Figure 0-4 – Road Traffic Noise Contour Map With Development 2016

Vibration Impacts
11.5.48 The assessment methodology, DMRB, indicates that road Traffic Vibration can be transmitted through the air or through the ground. Where Airborne vibration from traffic can be produced by the engines or exhausts of road vehicles, dominant in the audible frequency range of 50-100 Hz. Ground borne vibration is often in the 8-20 Hz range, and it is produced by the interaction between the rolling wheels and road surface, in particular when there are irregularities in the road surface.

11.5.49 Although ground borne vibration may be perceptible within a building, there is no evidence that traffic induced vibrations can cause significant damage to buildings. As significant ground borne vibrations can be generated from irregularities in the road surface, and the access to the station is a new section of road, with a smooth finish, this will not need to be assessed.

11.5.50 There is no evidence that airborne vibration from road traffic causes even minor damage to a building, and this is not being assessed at this stage.

The Impact of the Station Development

11.5.51 The station buildings themselves would be situated to the West of existing London to Kings Lynn Mainline Railway. The development would include the station building, access and car parking. There are potential noise impacts associated with some of these facilities, which are discussed below. All noise predictions have been made using noise modelling software, Noisemap 5. Figure 1.5 shows the noise contour map for the station development, where all noise levels shown are in $L_{Aeq\text{-daytime}}$.

Station Car Park

11.5.52 The proposed new station will have 450 car-parking spaces and would be accessed from Cowley Road. It has been assumed that the car park would only be used during normal operating hours, from around 6am until 1am.

11.5.53 Based upon Atkins previous project experience the following noise emissions would be expected from various activities associated with car parks.

Table 0-31 - Typical activities from car movements
<table>
<thead>
<tr>
<th>Activity</th>
<th>Average noise level, dB $L_{Aeq,5min}$</th>
<th>Maximum noise level, dB $L_{Amax}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car arriving / leaving @ 3.5m</td>
<td>66</td>
<td>71</td>
</tr>
<tr>
<td>Car manoeuvring @ 3.5m</td>
<td>63</td>
<td>66</td>
</tr>
<tr>
<td>Car door close @ 3.5m</td>
<td>n/a</td>
<td>75</td>
</tr>
</tbody>
</table>

11.5.54 The noise from the car park has been modelled, assuming that three quarters of all car parking spaces would be filled or emptied during the same peak hour. It has been assumed that as each space is filled, a car engine will be running for 2 minutes over the peak hour periods (5am to 9am and 4pm to 7pm), which include approximately 1 minute 10 of manoeuvring, and 50 seconds arriving/leaving per space.

11.5.55 This has been modelled using a point source to represent two spaces, with a percentage on-time of 0.5% for every space, in order to predict the average hourly noise level from the car park over the peak hour periods.

11.5.56 This is worst case, and is equivalent to 338 of the parking spaces filling up/emptying out during one the morning peak hour or one evening peak hour. In practice it is unlikely that this will occur.

11.5.57 The noise model has predicted the attenuation over distance assuming a soft ground correction. All predictions are free-field, and assume that there are no acoustically reflective surfaces near to the receptor. Plus, the noise predictions do not include screening by the other vehicles. Although the car park itself is hard ground, the noise from the nearest, and therefore the noisiest, car parking spaces would be affected by soft ground attenuation.

11.5.58 Table 11-33 is an example of how the noise model has predicted the noise from the entire car park, assuming that all car park spaces are between 100m and 220m from a noise sensitive property.

11.5.59 The rating level, for BS4142, includes a correction for intermittency (3dB) plus distinctive sound characteristics (3dB).

**Table 0-32 – Example of Noise Predictions – Car Park**

<table>
<thead>
<tr>
<th>Stage</th>
<th>Predicted Noise Levels</th>
</tr>
</thead>
</table>

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### Combined Noise Level from one car parking space at 3.5m

<table>
<thead>
<tr>
<th>Distance from Car Parking Space (m)</th>
<th>Soft Ground Distance Correction (dB)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>-32</td>
<td>(represents 50 car spaces)</td>
</tr>
<tr>
<td>120</td>
<td>-34</td>
<td>(represents 50 car spaces)</td>
</tr>
<tr>
<td>140</td>
<td>-36</td>
<td>(represents 50 car spaces)</td>
</tr>
<tr>
<td>160</td>
<td>-37</td>
<td>(represents 75 car spaces)</td>
</tr>
<tr>
<td>180</td>
<td>-39</td>
<td>(represents 75 car spaces)</td>
</tr>
<tr>
<td>200</td>
<td>-40</td>
<td>(represents 75 car spaces)</td>
</tr>
<tr>
<td>220</td>
<td>-41</td>
<td>(represents 75 car spaces)</td>
</tr>
</tbody>
</table>

### Combined noise level from all car parking spaces

Table 0-33 provides the results of the noise modelling at each representative noise sensitive property, during the peak hours 5am to 9am and 4pm to 7pm.

**Table 0-33 – Peak Hour Noise Predictions from Nearest Car Parking Space**
<table>
<thead>
<tr>
<th>Address</th>
<th>Distance to Receiver (m)</th>
<th>Measured Daytime $L_{A90}$, 15 min Free-Field Noise Levels (dB)</th>
<th>Measured $L_{Aeq}$, 15 min Free-Field Noise Levels (dB)</th>
<th>Predicted Average $L_{Aeq}$, 1 hr Free-Field Noise Levels (dB)</th>
<th>Predicted Maximum $L_{Amax}$ (dB)</th>
<th>Predicted Impact from BS4142</th>
<th>Predicted Impact from IEM A base criteria</th>
<th>Predicted Impact from BS4142</th>
<th>Predicted Impact from IEM A base criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>36 Discovery Way</td>
<td>95</td>
<td>37 (36 5-7am)</td>
<td>41</td>
<td>32 (38)</td>
<td>46</td>
<td>Less than Adverse Impact</td>
<td>Negligible Impact</td>
<td>Less than Adverse Impact</td>
<td>Negligible Impact</td>
</tr>
<tr>
<td>36 Discovery Way-Garden</td>
<td>80</td>
<td>37 (36 5-7am)</td>
<td>41</td>
<td>33 (39)</td>
<td>48</td>
<td>Less than Adverse Impact</td>
<td>Negligible Impact</td>
<td>Less than Adverse Impact</td>
<td>Negligible Impact</td>
</tr>
<tr>
<td>40 Ribston Way</td>
<td>200</td>
<td>36</td>
<td>43</td>
<td>28 (34)</td>
<td>40</td>
<td>Low impact</td>
<td>Negligible Impact</td>
<td>Low impact</td>
<td>Negligible Impact</td>
</tr>
<tr>
<td>78 Long Reach Road</td>
<td>110</td>
<td>36</td>
<td>43</td>
<td>33 (39)</td>
<td>45</td>
<td>Less than Adverse Impact</td>
<td>Negligible Impact</td>
<td>Less than Adverse Impact</td>
<td>Negligible Impact</td>
</tr>
<tr>
<td>Property</td>
<td>Daytime Level</td>
<td>Time 1</td>
<td>Time 2</td>
<td>Time 3</td>
<td>Impact</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>---------------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>-------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>78 Long Reach Road-Garden</td>
<td>90</td>
<td>36</td>
<td>43</td>
<td>33 (39)</td>
<td>Less than Adverse Impact</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>54 Long Reach Road</td>
<td>110</td>
<td>36</td>
<td>43</td>
<td>31 (37)</td>
<td>Less than Adverse Impact</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>54 Long Reach Road-Garden</td>
<td>100</td>
<td>36</td>
<td>43</td>
<td>30 (36)</td>
<td>Less than Adverse Impact</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32 Moss Bank</td>
<td>215</td>
<td>36</td>
<td>43</td>
<td>27 (33)</td>
<td>Low Impact</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kerry’s Yard Caravan Park</td>
<td>170</td>
<td>36</td>
<td>46</td>
<td>24 (30)</td>
<td>Low Impact</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 Sunningdale Caravan Park</td>
<td>125</td>
<td>36</td>
<td>46</td>
<td>32 (38)</td>
<td>Less than Adverse Impact</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sunningdale Caravan Park-yard</td>
<td>100</td>
<td>36</td>
<td>46</td>
<td>33 (39)</td>
<td>Less than Adverse Impact</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 0-33 shows that the resulting noise level from daytime car park activities would be less than the existing background daytime sound levels in the area. However, in accordance with BS4142, a 6dB penalty has been added to the predicted levels to account for the ‘acoustic features’ from the car park noise. Predicted noise associated with car park activities indicates levels ‘of Less than Adverse Impact’ or ‘Low Impact’ at all properties and gardens.
11.5.62 Using the assessment criteria based on examples within the IEMA document, the impact would be negligible at all properties and gardens of properties.

11.5.63 As there is not considered to be a noise impact during peak times, the noise level during the other quieter periods of the day has not been predicted, as the impact is still expected to be negligible.

11.5.64 However, as the station would be operational until 1am, the worst case off peak noise impact from the car park has also been predicted, where it has been assumed that up to one quarter of the peak hour cars could enter or leave the car park during one off peak hour (7pm to 5am), i.e. worst case 25% of the peak hour car park movements; which is a reduction of 6dB with relation to the peak hour movements. The predicted values have been compared with measured night time values, in order to assess the worst case off peak period.

Table 0-34 – Night Noise Predictions from Nearest Car Parking Space
<table>
<thead>
<tr>
<th>Address</th>
<th>Distance to Receptor (m)</th>
<th>Measured Night Time $L_{A90}$, $L_{A90\text{ min}}$ Free-Field Noise Levels (dB)</th>
<th>Measured Night Time $L_{Aeq, 5\text{ min}}$, $L_{Aeq, 5\text{ min}}$ Free-Field Noise Levels (dB)</th>
<th>Predicted Average $L_{Aeq}$, $L_{Aeq, 5\text{ min}}$ (dB) (and Rating Level for BS414 2)</th>
<th>Predicted Maximum $L_{Amax}$ (dB)</th>
<th>Predicted Impact from IEMA based criteria</th>
<th>Predicted Impact Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>36 Discover y Way</td>
<td>95</td>
<td>32 (37 in late evening)</td>
<td>34 (41 in late evening)</td>
<td>26 (32)</td>
<td>46</td>
<td>Less than Adverse Impact</td>
<td>Negligible Impact</td>
</tr>
<tr>
<td>40 Ribston Way</td>
<td>200</td>
<td>31 (37 in late evening)</td>
<td>34 (38 in late evening)</td>
<td>22 (28)</td>
<td>40</td>
<td>Low Impact</td>
<td>Negligible Impact</td>
</tr>
<tr>
<td>78 Long Reach Road</td>
<td>110</td>
<td>32 (36 in late evening)</td>
<td>34 (38 in late evening)</td>
<td>27 (33)</td>
<td>45</td>
<td>Less than Adverse Impact</td>
<td>Negligible Impact</td>
</tr>
<tr>
<td>54 Long Reach Road</td>
<td>110</td>
<td>32 (36 in late evening)</td>
<td>34 (41 in late evening)</td>
<td>25 (31)</td>
<td>45</td>
<td>Less than Adverse Impact</td>
<td>Negligible Impact</td>
</tr>
<tr>
<td>32 Moss Bank</td>
<td>215</td>
<td>31 (36 in late evening)</td>
<td>36 (41 in late evening)</td>
<td>22 (28)</td>
<td>39</td>
<td>Low Impact</td>
<td>Negligible Impact</td>
</tr>
<tr>
<td>Kerry’s Yard Caravan Park</td>
<td>170</td>
<td>33 (36 in late evening)</td>
<td>36 (39 in late evening)</td>
<td>18 (24)</td>
<td>41</td>
<td>Low Impact</td>
<td>Negligible Impact</td>
</tr>
</tbody>
</table>
Table 0-34 shows that the resulting noise level from car park activities would be less than or approximately equal to the existing background evening and night-time noise levels at all of the properties. However, in accordance with BS4142, a 6dB penalty has been added to the predicted levels to account for the ‘acoustic features’ from the car park noise. Predicted noise associated with car park activities indicates levels ‘of Less than Adverse Impact’ or ‘Low Impact’ at all properties. Using the assessment criteria based on examples within the IEMA guidelines, the impact would be Negligible.

The WHO guidelines state that ‘for reasonable standard in bedrooms at night, individual noise events should not normally exceed 45dB L_{Amax}’. The equivalent noise level outside the open window would be 57dB L_{Amax}. Therefore, the maximum noise levels from the car park have been predicted to fall well below the WHO night time external noise level values at all locations.

**Pick Up and Drop Off Point**

In addition to the car park, in front of the Station buildings there is a taxi rank, plus an area for picking up and dropping off train passengers, including an area for the vehicles to turn in. The noise from this area has been predicted during the ‘peak hour’ and ‘night-time’ operations.

It is assumed that most of the pick up and drop offs will be during peak times. The traffic assessment predicted that there would be around 250 pick up or drop offs per morning and evening peak, and the traffic assessment predicted that there would be 66 vehicles during each peak hour.

The ‘arriving and leaving’ and ‘manoeuvring’ values from Table 11-32 were used along with assumptions for the usage of this area during the rush hour period (5am to 9am and 4pm to 7pm) to predicted the noise from the waiting and turning vehicles. The taxis in the taxi rank are predicted to have their engines on for 25% of the time and the non-taxis are predicted to have their engines on for 10% of the time. An example of the predictions is provided in
11.5.70 Table 0-35.

11.5.71 The rating level, for BS4142, includes a correction for intermittency (3dB) plus distinctive sound characteristics (3dB).

**Table 0-35 – Example of Noise Predictions – Pick Up/Drop Off**

<table>
<thead>
<tr>
<th>Stage</th>
<th>Predicted Noise Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Turning Vehicles</td>
</tr>
<tr>
<td>Average noise level, dB $L_{Aeq,5min}$</td>
<td>Car arriving / leaving @ 3.5m</td>
</tr>
<tr>
<td>% on-time correction</td>
<td>N/A</td>
</tr>
<tr>
<td>Number of Vehicles</td>
<td>66/hr</td>
</tr>
<tr>
<td>Soft Ground Distance Correction at 100m</td>
<td>N/A</td>
</tr>
<tr>
<td>Noise Level at 100m</td>
<td>$37dB L_{Aeq,1hr}$</td>
</tr>
<tr>
<td>($LWA - 33 + 10\log Q - 10\log V - 10\log d$ for turning)</td>
<td>Combined Noise Level from one car parking space at 3.5m</td>
</tr>
</tbody>
</table>

11.5.72 Table 0-36 provides the results of the noise modelling at each representative noise sensitive property, during the peak hours 5am to 9am and 4pm to 7pm.

**Table 0-36 – Peak Time Noise Predictions from the Pick-Up Point**
<table>
<thead>
<tr>
<th>Address</th>
<th>Distance to Receiver (m)</th>
<th>Measured Daytime $L_{A90}$, 15 min Free-Field Noise Levels (dB)</th>
<th>Measured Daytime $L_{Aeq}$, 15 min Free-Field Noise Levels (dB)</th>
<th>Predicted Average $L_{Aeq}$, 1 hr (dB) (and Rating Level for BS414 2)</th>
<th>Predicted Impact from IEMA based criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>36 Discovery Way</td>
<td>215</td>
<td>37 (36 5-7am)</td>
<td>41</td>
<td>30 (36)</td>
<td>Less than Adverse Impact</td>
</tr>
<tr>
<td>36 Discovery Way-Garden</td>
<td>215</td>
<td>37 (36 5-7am)</td>
<td>41</td>
<td>30 (36)</td>
<td>Less than Adverse Impact</td>
</tr>
<tr>
<td>40 Ribston Way</td>
<td>210</td>
<td>36</td>
<td>43</td>
<td>24 (30)</td>
<td>Low Impact</td>
</tr>
<tr>
<td>78 Long Reach Road</td>
<td>130</td>
<td>36</td>
<td>43</td>
<td>35 (41)</td>
<td>Adverse Impact</td>
</tr>
<tr>
<td>78 Long Reach Road-Garden</td>
<td>115</td>
<td>36</td>
<td>43</td>
<td>35 (41)</td>
<td>Adverse Impact</td>
</tr>
<tr>
<td>54 Long Reach Road</td>
<td>110</td>
<td>36</td>
<td>43</td>
<td>36 (42)</td>
<td>Greater Adverse Impact</td>
</tr>
<tr>
<td>54 Long Reach Road-Garden</td>
<td>100</td>
<td>36</td>
<td>43</td>
<td>37 (43)</td>
<td>Greater Adverse Impact</td>
</tr>
<tr>
<td>32 Moss Bank</td>
<td>200</td>
<td>36</td>
<td>43</td>
<td>28 (34)</td>
<td>Less than Adverse Impact</td>
</tr>
<tr>
<td>Kerry’s Yard Caravan Park</td>
<td>150</td>
<td>36</td>
<td>46</td>
<td>29 (35)</td>
<td>Less than Adverse Impact</td>
</tr>
</tbody>
</table>
11.5.73 Table 0-36 shows that the resulting noise level from daytime pick up and drop off activities would be less than the existing background daytime sound levels in the area, other than in the garden of 54 Long Reach Road and Sunningdale Caravan Park. However, in accordance with BS4142, a 6dB penalty has been added to the predicted levels to account for the ‘acoustic features’ from the car park noise. Therefore, the predicted noise associated with taxis, and pick up and drop off activities is indicates levels ‘of Less than Adverse Impact’ or ‘Low Impact’ at all properties and gardens of properties, other than 54 Long Reach Road and the yard at Sunningdale Caravan Park, at which the predicted noise impact indicates an Adverse Impact.

11.5.74 Using the assessment criteria based on examples within the IEMA guidelines, the impact would be Negligible at all properties and gardens of properties.

11.5.75 As there is not considered to be a noise impact during peak times, the noise level during the other quieter periods of the day has not been predicted, as the impact is still expected to be slight.

11.5.76 As the station would be operational from around 5am until 1am, the worst case off peak noise impact from the pick up and drop off movements has also been predicted, where it has been assumed that up to a quarter of the cars could enter or leave the pick up and drop off area during off peak hours (7pm to 5am), i.e. worst case 25% of the peak hour car park movements; which is a reduction of 6dB with relation to the peak hour movements. The predicted values have been compared with measured night time values, in order to assess the worst case off peak period.

Table 0-37 – Night Time Noise Predictions from the Pick-Up Point
<table>
<thead>
<tr>
<th>Address</th>
<th>Distance to Recept (m)</th>
<th>Measured Night Time L_{A00}, 5 min Free-Field Noise Levels (dB)</th>
<th>Measured Night Time L_{Aeq}, 5 min Free-Field Noise Levels (dB)</th>
<th>Predicted Average L_{Aeq, 5 min} (dB) (and Rating Level for BS4142)</th>
<th>Predicted Impact from IEMA based criteria</th>
<th>Predicted Impact from IEMA based criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>36 Discovery Way</td>
<td>215</td>
<td>32 (37 in late evening)</td>
<td>34 (41 in late evening)</td>
<td>24 (30)</td>
<td>Low Impact</td>
<td>Negligible Impact</td>
</tr>
<tr>
<td>40 Ribston Way</td>
<td>210</td>
<td>31 (37 in late evening)</td>
<td>34 (38 in late evening)</td>
<td>18 (24)</td>
<td>Low Impact</td>
<td>Negligible Impact</td>
</tr>
<tr>
<td>78 Long Reach Road</td>
<td>130</td>
<td>32 (36 in late evening)</td>
<td>34 (38 in late evening)</td>
<td>29 (35)</td>
<td>Less than Adverse Impact</td>
<td>Slight Impact</td>
</tr>
<tr>
<td>54 Long Reach Road</td>
<td>110</td>
<td>32 (36 in late evening)</td>
<td>34 (41 in late evening)</td>
<td>30 (36)</td>
<td>Less than Adverse Impact</td>
<td>Slight Impact</td>
</tr>
<tr>
<td>32 Moss Bank</td>
<td>200</td>
<td>31 (36 in late evening)</td>
<td>36 (41 in late evening)</td>
<td>22 (28)</td>
<td>Low Impact</td>
<td>Negligible Impact</td>
</tr>
<tr>
<td>Kerry's Yard Caravan Park</td>
<td>150</td>
<td>33 (36 in late evening)</td>
<td>36 (39 in late evening)</td>
<td>23 (29)</td>
<td>Less than Adverse Impact</td>
<td>Negligible Impact</td>
</tr>
<tr>
<td>20 Sunningdale Caravan Park</td>
<td>140</td>
<td>33 (36 in late evening)</td>
<td>36 (39 in late evening)</td>
<td>26 (32)</td>
<td>Low Impact</td>
<td>Negligible Impact</td>
</tr>
</tbody>
</table>

11.5.77 Table 11-38 shows that the resulting noise level from the pick up and drop off point would be less than or approximately equal to the existing background night-time and evening noise.

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levels at all of the properties. However, in accordance with BS4142, a 5dB penalty has been added to the predicted levels to account for the ‘acoustic features’ from the the noise associated with taxis, and pick up and drop off activities. Predicted noise associated with Taxis and the Pick-up Point indicates levels ‘of Less than Adverse Impact’ or ‘Low Impact’ at all properties. Using the assessment criteria based on examples within the IEMA guidelines, the impact would be Slight at Long Reach Road and Negligible elsewhere.

**Public Announcements on Platforms**

11.5.78 The new railway platforms and station would be served by a Public Address System, which would be used to inform the users of the station of the train announcements and security announcements.

11.5.79 The Network Rail document entitled ‘Design and Installation for Public Announcement, Voice Alarm and Long Line Public Announcement Systems’, 2009. This document states that: “The system shall provide a minimum SPL of 10dBA above normal ambient noise levels at all times within the range of 65dBA up to a maximum SPL level unless environmental noise pollution issues prevent this figure being achieved”.

11.5.80 It is understood that the PA system will achieve this, by using speakers with a sound power level of 87dB(A), which has been obtained from manufacturers data. The speakers will not be angled towards the noise sensitive properties.

11.5.81 The station is expected to serve up to 3 trains in each direction, with additional services expected at peak times (5am to 9am and 4pm to 7pm), and there would be up to 6 PA announcements on each speaker per hour, one for each train, and they are expected to last no more than 1 minute each.

11.5.82 The locations of the 16 PA speakers were provided by the design engineers, and are shown on the Figure 0-5 along with the noise map of the PA system, which shows the predicted peak hourly average noise levels.

11.5.83 The rating level, for BS4142:2007, includes a correction acoustic features (5dB).

**Figure 0-5 – Noise Predictions of Public Address System**
11.5.84 A 10% on-time value has been assumed for each speaker and each speaker has been represented in its approximate location by a point source. These numbers are fairly robust, because it is unlikely that both platforms will make announcements for trains on the other platform, so allows for additional announcements, should they be required. The results of the daytime predictions have been provided in Table 11-40, where early and late evening background levels were similar to the measured daytime levels. Late evening ambient levels have also been shown in the table, with early evening ambient levels found to be very similar to daytime noise levels. The example calculation is shown in Table 0-38

<table>
<thead>
<tr>
<th>Stage</th>
<th>Predicted Noise Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sound Power Level for one speaker, dB SWL</td>
<td>87dB</td>
</tr>
<tr>
<td>% on-time correction</td>
<td>-10dB (10%)</td>
</tr>
<tr>
<td>Soft Ground Distance Correction at 20m</td>
<td>-43dB</td>
</tr>
<tr>
<td>Noise Level at 20m</td>
<td>34dB $L_{Aeq, 1hr}$</td>
</tr>
</tbody>
</table>
### Combined Noise Level from 5 nearest PA speakers

<table>
<thead>
<tr>
<th>Address</th>
<th>Distance to Platform (m)</th>
<th>Lowest Measured Daytime $L_{A90, 15\text{ min}}$ (dB)</th>
<th>Lowest Measured Daytime $L_{Aeq, 15\text{ min}}$ (dB)</th>
<th>Predicted Average $L_{Aeq, 1\text{ hr}}$ (dB)</th>
<th>Predicted Impact BS4142</th>
<th>Predicted Impact from IEMA based criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>36 Discovery Way</td>
<td>275</td>
<td>37</td>
<td>41 (late evening 41)</td>
<td>27 (32)</td>
<td>Less than Marginal Significance</td>
<td>Negligible Impact</td>
</tr>
<tr>
<td>36 Discovery Way-Garden</td>
<td>275</td>
<td>37</td>
<td>41 (N/A)</td>
<td>27 (32)</td>
<td>Less than Marginal Significance</td>
<td>Negligible Impact</td>
</tr>
<tr>
<td>40 Ribston Way</td>
<td>250</td>
<td>36</td>
<td>43 (late evening 38)</td>
<td>23 (28)</td>
<td>Less than Marginal Significance</td>
<td>Negligible Impact</td>
</tr>
<tr>
<td>78 Long Reach Road</td>
<td>180</td>
<td>36</td>
<td>43 (N/A)</td>
<td>31 (36)</td>
<td>Less than Marginal Significance</td>
<td>Negligible Impact</td>
</tr>
<tr>
<td>78 Long Reach Road-Garden</td>
<td>180</td>
<td>36</td>
<td>43 (late evening 38)</td>
<td>30 (35)</td>
<td>Less than Marginal Significance</td>
<td>Negligible Impact</td>
</tr>
<tr>
<td>54 Long Reach Road</td>
<td>95</td>
<td>36</td>
<td>43 (N/A)</td>
<td>32 (37)</td>
<td>Less than Marginal Significance</td>
<td>Negligible Impact</td>
</tr>
<tr>
<td>54 Long Reach Road-Garden</td>
<td>85</td>
<td>36</td>
<td>43 (late evening 38)</td>
<td>32 (37)</td>
<td>Less than Marginal Significance</td>
<td>Negligible Impact</td>
</tr>
</tbody>
</table>

Table 0-39 – Prediction of noise from Daytime and Evening PA Announcements
<table>
<thead>
<tr>
<th>Property</th>
<th>Daytime</th>
<th>Evening</th>
<th>Marginal Significance</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reach Road-Garden</td>
<td>140</td>
<td>43 (late evening 41)</td>
<td>Less than Marginal Significance</td>
<td>Negligible Impact</td>
</tr>
<tr>
<td>Moss Bank</td>
<td>36</td>
<td>25 (30)</td>
<td>Less than Marginal Significance</td>
<td>Slight Impact</td>
</tr>
<tr>
<td>Kerry’s Yard Caravan Park</td>
<td>75</td>
<td>46 (late evening 39)</td>
<td>Less than Marginal Significance</td>
<td>Slight Impact</td>
</tr>
<tr>
<td>Sunningdale Caravan Park-yard</td>
<td>20</td>
<td>46 (late evening 39)</td>
<td>More than Marginal Significance</td>
<td>Negligible Impact</td>
</tr>
</tbody>
</table>

11.5.85 Table 0-39 shows that the resulting noise level from PA Announcements would be less than the existing background day-time noise levels at all of the properties. However, in accordance with BS4142, and as a result of the acoustic features of the PA noise, a penalty of 5dB has been added to the predicted levels. Noise associated with the PA Announcements is therefore ‘of Less than Marginal Significance’ at all properties, other than Sunningdale Caravan Park which is of more than marginal significance.

