the phase 1 construction	N/A	N/A	N/A

Ecological Receptor	Nature Conservation Value	Description of Impact	Magnitude of Impact Prior to Mitigation	Magnitude of Residual Impact	Significance of Residual Impact
Standing Water (s41 Ponds and Rivers Habitat)	Medium	Damage to retained habitats	Slight negative	Negligible	Neutral
Running Water (s41 Ponds and Rivers Habitat)	Medium	Damage to retained habitats	Slight negative	Negligible	Neutral
Ditches	Negligible	Loss of habitat area	Negligible	Negligible	Neutral
		Damage to retained habitats	Negligible	Negligible	Neutral
Lesser Horseshoe Bat Maternity Roosts (Office Building, Bath House and Canteen) – also used by other species in low numbers (Common and Soprano Pipistrelle, Brown Long-eared and Bechstein's)	Very High	Disturbance of roosting sites due to increased site activities, particularly construction traffic	Slight negative	Negligible	Neutral

Ecological Receptor	Nature Conservation Value	Description of Impact	Magnitude of Impact Prior to Mitigation	Magnitude of Residual Impact	Significance of Residual Impact
Trees suitable for roosting bats	Medium	Loss of trees with the potential to be used as a roosting resource by bats	Slight negative	Negligible	Neutral
		Injury/mortality of bats within roost during site clearance work	Major negative	Negligible	Neutral
		Disturbance of tree roosts on site through increased activity, including construction traffic and lighting, noise and vibration during works	Slight negative	Negligible	Neutral
Commuting and foraging Lesser Horseshoe, Greater Horseshoe, Barbastelle and Bechstein's Bats	Very High	Loss of foraging habitat due to site clearance work	Moderate ~~Slight~~ negative	Negligible	Neutral
		Disturbance of foraging habitat due to construction works	Slight negative	Negligible	Neutral
		Disruption of commuting routes due to removal of linear vegetation features or construction site lighting	Slight negative	Negligible	Neutral
Commuting and foraging Nathusius Pipistrelles, other Myotis Sp., Brown Long-eared, Noctule, Leisler's and Serotine Bats	Medium	Loss of foraging habitat due to site clearance work	Slight negative	Negligible	Neutral
		Disturbance of foraging habitat due to construction works	Slight negative	Negligible	Neutral
		Disruption of commuting routes due to removal of linear vegetation features or construction site lighting	Slight negative	Negligible	Neutral
Commuting and Foraging Common and Soprano Pipistrelles	Lower	Loss of foraging habitat due to site clearance work	Moderate ~~Slight~~ negative	Negligible	Neutral
		Disturbance of foraging habitat due to construction works	Slight negative	Negligible	Neutral
		Disruption of commuting routes due to removal of linear vegetation features or construction site lighting	Slight negative	Negligible	Neutral
Dormice	Medium	Loss of woodland and scrub habitats due to site clearance work	Slight negative	Negligible	Neutral
		Injury/mortality of dormice during site clearance activities	Moderate negative	Negligible	Neutral
		Damage/disturbance of nests during site clearance work	Slight negative	Negligible	Neutral
		Injury/mortality of dependent young during site clearance work	Moderate negative	Negligible	Neutral

Ecological Receptor	Nature Conservation Value	Description of Impact	Magnitude of Impact Prior to Mitigation	Magnitude of Residual Impact	Significance of Residual Impact
		Disturbance of dormice in nearby retained habitats through construction site noise, lighting or vibration	Slight negative	Negligible	Neutral
12. Otters	13. Lower	Loss of habitat during the site clearance works	Slight negative	Negligible	Neutral
		Disturbance to Otters adjacent to the site during construction	Slight negative	Negligible	Neutral
		Injury/mortality to Otters accessing the site during construction	Slight negative	Negligible	Neutral
Water Vole	Lower	Loss of suitable habitat	Slight negative	Negligible	Neutral
		Disturbance to Water Voles adjacent to the site during construction	Slight negative	Negligible	Neutral
		Injury/mortality to Water Voles accessing the site during construction	Slight negative	Negligible	Neutral
Badgers	Lower	Disturbance to Badgers adjacent to the site during construction	Slight negative	Negligible	Neutral
		Injury/mortality to Badgers accessing site during construction	Slight negative	Negligible	Neutral
		Loss of foraging and sett habitat	Slight negative	Negligible	Neutral
Nesting birds	Medium~~Lower~~	Loss of nesting bird habitat during site clearance works, including foraging habitat within territories for breeding pairs	Slight negative	Negligible	Neutral
		Injury/mortality of nesting birds during site clearance works	Slight negative	Negligible	Neutral
		Damage or destruction of active nests/eggs/dependant young during site clearance works	Slight negative	Negligible	Neutral
		Disturbance to nesting birds (including potentially to birds listed on Schedule 1 of the WCA) in nearby retained habitat during construction works	Slight negative	Negligible	Neutral
Reptiles	Medium	Loss of slow worm, common lizard, adder and grass snake habitat during site clearance work	Slight negative	Negligible	Neutral
		Injury/mortality of reptiles during construction	Slight negative	Negligible	Neutral
		Disturbance to reptiles in nearby retained	Slight negative	Negligible	Neutral