11.5.86 The predicted impact according to the assessment criteria based on examples within the IEMA guidelines, is slight at Kerry’s Yard and Sunningdale Caravan Park and Negligible at all other properties for daytime and evening.

11.5.87 In order to mitigate any potential noise from the PA system at night, the PA system will not be used for train announcements from 11pm each night. Therefore the night time impact of the PA system at night has not been assessed.

11.5.88 However, the PA system will be operational between 5 and 7am. The impact during this time has been determined by using the background noise levels ($L_{A90}$) agreed with the Local
Planning Authority (36dB), plus the quietest measured daytime $L_{Aeq}$ noise levels; as the noise levels measured at this time were more typical of daytime than night time measured noise levels.

Table 0-40 – Prediction of Early Morning (5am to 7am) noise from PA Announcements

<table>
<thead>
<tr>
<th>Address</th>
<th>Distance to Platform (m)</th>
<th>Measured Night Time $L_{A90}$, 5 min Free-Field Noise Levels (dB)</th>
<th>Measured Night Time $L_{Aeq}$, 15 min Free-Field Noise Levels (dB)</th>
<th>Predicted Average $L_{Aeq}$, 5 min (dB) (and Rating Level for BS4142)</th>
<th>Predicted Impact from IEMA based criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>36 Discovery Way</td>
<td>275</td>
<td>36</td>
<td>41</td>
<td>27 (32)</td>
<td>Less than Marginal Significance</td>
</tr>
<tr>
<td>40 Ribston Way</td>
<td>250</td>
<td>36</td>
<td>43</td>
<td>27 (32)</td>
<td>Less than Marginal Significance</td>
</tr>
<tr>
<td>78 Long Reach Road</td>
<td>180</td>
<td>36</td>
<td>43</td>
<td>23 (28)</td>
<td>Less than Marginal Significance</td>
</tr>
<tr>
<td>54 Long Reach Road</td>
<td>95</td>
<td>36</td>
<td>43</td>
<td>31 (36)</td>
<td>Less than Marginal Significance</td>
</tr>
<tr>
<td>32 Moss Bank</td>
<td>140</td>
<td>36</td>
<td>43</td>
<td>30 (35)</td>
<td>Less than Marginal Significance</td>
</tr>
<tr>
<td>Kerry’s Yard Caravan Park</td>
<td>75</td>
<td>36</td>
<td>46</td>
<td>32 (37)</td>
<td>Less than Marginal Significance</td>
</tr>
<tr>
<td>20</td>
<td>20</td>
<td>36</td>
<td>46</td>
<td>32 (37)</td>
<td>More than Negligible Impact</td>
</tr>
</tbody>
</table>
Table 11-41 shows that with the same assumptions as used for the daytime noise, the resulting noise level from PA Announcements would be less than the existing background ‘early morning’ noise levels at all of the properties. However, in accordance with BS4142, and as a result of the acoustic features of the PA noise, a penalty of 5dB has been added to the predicted levels. Noise associated with the PA Announcements is therefore ‘of Less than Marginal Significance’ at all properties, other than Sunningdale Caravan Park, which is of more than marginal significance.

The predicted impact according to the assessment criteria based on examples within the IEMA guidelines, is negligible at all properties.

The WHO guidelines state that ‘for reasonable standard in bedrooms at night, individual noise events should not normally exceed 45dB LA_{max}'. The equivalent noise level outside the open window would have to be below 57dB LA_{max}. At this stage it is not possible to predict the LA_{max} levels, however, in order to achieve this standard at night, the maximum noise levels from the PA system would have to fall below the WHO 57dB outside an open window at all locations.

**Cambridgeshire Guided Busway and Standard Buses at Station Development.**

The development includes an extension of the Cambridgeshire Guided Busway from Milton Road to the station, plus additional buses will also service Cambridge Science Park Station. Buses will not be stabled and will have minimum dwell times. It is expected that both standard buses and Guided buses accessing the site will use Euro IV standard engines (or better).

In order to ascertain the noise emissions from these vehicles, noise measurements were carried out by Atkins on a similar section of the Busway. It was found that typical noise levels measured from the bus pass-bys at a similar location, away from main roads, bus stops and junctions, were 69 to71dB Leq at 10m. Maximum noise levels were measured to be around 73dB LA_{max} at 10m.
11.5.94 The noise level from the bus has been predicted using the assumption that it takes around 10 seconds for a bus to pass by, and therefore the noise from a bus is predicted to be $61\text{dB } L_{Aeq}$ at 10m (from $71-10\cdot\log(10\text{seconds})$).

11.5.95 At peak times there would be a guided bus movement approximately every 10 minutes to and from the station, which is 12 guided buses an hour. In addition to this, and based on the existing bus movements to the science park, there would be up to 12 standard buses in both directions.

<table>
<thead>
<tr>
<th>Table 0-41 – Example of Noise Predictions – Buses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage</td>
</tr>
<tr>
<td>Noise From Bus Pass-By</td>
</tr>
<tr>
<td>Passby Correction</td>
</tr>
<tr>
<td>Noise Level from One Bus</td>
</tr>
<tr>
<td>Number of Vehicles</td>
</tr>
<tr>
<td>Noise Level at 40m*</td>
</tr>
</tbody>
</table>

$LWA = 33 + 10\log Q - 10\log V - 10\log d$

*This simplified prediction is not comparable with more model prediction at Long Reach Road, due to bus turning circle

<p>| Table 0-42 – Prediction of Peak Time noise from the Guided Busway and Local Buses |
|---------------------------------|-------------------------------|-----------------|-----------------|-----------------|-----------------|
| Address                        | Nearest Distance to Bus (m)  | Lowest Measured | Predicted Average | Predicted Maximum | Predicted Impact from IEMA based criteria |
|                                 |                               | Daytime $L_{Aeq, 15\text{min}}$ Free-Field Noise Levels (dB) | $L_{Aeq, 1\text{hr}}$ (dB) | $L_{Amax}$ (dB) | |
| 36 Discovery Way               | 65                            | 41              | 33              | 45              | Negligible Impact |
| 36 Discovery Way-Garden        | 65                            | 41              | 32              | 44              | Negligible Impact |
| 40 Ribston Way                 | 175                           | 43              | 24              | 39              | Negligible Impact |</p>
<table>
<thead>
<tr>
<th>Property</th>
<th>Lmax</th>
<th>L eq</th>
<th>L Amax</th>
<th>L Aeq</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>78 Long Reach Road</td>
<td>100</td>
<td>43</td>
<td>32</td>
<td>47</td>
<td>Negligible</td>
</tr>
<tr>
<td>78 Long Reach Road-Garden</td>
<td>85</td>
<td>43</td>
<td>32</td>
<td>47</td>
<td>Negligible</td>
</tr>
<tr>
<td>54 Long Reach Road</td>
<td>40</td>
<td>43</td>
<td>38</td>
<td>50</td>
<td>Slight</td>
</tr>
<tr>
<td>54 Long Reach Road-Garden</td>
<td>20</td>
<td>43</td>
<td>41</td>
<td>53</td>
<td>Slight</td>
</tr>
<tr>
<td>32 Moss Bank</td>
<td>90</td>
<td>43</td>
<td>29</td>
<td>41</td>
<td>Negligible</td>
</tr>
<tr>
<td>Kerry’s Yard Caravan Park</td>
<td>65</td>
<td>46</td>
<td>33</td>
<td>45</td>
<td>Negligible</td>
</tr>
<tr>
<td>20 Sunningdale Caravan Park</td>
<td>180</td>
<td>46</td>
<td>25</td>
<td>37</td>
<td>Negligible</td>
</tr>
<tr>
<td>Sunningdale Caravan Park-yard</td>
<td>180</td>
<td>46</td>
<td>26</td>
<td>38</td>
<td>Negligible</td>
</tr>
</tbody>
</table>

11.5.96  According to the assessment threshold values which were based on assessment criteria based on examples within the IEMA guidelines, the change in noise would be Negligible at all properties other than 54 Long Reach Road, where the noise level increase is predicted to be a slight impact.

11.5.97  Maximum noise levels are predicted to be 12dB higher than predicted noise levels, as measured L\text{Amax} noise levels were 12dB higher than the predicted L\text{Aeq} at 10m. These values have been included in Table 11-43.

11.5.98  During off peak times the number of buses are expected to be lower, with the current timetable showing no buses before 6am, only three guided buses and three standard buses
between 6am and 7am going to the science park, just two standard buses after 8pm and only one standard bus after 11pm, per day.

11.5.99 In order to predict the worst case noise impact, the noise from six buses has been predicted at the nearest noise sensitive properties, and compared with the quietest night time noise levels at each property.

<table>
<thead>
<tr>
<th>Address</th>
<th>Nearest Distance to Bus (m)</th>
<th>Measured Night Time Free-Field Noise Levels (dB)</th>
<th>Predicted Average L_{A_{eq}, 5 min} (dB)</th>
<th>Predicted Maximum L_{A_{max}} (dB)</th>
<th>Predicted Impact from IEMA based criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>36 Discovery Way</td>
<td>65</td>
<td>34 (41 in late evening)</td>
<td>26</td>
<td>45</td>
<td>Negligible Impact</td>
</tr>
<tr>
<td>40 Ribston Way</td>
<td>175</td>
<td>34 (38 in late evening)</td>
<td>18</td>
<td>39</td>
<td>Negligible Impact</td>
</tr>
<tr>
<td>78 Long Reach Road</td>
<td>100</td>
<td>34 (38 in late evening)</td>
<td>26</td>
<td>47</td>
<td>Negligible Impact</td>
</tr>
<tr>
<td>54 Long Reach Road</td>
<td>40</td>
<td>34 (41 in late evening)</td>
<td>32</td>
<td>50</td>
<td>Slight Impact</td>
</tr>
<tr>
<td>32 Moss Bank</td>
<td>90</td>
<td>36 (41 in late evening)</td>
<td>23</td>
<td>41</td>
<td>Negligible Impact</td>
</tr>
<tr>
<td>Kerry’s Yard Caravan Park</td>
<td>65</td>
<td>36 (39 in late evening)</td>
<td>27</td>
<td>45</td>
<td>Negligible Impact</td>
</tr>
</tbody>
</table>
According to the assessment criteria based on examples within the IEMA guidelines, the change in noise would be Negligible at all properties other than 54 Long Reach Road, which is Slight. This assessment is worst case, as the impact is predicted to be lower between 6am and 7am, and between 8pm and 11pm, when noise levels were measured to be higher than those measured at the quietest time of the night.

The WHO guidelines state that ‘for reasonable standard in bedrooms at night, individual noise events should not normally exceed 45dB $L_{A_{max}}$’. The equivalent noise level outside the open window would be 57dB $L_{A_{max}}$. Therefore, the maximum noise levels from the buses have been predicted to fall well below the WHO night time external noise level values at all locations.

<table>
<thead>
<tr>
<th>Sunningdale Caravan Park</th>
<th>180</th>
<th>36 (39 in late evening)</th>
<th>19</th>
<th>37</th>
<th>Negligible Impact</th>
</tr>
</thead>
</table>

Table 0-43 – Prediction of Night time noise from the Guided Busway and Local Buses
Figure 0-6 - Development Noise Contour Map, with (a) and without (b) Road Traffic Noise
Plant Noise

11.5.102 It is understood that there will be ventilation equipment and air conditioning units for the main station building, and ventilation and comfort cooling in the retail units.

11.5.103 The Station building will contain ventilation equipment within the 1st floor level plant room, which will consist of a single air handling unit (AHU) and a separate extract fan unit. As both pieces of equipment will have double skin casing, the breakout levels are likely to be between 35 and 40dB at 1m. It is understood that transmitted noise emitted from the AHU on the air inlet and discharge openings will be dealt with by using inline attenuators, and no further mitigation would be required.

11.5.104 The air conditioning units within the building serving the internal rooms will have a total of three external condenser units/air heat pumps. Noise associated with each unit will be in the region of 49 dBA at 1m, it is understood that these units will be located on the facade of the station closest to the tracks.

11.5.105 The retail units within the building will also require mechanical ventilation and comfort cooling with external condenser units similar to the units for the main station building.

11.5.106 All plant will operate under a time switch regime, and will be off during periods when the building is unoccupied, which may still include some night time periods.

11.5.107 The Local Planning Authority have indicated that the noise from the plant should not increase the background sound levels by more than 3dB as a result of the specific noise from static plant and equipment at the boundary of the application site. In order to comply with this, the rating noise from the plant must not exceed measured background sound levels. The rating level, for BS4142, includes a correction for intermittency (3dB) plus distinctive sound characteristics (3dB), however the predictions do not include screening from the station building.

11.5.108 The station building is at least 50m from the boundary of the site, and the lowest measured night time background level is 31dB L_{A90}. Therefore, in order to ensure that the noise from the station plant is equal to the background sound at this location, the cumulative noise rating limit for all relevant plant should not exceed 25dB at the site boundary.
11.5.109 The (up to) six condenser units of 49dB at 1m would have a combined noise level of 57dB at 1m. At the site boundary, this predicted night time noise level is predicted to be 23dB, which is below 25dB, even without considering the effects of screening from the building or the time switch regime. Therefore, the noise from the AHU, extract fans, condenser units and air heat pumps at the station is predicted to be negligible and below the threshold indicated by the Local Authority. No mitigation is required.

**Railway Noise and Vibration**

11.5.110 The new train station will alter the some of the passenger train services along the existing railway line. Trains which previously travelled through Chesterton will now stop at the station, and one train service will continue past Cambridge and terminate at Chesterton. In order to accommodate this, 300 m of new track and a bay platform are proposed. The train movements are provided in Table 0-44.

**Table 0-44 – Details of Train Services**

<table>
<thead>
<tr>
<th>Train Service</th>
<th>Train Type</th>
<th>Existing Service</th>
<th>Service with Cambridge Science Park Station</th>
</tr>
</thead>
<tbody>
<tr>
<td>London Kings Cross – Kings Lynn</td>
<td>Electric Class 365</td>
<td>One train per hour in each direction, at 125kph</td>
<td>Stops at Chesterton</td>
</tr>
<tr>
<td>London Kings Cross to Cambridge</td>
<td>Electric Class 365/317</td>
<td>Currently terminates at Cambridge</td>
<td>Would terminate at Chesterton</td>
</tr>
<tr>
<td>Cambridge to Norwich Services</td>
<td>Diesel Class 170</td>
<td>One train per hour in each direction, at 125kph</td>
<td>Stops at Chesterton</td>
</tr>
<tr>
<td>Cross Country Stansted Airport to Birmingham New Street</td>
<td>Diesel Class 170</td>
<td>One train per hour in each direction, at 125kph</td>
<td>One train per hour in each direction, at 125mph</td>
</tr>
</tbody>
</table>

**Assessment of Noise Impact**

11.5.111 The noise impact from the altered train services have been predicted for railway traffic, which would be served by the proposed Railway Station in Chesterton.
11.5.112 The total noise ($L_{Aeq,1hr}$) from each of the lines has been predicted for a typical hour using the details above and guidance from within CRN, for each representative noise sensitive receptor. The details of the noise model input have been provided in Table 11-47, along with some example noise predictions. The noise model would also take into account distance corrections and ground topography.

0-45 – Example Noise Predictions - Railway

<table>
<thead>
<tr>
<th>Train Service</th>
<th>Train Service Correction</th>
<th>Number of Cars (+correction)</th>
<th>Existing Speed (+ Basic SEL Level)</th>
<th>Predicted Noise Level at 25m, for one train – Existing Situation</th>
<th>Proposed Speed Slowing for Station (+ Basic SEL Level)</th>
<th>Predicted Noise Level at 25m, for one train – Proposed Situation</th>
</tr>
</thead>
<tbody>
<tr>
<td>London Kings Cross – Kings Lynn</td>
<td>8.4dB (Electric Class 365)</td>
<td>4 (6dB)</td>
<td>125kph (73dB)</td>
<td>55</td>
<td>50kph (65dB)</td>
<td>47</td>
</tr>
<tr>
<td>London Kings Cross to Cambridge</td>
<td>11.3dB (Electric Class 365/317)</td>
<td>8 (9dB)</td>
<td>0</td>
<td>0</td>
<td>50kph (65dB)</td>
<td>53</td>
</tr>
<tr>
<td>Cambridge to Norwich Services</td>
<td>7.6dB (Diesel Class 170)</td>
<td>3 (5dB)</td>
<td>125kph (73dB)</td>
<td>53</td>
<td>50kph (65dB)</td>
<td>45</td>
</tr>
<tr>
<td>Cross Country Stansted Airport to Birmingham New</td>
<td>7.6dB (Diesel Class 170)</td>
<td>6 (8dB)</td>
<td>125kph (73dB)</td>
<td>56</td>
<td>125kph (73dB)</td>
<td>56</td>
</tr>
</tbody>
</table>
11.5.113 The results of the predictions with the scheme have been compared with the predicted noise levels from the existing situation. The predictions do not take into account a correction for ballast, but include the train slowing down and speeding up at the proposed station.

11.5.114 Curve squeal has not been considered, as this section of track is very straight, and curve squeal is unlikely to occur.

11.5.115 Worst case noise predictions were carried out to include two class 66 diesel freight trains with 10 wagons travelling at 60kph on the railway each hour. These predictions were consistently 1-2dB noisier. The frequency of freight trains is not expected to change with the scheme in place.

Table 0-46 – Railway Noise Predictions

<table>
<thead>
<tr>
<th>Address</th>
<th>Distance to Railway (m)</th>
<th>Predicted Average Railway Noise $L_{Aeq, 1hr}$ (dB)</th>
<th>Predicted Impact from IEMA based criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Without Development</td>
<td>With Development</td>
</tr>
<tr>
<td>36 Discovery Way</td>
<td>240</td>
<td>35</td>
<td>32</td>
</tr>
<tr>
<td>36 Discovery Way-Garden</td>
<td>230</td>
<td>35</td>
<td>32</td>
</tr>
<tr>
<td>40 Ribston Way</td>
<td>230</td>
<td>27</td>
<td>26</td>
</tr>
<tr>
<td>78 Long Reach Road</td>
<td>170</td>
<td>37</td>
<td>35</td>
</tr>
<tr>
<td>78 Long Reach Road-Garden</td>
<td>160</td>
<td>37</td>
<td>35</td>
</tr>
<tr>
<td>54 Long Reach Road</td>
<td>80</td>
<td>43</td>
<td>42</td>
</tr>
<tr>
<td>54 Long Reach</td>
<td>65</td>
<td>43</td>
<td>42</td>
</tr>
</tbody>
</table>
11.5.116 Close to the proposed station, where three of the four train services are slowing down, the change in noise levels are predicted to be negligible when compared with the existing situation. North of the station, with only two of the stopping trains operating at full speed, the change in noise is expected to be Slight and Beneficial.

11.5.117 South of the proposed station, and north of Cambridge Station, with trains travelling at full speed, the additional train service from Kings Cross could increase the noise levels alongside the railway line by up to 3dB. An increase of this magnitude is expected to have a slight impact, at those noise sensitive properties which are adjacent to the railway line. No mitigation is required as a result of the noise impact from railway noise.

11.5.118 There will be some ancillary noise associated with the stopping trains, such as doors opening, train dispatcher whistles, the voices of staff and passengers and the announcements from within the trains. However with the exception of the low level voices on the platforms, these short duration noises are predicted to be commensurate with the noise from the idling/moving trains at the station.

11.5.119 The noise contour maps of the combined railway and road traffic, both before and after the development, have been provided in Figures 1-6 and 1-7.
Figure 0-7 – Railway and Road Noise Contour Map Without Development

Figure 0-8 – Railway and Road Noise Contour Map With Development
Assessment of Vibration Impact

11.5.120 The vibration impact from the altered train services calling at the proposed new Cambridge Science Park Station has been predicted as a change between the existing vibration levels and predicted future vibration levels with the station in place. The details of the changes to the train service have been provided in Table 0-44.

11.5.121 As with the noise assessment, the vibration assessment does not include the freight trains on the railway line, as it is understood that the frequency of freight trains is not predicted to change with the proposed development.

11.5.122 The vibration assessment has been made using the initial assumption that all passenger trains cause the same level of vibration, and the number of trains has increased by one train per hour in each direction.

11.5.123 Using the equation for VDV from BS6472, the change in VDV level between the existing situation and future predicted noise levels is as follows;

\[ VDV_{dey} = \left( \frac{t_{dey}}{t_{e}} \right)^{0.25} VDV_{t} \]

Where VDV, and \( t_t \) is the same for each train, the equation can be converted to predict the change in noise level between the existing and future levels of vibration.

\[ VDV_{\text{percentage change}} = \left[ \frac{N_f}{N_e} \right]^{0.25} \times 100 - 100 \]

Where the \( N_f \) and \( N_e \) are the number of trains per hour in the future and existing situation respectively.

11.5.124 The results of this calculation show that the VDV value is only predicted to increase by 7% in the future situation, when compared with the existing situation. A change in VDV of 7% is not considered to be significant, as vibration from passenger trains was not perceptible during the noise survey.
11.5.125 In addition to this, trains pulling in and out of the station are slower, and therefore the rails are expected to be subject to less force from the unsprung mass of the train, therefore the change in vibration close to the proposed station is predicted to be less than 7%.

11.5.126 The joints in rails, as a result of point work, can be responsible for vibration impacts. The only new points introduced to the rails as part of the scheme, are replacement points for the freight trains. The change in levels of vibration from new points is expected to be negligible, when compared with levels from the existing points.
Cumulative Impact

11.5.127 The cumulative impact has been predicted for all time periods assessed; early morning, daytime, evening and night time. However, the cumulative BS4142 impact has not been predicted, because PA and transportation noise is not covered by the guidance within BS4142:2014.

11.5.128 The noise from station plant was not included in the assessment, as it was predicted to be more than 10dB below the measured ambient levels at the nearest representative property, and therefore unlikely to contribute to the cumulative levels.

11.5.129 The overall early morning (05:00 to 07:00) noise levels from the station have been provided below for each representative noise receptor and compared with the lowest measured noise levels at that location. The noise from the railway and road has not been included, as the change was predicted to be negligible at all noise sensitive receptors, and the measured levels include the noise from the roads and railway. The noise levels were combined using a ‘log sum’ of all the lowest measured values and the predicted values for the car park, pick up point, announcements and buses.

Table 0-47 – Cumulative Early Morning (5am to 7am) Impact of the Station when compared with Lowest Measured Ambient Noise Levels.

<table>
<thead>
<tr>
<th>Address</th>
<th>Lowest Measured Daytime $L_{A_{eq}}$, 15 min Free-Field Noise Levels (dB)</th>
<th>Predicted Peak Time Noise from Car Park $L_{A_{eq}}$, 1 hr (dB)</th>
<th>Predicted Peak Time Noise from Pick Up Point $L_{A_{eq}}$, 1 hr (dB)</th>
<th>Predicted Noise from PA Announcements $L_{A_{eq}}$, 1 hr (dB)</th>
<th>Predicted Off Peak Time Noise Level from Buses $L_{A_{eq}}$, 1 hr (dB)</th>
<th>Combined Noise Level $L_{A_{eq}}$, 5 min (dB)</th>
<th>Predicted Impact from IEMA based criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>36 Discovery Way</td>
<td>41</td>
<td>32</td>
<td>30</td>
<td>27</td>
<td>26</td>
<td>42</td>
<td>Slight Impact</td>
</tr>
<tr>
<td>Location</td>
<td>Number</td>
<td>Year 1</td>
<td>Year 2</td>
<td>Year 3</td>
<td>Year 4</td>
<td>Impact</td>
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<td></td>
</tr>
<tr>
<td>40 Ribston Way</td>
<td>43</td>
<td>28</td>
<td>24</td>
<td>23</td>
<td>18</td>
<td>Negligible Impact</td>
<td></td>
</tr>
<tr>
<td>78 Long Reach Road</td>
<td>43</td>
<td>33</td>
<td>35</td>
<td>31</td>
<td>26</td>
<td>Slight Impact</td>
<td></td>
</tr>
<tr>
<td>54 Long Reach Road</td>
<td>43</td>
<td>31</td>
<td>36</td>
<td>32</td>
<td>32</td>
<td>Slight Impact</td>
<td></td>
</tr>
<tr>
<td>32 Moss Bank</td>
<td>43</td>
<td>27</td>
<td>28</td>
<td>25</td>
<td>23</td>
<td>Negligible Impact</td>
<td></td>
</tr>
<tr>
<td>Kerry's Yard Caravan Park</td>
<td>46</td>
<td>24</td>
<td>29</td>
<td>35</td>
<td>27</td>
<td>Negligible Impact</td>
<td></td>
</tr>
<tr>
<td>20 Sunningdale Caravan Park</td>
<td>46</td>
<td>32</td>
<td>32</td>
<td>39</td>
<td>19</td>
<td>Slight Impact</td>
<td></td>
</tr>
</tbody>
</table>
The overall day time (07:00 to 19:00) noise levels from the station have been provided below for each representative noise receptor and compared with the lowest measured noise levels at that location. The noise from the railway and road has not been included, as the change was predicted to be negligible at all noise sensitive receptors, and the measured levels include the noise from the roads and railway. The noise levels were combined using a ‘log sum’ of all the lowest measured values and the predicted values for the car park, pick up point, announcements and buses.

Table 0-48 – Cumulative Daytime Impact of the Station when compared with Lowest Measured Ambient Noise Levels.

<table>
<thead>
<tr>
<th>Address</th>
<th>Lowest Measured Daytime $L_{A_{eq, 15\text{ min}}}$ Free-Field Noise Levels (dB)</th>
<th>Predicted Peak Time Noise from Car Park $L_{A_{eq, 1hr}}$ (dB)</th>
<th>Predicted Peak Time Noise from Pick Up Point $L_{A_{eq, 1hr}}$ (dB)</th>
<th>Predicted Noise from PA Announcements $L_{A_{eq, 1hr}}$ (dB)</th>
<th>Predicted Peak Time Noise Level from Buses $L_{A_{eq, 1hr}}$ (dB)</th>
<th>Combined Noise Level $L_{A_{eq, 1hr}}$ (dB)</th>
<th>Predicted Impact from IEMA based criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>36 Discovery Way</td>
<td>41</td>
<td>32</td>
<td>30</td>
<td>27</td>
<td>33</td>
<td>42</td>
<td>Slight Impact</td>
</tr>
<tr>
<td>36 Discovery Way - Garden</td>
<td>41</td>
<td>33</td>
<td>30</td>
<td>27</td>
<td>32</td>
<td>42</td>
<td>Slight Impact</td>
</tr>
<tr>
<td>40 Ribston Way</td>
<td>43</td>
<td>28</td>
<td>24</td>
<td>23</td>
<td>24</td>
<td>43</td>
<td>Negligible Impact</td>
</tr>
<tr>
<td>78 Long Reach Road</td>
<td>43</td>
<td>33</td>
<td>35</td>
<td>31</td>
<td>32</td>
<td>44</td>
<td>Slight Impact</td>
</tr>
<tr>
<td>78 Long Reach</td>
<td>43</td>
<td>33</td>
<td>35</td>
<td>30</td>
<td>32</td>
<td>44</td>
<td>Slight Impact</td>
</tr>
<tr>
<td>Location</td>
<td>43</td>
<td>31</td>
<td>36</td>
<td>32</td>
<td>38</td>
<td>45</td>
<td>Impact</td>
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</tr>
<tr>
<td>54 Long Reach Road</td>
<td>30</td>
<td>37</td>
<td>32</td>
<td>41</td>
<td>46</td>
<td>Slight Impact</td>
<td></td>
</tr>
<tr>
<td>Road Garden</td>
<td>43</td>
<td>27</td>
<td>28</td>
<td>25</td>
<td>29</td>
<td>43</td>
<td>Negligible Impact</td>
</tr>
<tr>
<td>32 Moss Bank</td>
<td>24</td>
<td>29</td>
<td>35</td>
<td>33</td>
<td>47</td>
<td>Negligible Impact</td>
<td></td>
</tr>
<tr>
<td>Kerry’s Yard Caravan Park</td>
<td>46</td>
<td>32</td>
<td>32</td>
<td>39</td>
<td>25</td>
<td>47</td>
<td>Slight Impact</td>
</tr>
<tr>
<td>20 Sunningdale Caravan Park</td>
<td>46</td>
<td>33</td>
<td>37</td>
<td>40</td>
<td>26</td>
<td>48</td>
<td>Slight Impact</td>
</tr>
<tr>
<td>Sunningdale Caravan Park-yard</td>
<td>46</td>
<td>32</td>
<td>37</td>
<td>40</td>
<td>26</td>
<td>48</td>
<td>Slight Impact</td>
</tr>
</tbody>
</table>
The overall worst case evening (19:00 to 23:00) noise levels from the station have been provided below for each representative noise receptor and compared with the lowest measured evening levels at that location. Due to higher ambient noise levels and a greater amount of station activity, daytime noise impact is considered to be more representative of the early evening period (around 19:00 to 21:00). The noise from the railway and road has not been included, as the change was predicted to be negligible at all noise sensitive receptors, and the measured levels include the noise from the roads and railway. The noise levels were combined using a 'log sum' of all the lowest measured values and the predicted values for the car park, pick up point, announcements and buses.

Table 0-49 - Cumulative Worst Case Evening (7pm to 11pm) Impact of the Station when compared with Lowest Measured Ambient Noise Levels.

<table>
<thead>
<tr>
<th>Address</th>
<th>Lowest Measured Evening $L_{Aeq, \ 15 \ min}$ Free-Field Noise Levels (dB)</th>
<th>Predicted Off Peak Noise from Car Park $L_{Aeq, \ 5 \ min}$ (dB)</th>
<th>Predicted Off Peak Noise from Pick Up Point $L_{Aeq, \ 5 \ min}$ (dB)</th>
<th>Predicted Noise from PA Announcements $L_{Aeq, \ 5 \ min}$ (dB)</th>
<th>Predicted Off Peak Noise Level from Buses $L_{Aeq, \ 5 \ min}$ (dB)</th>
<th>Combined Noise Level $L_{Aeq}$ (dB)</th>
<th>Predicted Impact from IEMA based criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>36 Discovery Way</td>
<td>41</td>
<td>26</td>
<td>24</td>
<td>27</td>
<td>26</td>
<td>42</td>
<td>Negligible Impact</td>
</tr>
<tr>
<td>40 Ribston Way</td>
<td>38</td>
<td>22</td>
<td>18</td>
<td>23</td>
<td>18</td>
<td>38</td>
<td>Negligible Impact</td>
</tr>
<tr>
<td>78 Long Reach Road</td>
<td>38</td>
<td>27</td>
<td>29</td>
<td>31</td>
<td>26</td>
<td>40</td>
<td>Slight Impact</td>
</tr>
<tr>
<td>54 Long Reach Road</td>
<td>41</td>
<td>25</td>
<td>30</td>
<td>32</td>
<td>32</td>
<td>42</td>
<td>Slight Impact</td>
</tr>
</tbody>
</table>

375
<table>
<thead>
<tr>
<th>Location</th>
<th>41</th>
<th>22</th>
<th>22</th>
<th>25</th>
<th>23</th>
<th>41</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>32 Moss Bank</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Negligible</td>
</tr>
<tr>
<td>Kerry’s Yard Caravan Park</td>
<td>39</td>
<td>18</td>
<td>23</td>
<td>35</td>
<td>27</td>
<td>41</td>
<td>Slight Impact</td>
</tr>
<tr>
<td>20 Sunningdale Caravan Park</td>
<td>39</td>
<td>26</td>
<td>26</td>
<td>39</td>
<td>19</td>
<td>42</td>
<td>Slight Impact</td>
</tr>
</tbody>
</table>
11.5.132 The overall night time noise levels (23:00 to 05:00) from the station have been provided below for each representative noise receptor and compared with the lowest measured noise levels at that location. The noise from the railway and road has not been included, as the change was predicted to be negligible at all noise sensitive receptors, and the measured levels include the noise from the roads and railway. The noise levels were combined using a ‘log sum’ of all the lowest measured values and the predicted values for the car park, pick up point, announcements and buses.

Table 0-50 – Night Time Impact of the Station when compared with Lowest Measured Ambient Noise Levels.

<table>
<thead>
<tr>
<th>Address</th>
<th>Lowest Measured Night time $L_{Aeq, 5 \text{ min}}$ Free-Field Noise Levels (dB)</th>
<th>Predicted Off Peak Noise from Car Park $L_{Aeq, 5 \text{ min}}$ (dB)</th>
<th>Predicted Off Peak Noise from Pick Up Point $L_{Aeq, 5 \text{ min}}$ (dB)</th>
<th>Predicted Off Peak Noise Level from Buses $L_{Aeq, 5 \text{ min}}$ (dB)</th>
<th>Combined Noise Level $L_{Aeq, 5 \text{ min}}$ (dB)</th>
<th>Predicted Impact from IEMA based criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>36 Discovery Way</td>
<td>34</td>
<td>26</td>
<td>24</td>
<td>26</td>
<td>36</td>
<td>Slight Impact</td>
</tr>
<tr>
<td>40 Ribston Way</td>
<td>34</td>
<td>22</td>
<td>18</td>
<td>18</td>
<td>34</td>
<td>Negligible Impact</td>
</tr>
<tr>
<td>78 Long Reach Road</td>
<td>34</td>
<td>27</td>
<td>29</td>
<td>26</td>
<td>36</td>
<td>Slight Impact</td>
</tr>
<tr>
<td>54 Long Reach Road</td>
<td>34</td>
<td>25</td>
<td>30</td>
<td>32</td>
<td>37</td>
<td>Slight Impact</td>
</tr>
<tr>
<td>32 Moss Bank</td>
<td>36</td>
<td>22</td>
<td>22</td>
<td>23</td>
<td>37</td>
<td>Negligible Impact</td>
</tr>
<tr>
<td>Kerry’s Yard Caravan Park</td>
<td>36</td>
<td>18</td>
<td>23</td>
<td>27</td>
<td>37</td>
<td>Negligible Impact</td>
</tr>
<tr>
<td>20 Sunningdale</td>
<td>36</td>
<td>26</td>
<td>26</td>
<td>19</td>
<td>37</td>
<td>Negligible Impact</td>
</tr>
</tbody>
</table>
11.6 Mitigation Measures

11.6.1 The station development is predicted to cause a slight impact at all of the nearest noise sensitive receptors, by increasing the noise levels by up to 3dB when compared with the lowest measured noise levels.

11.6.2 The noise from the Pick Up Point was predicted to cause an adverse impact for the properties on Long Reach Road, in accordance with BS4142:2014, and the Public Address System is predicted to cause an increase of more that Marginal significance at Sunningdale Caravan Park.

11.6.3 The noise calculations of the PA announcements on the platforms assumed that the announcements would not occur during the night time hours of 23:00 to 05:45.

11.6.4 In order to reduce the noise impact of the Development at noise sensitive properties, two barriers have been proposed as part of the scheme.

Concrete Barrier for Sunningdale Caravan Park

11.6.5 A 270m long, 19cm thick, precast concrete barrier, 3m above existing ground (2.5m above the platform height), has been proposed along the length of Platform 1, next to the caravan park. Table 0-51 provides details of the predicted reduction in noise with the barrier in place when compared with the most significant sources of noise, for this property.

<table>
<thead>
<tr>
<th>Table 0-51 – Noise Reduction from Sunningdale Noise Barrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zoned PA Noise Without Barrier</td>
</tr>
<tr>
<td>--------------------------------</td>
</tr>
<tr>
<td>Sunningdale property</td>
</tr>
<tr>
<td>Sunningdale Yard</td>
</tr>
</tbody>
</table>
11.6.6 The barrier would effectively reduce the BS4142 rating levels from the PA and Drop-offs to less than 5dB above background sound levels, as well as reducing the noise from Trains. These numbers are indicative, as the effectiveness of the barrier on the PA system will be dependent on the ultimate location of the speakers.

11.6.7 With the barrier in place, noise levels from the PA would be reduced to marginal impact and Taxi Drop off would be reduced to low impact in the yard and adverse impact at the property.

**Woven Willow Acoustic Barrier for Long Reach Road**

11.6.8 A 115m long woven willow, 2.5m above existing ground, has been proposed between the gardens of the properties on Long Reach Road and the Site.

11.6.9
11.6.10 Table 0-52 provides details of the predicted reduction in noise with the barrier in place, when compared with the most significant sources of noise for these properties.
Table 0-52 – Noise Reduction from Long Reach Barrier

<table>
<thead>
<tr>
<th></th>
<th>Bus Noise Without Barrier</th>
<th>Bus Noise With Barrier</th>
<th>Difference in Noise</th>
<th>Taxi Drop Off Noise Without Barrier</th>
<th>Taxi Drop Off Noise With Barrier</th>
<th>Difference in Noise</th>
</tr>
</thead>
<tbody>
<tr>
<td>54 Long Reach Road property</td>
<td>38dB</td>
<td>34dB</td>
<td>4dB</td>
<td>36dB</td>
<td>34dB</td>
<td>2dB</td>
</tr>
<tr>
<td>54 Long Reach Road garden</td>
<td>41dB</td>
<td>33dB</td>
<td>8dB</td>
<td>37dB</td>
<td>30dB</td>
<td>7dB</td>
</tr>
<tr>
<td>50 Long Reach Road garden</td>
<td>39dB</td>
<td>31dB</td>
<td>8dB</td>
<td>34dB</td>
<td>30dB</td>
<td>4dB</td>
</tr>
<tr>
<td>52 Long Reach Road garden</td>
<td>40dB</td>
<td>32dB</td>
<td>8dB</td>
<td>36dB</td>
<td>30dB</td>
<td>6dB</td>
</tr>
<tr>
<td>56 Long Reach Road garden</td>
<td>41dB</td>
<td>33dB</td>
<td>8dB</td>
<td>38dB</td>
<td>31dB</td>
<td>7dB</td>
</tr>
<tr>
<td>58 Long Reach Road garden</td>
<td>39dB</td>
<td>34dB</td>
<td>5dB</td>
<td>38dB</td>
<td>34dB</td>
<td>4dB</td>
</tr>
</tbody>
</table>
11.6.11 The barrier would effectively reduce the BS4142 rating levels from the Buses and Drop-offs to less than 5dB above background sound levels, as well as reducing the noise from Trains and the rest of the site.

11.6.12 With the barrier in place, noise levels from the buses would be reduced to negligible impact and noise from Taxi Pick up and Drop off would be reduced to low impact in the gardens and at the properties.

11.7 Uncertainty of Assessment

11.7.1 There is some uncertainty in the calculations arising from the following:

- The Assumptions made for the Construction Plant
- The Assumptions made for the Operational Assessment
- The validity of the data obtained from the noise survey

11.7.2 The construction plant on site, plus the construction programme have been based on assumptions on plant types, on-times and the combination of equipment used at the same time, for each stage of the works. The noise levels provided are average values; instantaneous noise levels will be higher when all equipment is in operation at the same time.

11.7.3 The predictions for operational noise have been based on advice and assumptions for the number of vehicles and people using the site, the location and design of the plant at the time of this assessment, and does not take into account any potential future growth of the station.

11.7.4 Finally, the data from the noise measurements provide indicative information of the noise climate at Chesterton. The noise measurements were short-term measurements taken during two days during June 2012 and do not provide any information regarding the daily or seasonal variation in noise levels. However, the wind conditions were still during much of the noise survey, the effects of wind noise and a dominant wind direction are minimised, which reduces the uncertainty in the noise measurements.
11.8 Summary and Conclusions

11.8.1 This chapter considers the potential noise and vibration impacts of the Development, both during construction and operation.

11.8.2 The assessment was undertaken in accordance with a number of key standards and guidance documents, and with reference to the measured ambient noise levels in and around the study area. The noise impact was based on the lowest measured noise levels.

11.8.3 The site is currently used by Freightliner for storing and distributing aggregate, and the noise from the current operation of the site can increase the ambient noise levels by up to 17dB at the nearest noise sensitive properties, when compared with the lowest measured ambient noise levels at the site.

11.8.4 The following impacts have been considered;

- Construction noise
- Construction vibration
- Noise from the Station development
- Rail traffic noise
- Road traffic noise
- Cumulative Impact

11.8.5 A summary of impacts and recommendations is provided below.

Construction Noise

11.8.6 Noise levels have been predicted at the closest noise sensitive properties for a range of construction activities, incorporating the likely plant and equipment to be employed during the phases of construction.

11.8.7 Construction noise from activities on-site could give rise to a significant impact at noise sensitive receptors, especially those within 20m of site during daytime works and all activities during the night.
However, the results of these predictions indicate that no properties would be eligible for Noise Insulation.

Temporary noise barriers around the site would reduce noise levels by up to 10dB, which would reduce all daytime workings, other than track works, to below significant noise levels. In addition, good working practices, as well as minimising the noisiest activities adjacent to noise sensitive properties at night, would minimise the extent of significant construction noise effects. A number of generic noise control measures were described in this report. The Construction Environmental Management Plan (CEMP) describes these measures in further detail.

Night time works will be kept to a minimum, as all disruptive night time works are scheduled to take place over the same weekends. Similar night time construction works already occur on the railway tracks as a matter of course, in order to replace rails, maintain points, carry out tamping and other noisy activities.

**Construction Vibration**

The construction of foundations for the new buildings may require piling. In order to reduce the impact from piling, it is recommended that rotary bored piling is the chosen method of working wherever possible.

**Road traffic noise**

An increase in traffic flows by 25% or a decrease by 20% would result in a 1 dB noise change. It is expected that the additional road traffic generated by the proposed development would be of sufficiently low volume not to affect the existing road network, on all but one of the roads. A small decrease in noise has been predicted on Station Road, Cambridge.

The impact on the road network has been predicted using noise modelling software, and it is expected that the impact from changes in traffic on the road network will result in a negligible change in noise at all properties.

**Noise from Station Car Park**

As part of the development, a 450 space car park has been proposed at the station.
11.8.15 The resulting daytime and night time noise levels from car park activities has been calculated as being a negligible impact at all properties, in accordance with the assessment criteria based on examples within the IEMA guidelines.

11.8.16 Also, in accordance with BS4142, the noise associated with car park activities is of less than adverse impact at all representative receptors.

Noise from Pick Up and Drop Off Area

11.8.17 As part of the development, there will be a taxi rank and an area for others to be picked up and dropped off at the station.

11.8.18 The resulting daytime and night time noise levels associated with taxis, and pick up and drop off activities has been calculated as being a slight impact at Long Reach Road and negligible at all other properties, in accordance with the assessment criteria based on examples within the IEMA guidelines.

11.8.19 Also, in accordance with BS4142, the noise associated with car park activities indicates that the noise is less than adverse impact at all representative properties, other than properties and gardens on Long Reach Road which are predicted to have an adverse impact, plus the yard of the nearest plot on Sunningdale Caravan Park, for daytime only. This plot at Sunningdale Caravan Park is not currently occupied.

11.8.20 The proposed noise mitigation would reduce the impact from the taxis and drop off to a low impact (BS4142).

Noise from PA Announcements

11.8.21 In accordance with BS4142, the noise levels from the PA announcements were considered to be of less than marginal significance at all properties, other than Sunningdale Caravan Park and yard. This plot at Sunningdale Caravan Park is not currently occupied.

11.8.22 The mitigation proposed would reduce the impact to marginal significance or less that all properties, during the evening and daytime.
However, all daytime and early morning impacts were considered slight, in accordance with the assessment criteria based on examples within the IEMA guidelines.

At night there will be no noise generated by the PA system as it will not operational when the Station is closed and the system will not operate between 23:00 and 05:45.

**The Guided Busway and Local Buses**

The extension to the Guided Busway is predicted have a slight impact at Long Reach Road and Negligible impact at all other representative properties.

The noise barriers proposed would reduce this impact to negligible at 54 Long Reach Road.

**Railway Noise and Vibration**

The proposed station development would enable an additional train service to use the railway line. Additional trains are unlikely to significantly increase the noise or vibration levels at the nearest noise sensitive receptors. The reduced speed of the stopping trains reduces the associated noise and vibration levels.

**Cumulative Impact**

The cumulative noise impacts were assessed in accordance with the IEMA example criteria, which showed that the increase in daytime noise at all properties would be no greater than slight.

The changes in noise early morning, evening and night time are also predicted to be no greater than slight at all properties.

With regard to the guidance from within IEMA, none of the properties are expected to be subjected to intrusive or disruptive noise levels at any time of day.
12. TRANSPORT AND ACCESS

Introduction

12.1 This chapter is concerned with the potential transport and traffic environmental impacts resulting from the Development.

12.2 The existing traffic conditions on the surrounding highway network have been assessed and are presented within the baseline conditions section of this chapter. An assessment has been made of the potential traffic impacts arising from the Development, which considers both the short term construction impacts and the long term operational traffic implications resulting from the proposals.

12.3 A TA, (Appendix 26) has also been produced in support of the Development. The findings of the TA have been utilised as part of environmental assessment and are referenced in this chapter where applicable.

12.4 As part of the transport study a transport policy review has been undertaken based on the following policy documents:

- NPPF (March 2012)
- Cambridgeshire and Peterborough’s Structure Plan (March 2003) (now part of Regional Spatial Strategy for East of England 2010)
- Cambridgeshire Local Transport Plan 2011-2026 (March 2011)
- SCDC Local Development Framework (various)
- CCIC Local Plan 2006
- Cambridge City Council Local Plan 2014: Proposed Submission (July 2013); and
- South Cambridgeshire Local Plan 2014: Proposed Submission (July 2013).

12.5 It is considered that the Development will meet the principal objectives of the key policy documents and its delivery is mentioned as a key policy objective. The Site will promote sustainable modes of travel by its very nature. In addition the proposed development will include; sufficient cycle parking storage for passengers to encourage sustainable travel to/from the station, a sufficient number of car parking spaces to meet necessary demand without over
provision, appropriate access for disabled passengers, a direct link to the Busway and safe &
convenient cycle & pedestrian access.

12.6 The location of Development will also encourage existing Cambridge Station passengers,
currently travelling by private car or other travel modes, to avoid the city centre by offering an
attractive alternative option to Cambridge City Centre Rail Station.

Assessment Methodology and Significance Criteria

Scope of Assessment

12.7 The scope and methodology employed for this ES has been developed in consultation with
CCoC. The assessment of the traffic has been carried out in accordance with Department for
Transport’s (DfT) Planning Practice Guidance ‘Travel Plans, transport assessments and statements
in decision making’ (March 2014). In addition, the impact has also been assessed with reference
to the Institute for Environmental Management and Assessment (IEMA) guidelines\(^ {57}\). Since the
submission of the original planning application for the Extant Consent, the IEMA Guidelines have
been replaced with ‘Planning Practice Guidance: Environmental Assessment: Preparing an
Environmental Statement (March 2014)’. This report will continue to refer to IEMA guidelines as
the guidance is in line with the requirements outlined in the Planning Practice Guidance.

12.8 The IEMA guidelines suggest a range of topics to be considered when determining the
magnitude and significance of the environmental impact of development proposals. These topics
include noise, vibration, severance, driver and pedestrian delay, fear and intimidation, accidents
and safety, hazardous loads, dust and dirt and ecological effects. It is likely that the development
will not have any effect on some of these factors.

12.9 It is outside the remit and competence of this chapter to assess the impact the additional
traffic has directly upon levels of ‘fear’ however this chapter does assess the impact of the
predicted increase in HGVs, accessing the development during the construction phase, that might
be used as a proxy for ‘fear and intimidation’ impacts. This chapter focuses upon the impacts of
the additional traffic, as per the environmental guidelines, rather than a measure of
‘environmental capacity’. Data relating to overall levels of additional traffic and additional HGV
traffic are provided.

\(^ {57}\) Guidelines for the Environmental Assessment of Road Traffic (Institute of Environmental
Assessment)
12.8 The methodology used for the assessment is as follows:

- The existing traffic conditions on the surrounding highway network have been assessed and are presented within the baseline conditions section.
- The principal routes used within the study area have been identified, as have the junctions on the surrounding highway network that may potentially be affected by the Development. The traffic assignment and hence the access routes have been derived from the TA in consultation with CCoC.
- Traffic flows have been determined from CCoC’s SATURN model in conjunction with traffic count surveys and the Cambridge Sub Regional Model (‘CSRM’).
- Personal Injury Accident (‘PIA’) data for the immediate highway network has been obtained and analysed to identify any road safety issues which are likely to be exacerbated by the presence of operational and construction traffic.
- Peak (worst case) and normal day operational traffic generation for the Development has been estimated based on a robust 600 space rail station car park (150 spaces larger than that proposed).
- Peak (worst case) and normal day construction traffic generation for the scheme has been estimated based on a worst case day where potential contaminated land is to be excavated in addition to an average day during construction of the station.
- An assessment has been made of traffic changes/impacts arising from the construction and operation of the station.
- The traffic impact and environmental impacts of the proposed traffic have been assessed with reference to the thresholds stated within the IEMA guidelines.
- Mitigation measures to reduce any adverse effects resulting from increased traffic have been developed as necessary.

12.9 Air quality and Noise are described in Chapters 5 and 11, respectively. This chapter does not therefore assess the impact of noise and air quality.

**Extent of the Study Area**

12.10 The following roads have been assessed in terms of development traffic impact:

- Cowley Road;
- Milton Road between A14 interchange and Elizabeth Way;
- Green End Road/Chesterton High Street;
- Kings Hedges Road between Cowley Road and St. Kilda Avenue;
- Union Lane;
- Arbury Road; and
- Elizabeth Way.

12.11 These links are identified in Figure 12.1.

Figure 12.1 – Study Area
12.12 The impact on pedestrian, cyclists and public transport has been assessed on the immediate area surrounding the Site.