Ecological Receptor	Nature Conservation Value	Description of Impact	Magnitude of Impact Prior to Mitigation	Magnitude of Residual Impact	Significance of Residual Impact
		habitat during construction works			
Great Crested Newt	Very High	Loss of Great Crested Newt habitat during site clearance work	Slight negative	Slight negative decreasing to neutral within 1-2 years due to delay in preparation of mitigation area	Slight adverse in the short term, neutral in the medium term
		Injury/mortality of Great Crested Newts during construction	Moderate negative	Negligible	Neutral
		Disturbance to Great Crested Newt in nearby retained habitat during construction works	Slight negative	Negligible	Neutral
Common frog, Common toad, Palmate newt and Smooth newt	Lower	Loss of amphibian habitat during site clearance work	Slight negative	Negligible	Neutral
		Injury/mortality of amphibians during construction	Slight negative	Negligible	Neutral
		Disturbance to amphibians in nearby retained habitat during construction works	Slight negative	Negligible	Neutral
White-clawed Crayfish	Medium	Loss of crayfish habitat during construction work	Slight negative	Negligible	Neutral
		Injury/mortality of crayfish during construction	Slight negative	Negligible	Neutral
		Disturbance to reptiles in nearby retained habitat during construction works	Slight negative	Negligible	Neutral
Invertebrates	Medium	Loss of habitats during site clearance	Slight negative	Negligible	Neutral

Phase 1 Operation/ Phase 2 Construction

Ecological Receptor	Nature Conservation Value	Description of Impact	Magnitude of Impact Prior to Mitigation	Magnitude of Residual Impact	Significance of Residual Impact
Wye Valley and Forest of Dean Bat Sites SAC	Very high	Impacts on Lesser Horseshoe Bat populations (refer to the 'bats' section below for details)	Major negative	Negligible	Neutral
		Impacts on Greater Horseshoe Bat	Slight ~~Major~~	Negligible	Neutral

Ecological Receptor	Nature Conservation Value	Description of Impact	Magnitude of Impact Prior to Mitigation	Magnitude of Residual Impact	Significance of Residual Impact
		populations (refer to the 'bats' section below for details)	negative		
River Wye SAC	Very high	No direct or indirect impacts are predicted. Site located 3.77km to the northwest	N/A	N/A	N/A
Wye Valley Woodlands SAC	Very high	No direct or indirect impacts are predicted. Site located 5.84km to the west.	N/A	N/A	N/A
		Impacts on Lesser Horseshoe Bat populations (refer to the 'bats' section below for details)	Major negative	Negligible	Neutral
Severn Estuary SAC	Very high	No direct or indirect impacts are predicted. Site located 9.29km to the southeast	N/A	N/A	N/A
Walmore Common SPA and Ramsar Site	Very high	No direct or indirect impacts are predicted. Site located 9.12km to the east.	N/A	N/A	N/A
Severn Estuary SPA and Ramsar Site	Very high	No direct or indirect impacts are predicted. Site located 9.64km to the southeast.	N/A	N/A	N/A
Westbury Brook Ironstone Mine SSSI	High	No direct impacts are predicted as site is located 1.46km to the northeast.	N/A	N/A	N/A
		Impacts on Lesser Horseshoe Bat populations (refer to the 'bats' section below for details)	Major negative	Negligible	Neutral
		Impacts on Greater Horseshoe Bat populations (refer to the 'bats' section below for details)	Slight ~~Major~~ negative	Negligible	Neutral
Edgehills Quarry SSSI	High	No direct or indirect impacts are predicted. Site located 1.66km to the northeast	N/A	N/A	N/A
Puddlebrook Quarry SSSI	High	No direct or indirect impacts are predicted. Site located 2.08km to the north	N/A	N/A	N/A
Stenders Quarry SSSI	High	No direct or indirect impacts are predicted. Site located 2.43km to the northeast	N/A	N/A	N/A
Speech House Oaks SSSI	High	No significant impacts are predicted. Site located 2.68km to the southwest	N/A	N/A	N/A
Scully Grove Quarry	High	No direct or indirect impacts are	N/A	N/A	N/A

Ecological Receptor	Nature Conservation Value	Description of Impact	Magnitude of Impact Prior to Mitigation	Magnitude of Residual Impact	Significance of Residual Impact
SSSI		predicted. Site located 2.69km to the north			
Buckshaft Mine and Bradley Hill SSSI	High	Impacts on Lesser Horseshoe Bat populations (refer to the 'bats' section below for details)	Major negative	Negligible	Neutral
		Impacts on Greater Horseshoe Bat populations (refer to the 'bats' section below for details)	Slight ~~Major~~ negative	Negligible	Neutral
Dean Hall Coach House and Cellar SSSI	High	Impacts on Greater Horseshoe Bat populations (refer to the 'bats' section below for details)	Major negative	Negligible	Neutral
Wigpool Ironstone Mine SSSI	High	Impacts on Lesser Horseshoe Bat populations (refer to the 'bats' section below for details)	Major negative	Negligible	Neutral
		Impacts on Greater Horseshoe Bat populations (refer to the 'bats' section below for details)	Slight ~~Major~~ negative	Negligible	Neutral
Soudley Ponds SSSI	High	No direct or indirect impacts are predicted. Site located 3.43km to the southeast	N/A	N/A	N/A
Land Grove Quarry, Micheldean SSSI	High	No direct or indirect impacts are predicted. Site located 3.44km to the northeast	N/A	N/A	N/A
Wood Green Quarry and Railway Cut	High	No direct or indirect impacts are predicted. Site located 4.62km to the east	N/A	N/A	N/A
Laymoor Quag GWT Nature Reserve	Lower	No direct or indirect impacts are predicted as the site is located to the south of Linear Park and has been designated for its habitats and floral interests.	N/A	N/A	N/A
Woorgreens Lake and Marsh, Crabtree Hill & Foxes Bridge GWT Nature Reserve and KWS	Lower	No direct or indirect impacts are predicted. Site located 1km to the south	N/A	N/A	N/A
Edgehills Bog GWT Nature Reserve and KWS	Lower	No direct or indirect impacts are predicted. Site located 1km to the east	N/A	N/A	N/A
Plump Hill Dolomite	Lower	No direct or indirect impacts are	N/A	N/A	N/A

Ecological Receptor	Nature Conservation Value	Description of Impact	Magnitude of Impact Prior to Mitigation	Magnitude of Residual Impact	Significance of Residual Impact
Quarry GWT Nature Reserve and KWS		predicted. Site located 1.85km to the northeast			
Hawkwell Inclosure KWS	Lower	Indirect impacts associated with the phase 2 construction works and phase 1 operation	Moderate/large negative	Slight negative decreasing to neutral within 10-15 years of planting	Slight adverse in the short term, neutral in the long term
Cinderford Linear Park KWS	Lower	Site will be directly and indirectly impacted by the footprint of the phase 2 development and operation of phase 1	Moderate/large negative	Slight negative decreasing to neutral within 10-15 years of planting	Slight adverse in the short term, neutral in the long term
Serridge Green KWS	Lower	No direct or indirect impacts are predicted. Site located 275m to the west	N/A	N/A	N/A
Heywood Inclosure KWS	Lower	No direct or indirect impacts are predicted. Site located 935m to the east	N/A	N/A	N/A
Ruardean Hill KWS	Lower	No direct or indirect impacts are predicted. Site located 1.14km to the north	N/A	N/A	N/A
Fairplay Iron Mine Reservoir KWS	Lower	No direct or indirect impacts are predicted. Site located 1.36km to the east	N/A	N/A	N/A
Merring Meend KWS	Lower	No direct or indirect impacts are predicted. Site located 1.43km to the northeast	N/A	N/A	N/A
Westbury Brook Mine Reservoir KWS	Lower	No direct or indirect impacts are predicted. Site located 1.43km to the northeast	N/A	N/A	N/A
Plump Hill Picnic Site KWS	Lower	No direct or indirect impacts are predicted. Site located 1.45km to the northeast	N/A	N/A	N/A
Cinderford Roughs KWS	Lower	No direct or indirect impacts are predicted. Site located 1.65km to the southeast	N/A	N/A	N/A
Dilke Pond KWS	Lower	No direct or indirect impacts are predicted. Site located 1.89km to the south	N/A	N/A	N/A
Serridge Inclosure KWS	Lower	No direct or indirect impacts are predicted. Site located 1.95km to the west	N/A	N/A	N/A

Ecological Receptor	Nature Conservation Value	Description of Impact	Magnitude of Impact Prior to Mitigation	Magnitude of Residual Impact	Significance of Residual Impact
Wilderness Field Centre KWS	Lower	No direct or indirect impacts are predicted. Site located 1.95km to the northeast	N/A	N/A	N/A
Micheldean Meend Marsh KWS	Lower	No direct or indirect impacts are predicted. Site located 1.95km to the north	N/A	N/A	N/A
Buildings and hard standing	Negligible	Loss of habitat area due to phase 2 development	Major negative	Major negative	Neutral
		Damage to retained habitats due to phase 2 construction works	Negligible	Negligible	Neutral
Coniferous plantation woodland	Lower	Loss of habitat area due to phase 2 development	Negligible	Negligible	Neutral
		Damage to retained habitats due to phase 2 construction works	Negligible	Negligible	Neutral
Broad-leaved plantation woodland	Lower	Loss of habitat area due to phase 2 development	Slight negative	Slight negative decreasing to neutral within 10-15 years of planting	Slight adverse in the short term, neutral in the long term
		Damage to retained habitats due to phase 2 construction works	Slight negative	Negligible	Neutral
Mixed plantation woodland (s41 Lowland Mixed Deciduous Woodland)	Lower	Loss of habitat area due to phase 2 development	Slight negative	Slight negative decreasing to neutral within 10-15 years of planting	Slight adverse in the short term, neutral in the long term
		Damage to retained habitats due to phase 2 construction works	Slight negative	Negligible	Neutral
Scattered Broad-leaved Trees	Lower	Loss of habitat area due to phase 2 development	Slight negative	Slight negative decreasing to neutral within 10-15 years of planting	Slight adverse in the short term, neutral in the long term
		Damage to retained habitats due to phase 2 construction works	Negligible	Negligible	Neutral
Dense and scattered scrub	Lower	Loss of habitat area due to phase 2 development	Moderate negative	Slight negative decreasing to neutral within 10	Slight adverse in the short term, neutral in the