12.13 A detailed capacity analysis (using LinSig and ARCADY) has been undertaken on the roads that surround the Site. The details of these assessments are provided within the TA.

**Significance Criteria**

12.14 IEMA guidelines state two ‘rules of thumb’ regarding the scope of the links that should be assessed for EIA purposes. The first rule advises on the inclusion of highway links where traffic flows will increase by more than 30% (or the number of heavy goods vehicles will increase by more than 30%).

12.15 The second rule of the IEMA guidelines regarding the scope of the links that should be assessed for EIA purposes advises on the inclusion of any specifically sensitive areas where total traffic flows have increased by 10% or more.

12.16 The key receptors of traffic impact are predominantly related to human health and wellbeing and relate to pedestrians, local residents, cyclists and other road users. These receptors have been considered during the determination of the significance of the effect and are described in more detail later in this chapter.

12.17 The following receptors have been used to determine the significance of each impact:

- Traffic growth (development traffic)
- Vehicle delay & queue length
- Pedestrian and cycle delay
- Pedestrian and cycle safety
- Fear and Intimidation
- Severance
- Public Transport provision
- Public Transport delay
12.20 The significance of the environmental effects is determined by the ‘magnitude of impact’ and the value / importance of the affected asset or resource. The overall methodology can be summarised as a three-step process, as follows:

- The determination of the value of a resource or receptor and its sensitivity to an impact;
- Prediction of the magnitude of the impact of the Development; and,
- Determination of the nature and extent of the effect resulting from impact (of a certain magnitude) on a resource (of a particular value) and its severity and significance.

12.21 More specifically the degree of significance has been determined in accordance with the DMRB Volume 11 guidelines HA 205/08 ‘Assessment and Magnitude of Environmental Effects’. This provides typical descriptors and criteria for magnitude of impact (degree of change) and receptor sensitivity but does not provide specific descriptors for the assessment of road traffic.

12.22 The typical significance of effects categories as detailed in Table 12.1 have been taken from the DMRB guidelines and used in this assessment.

### Table 12.1 – Establishing the Significance of Effect

<table>
<thead>
<tr>
<th>Environmental Value (Sensitivity)</th>
<th>Magnitude of Change</th>
<th>Negligible</th>
<th>Minor</th>
<th>Moderate</th>
<th>Major</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very High</td>
<td>Slight</td>
<td>Moderate or Large</td>
<td>Large or Very Large</td>
<td>Very Large</td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>Slight</td>
<td>Slight or Moderate</td>
<td>Moderate or Large</td>
<td>Large or Very Large</td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>Neutral or Slight</td>
<td>Slight</td>
<td>Moderate</td>
<td>Moderate or Large</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>Neutral or Slight</td>
<td>Neutral or Slight</td>
<td>Slight</td>
<td>Slight or Moderate</td>
<td></td>
</tr>
<tr>
<td>Negligible</td>
<td>Neutral</td>
<td>Neutral or Slight</td>
<td>Neutral or Slight</td>
<td>Slight</td>
<td></td>
</tr>
</tbody>
</table>

* Nb: Scoring can be either Beneficial or Adverse*
12.23 The guidance states that “change can be either beneficial or adverse, and effects can also, therefore, be either beneficial or adverse. In some cases the significance is shown as being one of two alternatives. In these cases a single description should be decided upon with reasoned judgement for that level of significance chosen.”

12.24 It should be noted that where the existing base line traffic flows are very minor, an increase of only a few vehicles would produce a large change in magnitude whereas in real terms the increase in traffic may still be considered to be neutral or slight. Such an assessment requires appropriate judgements to be made.

12.25 The determination of the importance/sensitivity of the receptors and the magnitude of change specifically relating to road traffic have been informed by the Institute for Environmental Management and Assessment (IEMA) ‘Guidelines for the Environmental Assessment of Road Traffic’ however as stated above, degree of professional judgement has been applied. This assessment is included in the sections of this chapter that follow.

12.26 For the purpose of this report, the potential traffic magnitude of impacts resulting from the Development are classified as follows:

- Negligible Change/Impact: The traffic from the Development creates no perceptible change on the surrounding highway network;
- Minor Change/Impact: The traffic from the Development creates a scarcely perceptible change on the surrounding highway network;
- Moderate Change/Impact: The traffic from the Development creates a noticeable change on the surrounding highway network; and,
- Major Change/Impact: The traffic from the Development creates a significant change on the surrounding highway network.

12.27 Other than percentage impact in traffic flows, and the results of junction capacity analysis carried out within the TA, no quantifiable range is available to determine the magnitude of each change on key receptors. As such, in all cases a degree of professional judgement has been applied when determining the significance of the effects, taking into account all local conditions. The effects have been considered for users of the highway network and for any key receptors potentially impacted upon by the changes in traffic conditions.
In the assessment of residual effects (post mitigation) these are categorised as direct / indirect and an assessment of the duration of impact made with each impact being classed as permanent or temporary and either short, medium or long term.

Importance of Receptors/Resources

12.29 The IEMA Guidance makes it clear that a “critical feature of Environmental Assessment is determining whether a given impact is significant.” Further, “for many effects there are no simple rules or formulae which define thresholds of significance and there is, therefore, a need for interpretation and judgement on the part of the assessor backed up by data or quantified information whenever possible. Such judgements will include the assessment of the numbers of people experiencing a change in environmental impact”.

12.30 Categories of receptor sensitivity have been defined from the principles set out in the IEMA Guidance, including the following:

- The need to identify particular groups or locations which may be sensitive to changes in traffic conditions; and
- The identification of links or locations where it is felt that specific environmental problems may occur.

12.31 Although not specifically identified within the IEMA Guidance, it considered necessary that residential properties and employment areas should be considered in the assessment. In broad terms, for the purpose of this assessment, the relative sensitivity, importance or value of a resource or receptor has been derived from an assessment of:

- The number of individual receptors, such as residents;
- An empirical assessment on the basis of characteristics such as condition/location; and
- A receptor’s ability to absorb change.
12.32 The main vulnerable receptors have been identified using IEMA Guidance, site investigations and the aforementioned scoping discussions had with CCoC. The identified receptors are as follows:

- People at home at existing residential properties and work places;
- People at work at existing work places;
- Pedestrians and cyclists; and
- Existing road users including emergency vehicles and service vehicles.

12.33 The relative importance of each receptor group is presented in Table 12.2.

**Table 12.2 – Relative Importance of Receptors/Resources**

<table>
<thead>
<tr>
<th>Resource/Receptor</th>
<th>Description</th>
<th>Importance / Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>People at home</td>
<td>This includes existing local residents, most notably those located to the south of the Site and to the east of the railway line. A medium level of importance has been applied given their distance from the local highway network and access route.</td>
<td>Medium</td>
</tr>
<tr>
<td>People at work</td>
<td>These include local businesses, most notably those to the west of the Site that are adjacent to the Site access road. A low level of importance has been attributed to these receptors owing to the distance from the access corridor from their main business activities.</td>
<td>Low</td>
</tr>
<tr>
<td>Pedestrians and Cyclists</td>
<td>This includes pedestrians and cyclists, most notably those who travel along Milton Road currently and those who will access the Site in the future. A high level of importance has been applied given the importance of sustainable travel within and around Cambridge.</td>
<td>High</td>
</tr>
<tr>
<td>Existing road users</td>
<td>This includes road users in vehicles, most notably those along Milton Road currently and those who will access the Site in the future.</td>
<td>Low</td>
</tr>
</tbody>
</table>
Whilst the number of individual receptors is high it is considered they have a higher ability to absorb change than people at home or more vulnerable road users such as pedestrians and cyclists.

Method of Baseline Data Collation

*Site Visit*

12.34 A number of site visits were undertaken during October, November and December 2012. All roads and footways surrounding the Site were investigated.

*Base Traffic Flows*

12.35 SATURN modelling for the required scenarios and highway network has been carried out for the weekday AM and PM peak hours and a 12 hour weekday period for a base year 2011.

12.36 2011 base SATURN model flows have then been calibrated, as part of this study, against 12 hour traffic counts undertaken on Milton Road south of the A14 interchange (undertaken 24th September 2012), at Kings Hedges Road / Milton Road junction (undertaken on 30th November 2012) and at the Cambridge Science Park accesses (undertaken on 12th October 2010).

*Development Traffic Flows*

12.37 The number of multi-modal trips predicted to be generated by the Development has been assessed using the Cambridge Sub Regional Model (CSRM) which is a land use and transport model of the Cambridge Sub Region. The current version of the model was developed to support the Cambridge Transport Innovation Fund (TIF) submission and the A14 ECI scheme and it continues to be used by Cambridgeshire County Council and the local authorities to look at planning and transport issues. The model comprises the four districts of Cambridge City, South Cambridgeshire, East Cambridgeshire and Huntingdonshire. The model has a validated base year of 2006 and runs through time in five year steps to generate forecasts for 2011, 2016, 2021, 2026 and 2031. The model was developed in line with DfT’s modelling guidance set out in WebTAG.

12.38 There are four linked modules that make up CSRM: a land use model; a transport demand model; a highway assignment model; and a public transport assignment model. The highway assignment model operates for a single hour in the AM and PM Peak hours and includes a simulation of the junction delays as a result of congestion. The public transport (bus) services
occupying road space are included within the highway model to reflect the space required and delays they cause. Freight is not modelled explicitly by CSRM. Goods vehicle movements are included in the highway assignment model with the numbers and growth in trips being derived externally to CSRM, using information from the East of England Regional Model and growth forecasts in line with DfT guidance.

12.39 The CSRM model forecasts used within the TA and ES are with Development included (referred to as Do Something or DS) and without Development included (referred to as Do Minimum or DM).

12.40 The trip generation for Development is detailed within the TA and is based on a worst case assumption of a 600 space car park rather the proposed 450 spaces.

12.41 Multi modal trip generation from Development has been determined from a first principles approach (discussed in more detail within the TA).

**Future Year Traffic Flow Data**

12.42 To assess the worst case impact of development traffic on the highway network the opening year of 2016 has been used. This will provide the lowest level of base traffic flow in comparison to the development traffic flow.

**Magnitude of Impact**

12.43 For the purpose of this assessment the categories for magnitude of impact have been derived from a combination of the IEMA Guidelines and the DfT’s website for guidance on the conduct of transport studies (WebTAG). In all cases a degree of professional judgement is applied when determining the magnitude of change/impact, taking into account all local conditions. The broad categories used in this assessment are presented in Table 12.3.

<table>
<thead>
<tr>
<th>Potential Effect</th>
<th>Magnitude of Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Negligible</td>
</tr>
<tr>
<td>Generic Description</td>
<td>The traffic generated creates</td>
</tr>
</tbody>
</table>

Table 12.3 – Magnitude of Impact
<table>
<thead>
<tr>
<th>Effect Specific Description</th>
<th>Severance</th>
<th>Pedestrian and cycle delay and amenity including fear and intimidation</th>
<th>Accidents and Safety</th>
<th>Residential Amenity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Severance</strong></td>
<td>Little or no hindrance to pedestrian movement. Change in total traffic flow of less than 30%.</td>
<td>Change in total traffic flow or HGV flow of less than 30%.</td>
<td>Professional judgement applied to assess the implications of local circumstances, and factors which may elevate or lessen risks of accidents.</td>
<td>This encompasses traffic elements of noise, dust and dirt, visual effects and air pollution in broad terms relating to the benefit enjoyed from physical external sources.</td>
</tr>
<tr>
<td><strong>Change in total traffic flow of less than 30%</strong></td>
<td>All people wishing to make pedestrian movements will be able to do so, but there will probably be some hindrance to movement. Change in total traffic flow of 30% - 60%.</td>
<td>Change in total traffic flow or HGV flow of 30% - 60%.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Change in total traffic flow of 30% - 60%</strong></td>
<td>Some people, particularly children and old people, are likely to be dissuaded from making journeys on foot. For others, pedestrian journeys will be longer or less attractive. Change in total traffic flow of 30% - 60%.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Change in total traffic flow of greater than 90%</strong></td>
<td>People are likely to be deterred from making pedestrian journeys to an extent sufficient to induce a reorganisation of their activities. Those who do make journeys on foot will experience considerable hindrance. Change in total traffic flow of greater than 90%.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Effect Specific Description</th>
<th>Severance</th>
<th>Pedestrian and cycle delay and amenity including fear and intimidation</th>
<th>Accidents and Safety</th>
<th>Residential Amenity</th>
</tr>
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<tbody>
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<td></td>
<td></td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Change in total traffic flow of greater than 90%</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
space which is part of the private home. Professional judgement has been applied using the parameters set out below.

| Minor change in the attractiveness of the residential environment. A small and discontinuous reduction in the benefit from physical external space which is part of the private home. Residents are unlikely to be dissuaded from using the physical external space which is part of the private home. | Moderate change in the attractiveness of the residential environment. Residents will have a moderate and discontinuous reduction in the benefit from physical external space which is part of the private home. Residents may be dissuaded from using the physical external space which is part of the private home. | Major change in the attractiveness of the residential environment. Residents will have a major and continuous loss of the benefit from physical external space which is part of the private home. Residents are highly likely to be dissuaded from using the physical external space which is part of the private home. |

Baseline Conditions

12.44 This section summarises the general characteristics of the existing network in the vicinity of the Site, a full commentary is provided in Chapter 3 of the TA in Technical Appendix 26.

Site Location and Local Highway Network

12.45 Cowley Road is a single carriageway road providing access to Cambridge Waste Water Treatment Works and industrial land located to the east of Milton Road (A1309). Cowley Road is
accessed from Milton Road via two signalised junctions. Cowley Road/Milton Road provides access onto and exit from Cowley Road for traffic entering from the north and exit from Cowley Road to traffic travelling south. The Cowley Road/ Milton Road/Science Park junction provides access to Cowley Road for traffic arriving from the south or the Science Park and exit from Cowley Road for traffic travelling south. No access to the Science Park from Cowley Road is available at this junction.

12.46 Milton Road provides access to the A14 via Milton Interchange to the north. The A14 is a trunk road providing access to the strategic road network servicing East Anglia and the wider UK including links to the M11 towards London. To the south of the Site Milton Road provides access to central Cambridge including the outer ring road and provides local access to residential areas of Chesterton, Kings Hedges and Arbury. Via the outer ring road alternative access is available to A14, M11 and villages surrounding Cambridge. Milton Road is a single carriageway to the south of the Site and dual carriageway to the north of the Site.

12.47 The local highway network is shown in Figure 12.1 located earlier within this chapter. The main link roads surrounding the Site are labelled.

Access for Public Transport Users

12.48 The Site is located opposite the Busway route which includes a section of guideway between Milton Road and St Ives. This route provides services from Huntington to Trumpington Park and Ride (via the Science Park, Cambridge Rail Station and Addenbrookes Hospital). The route accesses Milton Road to the south of the Science Park and continues on-road towards the city centre. The closest stop on this route at the current time is on the guideway itself at the Science Park.

12.49 Buses are an important mode of transport within Cambridge and the surrounding area. The majority of bus services currently travel into and through Cambridge City Centre, there are currently no orbital routes that circumnavigate around Cambridge.

12.50 Bus Routes C2, 9 and 99 currently run along Milton Road close to its junction with Cowley Road. Route C2 serves Milton Park & Ride site but includes a stop within the Science Park. Route 9 runs from Chatteris to Cambridge with one service per hour. Route C2 is a Citi bus route running from the Science Park to Addenbrookes Hospital and including numerous stops in and around the
City Centre, Chesterton, Romsey and Cherry Hinton areas. This service runs at an average frequency of one bus every 10 minutes (ranging from three buses per hour in the off peak to four per hour in the peak period). Route 99 service calls at the Science Park and Milton Road every 10 minutes throughout the day.

12.49 These bus services would provide a link between the proposed station and destinations/origins to the north of the Site. However, it is also evident that there is limited existing provision to link the station directly by public transport, as existing bus stops are located on Milton Road and don’t currently stop or route via Cowley Road.

Access for Pedestrians and Cyclists

12.50 Cowley Road has footpaths along much of its length although these are restricted to the north side of the road only. From Cowley Road pedestrians can access Milton Road which provides connections towards Cambridge, Milton and the CSP. A pedestrian crossing phase is available at the signals on Milton Road to allow access to the CSP. Further pedestrian crossing points, controlled and uncontrolled, are also available on Milton Road as it continues towards the city centre. From Milton Road a wider network of footpaths serving residential, commercial, leisure and employment areas within the city centre and surrounding area.

12.51 National Cycle Route 11 passes through Chesterton on Green End Road and the High Street as an on road strategic route. Route 11 continues as an on-road local route along Water Street, Fen Road and Cam Causeway, continuing off-road crossing the railway line and continuing alongside the river Cam towards Waterbeach. To the west Route 11 continues off-road alongside Milton Road towards Milton. From Chesterton High Street Route 11 continues into Cambridge City Centre and beyond with links to Trumpington and Shelford. From Route 11 a large number of local and strategic cycle routes can be accessed within Cambridge City Centre. These routes provide connections to most areas of the City and out into the wider village network surrounding the City.
12.52 In addition, National Cycle Route 51 runs along the Busway and links with Route 11 where the Busway connects with Milton Road at its eastern end. It is anticipated Route 51 will continue in the Site as part of the Busway extension consented under the, CGBO.

12.53 To the north a segregated cycle / pedestrian link is provided via Jane Costen Bridge, which links Cowley Road to the residential area of Milton.

12.54 To the south existing footpaths and cycle paths link up to the edge of the Site but do not currently permeate though the Site.

Road Safety
12.55 Personal Injury Accident (PIA) data was obtained from Cambridgeshire County Council for the most recent five year period (2007 to 2012) for the local area surrounding the Site. A summary of the results for the overall area is given below. The full accident descriptions can be found in the TA.

12.56 The search area included from Milton Road / Cowley Road to Highworth Avenue / Elizabeth Way / Milton Road.

12.57 Table 12.4 below shows a summary of the number of PIAs at each junction along Milton Road.

<table>
<thead>
<tr>
<th>Junction</th>
<th>Accident Severity</th>
<th>Total</th>
<th>Pedestrians</th>
<th>Cyclists</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Slight</td>
<td>Serious</td>
<td>Fat al</td>
<td></td>
</tr>
<tr>
<td>Milton Road / Cowley Road</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Milton Road / Science Park / Cowley Road</td>
<td>8</td>
<td>0</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>Milton Road / Cowley Park</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Milton Road / Green End Road / Kings Hedges Road</td>
<td>9</td>
<td>0</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>Arbury Road / Unicon Lane</td>
<td>10</td>
<td>1</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>Highworth Avenue / Elizabeth Way / Milton Road</td>
<td>14</td>
<td>1</td>
<td>0</td>
<td>15</td>
</tr>
</tbody>
</table>
Table 12.4 indicates that there have been 62 accidents at the seven junctions within the area surrounding the Site in the latest five year period. These consisted of 58 slight accidents, 3 serious accidents and 1 fatal accident.

Of these recorded accidents the following can be concluded:

- Of these 62 accidents three involved a pedestrian and 27 involved a cyclist;
- 12 of the pedestrian or cyclist accidents occurred in a similar location to another; and,
- 32% of the accidents involved the same manoeuvre and causation factor (most being rear end shunts).

A more detailed analysis of the PIAs is given below.

**Milton Road / Cowley Road Junction**

There have been two recorded PIAs at this junction (one of two site accesses) in the latest five year period. Of these three accidents both were slight in nature. One of the accidents involved a cyclist.

Of the two accidents recorded at this junction; one causation factor was a rear end shunt and the other was a vehicle overtaking another vehicle on the nearside.

**Milton Road / Science Park / Cowley Road Junction**

There have been eight recorded PIAs at this junction in the latest five year period. Of these eight accidents all were slight and three involved a cyclist.

Of the eight accidents recorded at this junction 50% involved a rear end shunt.

**Milton Road / Cowley Park Junction**

There have been no recorded PIAs at this junction in the latest five year period.
**Milton Road / Green End Road / Kings Hedges Road Junction**

12.65 There have been nine recorded PIAs at this junction in the latest five year period. Of these nine accidents all were slight in nature. One of the accidents involved a pedestrian and three involved a cyclist.

12.66 Of the nine accidents recorded at this junction 33% involved a rear end shunt.

**Arbury Road / Unicorn Lane Junction**

12.67 There have been 11 recorded PIAs at this junction in the latest five year period. Of these 11 accidents 10 were slight and 1 was serious in nature. None of the accidents involved a pedestrian and 1 involved a cyclist.

12.68 Of the 11 accidents recorded at this junction 27% involved a rear end shunt.

**Highworth Avenue / Elizabeth Way / Milton Road Junction**

12.69 There have been 15 recorded PIAs at this junction in the latest five year period. Of these 15 accidents 14 were slight and one was serious in nature. 12 of the accidents involved a cyclist.

12.70 Of the 15 accidents recorded at this junction 27% involved a rear end shunt and 20% involved vehicles crossing the path of another vehicle whilst negotiating the junction.

**Milton Road / Various Minor Roads Junction**

12.71 There have been 17 recorded PIAs along Milton Road at the various minor road junctions in the latest five year period. Of these 17 accidents 15 were slight, one was serious and one was fatal in nature. Two of the accidents involved a pedestrian and seven involved a cyclist.

12.72 Of the 17 accidents recorded at this junction three involved a rear end shunt and eight involved vehicles turning into the path of another vehicle. Of the accidents there was no obvious combined location/causation factor.
**Accidents on Milton Road**

12.73 There have been 18 recorded PIA on Milton Road between the junctions. Of these 18 accidents 17 were slight and one was serious in nature. Two of the accidents involved a pedestrian and 10 involved a cyclist.

12.74 Of these 18 PIAs there was no obvious combined location/causation factor.

**Accidents from 2012 onwards**

12.75 The data presented above is now out of date. Updated PIA data from Cambridgeshire County Council shows that within the study area, since 2012, there has been 1 fatal, 2 serious and 5 slight PIAs. The fatal PIA occurred on Milton Road in 2013 near its junction with Birch Close. The accident involved a pedal cycle and two cars. A serious PIA occurred in 2013 on Milton Road Southbound just south of the A14 roundabout and involved a single pedal cyclist. The third PIA, which was serious in nature, occurred in 2013 on Milton Road Northbound and involved a pedal cycle and a LGV at the junction with a private drive.

**Road Safety Summary**

12.76 Although all PIAs are regrettable, analysis of the information related to accidents gives no rise for undue concern that the travel modes related to the Development will increase the accident volumes in comparison to those experienced to date.

**Base Traffic Volumes**

12.76 In order to inform this ES the highway assignment model (SATURN) has been run for the base year 2011 and an opening year of 2016. The results of the model runs during the AM and PM peak hours are summarised in Table 12.5 below.

<table>
<thead>
<tr>
<th>Link</th>
<th>12-hour Two-way Flows</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2011</td>
</tr>
<tr>
<td>Cowley Road (Western End)</td>
<td>5,200</td>
</tr>
<tr>
<td>Milton Road (between Cowley Road – A14)</td>
<td>26,200</td>
</tr>
<tr>
<td>Milton Road (between Science Park and Cowley Road northern access)</td>
<td>23,700</td>
</tr>
<tr>
<td>Milton Road (between Science Park and Cowley Park)</td>
<td>17,200</td>
</tr>
<tr>
<td>Road</td>
<td>Current Capacity</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Milton Road (between Cowley Park and King Hedges Road)</td>
<td>14,400</td>
</tr>
<tr>
<td>Milton Road (between King Hedges Road and Union Lane)</td>
<td>9,300</td>
</tr>
<tr>
<td>Milton Road (between Union Lane and Elizabeth Way)</td>
<td>14,300</td>
</tr>
<tr>
<td>Milton Road (southwest of Elizabeth Way)</td>
<td>3,150</td>
</tr>
<tr>
<td>Elizabeth Way</td>
<td>14,250</td>
</tr>
<tr>
<td>Kings Hedges Road</td>
<td>1,750</td>
</tr>
<tr>
<td>Green End Road</td>
<td>4,550</td>
</tr>
<tr>
<td>Union Lane</td>
<td>300</td>
</tr>
<tr>
<td>Arbury Road</td>
<td>5,000</td>
</tr>
</tbody>
</table>

12.77 The operational performances of the existing highway network and junction capacity assessments have been undertaken, as part of the TA, for the principal junctions within the study network using LinSig ARCADY modelling software.

12.78 The results of this capacity analysis are detailed within the TA. Overall the results show that existing capacity issues are evident along the entire Milton Road route into Cambridge City Centre.

**Future Baseline**

**Site Access**

12.79 The main Site access for vehicular traffic and on-road buses is via Cowley Road.

12.80 Access to the Site will also be provided via the extended Busway (explained in more detail later).

12.81 Cycle access to the Site will be available via Cowley Road and the Busway.

12.82 Pedestrian access is also available via these cycle routes, with further links into residential and employment areas to the north, south and west of the Site. The aim is to provide maximum accessibility to the Site for all sustainable modes of travel.
Parking

12.83 A car park allowing approximately 450 vehicles to park will be provided on the Site. This will include free short-stay waiting for cars. The charging regime will be determined by the rail operators.

12.84 Parking standards appropriate to the development would usually be included within the ES. However no existing guidance is available from local planning guidance relating to car/cycle parking at rail stations. The number of parking spaces has therefore been determined following detailed analysis of the provision at a range of other stations in the Cambridge sub-region, as well as reviewing the forecast trips and geographic location in relation to accessing the new station.

12.85 A more detailed explanation to the demand forecasting and mode share distributions is provided in the TA.

Taxi & Passenger Drop Off

12.86 It is proposed to provide a taxi and car drop off area to the north of the Site extending close to the station building. This area will be 20m long allowing space for at least four cars to wait. The access road leading up to the drop off area is 70m long and only provides access to the drop off area.