Ecological Receptor	Nature Conservation Value	Description of Impact	Magnitude of Impact Prior to Mitigation	Magnitude of Residual Impact	Significance of Residual Impact
				years of planting	long term
		Damage to retained habitats due to phase 2 construction works	Slight negative	Negligible	Neutral
Semi-improved neutral grassland	~~Lower~~Medium	Loss of habitat area due to phase 2 development	Major negative	Slight negative decreasing to neutral within 1-2 years	Slight adverse in the short term, neutral in the medium term
		Damage to retained habitats due to phase 2 construction works	Slight negative	Negligible	Neutral
Poor semi-improved grassland	Negligible	Loss of habitat area due to phase 2 development	Moderate negative	Slight negative decreasing to neutral within 1-2 years	Neutral
		Damage to retained habitats due to phase 2 construction works	Slight negative	Negligible	Neutral
Bare Ground	Negligible	Loss of habitat area due to phase 2 development	Negligible	Negligible	Neutral
		Damage to retained habitats due to phase 2 construction works	Negligible	Negligible	Neutral
Spoil	Negligible	Loss of habitat area due to phase 2 development	Negligible	Negligible	Neutral
		Damage to retained habitats due to phase 2 construction works	Negligible	Negligible	Neutral
Heath (s41 Lowland Heath)	Lower	Loss of habitat area due to phase 2 development	Major negative	Major negative as this habitat is difficult to re-create	Slight adverse
Standing Water (s41 Ponds and Rivers Habitat)	Medium	Loss of habitat area due to phase 2 development	Negligible	Negligible	Neutral
		Damage to retained habitats due to phase 2 construction works	Slight negative	Negligible	Neutral

Ecological Receptor	Nature Conservation Value	Description of Impact	Magnitude of Impact Prior to Mitigation	Magnitude of Residual Impact	Significance of Residual Impact
Running Water (s41 Ponds and Rivers Habitat)	Medium	14. Damage to retained habitats due to phase 2 construction works	Slight negative	Negligible	Neutral
Ditches	Negligible	Damage to retained habitats due to phase 2 construction works	Negligible	Negligible	Neutral
Lesser Horseshoe Bat Maternity Roosts (Office Building, Bath House and Canteen) – also used by other species in low numbers (Common and Soprano Pipistrelle, Brown Long-eared and Bechstein's)	Very High	Loss of roosting sites due to phase 2 development	Major negative	Negligible	Neutral
		Injury/mortality of bats within roosts	Major negative	Negligible	Neutral
Trees suitable for roosting bats	Medium	Loss of trees with the potential to be used as a roosting resource by bats due to phase 2 development	Slight negative	Negligible	Neutral
		Injury/mortality of bats within roosts	Major negative	Negligible	Neutral

Ecological Receptor	Nature Conservation Value	Description of Impact	Magnitude of Impact Prior to Mitigation	Magnitude of Residual Impact	Significance of Residual Impact
		Disturbance of tree roosts within vicinity of phase 2 works through increased activity, including construction traffic and lighting, noise and vibration during works	Slight negative	Negligible	Neutral
		Disturbance of tree roosts within vicinity of phase 1 during operation through increased activity, particularly lighting and noise	Moderate negative	Negligible	Neutral
Commuting and foraging Lesser Horseshoe, Greater Horseshoe, Barbastelle and Bechstein's Bats	Very High	Loss of foraging habitat due to phase 2 development	Moderate ~~Slight~~ negative	Negligible	Neutral
		Disturbance of foraging habitat due to phase 2 development	Slight negative	Negligible	Neutral
		Disruption of commuting routes due to removal of linear vegetation features or construction site lighting associated with phase 2 development	Major negative	Negligible	Neutral
		Disturbance and fragmentation of commuting routes and foraging habitats due to completion of phase 1, particularly section 1 of the spine road	Slight negative	Negligible	Neutral
		Injury/mortality of bats through vehicle collisions associated with operation of phase 1	Slight negative	Negligible	Neutral
Commuting and foraging Nathusius Pipistrelles, other Myotis Sp., Brown Long-eared, Noctule, Leisler's and Serotine Bats	Medium	Loss of foraging habitat due to phase 2 development	Slight negative	Negligible	Neutral
		Disturbance of foraging habitat due to phase 2 development	Slight negative	Negligible	Neutral
		Disruption of commuting routes due to removal of linear vegetation features or construction site lighting associated with phase 2 development	Slight ~~Moderate~~ negative	Negligible	Neutral
		Disturbance and fragmentation of commuting routes and foraging habitats due to completion of phase 1, particularly section 1 of the spine road	Slight negative	Negligible	Neutral
		Injury/mortality of bats through vehicle collisions associated with operation of	Slight negative	Negligible	Neutral