12.87 A short-stay waiting area for cars will also be provided within the main car park.

Cycle Parking

12.88 It is proposed to provide covered parking for approximately 1,000 cycles close to the station building.

Public Transport

Busway Extension
12.89 Access for the Busway will be made available, which is based on the committed extension of the existing route across Milton Road and into the Site. This is secured under the CGBO, with only the extension into the sidings forming part of the planning application for the Development. Arrangements for the Busway crossing of Milton Road and onto the former St Ives branch line are included within the CGBO and do not form a part of this planning application although the impact is assessed as part of this EIA.

Other Bus Services

12.90 The extension of existing bus services in the local area would provide a link between the proposed station and destinations/origins to the north and south of the Site.

12.91 As part of the Development it is anticipated the Citi2 bus service that runs along Milton Road will be diverted into the station via Cowley Road. As part of this anticipated proposal the Citi2 service will then be diverted up to the main station building via an internal road linking onto the Busway. At the end of the Busway a turning head suitable for buses will be provided to allow the Citi2 and Busway services space to turn around and head back out of the main Cowley Road vehicle entrance. It is anticipated the Citi2 service will continue to operate every 10 minutes.

Operational Traffic Generation

12.92 Based on a robust assumption of 600 parking spaces (33% higher than the 450 spaces that will be provided) a 12 hour trip generation of 1,300 two-way vehicle trips has been predicted and used. During the worst case three hour peak period (7am - 10am) just over 400 two-way vehicle trips are predicted to be generated.
Construction Traffic Generation

12.93 It is predicted that the number of vehicles generated by the Site during construction will be significantly less than the number generated during the operational stage following the opening of the Development.

12.94 However, given that the proportion of HGVs will obviously be higher during the construction period, the number of construction vehicles has been estimated for an average day during construction in addition to a worst case scenario (i.e. during the site clearance phase assuming a high level of ground contamination).

12.95 At this stage it is only possible to estimate the level of construction traffic based on engineering judgment, taking into account an average and worst case scenario.

Average Scenario (average ground contamination)

12.96 Assuming an average level of ground contamination it is anticipated that the Site could generate approximately 1,000 two way HGV trips over the entire construction period (18 months) in addition to approximately 30 two-way staff car trips per day.

12.97 Based on these total anticipated trips over an 18 month construction period (390 working days) it is anticipated that on average two one-way HGVs trips plus 15 one-way car trips could be generated by the Site. In reality though there will be a peak phase within the construction period where construction traffic could double or triple (i.e. up to six one way trips per day).

12.98 Based on an assumed average scenario it is therefore anticipated that the Site could generate up to 42 new two way trips (12 HGVs plus 30 cars) per day during the construction period.

Worst Case Scenario (high level of ground contamination)

12.99 Assuming a worst case level of ground contamination it is anticipated that the Site could generate approximately 3,000 two way HGV trips over the entire construction period (18 months) in addition to approximately 30 two-way staff car trips per day. However, in order to limit risk of holding up construction most of these trips will take place over one quarter of the construction period (4.5 months).
12.100 Based on these total anticipated trips over the peak 4.5 month construction period (approximately 100 working days) it is anticipated that on average 15 one-way HGVs trips plus 15 one-way car trips could be generated by the Site.

12.101 Based on an assumed average scenario it is therefore anticipated that the Site could generate up to 60 new two way trips (30 HGVs plus 30 cars) per day during the construction period.

**Assessment of Impacts, Mitigation and Residual Effects**

**Assessment of Magnitude of Change/Impact**

*Increase in traffic levels*

- **Construction Phase**

12.102 The Site is located on operational freight sidings, which are currently utilised by two operators who currently generate high levels of HGV movements along Cowley Road, due to their transfer of aggregate to/from Site, as well as a small amount of ancillary servicing traffic. There are also number of other businesses that generate mainly light vehicle trips (i.e. cars) along Cowley Road but for robustness these have been ignored.

12.103 A traffic survey was carried out at the entrance to the two aggregate sites in July 2012. This survey shows that on an average weekday these two sites generate approximately 187 two way trips (nearly 400 passenger car units) per day of which 51 of the vehicles were HGVs.

12.104 It is anticipated that these freight operations will remain on the rail sidings with the Dickerson operations being relocated within the Site to a more northerly location adjacent to the Lafarge siding and will therefore continue to access the Site via Cowley Road.

12.105 A summary of the change in total traffic volumes along Cowley Road, over a 12 hour period, during the construction phase is presented in Table 12.6.

**Table 12.6 – Predicted Increases in Total Vehicles (12 hours) During Construction Phase**

<table>
<thead>
<tr>
<th>Link</th>
<th>12-hour Two-way Flows</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total Vehicles</td>
</tr>
</tbody>
</table>

### Table 12.6

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cowley Road</td>
<td>187</td>
<td>60</td>
<td>51</td>
<td>30</td>
</tr>
<tr>
<td>(Eastern End)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

12.106 In terms of magnitude Table 12.6 shows that during the construction period the Development is expected to have a negligible impact on the local highway network in environmental terms. It is anticipated that the construction of the Development will generate nearly 70% fewer vehicle trips and 40% fewer HGV trips than are currently generated by aggregate operators that currently access the Site.

12.107 In addition, it is worth noting that Stagecoach currently use Cowley Road to access their Depot but, due to the location of the survey, these vehicle trips were not surveyed.

12.108 On the wider network the impact will be diluted as base traffic levels increase and construction traffic access directly onto the A14 trunk road.

12.109 It is thus considered that as a result of the Development, during the construction the impact of the change in traffic flow generated by the Development will be of neutral significance overall (negligible magnitude and medium sensitivity).

- **Operational Phase**

12.112 The magnitude of change in traffic has been considered for the operational traffic over a 12 hour period. Environmental impacts are most typically considered over 12 hour periods or longer.

12.113 As stated previously the IEMA guidelines state two ‘rules of thumb’ regarding the scope of the links that should be assessed for EIA purposes. The first rule advises on the inclusion of highway links where traffic flows will increase by more than 30% (or the number of heavy goods vehicles will increase by more than 30%).

12.114 The second rule of the IEMA guidelines regarding the scope of the links that should be assessed for EIA purposes advises on the inclusion of any specifically sensitive areas where total traffic flows have increased by 10% or more.
Whilst this guidance is used to determine only which links to appraise in further detail it also gives an indication as to the level of traffic increase which is deemed to be material in terms of the environmental appraisal of road traffic.

A summary of the change in total traffic volumes on the key highway links is presented in Table 12.7 for a 12 hour period on a normal day.

**Table 12.7 – Predicted Development Increases in Total Vehicles (12 hours) During Operational Phase**

<table>
<thead>
<tr>
<th>Link</th>
<th>12-hour Two-way Flows</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Base (2016) without the Development</td>
</tr>
<tr>
<td>Cowley Road (Western End)</td>
<td>5,400</td>
</tr>
<tr>
<td>Milton Road (between Cowley Road – A14)</td>
<td>27,700</td>
</tr>
<tr>
<td>Milton Road (between Science Park and Cowley Road northern access)</td>
<td>25,250</td>
</tr>
<tr>
<td>Milton Road (between Science Park and Cowley Park)</td>
<td>18,400</td>
</tr>
<tr>
<td>Milton Road (between Cowley Park and King Hedges Road)</td>
<td>15,600</td>
</tr>
<tr>
<td>Milton Road (between King Hedges Road and Union Lane)</td>
<td>10,000</td>
</tr>
<tr>
<td>Milton Road (between Union Lane and Elizabeth Way)</td>
<td>15,900</td>
</tr>
<tr>
<td>Milton Road (southwest of Elizabeth Way) – A1134</td>
<td>3,900</td>
</tr>
<tr>
<td>Elizabeth Way</td>
<td>15,600</td>
</tr>
<tr>
<td>Kings Hedges Road</td>
<td>2,200</td>
</tr>
<tr>
<td>Green End Road</td>
<td>5,000</td>
</tr>
<tr>
<td>Union Lane</td>
<td>450</td>
</tr>
<tr>
<td>Arbury Road</td>
<td>5,750</td>
</tr>
</tbody>
</table>
12.111 In terms of magnitude Table 12.7 shows that the Development is expected to have a minor impact on the local highway network in environmental terms. The increase in traffic on the highway network, over a 12 hour period, anticipated in the opening year of the Development (2016) makes up for less than 10% of base traffic on all local link roads except for the Site access road itself.

12.112 A number of the minor local link roads are expected to experience a beneficial impact (decrease in traffic flow) following the opening of the Development.

12.113 The worst case impact (in terms of percentage increase in vehicle trips) on the highway network (excluding the Site access road) is predicted on Milton Road to the southwest of Elizabeth Way roundabout (A1134) where base traffic levels are lower on this link than the surrounding highway network. Traffic travelling through to the Development from the west is anticipated to use Histon Road & Huntingdon Road and then Victoria Road (A1134). Whereas most base traffic tends to travel into and out of the city centre via Elizabeth Way. The higher level of impact on this road is therefore created by the existence of low base traffic levels on this link road compared to the rest of the highway network. However, the increase in traffic flow is still anticipated to be below 10%.

12.114 The greatest impact is expected to arise on the Site access (Cowley Road). The increase in traffic on the Site access road still falls below the 30% impact threshold though where an increase in traffic levels of 24% is expected during a 12 hour period. The Development will generate a moderate impact on this link road, as would be expected from new trips accessing the station. However, compared to the rest of the highway network traffic flows those on Cowley Road are currently low.

12.115 A summary of the change in total traffic volumes on the key highway links is presented in Table 12.8 for the peak periods on a normal day.
## Table 12.8 – Predicted Increases in Total Vehicles (Peak 3 Hour Periods) During Operational Phase

<table>
<thead>
<tr>
<th>Link</th>
<th>AM (7am – 10am)</th>
<th>PM (4pm – 7pm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Base (2016)</td>
<td>Increase in Traffic</td>
</tr>
<tr>
<td>Cowley Road (Western End)</td>
<td>1,800</td>
<td>400</td>
</tr>
<tr>
<td>Milton Road (between Cowley Road – A14)</td>
<td>8,800</td>
<td>100</td>
</tr>
<tr>
<td>Milton Road (between Science Park and Cowley Road northern access)</td>
<td>7,000</td>
<td>-100</td>
</tr>
<tr>
<td>Milton Road (between Science Park and Cowley Park)</td>
<td>5,200</td>
<td>100</td>
</tr>
<tr>
<td>Milton Road (between Cowley Park and King Hedges Road)</td>
<td>4,200</td>
<td>100</td>
</tr>
<tr>
<td>Milton Road (between King Hedges Road and Union Lane)</td>
<td>2,400</td>
<td>65</td>
</tr>
<tr>
<td>Milton Road (between Union Lane and Elizabeth Way)</td>
<td>3,900</td>
<td>-30</td>
</tr>
<tr>
<td>Milton Road (southwest of Elizabeth Way) – A1134</td>
<td>1,000</td>
<td>100</td>
</tr>
<tr>
<td>Elizabeth Way</td>
<td>3,200</td>
<td>-200</td>
</tr>
<tr>
<td>Kings Hedges Road</td>
<td>600</td>
<td>-30</td>
</tr>
<tr>
<td>Green End Road</td>
<td>1,600</td>
<td>100</td>
</tr>
<tr>
<td>Union Lane</td>
<td>400</td>
<td>-10</td>
</tr>
<tr>
<td>Arbury Road</td>
<td>1,200</td>
<td>-60</td>
</tr>
</tbody>
</table>
In terms of magnitude Table 12.9 shows that the Development is expected to have a minor impact on the local highway network in environmental terms. The increase in traffic on the highway network, during the peak periods, anticipated in the opening year of the Development (2016) makes up less than 10% of base traffic on all local link roads except for the Site access road and Milton Road to the south of the Elizabeth Way roundabout.

A number of the minor local link roads are expected to experience a beneficial impact (decrease in traffic flow) following the opening of the Development.

The greatest impact (in terms of percentage increase in vehicle trips) on the highway network (excluding the Site access) during the peak periods is again predicted on Milton Road to the southwest of Elizabeth Way roundabout (A1134) where peak period base traffic levels are lower on this link road than the surrounding highway network. An impact of 10% is anticipated on this link road during the AM peak period, which meets the upper limit of the threshold for sensitive areas but well below the 30% threshold for normal areas.

As per the 12 hour assessment the greatest peak period impact is expected to arise on the Site access road (Cowley Road). Again though, compared to the rest of the highway network traffic flows on the Site access road are currently low and therefore the Development will generate a noticeable level of impact on this link road. However, the increase in traffic on the Site access road, during a worst case peak period, still falls below the 30% impact threshold where an increase in traffic levels of 25% is expected in the PM peak period.

It is thus considered that as a result of the Development, during the operation of the development, the overall impact of the change in traffic flow generated by the Development will be of neutral significance overall (minor magnitude and low sensitivity).

In addition to the neutral impact on traffic generation it is also worth noting that a large proportion of the vehicle trips generated by the Development are likely to be on the highway network in the future with or without the opening of the Development. The Development will help to limit the number of vehicles accessing Cambridge City Centre whilst also reducing the journey distance need to be travelled by passengers on the highway network.
12.122 In addition increases in traffic levels further afield from the Site are anticipated to negligible. Some links on the wider highway network are anticipated to experience decreases in traffic levels as a result of the opening of the Development, for example; Station Road, Hills Road, sections of the A14 and M11.

Noise and Vibration
12.123 Traffic data for the noise and vibrations assessments have been provided and the results of these can be found Chapter 11 of this ES.

Severance
12.124 Severance is the perceived division that can occur within a community when it becomes separated by a major traffic artery. It is common with heavily trafficked roads or where the road becomes a physical barrier itself, however it can also relate to quiet minor traffic flows if it impedes access to essential facilities. People walking and cycling are the receptors most likely to be affected by severance and these have been identified as being of low importance due to the relatively low number of individual receptors.

12.125 The largest increase in traffic is predicted to occur on the Site access road (Cowley Road) and Milton Road to the southwest of Elizabeth Way roundabout.

12.126 Over a 12 hour period it is predicted that 1,322 additional vehicles will use Cowley Road which will result in approximately two additional vehicles per minute over the course of 12 hours although there will be peaks and troughs throughout this period.

12.127 During the peak period (4pm – 7pm) it is predicted that 433 additional vehicles will use Cowley Road which will result in approximately three additional vehicles per minute over this peak period.

12.128 Over a 12 hour period it is predicted that 274 additional vehicles will use Milton Road (A1134) which will result in less than one additional vehicle per minute over the course of 12 hours although there will be peaks and troughs throughout this period.
12.129 During the peak period (4pm – 7pm) it is predicted that 104 additional vehicles will use Milton Road (A1134) which will result in less than one additional vehicle per minute over this peak period.

12.130 On the wider network the impact will be diluted and existing footways, cycle ways and crossing points will do much to mitigate any potential severance issues associated with the proposals.

12.131 On Milton Road, Cowley Road and on all other links, the increase in overall traffic flows is less than 30% and therefore the magnitude of change is negligible and as such the significance of effect can be categorised as neutral or slight. Given that the overall increase in traffic is less than 30% on the Site access road and less than 10% on the wider network (11% on Milton Road A1134) the significance of effect has been classified as neutral.

12.132 The provision of new and improved pedestrian and cycle links to surrounding area including; Discovery Way, Pippin Drive, Ribston Way, Long Reach Road, Nuffield Road Industrial Estate and through Bramblefields Local Nature Reserve will significantly improve the permeability and accessibility of the Site for pedestrians and cyclists.

12.133 Existing pedestrian / Cycle crossings over Milton Road are located at the junction between Cowley Road / Milton Road / Science Park in addition to a number of other junctions to the south. The extension of the Busway will also provide for a new crossing over Milton Road between the Development and the Science Park.

12.134 The railway line and river located adjacent to the Site severs the Site from the east, which therefore limits sustainable access to/from the east. The Site is however linked to the north, south (city centre) and northwest by public transport with excellent opportunity to link the Site to the wider area through the extension of the Busway into the Site.

12.135 It is thus considered that any effect upon severance as a result of the Development during the construction and operation of the development would be of slight adverse significance (negligible magnitude but high sensitivity).
**Driver Delay**

12.136 Driver delay to non-development traffic can occur at several points on the network surrounding the Site including Site entrances, the roads in the immediate vicinity of the Site and key junctions along the highway. This includes side roads which may be affected by acceptance gaps in the traffic flow being reduced.

12.137 An impact of driver delay is most likely to occur during the AM (08:00 – 09:00) and PM (17:00 – 18:00) peak periods when base traffic flows are at their highest. It is estimated that the development will generate a total of 216 additional vehicle movements in the highway AM peak hour and 181 additional vehicle movements in the highway PM peak hour. In the AM peak this will result in an average of four additional vehicles per minute on the local highway network. Although given the very nature of rail station there will be peaks within the peak period that relate to the arrival and departure of trains services.

12.138 The Transport Assessment that accompanies this application shows that the local highway network along Milton Road is in general currently approaching capacity. The capacity constraint along Milton Road is anticipated to be exacerbated by background traffic growth with or without the Development, most notably between the years 2016 and 2026.

12.139 The Cowley Road North junction is anticipated to experience reduced queue levels and delay, following the opening of the Development, due to the reduction in southbound traffic passing through this junction into the city centre.

12.140 Overall the capacity constraint on the network is an existing issue that is exacerbated by long term background traffic growth. The traffic generated by the Development is anticipated to increase queues marginally on some links but also decrease queues on other links. Whilst the increase in queue levels and delay, created by the opening of the Development, are noticeable on some links the percentage increase in traffic flow is minimal compared to the ‘without’ the Development scenario at most junctions.

12.141 As the traffic dissipates over the network the impact of the traffic is diluted, therefore this is unlikely to have a major impact on driver delay on the wider network.

12.142 The level of construction traffic generated by the Site will be minimal and will therefore have negligible impact on driver delay.
12.143 It is thus considered that any effect upon driver delay as a result of the Development during the construction of the development would be of neutral significance. During the operation of the Site any effect upon driver delay as a result of the Development would be of slight adverse significance (moderate magnitude but low sensitivity).

**Pedestrian and Cyclist Delay and Amenity**

12.144 Change in the volume, composition or speed of traffic may affect the ability for pedestrians to cross the road. Pedestrian delays are also dependent upon the general level of pedestrian activity, visibility and physical conditions of the Site.

12.145 The Development includes a number of new pedestrian and cycle links to surrounding areas will also be provided along the Busway route into the Site and Cowley Road. These are mapped onto the catchment areas to ensure key routes are adequately catered for.

12.146 During the operational phase it is important to note that some existing pedestrian and cycle trips will be diverted from Cambridge Rail Station to the Development. The proportion and number of cycle/walk trips diverted from Cambridge Station have been identified within the TA to be over 600. This abstraction of trips will relieve existing cycle parking pressure at Cambridge Rail Station improving conditions for existing users of the station.

12.147 Due to the number of lanes that need to be crossed the existing layout of the Milton Road / Cowley Road junction currently delays existing pedestrians trying to cross Milton Road. However, the introduction of the Busway across Milton Road will have a beneficial impact on pedestrian/cyclist delay.

12.148 It is thus considered that any effect upon pedestrian and cyclist delay and/or amenity as a result of the Development during the construction and operation of the development would be of slight beneficial (negligible magnitude but high sensitivity).

**Pedestrian and Cyclist Fear and Intimidation**

12.149 Pedestrian and cyclist ‘fear and intimidation’ is one of the factors that is affected by an increase in traffic flow. It is outside the remit and competence of this chapter to assess the impact of the additional traffic directly upon levels of ‘fear’ however this chapter does assess
predicted increase in traffic flow and this will be used as a proxy for ‘fear and intimidation’ impacts.

12.150 The largest volume and percentage increase in traffic flow is predicted on Cowley Road but is less than 30%.

12.151 On the wider network the impact is diluted further. As such the impact on pedestrian and cyclist fear and intimidation is likely to be negligible beyond Cowley Road.

12.152 During the construction phase impacts on pedestrians and cyclists will be restricted to existing users of Cowley Road and key junctions on the proposed construction vehicle access route. Impacts on these users are expected to be adverse and have been assessed qualitatively.

12.153 The provision of new and improved pedestrian and cycle links to surrounding will significantly improve the permeability and accessibility of the Site for pedestrians and cyclists.

12.154 It is thus considered that any effect upon pedestrian / cyclist fear & intimidation as a result of the Development during the construction and operation of the development would be of slight adverse significance (negligible magnitude but high sensitivity).

Public Transport Network

12.155 The extension of the existing Busway services into the Development will open up a new route for public transport users to the Development and is likely to be a popular travel choice for existing people located, in the north of Cambridge, along the Busway route that currently travel to Cambridge Rail Station by bus or car.

12.156 The anticipated extension of the Citi2 bus service into the Site will also benefit the local highway network by offering an alternative to the private car.

12.157 In addition the very nature of the Development will encourage public transport use.

12.158 It is thus considered that any effect upon public transport use as a result of the Development would be of large beneficial significance (major magnitude and high sensitivity).
Residential Amenity

12.159 The term residential amenity is one that is difficult to define and there are no clearly quantifiable standards of amenity which could be justifiably used to assess the impact of the Development. For the purpose of this assessment it is defined as a general, all encompassing term for the attractiveness of the residential environment, most notably the benefit enjoyed from physical external space which is part of the private home. The assessment includes elements of noise disturbance, visual intrusion and air quality but in more general terms. The determination of the magnitude of effect has taken account of local circumstances and the nature of the locality but relies solely on professional judgement. Residential amenity in this case, affects receptors including people at home and sensitive groups and locations including the residents of Hovefields Caravan Park.

12.160 The Site is located in an existing commercial area although a number of residential properties are located to the south of the Site. However, access to the Site by car is through the commercial link roads. Passengers travelling by car will therefore avoid local residential areas.

12.161 There is potential risk of parking on local residential roads, however this risk is deemed minimal given the high level of sustainable travel options made available for passengers.

12.162 The significance of effect on residential amenity can be related to the impact of magnitude of the increase in the number of vehicles and the composition of these vehicles. The increase in total vehicles, in addition to the composition of vehicles being mainly cars, is such that the magnitude of impact is likely to be negligible but the sensitivity is classified as medium and hence the significance of effect is likely to be neutral.

12.163 During the construction period the significance of effect is anticipated to be slight adverse (minor magnitude and medium sensitivity) but this period will be short lived.

12.164 Further analysis is included within the Noise and Air Chapter.

Hazardous Loads

12.165 It is understood that the Site will not generate loads deemed to be hazardous.
Air Quality

12.166 Traffic data for the air quality assessments have been provided and the results of these can be found elsewhere Chapter 6 of this ES.

Dust and Dirt

12.167 Dust and dirt is considered appropriate to assess, most notably during the construction phase of the development as this is likely to be when most dust and dirt is generated by site traffic. This will be considered further in the air quality section of the report (Chapter 5) however mitigation relating to dust and dirt associated with vehicular traffic is identified in this chapter.

12.168 Specifically the provision of wheel washing or wash down facilities and the regular sweeping of roads would ensure that any dust or dirt generated by the Site is controlled.

12.169 In addition, any impacts related to dust and dirt during construction will be short lived and localised. Beyond Milton Road impacts are likely to be negligible.

12.170 It is thus considered that any effect upon dust and dirt as a result of the traffic generated through the construction of the development would be of negligible significance.

Accidents and Safety

12.171 Although all PIAs are regrettable, analysis of the information related to accidents gives no rise for undue concern that the travel modes related to the Development will increase the accident volumes in comparison to those experienced to date.

12.172 It is therefore considered that any effect upon accidents and safety as a result of the Development would be of negligible significance.

Mitigation Measures

12.173 It is acknowledged that the proposed traffic generation of the Development once operational will be greater than that during the construction phase in terms of total volume of vehicle traffic generated. Whilst some mitigation measures will apply to both construction and operation, due to the different function of the traffic, mitigation measures specific to the construction traffic has also been provided.
Construction Period

12.174 A CEMP accompanies the planning application and outlines measures to mitigate the impact of Construction. It is predicted that construction of the Site can be mitigated with appropriate controls on vehicle routings.

12.175 It is proposed that the measures set out below would form the basis of a traffic management plan and CEMP document that would be discussed and agreed with both the Highway Authority and the Local Planning Authority prior to commencing the construction of the Development.

Highway Mitigation

- Whilst no junction assessments have been undertaken, in terms of construction traffic, junction assessments of the baseline have been undertaken and indicate that the minimal increase in traffic flow (generated by the construction phase) can be accommodated at the northern Cowley Road junction. Further afield construction traffic will be directed directly to the A14 trunk and as such no off-site highway mitigation is proposed during the construction period.

Restriction of Access Route

- The use of the proposed access route would be a contractual requirement for all contractors working at the Site. Contractor performance will be regularly monitored so as to enforce the access route.

Keeping the Route Clean

- A contractual requirement will be placed upon the contractor to provide wheel wash facilities for vehicles on departure from the construction site. This will help keep the route clean and prevent impacts associated with dust and dirt. Should a temporary haul road be provided this will be damped down in dry conditions so as to prevent dust being emitted by HGV traffic.

Timing of Arrivals and Departures

- HGV trips to and from the Site will, where possible, be evenly spread during the day. The spreading of trips will minimise the impact of HGV traffic during the peak hours and reduce any impacts on driver delay.
Presence of Personnel to Guide Construction Traffic

- The site supervisor will manage and coordinate the construction traffic on the Site so no conflicts or blocking back to the highway network occurs.