Ecological Receptor	Nature Conservation Value	Description of Impact	Magnitude of Impact Prior to Mitigation	Magnitude of Residual Impact	Significance of Residual Impact
		phase 1			
Commuting and Foraging Common and Soprano Pipistrelles	Lower	Loss of foraging habitat due to phase 2 development	Slight negative	Negligible	Neutral
		Disturbance of foraging habitat due to phase 2 development	Slight negative	Negligible	Neutral
		Disruption of commuting routes due to removal of linear vegetation features or construction site lighting associated with phase 2 development	Slight negative	Negligible	Neutral
		Disturbance and fragmentation of commuting routes and foraging habitats due to completion of phase 1, particularly section 1 of the spine road	Slight negative	Negligible	Neutral
		Injury/mortality of bats through vehicle collisions associated with operation of phase 1	Slight negative	Negligible	Neutral
Dormice	Medium	Loss of woodland and scrub habitats due to phase 2 development	Slight negative	Negligible	Neutral
		Injury/mortality of dormice due to phase 2 development	Moderate negative	Negligible	Neutral
		Damage/disturbance of nests due to phase 2 development	Slight negative	Negligible	Neutral
		Injury/mortality of dependent young due to phase 2 development	Moderate negative	Negligible	Neutral
		Disturbance of dormice in nearby retained habitats through phase 2 construction site noise, lighting or vibration	Slight negative	Negligible	Neutral
		Fragmentation of habitats and populations through the barrier effect created by operation of phase 1	Slight negative	Negligible	Neutral
		Ongoing disturbance of dormice in retained habitats surrounding phase 1	Slight negative	Negligible	Neutral
15. Otters	16. Lower	Loss of habitat due to phase 2 development	Slight negative	Negligible	Neutral
		Disturbance to Otters adjacent to the site during phase 2 construction	Slight negative	Negligible	Neutral
		Injury/mortality to Otters accessing the site	Slight negative	Negligible	Neutral

Ecological Receptor	Nature Conservation Value	Description of Impact	Magnitude of Impact Prior to Mitigation	Magnitude of Residual Impact	Significance of Residual Impact
		during phase 2 construction			
		Fragmentation of habitats and populations through the barrier effect created by operation of phase 1	Slight negative	Negligible	Neutral
		Ongoing disturbance of Otters utilising retained habitats surrounding phase 1	Slight negative	Negligible	Neutral
Water Vole	Lower	Loss of suitable habitat due to phase 2 development	Slight negative	Negligible	Neutral
		Disturbance to Water Voles adjacent to the site during phase 2 construction	Slight negative	Negligible	Neutral
		Injury/mortality to Water Voles accessing the site during phase 2 construction	Slight negative	Negligible	Neutral
		Fragmentation of habitats and populations through the barrier effect created by operation of phase 1	Slight negative	Negligible	Neutral
		Ongoing disturbance of Water Voles utilising retained habitats surrounding phase 1	Slight negative	Negligible	Neutral
Badgers	Lower	Disturbance to Badgers adjacent to the site during phase 2 construction	Slight negative	Negligible	Neutral
		Injury/mortality to Badgers accessing site during construction	Slight negative	Negligible	Neutral
		Loss of foraging and sett habitat due to phase 2 development	Slight negative	Negligible	Neutral
		Ongoing disturbance of Badgers utilising retained habitats surrounding phase 1	Slight negative	Negligible	Neutral
Nesting birds	Medium~~Lower~~	Loss of nesting bird habitat due to phase 2 development, including foraging habitat within territories for breeding pairs	Slight negative	Negligible	Neutral
		Injury/mortality of nesting birds due to phase 2 development	Slight negative	Negligible	Neutral
		Damage or destruction of active nests/eggs/dependant young due to phase 2 development	Slight negative	Negligible	Neutral
		Disturbance to nesting birds (including potentially to birds listed on Schedule 1 of the WCA) in nearby retained habitat	Slight negative	Negligible	Neutral

Ecological Receptor	Nature Conservation Value	Description of Impact	Magnitude of Impact Prior to Mitigation	Magnitude of Residual Impact	Significance of Residual Impact
		during phase 2 construction works			
		Ongoing disturbance to birds utilising retained habitats surrounding phase 1	Slight negative	Negligible	Neutral
Reptiles	Medium	Loss of slow worm, common lizard, adder and grass snake habitat due to phase 2 development	Slight negative	Negligible	Neutral
		Injury/mortality of reptiles during phase 2 construction	Slight negative	Negligible	Neutral
		Disturbance to reptiles in nearby retained habitat during phase 2 construction works	Slight negative	Negligible	Neutral
		Fragmentation and isolation of habitats and populations due to the operation of phase 1	Slight negative	Negligible	Neutral
		Ongoing disturbance to reptiles utilising retained habitats surrounding phase 1	Slight negative	Negligible	Neutral
Great Crested Newt	Very High	Loss of Great Crested Newt habitat due to phase 2 development	Moderate negative	Negligible	Neutral
		Injury/mortality of Great Crested Newts during phase 2 construction	Moderate negative	Negligible	Neutral
		Disturbance to Great Crested Newt in nearby retained habitat during phase 2 construction works	Slight negative	Negligible	Neutral
		Fragmentation and isolation of habitats and populations due to the operation of phase 1, including breeding ponds	Slight negative	Negligible	Neutral
		Ongoing disturbance to GCN utilising retained habitats surrounding phase 1	Slight negative	Negligible	Neutral
Common frog, Common toad, Palmate newt and Smooth newt	Lower	Loss of amphibian habitat due to phase 2 development	Moderate negative	Negligible	Neutral
		Injury/mortality of amphibians during phase 2 construction	Slight negative	Negligible	Neutral
		Disturbance to amphibians in nearby retained habitat during phase 2 construction works	Slight negative	Negligible	Neutral
		Fragmentation and isolation of habitats and populations due to the operation of phase 1, including aquatic habitats	Slight negative	Negligible	Neutral

Ecological Receptor	Nature Conservation Value	Description of Impact	Magnitude of Impact Prior to Mitigation	Magnitude of Residual Impact	Significance of Residual Impact
		Ongoing disturbance to amphibians utilising retained habitats surrounding phase 1	Slight negative	Negligible	Neutral
White-clawed Crayfish	Medium	Loss of crayfish habitat due to phase 2 development	Slight negative	Negligible	Neutral
		Injury/mortality of crayfish during phase 2 construction	Slight negative	Negligible	Neutral
		Disturbance to reptiles in nearby retained habitat during phase 2 construction works	Slight negative	Negligible	Neutral
Invertebrates	Medium	Loss of habitats due to phase 2 development	Slight negative	Negligible	Neutral

Phase 3

Ecological Receptor	Nature Conservation Value	Description of Impact	Magnitude of Impact Prior to Mitigation	Magnitude of Residual Impact	Significance of Residual Impact
Wye Valley and Forest of Dean Bat Sites SAC	Very high	Impacts on Lesser Horseshoe Bat populations (refer to the 'bats' section below for details)	Moderate negative	Negligible	Neutral
		Impacts on Greater Horseshoe Bat populations (refer to the 'bats' section below for details)	Moderate negative	Negligible	Neutral
River Wye SAC	Very high	No direct or indirect impacts are predicted. Site located 3.77km to the northwest	N/A	N/A	N/A
Wye Valley Woodlands SAC	Very high	No direct or indirect impacts are predicted. Site located 5.84km to the west.	N/A	N/A	N/A
		Impacts on Lesser Horseshoe Bat populations (refer to the 'bats' section below for details)	Moderate negative	Negligible	Neutral
Severn Estuary SAC	Very high	No direct or indirect impacts are predicted. Site located 9.29km to the southeast	N/A	N/A	N/A
Walmore Common SPA and Ramsar Site	Very high	No direct or indirect impacts are predicted. Site located 9.12km to the east.	N/A	N/A	N/A

Ecological Receptor	Nature Conservation Value	Description of Impact	Magnitude of Impact Prior to Mitigation	Magnitude of Residual Impact	Significance of Residual Impact
Severn Estuary SPA and Ramsar Site	Very high	No direct or indirect impacts are predicted. Site located 9.64km to the southeast.	N/A	N/A	N/A
Westbury Brook Ironstone Mine SSSI	High	No direct impacts are predicted as site is located 1.46km to the northeast.	N/A	N/A	N/A
		Impacts on Lesser Horseshoe Bat populations (refer to the 'bats' section below for details)	Moderate negative	Negligible	Neutral
		Impacts on Greater Horseshoe Bat populations (refer to the 'bats' section below for details)	Moderate negative	Negligible	Neutral
Edgehills Quarry SSSI	High	No direct or indirect impacts are predicted. Site located 1.66km to the northeast	N/A	N/A	N/A
Puddlebrook Quarry SSSI	High	No direct or indirect impacts are predicted. Site located 2.08km to the north	N/A	N/A	N/A
Stenders Quarry SSSI	High	No direct or indirect impacts are predicted. Site located 2.43km to the northeast	N/A	N/A	N/A
Speech House Oaks SSSI	High	No significant impacts are predicted. Site located 2.68km to the southwest	N/A	N/A	N/A
Scully Grove Quarry SSSI	High	No direct or indirect impacts are predicted. Site located 2.69km to the north	N/A	N/A	N/A
Buckshaft Mine and Bradley Hill SSSI	High	Impacts on Lesser Horseshoe Bat populations (refer to the 'bats' section below for details)	Moderate negative	Negligible	Neutral
		Impacts on Greater Horseshoe Bat populations (refer to the 'bats' section below for details)	Moderate negative	Negligible	Neutral
Dean Hall Coach House and Cellar SSSI	High	Impacts on Greater Horseshoe Bat populations (refer to the 'bats' section below for details)	Moderate negative	Negligible	Neutral
Wigpool Ironstone Mine SSSI	High	Impacts on Lesser Horseshoe Bat populations (refer to the 'bats' section below for details)	Moderate negative	Negligible	Neutral
		Impacts on Greater Horseshoe Bat populations (refer to the 'bats' section	Moderate negative	Negligible	Neutral

Ecological Receptor	Nature Conservation Value	Description of Impact	Magnitude of Impact Prior to Mitigation	Magnitude of Residual Impact	Significance of Residual Impact
		below for details)			
Soudley Ponds SSSI	High	No direct or indirect impacts are predicted. Site located 3.43km to the southeast	N/A	N/A	N/A
Land Grove Quarry, Micheldean SSSI	High	No direct or indirect impacts are predicted. Site located 3.44km to the northeast	N/A	N/A	N/A
Wood Green Quarry and Railway Cut	High	No direct or indirect impacts are predicted. Site located 4.62km to the east	N/A	N/A	N/A
Laymoor Quag GWT Nature Reserve	Lower	No direct or indirect impacts are predicted as the site is located to the south of Linear Park and has been designated for its habitats and floral interests.	N/A	N/A	N/A
Woorgreens Lake and Marsh, Crabtree Hill & Foxes Bridge GWT Nature Reserve and KWS	Lower	No direct or indirect impacts are predicted. Site located 1km to the south	N/A	N/A	N/A
Edgehills Bog GWT Nature Reserve and KWS	Lower	No direct or indirect impacts are predicted. Site located 1km to the east	N/A	N/A	N/A
Plump Hill Dolomite Quarry GWT Nature Reserve and KWS	Lower	No direct or indirect impacts are predicted. Site located 1.85km to the northeast	N/A	N/A	N/A
Hawkwell Inclosure KWS	Lower	Indirect impacts associated with the operation of phase 1 and 2	Moderate negative	Negligible	Neutral
Cinderford Linear Park KWS	Lower	Indirect impacts associated with the operation of phase 1 and 2	Moderate negative	Negligible	Neutral
Serridge Green KWS	Lower	No direct or indirect impacts are predicted. Site located 275m to the west	N/A	N/A	N/A
Heywood Inclosure KWS	Lower	No direct or indirect impacts are predicted. Site located 935m to the east	N/A	N/A	N/A
Ruardean Hill KWS	Lower	No direct or indirect impacts are predicted. Site located 1.14km to the north	N/A	N/A	N/A
Fairplay Iron Mine Reservoir KWS	Lower	No direct or indirect impacts are predicted. Site located 1.36km to the east	N/A	N/A	N/A
Merring Meend KWS	Lower	No direct or indirect impacts are	N/A	N/A	N/A