Existing footpaths and cycle routes will be rerouted as appropriate where construction traffic is likely to impact on pedestrian or cyclists along Cowley Road and Milton Road

A HGV booking / management system

- A management system for vehicles of 10T and over, which will allow drivers to book predetermined time slots for deliveries. This will ensure that arrivals and departures are spread evenly during the course of the working day. It is acknowledged that road conditions and delays that are not foreseen may cause drivers to miss their allotted time slot on occasion, however an effective management system will ensure that significant peaks in the day do not occur;

Oversized Loads

- Deliveries or plant movements that are outside the normal permitted size or weight will be notified to the authorities. These will be identified in advance to allow liaison with interested parties;

Monitoring and Reporting

- Contact details for a member of construction site staff will be made available to members of the public to report any issues or concerns relating to the construction activities. This will allow non compliance with agreed access routes and inappropriate driving to be reported and addressed;

Signing Strategy

- Warning signs (to Local Highway Authority specification and approval) will be provided to alert drivers to the presence of turning HGVs in the vicinity of the Site access point(s). Signage to direct deliveries and staff to the Site from the A14 will be provided (to Local Highway Authority specification and approval);
**Remedial Highway Work**
- During the contract, remedial work will be undertaken as necessary to maintain the access roads to ensure they are fit for purpose. On completion of the contract, the roads will be reinstated to a condition similar to that before work commenced.

**Operational Period**

12.176 The following mitigation will be implemented as part of the development to limit the impact of the Development on the local highway network.

**Highway Mitigation**
- Revised lane designation on the southbound Milton Road approach to the northern Cowley Road junction
- Provision of above standard pedestrian / cycle links to the local surrounding area
- TROs introduced along the entire length of Cowley Road to prevent on street parking
- High quality signage to the Site will be provided for all travel modes
- Monitor parking within the local residential area before and after the opening of the new station. Necessary controls will be developed and introduced in consultation with local residents if issues are observed.

**Signing**
- Access to the Site will be signed from the A14 and the southern end of Milton Road for passengers travelling by car
- Access to/from the Site will also be signed to/from local facilities, residential areas and local businesses to encourage sustainable travel along appropriate routes
- The Site will also be well publicised as a destination along the Busway
- Signing will make it clear to rail passengers how to access the Site by the appropriate route/travel mode and more importantly discourage use of less appropriate routes.

**Cycle and Walking Infrastructure**
- The Site will provide for 1,000 cycle stands to encourage access by bicycle
- High quality, safe and accessible pedestrian and cycle infrastructure will be provided on Site linking the Site to the wider sustainable infrastructure available
**Public Transport Infrastructure**

- The extension of the Busway into the Site across Milton Road
- The anticipated extension of Citi2 bus service into the Site via Cowley Road

**Residual Impacts**

12.177 Overall the proposed mitigation measure to revise the lane markings on Milton Road will not fully resolve the significant queuing that currently occurs in the “City Only” lane at the Science Park junction, however it will offer a noticeable improvement on the existing situation. It is also worth noting that the Development is not anticipated to increase traffic flow in this dedicated lane (in fact traffic flow is anticipated to decrease in this lane following the opening of the Development). The significance of effect is therefore anticipated to reduce to a neutral/slight adverse impact on driver delay (minor magnitude and low sensitivity).

12.178 Following the extension of the Busway and the anticipated extension of Citi2 bus service into the Site the residual impact on public transport will be of large beneficial significance.

12.179 The provision of high quality pedestrian / cycle links to the local surrounding area will allow for a large beneficial residual impact to be realised within the Site boundary. External to the Site the impact on pedestrian and cyclists on the whole will remain as neutral (combining the significance of effect on severance, pedestrian/cyclist delay, pedestrian/cyclist fear and intimidation and pedestrian / cyclist amenity).

**Summary and Conclusion**

12.180 The effect of road traffic resulting from the construction and operation of the Development has been assessed in accordance with the guidance set out in the IEMA publication Guidelines for the Environmental Assessment of Road Traffic, Guidance Note No. 1.

12.181 The assessments undertaken above have demonstrated that the construction and operational traffic generated by the proposals would be of neutral significance.

12.182 Overall the Development is envisaged to generate a slight beneficial benefit effect on local transport infrastructure. Taking into account the very nature of the development being a interchange station as well as the reduction in car trips within the city centre, the Development is envisaged to generate a moderate beneficial benefit effect in transport terms.
12.183 The transportation impacts, mitigation measures and residual effects of the Development are summarised in Table 12.9.
<table>
<thead>
<tr>
<th>Description of Likely Significant Effects</th>
<th>Significance of Effects</th>
<th>Summary of Mitigation / Enhancement Measures</th>
<th>Significance of Residual Effects</th>
<th>Relevant Policy Legislation</th>
</tr>
</thead>
<tbody>
<tr>
<td>(V.Large, Large, Moderate, Slight, Neutral)</td>
<td>Beneficial / Adverse</td>
<td>(P/T) (D/I) ST/MT/LT</td>
<td>(Major, Moderate, Minor, Negligible)</td>
<td>Beneficial / Adverse (P/T) (D/I) ST/MT/LT</td>
</tr>
<tr>
<td>Site Preparation, Demolition, Earthworks and Construction Phase</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction traffic impacts</td>
<td>Neutral</td>
<td>- T D ST</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operational Phase</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change in Traffic Flows</td>
<td>Neutral</td>
<td>- P D ST/MT/LT</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Severance</td>
<td>Slight</td>
<td>Adverse</td>
<td>P I ST/MT/LT</td>
<td></td>
</tr>
<tr>
<td>Driver Delay</td>
<td>Slight</td>
<td>Adverse</td>
<td>P D ST/MT/LT</td>
<td>Revised lane designation at Cowley Road / Milton Road junction</td>
</tr>
<tr>
<td>Pedestrian &amp; Cyclist Delay &amp; Amenity</td>
<td>Slight</td>
<td>Beneficial</td>
<td>P I ST/MT/LT</td>
<td>Provision of high quality pedestrian and cycle facilities including 1,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Sites Preparation, Demolition, Earthworks and Construction Phase: See para 13.9.3

Operational Phase:
- DMRB Volume 11 guidelines HA 205/08.
- Environmental Management and Assessment (IEMA) guidelines.
- Cambridge City Council Local Plan
- Cambridgeshire Local Transport Plan 2011-2026 (March 2011)
- South Cambridgeshire District Council Local
| Pedestrian & Cyclist Fear & Intimidation | Slight | Adverse | P | D/I | ST/MT/LT | • Committed Busway across Milton Road into site.  
• High quality on site pedestrian/cycle infrastructure | Slight | Adverse | P | D/I | ST/MT/LT | Development Framework  
Cambridge City Council Local Plan  
Cambridgeshire Local Transport Plan 2011-2026 (March 2011)  
East of England Plan (May 2008)  
National Planning Policy Framework (March 2012) | **Pedestrians & cyclists - General** | Neutral | - | P | D/I | ST/MT/LT | - |
<table>
<thead>
<tr>
<th>Description of Likely Significant Effects</th>
<th>Significance of Effects</th>
<th>Summary of Mitigation / Enhancements Measures</th>
<th>Significance of Residual Effects</th>
<th>Relevant Policy Legislation</th>
</tr>
</thead>
<tbody>
<tr>
<td>(V.Large, Large, Moderate, Slight, Neutral)</td>
<td>Beneficial / Adverse</td>
<td>(P/T) (D/I) ST/MT/LT</td>
<td>(Major, Moderate, Minor, Negligible)</td>
<td>Beneficial / Adverse</td>
</tr>
</tbody>
</table>
| **Public Transport Provision** | Large | Beneficial | P I ST/MT/LT | • Committed Busway across Milton Road into Site.  
• Anticipated extension of Citi2 bus service into Site. |  |
| **Residential Amenity** | Neutral | - | P I ST | • Residential Parking Monitoring and relevant controls (see para) |  |

- Cambridgeshire Local Transport Plan 2011-2026 (March 2011)
| Safety | Neutral | Adverse | P | D | ST/MT/LT | - |

**Key to table:**

- P/T = Permanent or Temporary
- D/I = Direct or Indirect
- ST/MT/LT = Short Term, Medium Term or Long Term
- N/A = Not applicable
13. WASTE

Introduction

13.1 The generation of waste in one form or another is an inevitable consequence of all forms of development and the sustainable management of waste is an important issue. The purpose of this Chapter is to provide a prediction of the amount of material/waste that is envisaged as a result of the Development, identify how it can be managed and assess the impacts of this waste on the environment.

13.2 Reducing the amount of material leaving the Site as a waste is important, both in terms of managing the material through the principles of the waste hierarchy, whilst minimising the number of vehicle movements at the site and the associated impacts increased traffic may have on the local environs.

13.3 The assessment will consider the types and quantities of solid waste that will be generated during demolition, excavation and construction and the severity of the likely significant environmental effects that may arise from the quantity of waste requiring offsite disposal to landfill (this being a finite resource and the least preferred waste management option).

Key Aspects of the Development

13.4 The Development encompasses the removal of existing sidings (track) and the demolition of eight of buildings no longer in use along with associated ground/civil works (of which three will be demolished to facilitate the Development).

13.5 The Development will include demolition, excavation and construction activities which will produce a variety of materials including aggregates, concrete, metal, soils, plastic, steel and timber. There is also the potential that the development may result in the generation of hazardous waste including contaminated soils and contaminated ballast from excavation works.

13.6 Waste produced can be mitigated through design and construction methods, such as reuse of excavated material. A Site Waste Management Plan (‘SWMP’) has been developed to identify the types and quantities of wastes arising and how best to manage waste volumes minimising the environmental impact. The SWMP can be viewed in Appendix 27.

13.7 By adopting the principles of good waste management practice, it is possible for high levels of minimisation, reuse, recycling and recovery to be achieved. This will reduce the quantity of waste produced or sent to landfill and the environmental impact (in terms of pollution, energy and carbon impact producing from virgin materials).
Regulatory/Policy Framework

National
13.8 The National Waste Strategy 2007 aims to reduce waste at source, increase recycling and promote energy recovery from waste. Landfill is the least preferred option for managing the waste stream.

13.9 In 2011, the UK Government carried out a waste policy review. The review outlined the plans to create a ‘zero waste economy’ where the amount of waste being sent to landfill is reduced in favour of reuse, recycling or waste-to-energy infrastructure.

13.10 It reiterates the requirements to manage waste in line with the waste hierarchy and reduce the carbon impacts of waste. Targets include the requirement to recover 70% of construction and demolition waste by 2020.

13.11 The NPPF aims to move waste up the waste hierarchy and utilise it as a resource, as far as possible. Sustainable waste management looks to manage waste in line with the waste hierarchy through prevention, preparing for reuse, recycling and other recovery with disposal as a last resort only.

13.12 The Waste Management Plan (WMP) for England was revised in December 2013 following the consultation and production of the post adoption statement. The WMP itself is a compilation of existing waste management information and policies with regards to the current situation in England, with the main aim to ensure that current policies are within one national plan. The WMP details the use of the waste hierarchy and how this should be enforced through both national and local policies.

13.13 The recently published National Planning Policy for Waste (2014) is the formal replacement for Planning Policy Statement 10. It does however still follow the principles set out in the superseded PPS10 – which states that waste should be managed in line with the principles of the waste hierarchy. The facility promotes waste management in line with the principles of the hierarchy through the provision of skips for materials that have been source segregated and minimising the opportunity for disposal of residual waste.

Regional and Local Policy

13.15 Policy CS2: Strategic Vision and Objectives for Sustainable Waste Management Development states that “in line with sustainability, and as a reflection of the growth agenda, a pro-active approach to sustainable construction and recycling will be taken, and strategic development will be required to
maximise the reuse, recovery and recycling of inert and sustainable construction materials through the provision of temporary waste recycling facilities. These should be in place prior to and throughout the construction phases. Construction / demolition and inert waste will be the largest waste stream to be managed. An increasing proportion of this waste will be recycled, but a significant amount of that which requires disposal will be used in a positive manner to secure restoration of mineral extraction sites”.

13.16 Policy CS3 Strategic Vision and Objectives for Block Fen / Langwood Fen, Earith / Mepal identifies the area as a future strategic resource for recycling of construction waste and disposal of inert waste with an objective set for the area to “establish at least 3 long term construction waste recycling facilities, capable of recycling up to 50%, increasing up to 70%, of construction waste by 2026.

13.17 The authorities have also produced the Joint Municipal Waste Management Strategy (2008-2022) for the management of household waste and similar waste streams.

13.18 There are no specific policies or targets for the treatment of commercial and industrial or construction and demolition waste within the Waste Management Strategy, although the treatment of these wastes is identified as requiring encouragement and promotion.

13.19 The Strategy (Objective 18) sets out measures to explore new and current recycling/processing facilities to improve the development between commercial and other waste streams.

13.20 Policy CS28, Waste Minimisation, Re-use and Resource Recovery also requires waste audits to be prepared. This is to ensure early consideration of the scope for recycling, land take and mitigation measures. A waste audit, as a minimum should provide information on:

- anticipated nature and volumes of waste arising;
- the steps that will be taken to minimise the amount of waste arising;
- the steps that will be taken to ensure segregation of waste at source and its sorting, storage, recovery and recycling;
- steps taken to ensure the re-use of waste arising in the development e.g. soils and recycled aggregate; and
- any other steps taken to manage the waste that cannot be incorporated within the development or that arises once the development is complete.

13.21 This chapter of the ES and accompanying SWMP provide the information required to satisfy the requirements of the waste audit outline above.
Assessment Methodology

13.22 The approach to the waste management assessment has been to consider the likely types and volumes of waste generated during demolition, excavation and construction. An assessment has been made of the different waste quantities and material types and these are further detailed in the accompanying SWMP.

13.23 Given the very low levels of operational waste anticipated to be generated by the Development, this is not considered to have any material impact. Based on the existing waste disposal capacity in the region, it is anticipated that any additional waste during this time will have a neutral, long term impact, and so has not been further assessed in the EIA.

Assessment of Impact and Significance

13.24 Waste arisings have been calculated based on the following activities;
  - Waste generated through demolition of buildings and the removal of sidings;
  - Waste generated throughout excavation; and
  - Waste generated by materials brought onto site for construction.

13.25 In assessing the impact of the waste arisings the following assumptions have been made:
  - Where materials are available and suitable for reuse measures will be taken to incorporate this material within the construction process.
  - It is anticipated that uncontaminated excavated material will be available for reuse on site, while the contaminated material will be removed offsite for remediation.
  - The quantity of waste arisings during all three phases will be assessed against the existing waste arisings/infrastructure in the area, to determine if a significant impact is anticipated.

13.26 The significance criteria used to assess the impact of the Development has been developed specific to the Development and is detailed in Table 0-1. For the purposes of the waste assessment, those effects indicated as being of ‘major adverse’ and ‘moderate adverse’ may be considered as significant.
### Table 0-1  The significance criteria used to assess the impact of the Development

<table>
<thead>
<tr>
<th>Major adverse effect</th>
<th>Severe permanent reduction in landfill void space capacity on a local and regional scale. Need for large scale waste treatment facilities to protect against adverse environmental effects.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate adverse effect</td>
<td>Slight or moderate, local-scale reduction in landfill void space capacity. Need for medium scale waste treatment facilities to protect against adverse environmental effects.</td>
</tr>
<tr>
<td>Minor adverse effect</td>
<td>Slight or moderate, local-scale reduction in landfill void space capacity reversible with time. Need for medium scale waste treatment facilities to protect against adverse environmental effects.</td>
</tr>
<tr>
<td>Neutral effect</td>
<td>No waste generation, no discernible effects due to waste management.</td>
</tr>
<tr>
<td>Minor beneficial effect</td>
<td>Minor decrease in waste generation or minor increase in re-use and recycling levels. Slight or moderate, local-scale reduction in use of landfill.</td>
</tr>
<tr>
<td>Moderate beneficial effect</td>
<td>Slight or moderate decrease in waste generation or moderate increase in reuse and recycling levels. Slight or moderate reduction in use of landfill.</td>
</tr>
<tr>
<td>Major beneficial effect</td>
<td>Significant decrease in waste generation, landfill disposal or major increase in recycling and re-use levels.</td>
</tr>
</tbody>
</table>

**Baseline Conditions**

13.27  It is anticipated that any waste arisings will be small and are likely to relate to track maintenance. In order to establish a baseline against which to compare waste arisings associated with the Development, a conservative approach has been taken and the assumption made is that no waste is currently generated by the Site.

13.28  In general waste is managed at a county, regional or sub-regional level depending on the waste type and availability of facilities. The baseline position presented in this report represents the most recently available published data concerning waste arisings at a county and regional level. Local Authorities have not been required to report on data pertaining to Construction, Demolition and Excavation Waste (‘CDEW’) and so only limited information is available.

13.29  The total volume of CDEW generated in Cambridgeshire, Norfolk and Suffolk and the East of England for 2005 is detailed in Table 0-1. This highlights that 11.55 million tonnes of CDEW was

---

generated in the East of England area. In Cambridgeshire, Norfolk and Suffolk the amount of CDEW generated was 4.78 million tonnes.

<table>
<thead>
<tr>
<th>Region</th>
<th>Waste type</th>
<th>2005 (tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>East of England</td>
<td>CDE</td>
<td>11,553,299</td>
</tr>
<tr>
<td>Cambridgeshire, Norfolk and</td>
<td>CDE</td>
<td>4,780,477</td>
</tr>
<tr>
<td>Suffolk</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CLG 2007

13.30 Waste arisings from demolition and excavation waste are entirely driven by redevelopment activity and therefore accurate forecasting of these waste streams is extremely difficult, especially due to the volatility within the construction market at present.

13.31 Data collected by the Environment Agency shows that the amount of CDEW arisings decreased from this 11.55 million in 2005 to 10.3 million in 2008 (Table 0-2). However there is insufficient data available to make any assumptions as to whether this is a continuing trend.

<table>
<thead>
<tr>
<th>Year</th>
<th>Reference</th>
<th>Tonnages of CDEW</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>CDE</td>
<td>11,553,299</td>
</tr>
<tr>
<td>2008</td>
<td>CDE</td>
<td>10,300,000</td>
</tr>
</tbody>
</table>

Source: Environment Agency (2009)

13.32 The Cambridgeshire and Peterborough Core Strategy (2011) indicates that arisings of C&D/inert waste are in the order of 2.61 million tonnes per annum for 2006, and are projected to increase to 2.99 million tonnes in 2026 (see Table 0-3).

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Table 0-3  C&D Waste Quantities – Cambridgeshire and Peterborough$^{63}$

<table>
<thead>
<tr>
<th></th>
<th>Quantity 2006 Tonnes</th>
<th>Quantity 2011 Tonnes</th>
<th>Quantity 2016 Tonnes</th>
<th>Quantity 2021 Tonnes</th>
<th>Quantity 2026 Tonnes</th>
</tr>
</thead>
<tbody>
<tr>
<td>C&amp;D/Inert</td>
<td>2,611,000</td>
<td>2,719,000</td>
<td>2,825,000</td>
<td>2,908,000</td>
<td>2,985,000</td>
</tr>
</tbody>
</table>

Source: Cambridge County Council and Peterborough City Council, 2007$^{64}$

13.33 In terms of treatment capacity, data from the Environment Agency shows that in 2010 Cambridgeshire had 2.11 million tonnes of inert landfill capacity and circa 13.16 million tonnes of non-hazardous landfill capacity. However, neither the County nor the region has any provision for hazardous waste disposal (Table 0-4).$^{65}$

Table 0-4  Landfill Capacity for the East of England and Cambridgeshire in 2010

<table>
<thead>
<tr>
<th></th>
<th>Cambridgeshire Tonnes</th>
<th>East of England Tonnes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazardous</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Non-hazardous</td>
<td>13,164,840</td>
<td>47,632,500</td>
</tr>
<tr>
<td>Inert</td>
<td>2,105,520</td>
<td>8,872,200</td>
</tr>
</tbody>
</table>

Source: Environment Agency, 2010$^{66}$

13.34 The Core Strategy states that 1.13 million tonnes of inert recycling capacity was available in the Plan area in 2009. The CS also identifies that the Whitemoor rail depot at March provides an opportunity for large scale recycling of aggregates. The depot serves the East of England Region, is an existing recycling facility for used railway ballast and the Development identifies its potential for recycling other railway related materials.

2. Potential Impacts

13.1 A variety of wastes will be produced from the demolition of buildings on the Site and these estimates, the recycling potential for these materials, including timber, gypsum and plastics, is relatively high. Material produced during the demolition of redundant buildings, sidings and other demolition waste onsite will be managed in accordance with the mitigation measures outlined later in this chapter to minimise waste materials where possible.


Table 2-1  Estimated demolition waste arisings

<table>
<thead>
<tr>
<th>Waste type</th>
<th>Tonnage</th>
<th>Reuse on-site (tonnes)</th>
<th>Reuse Off-site (tonnes)</th>
<th>Recycling off-site (tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel</td>
<td>867</td>
<td>0</td>
<td>0</td>
<td>867</td>
</tr>
<tr>
<td>Timber</td>
<td>583</td>
<td>0</td>
<td>583</td>
<td>0</td>
</tr>
<tr>
<td>Ballast</td>
<td>6,583</td>
<td>0</td>
<td>0</td>
<td>6,517</td>
</tr>
<tr>
<td>Mixed C&amp;D</td>
<td>790</td>
<td>0</td>
<td>0</td>
<td>750</td>
</tr>
<tr>
<td>Total</td>
<td>8,823</td>
<td>0</td>
<td>583</td>
<td>8,134</td>
</tr>
</tbody>
</table>

13.2  75% of the demolition waste estimated in Table 2-1 comprises used ballast. It is understood that this material is likely to contain some contamination, potentially leading to a hazardous waste classification.

13.3  Treatment facilities exist to clean contaminated railway ballast prior to reuse in the construction of new track. A local facility is reported to exist which is able to treat contaminated ballast from the Development.

13.4  The main waste during excavation will be inert soil and stones. Table 2-2 presents the calculated tonnages of excavated materials. The exact volumes of inert soil and stone which can be utilised on site as part of the backfilling and levelling of the Site will, to a certain degree, be limited by contamination levels, a nominal 10% contamination has been assumed for the assessment.

Table 2-2  Estimated excavation waste arisings

<table>
<thead>
<tr>
<th>Waste type</th>
<th>Tonnage</th>
<th>% Reuse on-site</th>
<th>Reuse on site (tonnes)</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inert soil and stones</td>
<td>6,662</td>
<td>100%</td>
<td>6,662</td>
<td>0</td>
</tr>
<tr>
<td>Contaminated soils</td>
<td>740</td>
<td>0%</td>
<td>0</td>
<td>740</td>
</tr>
<tr>
<td>Total</td>
<td>7,402</td>
<td></td>
<td>6,662</td>
<td>740</td>
</tr>
</tbody>
</table>

13.5  The calculated volumes of construction material required for the works on-site is presented in Table 2-3. In order to estimate the amount of material that will become waste either through material brought on Site and not used or waste arising from the construction activities is calculated by applying a standard wastage rate for each material type (this is further detailed in the accompanying SWMP).
Table 2-3  Estimated construction waste arisings

<table>
<thead>
<tr>
<th>Waste type</th>
<th>Tonnage of material required</th>
<th>Wastage rate (%)</th>
<th>Waste arisings (tonnes)</th>
<th>Reuse on site (tonnes)</th>
<th>Recycling off site (tonnes)</th>
<th>Disposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel</td>
<td>411</td>
<td>1%</td>
<td>4</td>
<td>-</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>Concrete</td>
<td>5,531</td>
<td>3%</td>
<td>57</td>
<td>-</td>
<td>57</td>
<td>-</td>
</tr>
<tr>
<td>Bitumen/asphalt</td>
<td>2,218</td>
<td>6%</td>
<td>131</td>
<td>-</td>
<td>131</td>
<td>-</td>
</tr>
<tr>
<td>Soil</td>
<td>10,190</td>
<td>0%</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Geotextile membrane</td>
<td>1,010</td>
<td>7%</td>
<td>66</td>
<td>33</td>
<td>-</td>
<td>33</td>
</tr>
<tr>
<td>Plastic Packaging</td>
<td>2</td>
<td>100%</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Wood Packaging</td>
<td>2</td>
<td>100%</td>
<td>2</td>
<td>-</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>19,364</strong></td>
<td>-</td>
<td><strong>262</strong></td>
<td><strong>33</strong></td>
<td><strong>194</strong></td>
<td><strong>35</strong></td>
</tr>
</tbody>
</table>

* Plastic and Wood packaging has been taken as 1% percent of the total construction materials tonnage brought onto site.

13.6 In terms of overall waste generated, the total amount of demolition waste arising is 8,823 tonnes, waste arisings during the excavation phase are estimated to amount to 7,402 tonnes and the construction phase will generate 262 tonnes. As presented in tables 13.6 to 13.8 a total of 16,487 tonnes of CDEW will be produced by the Development. When compared to total CDE waste arisings for the County of 2,719,000 tonnes (2011); total waste arisings equate to 0.60%. The environmental impact of the waste arisings associated with the Development is therefore considered to have a neutral effect on waste management infrastructure within the County.

**Mitigation Measures**

13.7 Estimated waste arisings associated with the Development are outlined in Baseline Conditions. These waste arisings will be minimised as far as possible through the implementation of the following key management practices and mitigation measures;

**Demolition**

- On site segregation of materials for reuse and recycling / treatment, and the adoption of a SWMP ;
- Material reuse on site during construction phase; and
- Recovery of materials for reuse on or off site.
**Excavation**

- Segregation of excavated materials onsite will enable the allocation of materials for reuse on site and those requiring off site treatment (involving decontamination and recycling and recovery);
- Reuse of excavated material where possible; and
- Surplus material used on site for levelling, infilling and landscape proposals.