Ecological Receptor	Nature Conservation Value	Description of Impact	Magnitude of Impact Prior to Mitigation	Magnitude of Residual Impact	Significance of Residual Impact
		predicted. Site located 1.43km to the northeast			
Westbury Brook Mine Reservoir KWS	Lower	No direct or indirect impacts are predicted. Site located 1.43km to the northeast	N/A	N/A	N/A
Plump Hill Picnic Site KWS	Lower	No direct or indirect impacts are predicted. Site located 1.45km to the northeast	N/A	N/A	N/A
Cinderford Roughs KWS	Lower	No direct or indirect impacts are predicted. Site located 1.65km to the southeast	N/A	N/A	N/A
Dilke Pond KWS	Lower	No direct or indirect impacts are predicted. Site located 1.89km to the south	N/A	N/A	N/A
Serridge Inclosure KWS	Lower	No direct or indirect impacts are predicted. Site located 1.95km to the west	N/A	N/A	N/A
Wilderness Field Centre KWS	Lower	No direct or indirect impacts are predicted. Site located 1.95km to the northeast	N/A	N/A	N/A
Micheldean Meend Marsh KWS	Lower	No direct or indirect impacts are predicted. Site located 1.95km to the north	N/A	N/A	N/A
Buildings and hard standing	Negligible	No operational impacts expected	N/A	N/A	N/A
Coniferous plantation woodland	Lower	No operational impacts expected	N/A	N/A	N/A
Broad-leaved plantation woodland	Lower	No operational impacts expected	N/A	N/A	N/A
Mixed plantation woodland (S41 Lowland Mixed Deciduous Woodland)	Lower	No operational impacts expected	N/A	N/A	N/A
Scattered Broad-leaved Trees	Lower	No operational impacts expected	N/A	N/A	N/A
Dense and scattered scrub	Lower	No operational impacts expected	N/A	N/A	N/A
Semi-improved neutral grassland	~~Lower~~Medium	No operational impacts expected	N/A	N/A	N/A

Ecological Receptor	Nature Conservation Value	Description of Impact	Magnitude of Impact Prior to Mitigation	Magnitude of Residual Impact	Significance of Residual Impact
Poor semi-improved grassland	Negligible	No operational impacts expected	N/A	N/A	N/A
Bare Ground	Negligible	No operational impacts expected	N/A	N/A	N/A
Spoil	Negligible	No operational impacts expected	N/A	N/A	N/A
Heath (S41 Lowland Heath)	Medium	No operational impacts expected	N/A	N/A	N/A
Standing Water (S41 Ponds and Rivers Habitat)	Medium	No operational impacts expected	N/A	N/A	N/A
Running Water (S41 Ponds and Rivers Habitat)	Medium	No operational impacts expected	N/A	N/A	N/A
Ditches	Negligible	No operational impacts expected	N/A	N/A	N/A
Lesser Horseshoe Bat Maternity Roosts (Office Building, Bath House and Canteen) – also used by other species in low numbers (Common and Soprano Pipistrelle, Brown Long-eared and Bechstein's)	Very High	Feature removed as part of phase 2 development therefore no operation impacts	N/A	N/A	N/A
Trees suitable for roosting bats	Medium	Disturbance of tree roosts during operation through increased activity, particularly lighting and noise	Moderate negative	Negligible	Neutral
Commuting and foraging Lesser	Very High	Disturbance and fragmentation of commuting routes and foraging habitats	Moderate negative	Negligible	Neutral

Ecological Receptor	Nature Conservation Value	Description of Impact	Magnitude of Impact Prior to Mitigation	Magnitude of Residual Impact	Significance of Residual Impact
Horseshoe, Greater Horseshoe, Barbastelle and Bechstein's Bats		Injury/mortality of bats through vehicle collisions, particularly along spine road	Moderate negative	Negligible	Neutral
Commuting and foraging Nathusius Pipistrelles, other Myotis Sp., Brown Long-eared, Noctule, Leisler's and Serotine Bats	Medium	Disturbance and fragmentation of commuting routes and foraging habitats	Slight ~~Moderate~~ negative	Negligible	Neutral
		Injury/mortality of bats through vehicle collisions particularly along spine road	Slight negative	Negligible	Neutral
Commuting and Foraging Common	Lower	Disturbance and fragmentation of commuting routes and foraging habitats	Slight negative	Negligible	Neutral

Ecological Receptor	Nature Conservation Value	Description of Impact	Magnitude of Impact Prior to Mitigation	Magnitude of Residual Impact	Significance of Residual Impact
and Soprano Pipistrelles		Injury/mortality of bats through vehicle collisions particularly along spine road	Slight negative	Negligible	Neutral
Dormice	Medium	Fragmentation of habitats and populations	Moderate negative	Negligible	Neutral

Ecological Receptor	Nature Conservation Value	Description of Impact	Magnitude of Impact Prior to Mitigation	Magnitude of Residual Impact	Significance of Residual Impact
		Ongoing disturbance of dormice in retained habitats	Slight negative	Negligible	Neutral
Otters	Lower	Fragmentation of habitats and populations	Moderate negative	Negligible	Neutral
		Ongoing disturbance of Otters utilising retained habitats	Slight negative	Negligible	Neutral
Water Vole	Lower	Fragmentation of habitats and populations	Moderate negative	Negligible	Neutral
		Ongoing disturbance of Water Voles utilising retained habitats	Slight negative	Negligible	Neutral

Ecological Receptor	Nature Conservation Value	Description of Impact	Magnitude of Impact Prior to Mitigation	Magnitude of Residual Impact	Significance of Residual Impact
Badgers	Lower	Ongoing disturbance of Badgers utilising retained habitats	Slight negative	Negligible	Neutral
Nesting birds	Medium~~Lower~~	Ongoing disturbance to birds utilising retained habitats	Slight negative	Negligible	Neutral
Reptiles	Medium	Fragmentation and isolation of habitats and populations	Moderate negative	Negligible	Neutral
		Ongoing disturbance to reptiles utilising	Slight negative	Negligible	Neutral

Ecological Receptor	Nature Conservation Value	Description of Impact	Magnitude of Impact Prior to Mitigation	Magnitude of Residual Impact	Significance of Residual Impact
		retained habitats			
Great Crested Newt	Very High	Fragmentation and isolation of habitats and populations, including breeding ponds	Moderate negative	Negligible	Neutral
		Ongoing disturbance to GCN utilising retained habitats	Slight negative	Negligible	Neutral
Common frog, Common toad, Palmate newt and Smooth newt	Lower	Fragmentation and isolation of habitats and populations, including aquatic habitats	Moderate negative	Negligible	Neutral
		Ongoing disturbance to amphibians utilising retained habitats	Slight negative	Negligible	Neutral
White-clawed Crayfish	Medium	No operational impacts expected	N/A	N/A	N/A
Invertebrates	Medium	No operational impacts expected	N/A	N/A	N/A

Assessment of Cumulative Effects

7.520 An assessment of cumulative effects in relation to Ecology and Biodiversity effects is present in Chapter 16: Cumulative Impacts.

Shadow Habitat Regulations Assessment and discussion of European Protected Species derogation tests / wild bird duties

7.520a A shadow Habitat Regulations Assessment screening assessment relating to the proposed development at the Hybrid Application Site, which draws from and refers to the information and conclusions in this chapter of the ES is at Appendix 7.9.

7.520b Appendix 7.10 contains comment as regards the derogation tests which arise from Article 16 of the Habitats Directive in relation to European Protected Species and as regards legal duties relating to wild birds.

Summary

7.521 Before taking account of the proposed mitigation, none of the three phases of the proposed development at the Hybrid Application Site are anticipated to have any effects on statutorily designated sites other than those designated for their bat interests, particularly Lesser and Greater Horseshoe bats.

7.522 The proposals will directly affect the Cinderford Linear Park and Hawkwell Inclosure Key Wildlife Sites as well as directly and indirectly affecting a number of ecological receptors including habitats and protected species, some of which are considered of high or very high ecological value, both during the construction and operational phases of the proposed development at the Hybrid Application Site.

7.523 The proposed mitigation measures described in this chapter will however ensure that residual impacts on a majority of these receptors are avoided in the short and medium term and that residual impacts on all ecological receptors are avoided in the long term.

7.524 Phase 1 of the works will have residual slight adverse effects in the short to medium term in relation to certain ecological features as habitat creation work is undertaken and establishes.

7.525 Phase 2 of the works will have residual slight adverse effects in the short to medium term in relation to certain ecological features as habitat creation work is undertaken and

establishes. This phase will also have a more permanent slight adverse impact on heath habitats as the total site resource will be lost as a result of the development works.

7.526 Phase 3 will not have any residual effects following mitigation.

Assumptions and Limitation

7.527 The survey information used is considered robust and detailed enough to determine the status of the ecological receptors on site, except in relation to White-clawed Crayfish where further surveys will be undertaken in July 2014. In this instance for the purposes of the assessment it has been assumed that this species is present and the mitigation measures have been designed on this basis. This is compatible with the Biodiversity Strategy (Committee Draft May 2014) and the requirements of environmental impact assesment.

7.528 Due to the uncertainty regarding the details of the phase 2 reserved matters developments it has been assumed that all of the habitats within these areas will be lost, providing a worst case scenario for the purposes of assessment.

7.529 It has also been assumed that the phase 2 detailed application works would occur following the establishment of the phase 2 mitigation areas while the phase 2 reserved matters development would occur following establishment of the phase 2 mitigation areas. ~~all of the phase 2 construction works would occur simultaneously, again providing a worst case scenario for the purposes of assessment.~~

References

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