**Construction**

- Encourage use of non-primary materials over primary materials;
- Support for waste minimisation and recycling initiatives – setting KPIs;
- Preference given to renewable materials, materials with low(er) environmental impacts and towards components with high(er) proportions of recycled material;
- Encourage the use of locally sourced materials where appropriate;
- Contractors will maintain the Site Waste Management Plan (SWMP), to identify responsibilities, waste streams and plan for efficient materials and waste handling; and
- Site materials will be quantified and categorised in order to identify options for recycling and re-use versus disposal.

**Residual Impacts**

13.8 Following the implementation of the mitigation measures outlined, a residual amount of waste will remain that requires disposal. These have been calculated utilising assumed recycling/ reuse rates based on best practice management methods. Table 2-1 to Table 2-3 present this data.

13.9 As can be seen in Table 2-1 to Table 2-3, it is forecast that 288 tonnes of residual CDE waste will be generated by the development. This amounts to 0.01% of C&D waste arisings in the Cambridge and Peterborough Authorities area (as presented in Table 0-3 for 2011). This development is therefore considered to have a neutral effect on the County’s waste arisings and waste infrastructure.

**Conclusion**

13.10 The waste management mitigation measures described divert an estimated 98% of the waste arisings generated by the Development from landfill/ disposal.

13.11 The remaining residual waste amounts to 0.01% of the CD&E waste arising within Cambridge and Peterborough. The assessment concludes that the overall impact of the waste generated by the Development will be neutral effect on waste management arisings and infrastructure capacity within the Region.
13.12 The sustainable waste management measures detailed will be implemented through the SWMP which provides a living document to plan, track and record the management of waste arisings.

13.13 The estimated waste arisings produced during the demolition phase was dominated by ballast, which contributed 80% towards waste being recycled offsite. The steel from the track removal and track relay and mixed C&D waste from building demolitions will be recycled off-site. The timber sleepers will be the only waste produced during the demolition phase to be reused off-site without prior treatment.

13.14 Prior to construction all contaminated land will require to be remediated or removed from this site in line with a methodology and specification to be developed/agreed with the Environment Agency.

13.15 Materials may be reused if testing shows no residual contamination following treatment/remediation. Should there still be residual contamination it will require to be disposed of at a hazardous waste site.

13.16 On this basis there is an assumption that 90% of the land/materials arising will be treatable and 10% will require to be recycled/removed from Site.

13.17 The estimated waste arisings produced during the construction phase is 262 tonnes. Of the waste to be recycled off-site, bitumen/asphalt contributes to 50% of materials. Thirty three tonnes of geotextile membrane will be reused on-site for under tracking and the station area. The remaining 33 tonnes of geotextile membrane will be sent for disposal along with 2 tonnes of plastic packaging.
14. WATER CONSERVATION, FLOOD RISK ASSESSMENT AND DRAINAGE

Introduction

Site

14.1 The Site is shown in Figure 14.1. The average ground levels of the existing site are at approximately 6 metres above ordnance datum which is above the 1 in 1000 annual probability (0.1%) fluvial event extents shown in Figure 14.2. Topographical surveys have shown that existing ground levels for the site vary typically within 0.1 metres above the average ground level. In some places existing tracks are elevated by a further 0.2 metres to 6.2 metres above ordnance datum. However, access to the west of the site is slightly elevated and enters the site at around 8.5 metres above ordnance datum to the west sloping gently down to around 6 metres above ordnance datum when entering the wider part of the site.

Figure 14.1 Approximate site location and watercourses.
Scope

14.2 This chapter will assess the short and long term impacts of the Development on the water environment and will provide assessment of flood risk and drainage and the impact of the Development on the water environment as outlined in the Methodology section.

Policy Context

14.3 The assessment of flood risk, drainage and the water environment is guided by European, National and local legislation. The following section considers each of these sources of policy in turn.

European Legislation

14.4 With regard to the protection of specific water resources, water quality standards and related policy relevant to the Development are set out in the following relevant European legislation:

- The Groundwater Directive, 2006/118/EC;
- The Urban Waste Water Treatment Directive (91/271/EEC);
- The Habitats Directive (92/43/EEC); and
14.5 The aim of water policy in England is to protect both public health and the environment by maintaining and improving the quality of natural waters. These include surface water bodies (e.g. rivers, streams, lakes, ponds) and groundwater.

National Legislation

14.6 European legislation is implemented in the UK through specific sets of Regulations. The National Planning Policy Framework guides all national planning. Management and enforcement of water policy is the responsibility of the Environment Agency.

14.7 The following national legislation is also relevant:
- Environmental Protection Act (1990);
- Water Industry Act (1991);
- Water Industry Act (1991) (Amendment) (England and Wales) Regulations (2009);
- Environment Act (1995);
- Water Act (2003);
- Environmental Damage (Prevention and Remediation) Regulations (2009);
- Groundwater (England and Wales) Regulations (2009); and

Planning policy and guidance

14.8 The NPPF guides all national planning. When the NPPF was published it superseded Planning Policy Statement 25 (PPS25) on development and flood risk although the principles remain the same and there is reference back to the use of PPS25 in the accompanying technical notes. The assessment of flood risk has been completed in line with the requirements of the NPPF. As required by the NPPF, the sequential test will be undertaken. No exception test is required.

14.9 With regard to flood risk the aim of NPPF is to avoid inappropriate development in areas at risk from flooding, but where development is necessary, making it safe without increasing flood risk elsewhere. In accordance with NPPF, proposed development in areas at risk from flooding, (i.e. located in Flood Zone 2 or 3) or development in excess of 1ha requires the submission of a flood risk assessment with the planning application. At Chesterton none of the site is within Flood zone 2 or 3. However, although the fluvial flood risk is low, an assessment of flood risk is provided within this chapter in particular to consider surface water and groundwater flood risk and inform development of sustainable drainage solutions.
14.10 The government document detailing non statutory technical standards for sustainable drainage systems provides guidance on the assessment and design of new drainage on brownfield sites to ensure the risk of flooding is not made worse by new development.

Local Planning Policy and Documents

14.11 CCiC has prepared a Sustainable Drainage Design and Adoption manual to enhance the local implementation of Sustainable Drainage Systems (CCiC, 2009). Reference has also been made to the Sustainable Design and Construction Supplementary Planning Document, (CCiC, 2007). There are a number of local planning documents including the Cambridge Local Plan (CCiC, 2006), and Local Development Framework – Core strategy (SCDC, 2007). A Local Flood Risk Management Strategy for Cambridgeshire (Cambridgeshire’s Local Flood Risk Management Strategy CCoC et al, 2013-2015) identifies roles and responsibilities for Flood Risk Management Partners including the Lead Local Flood Authority (LLFA).

14.12 These plans variously promote common themes such as:

- reducing use of water;
- becoming more water efficient;
- minimising pollution to water;
- storage of water to benefit flood risk;
- enhancement of waterside recreation, access and habitats;
- managing run-off on site; and
- use of SUDS


Other general water policy

14.14 Cambridgeshire Horizons produced a Detailed Water Cycle Strategy in July 2011 which includes consideration of water resources use (Cambridgeshire Horizons, 2011). CCiC and SCDC have developed a Strategic Flood Risk Assessment (SFRA) that identifies flood risk to strategic land use planning (CCiC, 2010). The principles of the Environment Agency Pollution Prevention Guidance notes will be applied to mitigate potential impacts for works during construction and operation. CIRIA (c648) (CIRIA, 2006) will also be considered to help identify and mitigate risks during construction.
Methodology

14.15 Impacts from the construction and operational stages of the Development will be identified during the assessment process of the Environmental Statement for the water environment and flood risk. Impacts will be considered in terms of their nature, the physical extent of their influence, and the magnitude of their effects, on the following basis:

- Direct or indirect
- Temporary, short, medium or long term
- Reversible or irreversible
- Beneficial or adverse
- Cumulative

14.16 The methodology of assessment of the water environment will be based on method in webTAG unit 3.3.11 (DfT, 2014) and volume 11 section 3 part 10 of the Design Manual for Roads and Bridges (HD45/09) (DfT, 2009). These methods use a three stage procedure to identify importance of receptors, magnitude of impact of the Development and an overall significance of effects. Importance of all water attributes are assessed in the Existing Conditions section and the magnitude of impacts and significance of effects are assessed in the Potential Effects of the Development. There will be use of the sequential test to determine if the location of development is satisfactory with regard to flood risk. This can be seen in Figure 14.3 and Tables 14.1 and 14.2. For the access route to the Development, quantitative assessment has been considered in accordance with HD45/09. However, as the volume of traffic flow to the site will be lower than 10000 Annual Average Daily Traffic Flow, it is considered the likelihood of pollutant loading is so low as to be insignificant. No further tests are proposed for the Development.
Figure 14.3 Ground investigation plan.
<table>
<thead>
<tr>
<th>Land Use Vulnerability</th>
<th>Type of Development</th>
</tr>
</thead>
</table>
| **Essential Infrastructure** | Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk  
Essential utility infrastructure, which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood.  
Wind turbines. |
| **Highly Vulnerable** | Police Stations, Ambulance Stations and Fire stations, Command Centres and telecommunications installations required to be operational during flooding.  
Emergency dispersal points.  
Basement dwellings.  
Caravans, mobile homes and park homes intended for permanent residential use.  
Installations requiring hazardous substances consent. |
| **More Vulnerable** | Hospitals.  
Residential institutions such as care homes, children’s homes, social services homes, prisons and hostels.  
Buildings used for: dwelling houses; student halls of residence; drinking establishments; nightclubs and hotels.  
Non-residential uses for health services, nurseries and educational establishments.  
Landfill and sites used for waste management facilities for hazardous waste.  
Sites used for holiday or short let caravans and camping, subject to specific warning and evacuation plans. |
| **Less Vulnerable** | Police Stations, Ambulance Stations and Fire stations which are not required to be operational during flooding.  
Buildings used for: shops, financial, professional and other services; restaurants and cafes, hot food takeaways; offices; general industry; storage and distribution; non-residential institutions not included in ‘more vulnerable’; and assembly and leisure.  
Land and buildings used for agriculture and forestry.  
Waste treatment (except for landfill and hazardous waste facilities). |
Minerals working and processing (except for sand and gravel working).
Water treatment plants which do not need to remain operational during times of flood.
Sewage treatment plants (if adequate pollution control measures in place).

<table>
<thead>
<tr>
<th>Water Compatible Development</th>
<th>Minerals working and processing (except for sand and gravel working).</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Water treatment plants which do not need to remain operational during times of flood.</td>
</tr>
<tr>
<td></td>
<td>Sewage treatment plants (if adequate pollution control measures in place).</td>
</tr>
</tbody>
</table>

- Flood control infrastructure.
- Water transmission infrastructure and pumping stations.
- Sewage transmission infrastructure and pumping stations.
- Sand and Gravel workings.
- Docks, Marinas and Wharves.
- Navigation facilities.
- MOD installations.
- Shipbuilding, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location.
- Water based recreation (excluding sleeping accommodation).
- Lifeguard and coastguard operations.
- Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.
- Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to specific warning and evacuation plans.

<table>
<thead>
<tr>
<th>Flood Risk Vulnerability Classification (see Table D2 of PPS25)</th>
<th>Essential Infrastructure</th>
<th>Water Compatible</th>
<th>Highly Vulnerable</th>
<th>More Vulnerable</th>
<th>Less Vulnerable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flood Zone (see Table D1 of PPS25)</td>
<td><img src="https://via.placeholder.com/150" alt="Image" /></td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Zone1 Low Probability</td>
<td><img src="https://via.placeholder.com/150" alt="Image" /></td>
<td>✔️</td>
<td>✔️</td>
<td>Exception Test</td>
<td>✔️</td>
</tr>
<tr>
<td>Zone2</td>
<td><img src="https://via.placeholder.com/150" alt="Image" /></td>
<td>✔️</td>
<td>✔️</td>
<td>Exception Test</td>
<td>✔️</td>
</tr>
<tr>
<td>Medium Probability</td>
<td>Exception Test required</td>
<td>1990 to 2025</td>
<td>2025 to 2055</td>
<td>2055 to 2085</td>
<td>2085 to 2115</td>
</tr>
<tr>
<td>--------------------</td>
<td>-------------------------</td>
<td>--------------</td>
<td>--------------</td>
<td>--------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Zone 3a High Probability</td>
<td>✓</td>
<td>X</td>
<td>Exception Test required</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Zone 3b ‘Functional Floodplain’</td>
<td>✓</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

- ✓ Development is appropriate
- x Development should not be permitted

<table>
<thead>
<tr>
<th>Net sea level rise (mm per year) relative to 1990</th>
</tr>
</thead>
<tbody>
<tr>
<td>East of England, east midlands, London, south-east England (south of Flamborough Head)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>1990 to 2025</th>
<th>2025 to 2055</th>
<th>2055 to 2085</th>
<th>2085 to 2115</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Rainfall Intensity</td>
<td>+5%</td>
<td>+10%</td>
<td>+20%</td>
<td>+30%</td>
</tr>
<tr>
<td>Peak River Flow</td>
<td>+10%</td>
<td></td>
<td>+20%</td>
<td></td>
</tr>
</tbody>
</table>
14.17 Table 14.2 presents the assessment matrix that will be used to determine significance of effect considering receptor importance and magnitude of impact.

### Table 14.2 Assessing Impact Severity

**NB:** Scoring can be either Beneficial or Adverse

<table>
<thead>
<tr>
<th>Importance of resource or receptor</th>
<th>Magnitude of potential impact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Very High</td>
</tr>
<tr>
<td>Very High</td>
<td>Very Large</td>
</tr>
<tr>
<td>High</td>
<td>Large</td>
</tr>
<tr>
<td>Medium</td>
<td>Large</td>
</tr>
<tr>
<td>Low</td>
<td>Moderate</td>
</tr>
<tr>
<td>Negligible</td>
<td>Neutral</td>
</tr>
</tbody>
</table>

14.18 The area over which impacts may occur could be wider than the area of land directly influenced by the proposed Development. For the water environment the area of assessment has been taken to be approximately 500m from the edge of the Development area. It is recognised that some environmental design measures would take time to become established and effective. The assessment should therefore consider impacts in Year 1 (Opening Year) and in Year 15 (Design Year), where appropriate. It is also recognised that some effects would be of a permanent nature whereas others would be temporary. Where likely significant adverse effects are identified during the assessment, mitigation measures will be proposed, where practicable, to avoid, reduce or remedy the adverse environmental effects as far as possible. Measures to enhance beneficial environmental effects will also be considered as part of this assessment.

14.19 Cumulative effects arise from the combination of the Development and other developments not yet constructed or currently under construction in the vicinity, acting together to generate elevated levels of effects will be assessed. The impacts from a single development may not be significant on their own but when combined with other impacts spatially connected to a site these effects could become significant. Cumulative effects can also occur within the Development where components of the design may combine to provide a changed affect.

14.20 Residual effects are those effects that would remain after mitigation and enhancement measures have been fully implemented and these will be summarised in this chapter. Residual Impacts will be defined in terms of resources and receptors. Resources are defined as biophysical features or items of "environmental capital" (such as elements of ecological, landscape or heritage value, watercourses,
dwellings, places of employment, and community facilities. Receptors are simply human beings, either individually or collectively, and the socio-economic systems on which they depend.

**Data sources and other information**

14.21 Freely available data referred to within this assessment includes information from the Natural England website, the Environment Agency website, Topographical and Ground Investigation information collected as part of this assessment, and information collected on site visits. Topographical survey information has been obtained from L&M Services Ltd and Atkins Ltd to determine ground level of the Development and access routes. A ground investigation has been undertaken by URS (Appendix 15) which has included soil and water quality sampling and groundwater level measurement. Further investigation by Atkins in 2014 and 2015 provides additional information. Other potential constraints have been identified through a specific data requests to the Environment Agency (Appendix 28).

**Surface Water**

14.22 Water quality sampling has been undertaken to help determine if contaminated land at the Site may impact on the River Cam and consideration will be made of potential pathways for impact on the River Cam.

**Groundwater**

14.23 A data request was submitted to the Environment Agency to provide information on groundwater levels, monitoring boreholes and logs within 5km of the location of the Development. However, the Environment Agency only provided a summary of boreholes within 1km of this site rather than time series data when data was returned and no borehole logs for boreholes within 1km of the Site were provided by the Environment Agency. Other information has been obtained from the Environment Agency website. Further ground investigations have been undertaken including permeability testing, soil and water quality testing and borehole logs and are summarised within Chapter 7. They are reported more fully within the Preliminary Assessment Report. Consideration will be made of the requirements of the Environment Agency’s Groundwater protection principles and practise that there is no significant and upward trend in the concentration of pollutants toward groundwater from any perched water within this site.

**Water Resources**

14.24 Consideration of the demand and requirements for water use has been made by considering the Cambridge Water Cycle Strategy (Cambridgeshire Horizons, 2011) and by submission of pre development applications to determine capacity for use of potable water.
Flood risk and sustainable drainage

14.25 The approach for the flood risk assessment for the Development was developed in accordance with methodology set out in HD45/09 Annex I Method E and through consultation with the Environment Agency, SCDC, CCiC and CCoC.

14.26 The scope of the assessment of the flood risk associated with the Development was discussed and agreed with the Environment Agency, CCoC and SCDC at a meeting in 1st August, 2012 and 28th March 2013. At the meeting of the 1st August 2012 with the Environment Agency and CCiC, some important points raised included:

- Further investigation would be required if the redundant outfall of the First Public Drain that runs under the sidings is used;
- Rates of discharge to surface water systems will be targeted at around 2 l/s/ha with 30 % climate change;
- Groundwater investigations would be undertaken to determine groundwater levels and ground permeability; and
- Options for dealing with the surface water runoff in order of preference, direct infiltration, indirect infiltration, attenuated discharge to surface water systems and pumping.

14.27 To compliment this approach two other key points should be highlighted.

- The Development is located in Flood Zone 1 and therefore it is considered the Development will be at low risk from fluvial flooding.
- No hydraulic modelling will be undertaken unless the initial investigation shows that this is required.

14.28 The Strategic Flood Risk Assessments for Cambridge (CCiC, 2010) guides use of SUDS and provides guidance as to what should be considered with regard to flood risk within a flood risk assessment.

14.29 Existing records of surface water flooding caused by an overload of the surface water drainage system, which is referred to as pluvial flooding, will be determined by consultation with relevant stakeholders, including the Environment Agency, CCiC, CoCC, and SCDC.

Abstractions and Discharges

14.30 Information from the Environment Agency data request has provided sources of existing licensed abstractions and discharges within 1km of the Development. Both CCiC and SCDC have been consulted to determine if any further private abstractions were present within 500m of the Development.
Existing soil and water ground contamination assessment

14.31 Following ground investigations a water quality risk assessment was undertaken by the land contamination team (Appendix 15). The results of this assessment have been considered within this report and are summarised where required.

Consultation

14.32 Consultation has been undertaken with the Environment Agency, Local Authorities and other relevant stakeholders to obtain historical environmental records and local records and, where appropriate, progress meetings were held to ensure all parties remained informed.

Baseline Information

14.33 The first part of assessing the significance of effects of development on the water environment is to consider the importance of the receptors. There are a wide range of receptors in the water environment including surface waters, groundwater, abstractions and discharges, lakes and other surface water bodies, water resources and flood risk.

Surface water quality

14.34 With the exception of the Bramblefields LNR, there are two adjacent watercourses shown in Figure 14.1. It is assumed the First Public Drain is culverted under the site but is not operational. Table 14.3 shows the importance of surface waters near to the Development.

14.35 All water courses are required to meet a standard of “Good” through the Water Framework Directive. This gives them a High importance. As First Public Drain discharges to the River Cam it takes on its “High” importance as it will contribute to the classification of the River Cam watercourse catchment.

Table 14.3 Importance of surface water quality

<table>
<thead>
<tr>
<th>Name</th>
<th>Closest proximity to the Development</th>
<th>WFD reference</th>
<th>WFD classification</th>
<th>Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>River Cam</td>
<td>&gt;100m</td>
<td>gb105033042750</td>
<td>Moderate potential (ecological)</td>
<td>High</td>
</tr>
<tr>
<td>First Public Drain (west and north of)</td>
<td>&lt;10m</td>
<td>None</td>
<td>None</td>
<td>High</td>
</tr>
</tbody>
</table>
14.36 The Environment Agency has provided some monitoring data from the River Cam between the Green Dragon, Cambridge and Chesterton between 2003 and 2012 as part of data request. The range of total suspended solids can provide a baseline water quality within the River Cam and is summarised in Table 14.4.

**Table 14.4 Summary of water quality data for River Cam**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Range (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total suspended solids</td>
<td>3-60</td>
</tr>
</tbody>
</table>

Source: Environment Agency data request CCC201217237

**Groundwater quality**

14.37 The BGS Map Sheet No. 188 shows Secondary A aquifer Superficial Deposits underlying the majority of the Site comprise River Terrace Deposits (sand and gravel), although no Superficial Deposits are shown under the north part of the Site. These deposits are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. Bedrock is the Gault Formation (mudstone) and the Lower Chalk. Alluvium associated with the River Cam is located 225m to the south and east of the Site. Made Ground is present associated with railway operations and infrastructure and past earthworks. The groundwater vulnerability suggests it is a minor aquifer with intermediate or low vulnerability generally across most of the Site. However, the southern part of the site includes Major Aquifer with High and Intermediate vulnerability.

14.38 The importance of groundwater quality is low for the majority of the site and high in the south east of the Site.

**Existing ground contamination**

14.39 Following site investigations (Appendix 15) an assessment of existing contaminated land and water has been undertaken. These reports have been summarised below. Historically the site has been occupied by railway sidings for the past 120 years. Typically there was up to a minimum of 200mm and maximum of 5000mm of made ground on top of the site of varying material fine to coarse with varying amounts of ash. Leachate measured in laboratory conditions by solution of soil samples, showed,
arsenic zinc, copper, iron and TPH all breached drinking water standards on at least one occasion with the potential for vanadium to pose a risk too to groundwater. All pollutants tested in groundwater sampling posed a risk to groundwater on at least one occasion when assessed to UK drinking water standards.

**Abstractions**

14.40 The Site is not located within a Source Protection Zone. There are no other abstractions within 1km of the site known to the Environment Agency. CCiC and SCDC have both confirmed there are no private abstractions within 500m of the Development. The importance of abstractions from surface water or groundwater is **low** and they will not be considered further in this assessment.

**Discharges**

14.41 Discharges have been identified and are shown in Table 14.5.

### Table 14.5 Existing discharges

<table>
<thead>
<tr>
<th>Permit name</th>
<th>Discharge type</th>
<th>Easting</th>
<th>Northing</th>
<th>Receiving waters</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBP</td>
<td>Not recorded</td>
<td>547200</td>
<td>261170</td>
<td>First Public Drain</td>
</tr>
<tr>
<td>Camside View</td>
<td>Sewage discharges - sludge - water company</td>
<td>547850</td>
<td>260780</td>
<td>Unnamed Trib Or River Cam</td>
</tr>
<tr>
<td>Caravan Site Fen Road</td>
<td>Sewage discharges - sludge - water company</td>
<td>547960</td>
<td>260940</td>
<td>Trib River Cam</td>
</tr>
<tr>
<td>Chesterton Junction</td>
<td>Unspecified</td>
<td>547500</td>
<td>260800</td>
<td>No.1 Public Drain</td>
</tr>
<tr>
<td>Depot Into No.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fen Road</td>
<td>Sewage discharges - sludge - water company</td>
<td>547480</td>
<td>260780</td>
<td>Unnamed Trib Of River Cam</td>
</tr>
<tr>
<td>Hall Farm</td>
<td>Agriculture - fish farming - not water company</td>
<td>548100</td>
<td>260300</td>
<td>Trib River Cam</td>
</tr>
<tr>
<td>Lomas Farm</td>
<td>Sewage discharges - sludge - water company</td>
<td>547820</td>
<td>260710</td>
<td>Land</td>
</tr>
<tr>
<td>National Grid Wireless</td>
<td>Sewage discharges - sludge - water company</td>
<td>547700</td>
<td>260840</td>
<td>Unnamed Trib Of River Cam</td>
</tr>
<tr>
<td>Newfields Caravan Site</td>
<td>Sewage discharges - sludge - water company</td>
<td>548200</td>
<td>261450</td>
<td>Trib River Cam</td>
</tr>
<tr>
<td>Stp @ Red House Close</td>
<td>Trade discharges - boiler blowdown effluent</td>
<td>548352</td>
<td>261075</td>
<td>River Cam</td>
</tr>
<tr>
<td>Sunningdale Park</td>
<td>Sewage discharges - sludge - water company</td>
<td>547640</td>
<td>260850</td>
<td>An Award Drain, Tributary Rive</td>
</tr>
<tr>
<td>Vine Cottage Site</td>
<td>Trade discharges - boiler blowdown effluent</td>
<td>547700</td>
<td>260500</td>
<td>Into Land</td>
</tr>
</tbody>
</table>

**Lakes and other surface water bodies**

14.42 With the exception of Bramblefields, there is one pond within 500m of the Development. This is located less than 100m to the south east of the Site located within Cave industrial estate. It is assumed that there may be some connectivity with the lake through terrace gravels or made ground under the railway line. The lake has no designation and no known amenity use and is considered to be of **low** importance.

**Recreational activities**

14.43 Fishing rights along the west bank between the Penny Ferry public house (formerly the Pike & Eel) at Chesterton and Clayhithe Bridge are leased annually to the Cambridge Fish Preservation and Angling Society (CFPAS). There are a number of rowing clubs that are known to use the River Cam including The Chesterton Rowing Club. There is anecdotal use of the River Cam for canoeing and kayaking.

14.44 Based on the likely demand for shop facilities and public toilets the importance for water resources related to the Development is likely to be **low**.

**Conservation sites**

14.45 The importance of conservation sites as part of the Development is **low** and they will not be considered further in this assessment.

**Flood Risk**

14.46 It is outlined within the NPPF Technical Guidance (DCLG, 2012a) that flood risk from all sources must be addressed within the Flood Risk Assessment to ensure that potential flood risk has been considered during the development design and proposed works. Therefore this section outlines all the potential sources of flood risk to the site and the implications these risks have on development. It is also necessary to outline any records of previous flooding events as these may identify areas vulnerable to flooding.

14.47 The mapping provided within the Level 1 Strategic Flood Risk Assessment (CCiC, 2010) indicates areas that have experienced flooding from a range of sources including fluvial and surface water. The Strategic Flood Risk Assessment mapping indicates that the site has not experienced flooding but adjacent areas have.
**Historical incidents of flooding**

14.48 Historical fluvial flood mapping data shows fluvial flooding around 50m to the north of the Site and further flooding 250m the east of the site during the 1947 flood event but not within the area of the Development.

**Fluvial flood risk**

14.49 Fluvial flooding occurs when the capacity of a watercourse is exceeded. There are two sources of fluvial flood risk as shown on Figure 14.1. The First Public drain to the west and the north of the Site and the disused public drain flowing through the Site from the west to the east. The River Cam which is sensitive to flooding is less than 100 metres away from the eastern side of the Site boundary and main line railway. The Environment Agency flood maps which are freely available from the Environment Agency website are the initial source to determine fluvial flood risk to the site. Figure 14.2 shows that there is a low risk to the proposed site for the 1 in 1000 year (0.1%) Annual Probability event shown as light blue.

14.50 NPPF describes four Flood Zone classifications of which three have been utilised by the Environment Agency in the creation of their Flood Map. These Flood Zones should be used in determining the appropriateness of proposed development uses when considering flood risk through the application of the Sequential Test. They represent flooding without flood defences in place. The Development is located in Flood Zone 1. Flood Zone 1 is described as Areas with a ‘Low Probability’ of flooding and where the annual probability of flooding is lower than 0.1% Annual Exceedance Probability for either fluvial or sea flooding. NPPF impose no constraints upon the type of development within Flood Zone 1. According to NPPF the Development is classed as ‘Essential infrastructure” see table 14.1). This classification is based on Table 14.2: Flood Risk Vulnerability Classification, within NPPF.

14.51 The risk of fluvial flooding is **low**.

**Tidal flood risk**

14.52 There is no known Tidal flood risk in this location and the risk is considered to be **low**. Tidal flood risk will not be considered further in this report.

**Surface water flood risk**

14.53 Surface water flooding occurs when rainfall intensities exceed the infiltration capacity of the ground such that water collects on the surface or existing surface water drainage systems. Developed land, specifically with large areas of impermeable surfacing, can be vulnerable to surface water flooding where an adequate drainage system is not present. The SFRA (CCiC, 2010) shows that this site location...
is potentially at intermediate risk of surface water flood risk. However this does not indicate potential depths of flooding or provide a return period for the event considered. This risk is based upon Environment Agency surface water mapping. The existing risk of pluvial flooding is medium based on the SFRA.

**Groundwater flood risk**

14.54 Groundwater flooding normally occurs where the water table meets the ground surface in low lying areas which are underlain by permeable rock known as aquifers. This tends to follow long periods of sustained rainfall, but can also be caused as a result of local obstructions to groundwater flow (e.g. following the placement of engineering structures or buildings with foundations) or by the rebound of groundwater levels after a decrease in abstraction or dewatering. It is important to recognise that the risk of groundwater flooding is typically highly variable and heavily dependent on local geological, topographical and weather conditions. Groundwater flooding is hard to predict and challenging to mitigate. An understanding of groundwater flood risk can be developed by considering known geology, historical groundwater levels and information from recent site investigations.

14.55 The Site is underlain by the Gault Formation. Overlying this are superficial deposits comprising River Terrace Deposits and Alluvium. The Environment Agency mapping classifies the River Terrace Deposits and Alluvium underlying the site is a Secondary A Aquifer which is described ‘as permeable layers capable of supporting water supplies at a local scale’. The Gault Formation which typically underlies the superficial deposits is classified as Unproductive Strata due to its low permeability.

14.56 A ground investigation completed in January 2013 (Appendix 15) has indicated the following geological sequence beneath the Site:

- Made Ground encountered from ground level, up to 5m thick and described as soft to stiff, sandy and gravelly clay, silty, gravelly sand with ash and clayey sandy gravel;
- Alluvium, encountered from 0.9 and 4.4m below ground level (bgl), 0.4 to 1.1m thick and described as soft, sandy clay and gravelly sand;
- River Terrace Deposits, encountered from 0.25 and 5.5mbgl, 0.4 to 2.05m thick and described as clayey sand and gravel; and
- Gault Formation, encountered from 1.15 to 5mbgl, at least 13m thick and described as clay, locally fissured.

14.57 The Environment Agency provided a summary of monitoring information from borehole TL45/001 which is around 500 metres to the south east of the site. This is likely to be in monitoring water levels in either the River Terrace or Alluvium. This showed that recorded monthly monitoring water levels varied between 4.52m AOD and 5.87m AOD between September 1977 and April 1985 (Environment Agency
Monitoring of groundwater levels during site investigations in December 2012 and subsequent water level monitoring on a total of three site visits in February and March 2013 has been presented in Table 5. Monitoring locations are shown on Figure 3 in Annex 14.1. The depth at which groundwater levels were monitored on the site within boreholes ranged from 0.5m to 10m below ground level. Groundwater was encountered in the superficial deposits during excavation/drilling during the ground investigation in December 2012 at depths of 0.1 and 1.8 mbgl. During subsequent monitoring visits in February and March 2013 groundwater was recorded at depths ranging from 0.16 to 3.05 mbgl. Typically water levels are highest in the west of the site and lowest in the east of the site. Rainfall data reported in the monthly water situation report for March 2013 showed that since June last year there has been a monthly surplus of rainfall to over 40% above the long term average by March 2013. This suggests water levels in river terrace deposits could be above the long term average. Summaries of groundwater levels in regional aquifers of chalk or greensands suggests groundwater levels at normal to notably high levels (Environment Agency, 2013).

14.58 The information available on the geology underlying the site and groundwater monitoring suggest that there is a perched groundwater table within the superficial deposits which flows in a north easterly direction toward the River Cam and the eastern end of the First Public Drain. This perched water table may respond to river levels in the Cam.

14.59 The SFRA (CCC, 2012) provides no further information on the risk of groundwater flooding to the site, other than that there are no historical records of groundwater flooding either within the site or in adjacent areas.

14.60 Although there is no historical records of existing groundwater flood risk the site investigations and subsequent monitoring have identified a perched groundwater table in the superficial deposits close to the ground surface of the site. These permeable superficial deposits are likely to be relatively local in terms of spatial extent and may respond to river levels in the Cam which is approximately 300 to 600m to the east of the site. It is concluded that, based on the limited data available, the Development will be at a medium risk of groundwater flooding.

Other sources of flood risk

14.61 There is no risk of reservoir flooding as indicated on the Environment Agency website. This will not be considered further in this report. No further sources of flood risk have been identified by stakeholders during consultation and therefore no other sources of flood risk will be considered within this report.
Climate Change

14.62 For the purposes of this Development assessment on the water environment consideration of climate change has been made by considering an increasing intensity of rainfall for the assessment of surface water flood risk. This is in line with the latest guidance from the NPPF technical guidance and PPS25. In particular this will ensure that the proposed drainage systems for the Development will accommodate and attenuate a potentially increased volume and discharge of water.
Table 14.6 Water levels recorded during site investigations at Chesterton Sidings (Atkins, 2013)

<table>
<thead>
<tr>
<th>Reference</th>
<th>Water level after 20 minutes (mbgl) - site visit Dec 2012</th>
<th>Water level (maOD)</th>
<th>Stratum</th>
<th>Water level after 20 minutes (mbgl) - site visit Dec 2012</th>
<th>Water level (maOD)</th>
<th>Stratum</th>
<th>Reference</th>
<th>Water level after 20 minutes (mbgl) - site visit Dec 2012</th>
<th>Water level (maOD)</th>
<th>Stratum</th>
</tr>
</thead>
<tbody>
<tr>
<td>BH01</td>
<td>1.9-3.05</td>
<td>TP19</td>
<td>0.70</td>
<td>5.94</td>
<td>Made Ground</td>
<td>SM02A</td>
<td>0.40</td>
<td>-</td>
<td>Made Ground</td>
<td></td>
</tr>
<tr>
<td>BH02</td>
<td>1.45</td>
<td>TP26</td>
<td>0.75</td>
<td>5.44</td>
<td>Made Ground</td>
<td>SM02A</td>
<td>0.70</td>
<td>-</td>
<td>Made Ground</td>
<td></td>
</tr>
<tr>
<td>BH03</td>
<td>1.80</td>
<td>TP28A</td>
<td>1.05</td>
<td>5.29</td>
<td>Made Ground</td>
<td>SM03</td>
<td>0.15</td>
<td>-</td>
<td>Made Ground</td>
<td></td>
</tr>
<tr>
<td>S1</td>
<td>0.6</td>
<td>WS01</td>
<td>1.00</td>
<td>4.88</td>
<td>River Terrace</td>
<td>SM04</td>
<td>0.60</td>
<td>-</td>
<td>Made Ground</td>
<td></td>
</tr>
<tr>
<td>S2</td>
<td>0.15</td>
<td>WS02</td>
<td>1.70</td>
<td>4.45</td>
<td>Made Ground</td>
<td>SM05</td>
<td>0.30</td>
<td>-</td>
<td>Made Ground</td>
<td></td>
</tr>
<tr>
<td>S2B</td>
<td>0.30</td>
<td>WS05</td>
<td>1.80</td>
<td>5.91</td>
<td>River Terrace</td>
<td>SM07</td>
<td>1.20</td>
<td>-</td>
<td>Made Ground</td>
<td></td>
</tr>
<tr>
<td>S2C</td>
<td>0.23</td>
<td>WS06</td>
<td>1.00</td>
<td>6.03</td>
<td>River Terrace</td>
<td>SM08</td>
<td>0.20</td>
<td>-</td>
<td>Made Ground</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ground</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ground</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>-----------------</td>
<td>---</td>
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<td>---</td>
<td>---</td>
<td>-----------------</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>S3</td>
<td>0.30</td>
<td>5.83</td>
<td>Made Ground</td>
<td>WS06</td>
<td>0.10</td>
<td>-</td>
<td>SM09</td>
<td>0.70</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>TP08</td>
<td>0.76</td>
<td>5.31</td>
<td>Made Ground</td>
<td>WS07</td>
<td>0.90</td>
<td>5.34</td>
<td>River Terrace</td>
<td>SM10</td>
<td>1.10</td>
<td>-</td>
</tr>
<tr>
<td>TP08A</td>
<td>0.16</td>
<td>5.73</td>
<td>Made Ground</td>
<td>WS08</td>
<td>1.15</td>
<td>4.74</td>
<td>Made Ground</td>
<td>SM11</td>
<td>0.80</td>
<td>-</td>
</tr>
<tr>
<td>TP10</td>
<td>0.70</td>
<td>5.34</td>
<td>Made Ground</td>
<td>WS09</td>
<td>0.64</td>
<td>0.67</td>
<td>Alluvium</td>
<td>SM12</td>
<td>0.90</td>
<td>-</td>
</tr>
<tr>
<td>TP10A</td>
<td>0.22</td>
<td>5.85</td>
<td>Made Ground</td>
<td>WS10</td>
<td>1.15</td>
<td>4.8</td>
<td>Made ground/ river terrace</td>
<td>SM14</td>
<td>0.60</td>
<td>-</td>
</tr>
<tr>
<td>TP13</td>
<td>0.95</td>
<td>5.12</td>
<td>Made Ground</td>
<td>WS11</td>
<td>0.71</td>
<td>0.78</td>
<td>River Terrace</td>
<td>SM15</td>
<td>0.70</td>
<td>-</td>
</tr>
<tr>
<td>TP14</td>
<td>0.90</td>
<td>5.82</td>
<td>River Terrace</td>
<td>WS12</td>
<td>1.76</td>
<td>4.74</td>
<td>Made Ground</td>
<td>SM16</td>
<td>0.90</td>
<td>-</td>
</tr>
<tr>
<td>TP19</td>
<td>0.6</td>
<td>5.84</td>
<td>Made Ground</td>
<td>SM01</td>
<td>0.30</td>
<td>-</td>
<td>Made Ground</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Assessment of Drainage**

14.63 This section considers the existing drainage on the Site, key site conditions and the selection of proposed drainage of water from the Site. It will consider an approach based on best practise CIRIA guidance and local guidance.

**Existing drainage**

14.64 The Site is currently Brownfield but mostly permeable.

**Removal of contaminated land**

14.65 Following risk assessment is considered that the site does not pose a significant risk to human health or controlled waters. Prior to construction any material remaining on site should be confirmed to be suitable for re-use through materials testing and re-use of made ground beneath areas of hard landscaping. There is a potential increased level of risk during construction work and as well as a possibility that unidentified areas of contamination may be present and so it is recommended appropriate Health and Safety measures are implemented during construction work to prevent harm to construction workers and the general public.

14.66 CATWastesoil was used to screen the soil chemical data available from eighty four (84 No.) soil samples retrieved during site investigation works and all samples were found to be non-hazardous.

14.67 Due to the presence of chrysotile asbestos fibres in a sample collected from TP07 at 1.0mbgl the material at this location would be regarded as potentially hazardous. If this material is to remain in-situ it poses no risk to human health due to the depth to the contamination.

14.68 The Contractor will be required to undertake specific Waste Acceptance Classification (WAC) chemical testing to BSEN12457 – 3. It is the Contractor’s responsibility to agree with the landfill operators the appropriate testing regime. Treatment of potentially hazardous materials may be feasible to allow disposal of materials within a stable non-reactive or non-hazardous landfill, or to re-use the materials elsewhere on another site.

**Proposed drainage**

14.69 Sustainable drainage has been selected as the preferred method of drainage at this Site following the NPPF, technical non statutory guidance for SuDS and other best practise guidance. The following sections describe the selection of a preferred type of sustainable drainage system.
Selection of Sustainable drainage system

14.70 The NPPF, The SUDS Manual (CIRIA, 2007), Technical (non statutory) guidance for SuDS and Cambridge City Council design and adoption guide have been considered in choosing appropriate SUDS at this Site. This Development will consider a hierarchy of drainage that prefers discharge to groundwater, then surface water, the storm sewer and as a last resort foul sewer.

14.71 The proposal at this Site is for a railway station building, bridge, platforms, toilet and shop facilities, bicycle parking and car parking.

14.72 There should be a strong landscape focus to SUDS.

14.73 The process followed here follows chapter 5 of The SUDS Manual (DCLG,2012a) which has 5 steps including consideration of;

- Land Use
- Site Characteristics
- Catchment Characteristics
- Quantity and Quality Performance requirements
- Amenity and environmental requirements.

Land Use

14.74 The predominant land use will be car parking and bicycle parking with a smaller amount of land for station buildings and access roads. In line with the best practice guidance for SUDS is recommended that two levels of treatment are provided to treat water quality from this the access roads and car parking areas that discharge to secondary aquifer. This should include some form of source control. It is recommended that one level of treatment is required to treat water quality from station buildings to secondary aquifer.

Site Characteristics

14.75 The soils on the site, which include terrace gravels, are permeable to some extent. Ground investigations have shown permeability of $5.45 \times 10^{-6} \text{ m/s}$ which would be suitable for infiltration (URS, 2013). Where soil is removed it will be replaced where there is a need to raise ground levels above groundwater level to allow any infiltration drainage. There is suitability within the
site boundaries for space for infiltration. The Site is particularly flat and suited to infiltration but groundwater is high in a number of areas. The minimum depth to groundwater varies across the site from 0.1 to 1.9 mbgl. In some places this will potentially allow an infiltration device without ground raising.

14.76 It would be preferred that <2ha of impermeable area will flow to any single attenuation or treatment device. It is recommended that discharge is proposed to localised infiltration where groundwater levels allow. However, in many areas this may not be possible. It is also proposed that source control is considered at this site including green roofs for the station buildings, rainwater harvesting and permeable paving. To allow two levels of treatment from roads and car parking it is proposed permeable pavements with a 600mm formation will provide a restricted discharge through a bypass separator. Bioretention areas could also receive car park run off before infiltration improving treatment.

Catchment Characteristics

14.77 It is important to determine if there are any regulatory criteria that may restrict or preclude the use of a particular type of SUDS. The following factors must be considerations.

- With the exception of Bramblefields LNR and River Cam, there are no designated sites within 500m of the Development.
- There are no SPZ within 500m of the Development.
- There are no surface water abstractions within 500m of the Development from ground or surface waters.
- There are recreational users of the River Cam within 500m of the Site.
- There are no specific catchment characteristics that require additional mitigation measures.

Quantity and quality performance

14.78 The key pollutants that will be produced by the Development are sediments and metals from road run-off. The loading of pollutants from these surfaces provide a medium hazard. There should be consideration of removal of oils. Run-off reduction and attenuation would be required at the Site. The drainage system should be designed for 1 in 100yr events plus 30% increase in rainfall intensity for climate change in line with requirements from the design manual for roads and bridges. Discharge rates should be restricted to Qbar (a rate between to 1 and 2 year return period run-off) or agreed rates where discharge is not to the ground. Shallow
infiltration is preferred as a method of discharge. Further water quality mitigation should be provided by source control features and catchpits prior to discharge to infiltration.

14.79 No new pathways for discharge of water should be opened up nor should discharge be made by infiltration to land identified as contaminated that will not receive removal or remediation.

Community, environmental and amenity

14.80 The Development is located within a mainly industrial area with little thoroughfare. The Site currently does not have any connectivity with other open spaces and it is unlikely that any SUDS developed would be within open spaces. There could be an opportunity to develop a “communal” SUDS scheme with a potential development plot to the north or west of the Development. There is an opportunity to create smaller green areas and provide signage for the use of rail commuters on the approach to the station entrance. The site will be well used by members of the public. It is recommended that an area of planting and seating is combined with the proposed SUDS source control features near to the station entrance.

Proposed drainage system

14.81 The estimated total Development area is 3.836ha. In accordance with the SUDS Manual (CIRIA, 2007) there has been consideration of appropriate run-off rates and attenuation storage as part of this assessment. There has also been identification of specific water quality issues related to land use and level of treatment train. This section summarises the approach provided in the Cambridge Science Park Interchange Drainage Design Report (CCC, 2015).

14.82 Due to a locally high perched water table no drainage system will be able to discharge directly to ground. Therefore, it is proposed to will be retention of some volume of stormwater within the void spaces of the subgrade in the parking.

14.83 Discharge restriction has been modelled in Micro-drainage to include orifice plates and vortex control. Other attenuation has been modelled in Micro-drainage to include geocellular blocks, oversized pipes and tanks.

14.84 Table 14.7 shows the two main drainage catchments proposed to the First Public Drain and to the River Cam and the respective discharge rates and attenuation proposed.
Table 14.7. Proposed restricted discharge rates to surface waters and attenuation

<table>
<thead>
<tr>
<th>Name</th>
<th>Receptor</th>
<th>Catchment size (ha)</th>
<th>Restricted discharge rate</th>
<th>Storage (m3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catchment 1</td>
<td>First Public Drain</td>
<td>0.3</td>
<td>7 l/s</td>
<td>130</td>
</tr>
<tr>
<td>Catchment 2</td>
<td>River Cam</td>
<td>3.536</td>
<td>7.1 l/s</td>
<td>90 m³ tank storage, up to 4000 m³ permeable paving void storage and over 50 m³ pipe storage</td>
</tr>
</tbody>
</table>

14.85 The preferred drainage system will include source control, lined permeable pavements and kerb and gulleys discharging to oversized pipes and geocellular storage and a piped system ultimately flowing to the First Public Drain and the River Cam. It is proposed the following source control measures are also applied:

- Green/brown roofs for station buildings,
- Bioretention area for open plaza area before station entrance, and
- Planted areas to receive car parking water before discharge to permeable pavement.

Mitigation

14.86 The potential effects of the Development could cause an adverse impact without mitigation. The potential effects of the Development are likely to cause a negligible adverse impact to the water environment with mitigation and potentially mitigation could even qualitatively enhance drainage and reduce flood risk at the Site. The key measures of mitigation proposed for the water environment for the Development applicable during construction and operation are described further in this section for each of the key attributes of the water environment.

General mitigation

14.87 Throughout both construction and operation, consultation with relevant bodies including the Lead Local Flood Authority and Environment Agency will help direct proposed mitigation and reduce the impact of potential effects on the water environment. It is assumed that best
practice guidance will be used to aid prevention of pollution during construction. This will include the Environment Agency’s Pollution Prevention Guidance notes. The proposed operational drainage system should be used through construction and if possible constructed first.

**Surface water quality**

14.88 A key priority for the Development will be to minimise sediment creation and transfer to the First Public Drain which includes the redundant section of the drain as well as the operational section of the drain. Mitigation will be provided through the creation of a sediment management plan which will direct sediment netting, sweeping down compounds, damping and other prevention methods during the construction period.

**Groundwater quality**

14.89 If any perched groundwater is encountered during construction the Environment Agency should be consulted. If required to be removed, it is likely this water would be extracted by pumping and taken by tanker from the Site. The provision of source control and lined permeable paving that will be used during operation, will ensure sediment and soluble pollutants are treated before discharge to surface water.

**Abstractions**

14.90 There is no presence of a SPZ within 500m of the Development. Therefore it is considered no further mitigation is required with regard to abstractions.

**Discharges**

14.91 The combined impact of discharge from the Development and other existing discharges is not considered to require any further mitigation.

**Lakes and other water bodies**

14.92 No specific mitigation is proposed for the pond to the south east of the Development within Cave Industrial Estate. However, if there is a requirement for dewatering near to the site of the pond further investigation and consultation of impacts should be undertaken with the Environment Agency.
**Recreational users**

14.93 No specific mitigation is proposed for recreational users of the River Cam during construction and operation however the provision of mitigation and sustainable drainage for groundwater quality and surface water quality will ensure that there will be no detrimental impact on users of the River Cam.

**Water resources**

14.94 It is proposed that during construction water supplies are provided by bowser to welfare facilities that are isolated from mains supply. A predevelopment application to the appropriate utilities company has described these requirements and will determine contributions required from the Development to provide available water resources. Where possible rainwater should be reused and grey water recycled.

**Fluvial flood risk**

14.95 All materials will be stored in a location in Flood Zone 1. Any temporary discharges to or work within close proximity to surface water courses will required consent from the local authority and the Environment Agency.

**Pluvial flood risk**

14.96 Run-off generated by rainfall will require attenuation by storage and sustainable drainage methods. These will include source control and a lined permeable paving. These methods would meet local and national standards.

**Groundwater flood risk**

14.97 Interceptor drains will be provided where required to ensure high perched groundwater is suppressed. This will reduce the likelihood of groundwater flood risk impacting on the formation of car parks and access roads during operation.

**Maintenance**

14.98 During operation it is assumed best practice maintenance of the sustainable drainage proposed at this site will be undertaken. Prior to construction agreement will be made as to who will maintain the sustainable drainage proposed. It is assumed unless otherwise stated that a combination of Network Rail and Cambridgeshire County Council will undertake maintenance to best practice standards.
**Cumulative impacts**

14.99 It is known that a site to the north west of the station is proposed to be developed but it is unlikely this will have any direct impact of the water environment in relation to this Development. No other cumulative effects have been identified either during temporary or permanent for the water environment.

**Temporary effects**

14.100 Typically temporary effects will relate to construction impacts of the Development. Each of the water attributes has been considered. This assessment of potential construction risks is based on knowledge of the potential receptors using the methodology outlined in paragraph 14.15.

**Surface water quality**

14.101 Construction or modification of access roads running adjacent to the First Public Drain and Drain 1 are likely to be at greatest risk from discharges of sediment during construction. A sediment erosion management plan should be produced to identify specific parts of the site at risk and proposed mitigation measures agreed with the Environment Agency prior to construction. The magnitude of impact of this risk is likely to be low and the significance of effects negligible due to mitigation measures outlined to control sediment.

**Groundwater quality**

14.102 The perched groundwater table may be encountered during construction and remediation or removal of contaminated land. Using existing groundwater monitoring information the locations where interaction with groundwater is most likely to occur should be identified. The Environment Agency must be consulted before any known site discharge is undertaken to give consent. Mitigation should be proposed in a CEMP with specific reference to method of removal of contaminated soils and land. The magnitude of impact of this risk is likely to be moderate should further contamination be released into the water environment. However, the significance of effects will be negligible due to mitigation measures to be outlined in the construction environmental management plan to ensure controlled dewatering and removal of contaminated land.
**Abstractions**

14.103 The Development will not have an impact on any SPZ during construction as there are none present. The Development will not have any impact on local or private abstractions during construction as there are none within 500m of the Development. Any proposed abstractions for use on site during construction should be agreed with the Environment Agency. The temporary magnitude of impact to abstractions will be negligible and the significance of effects neutral.

**Discharges**

14.104 It is proposed to discharge all temporary Development discharges that may be required through the construction period through the proposed drainage system. This will require the drainage system to be one of the first parts of the Development constructed. Due to the likely remediation of contaminated ground other temporary drainage networks may require construction to manage surface water discharges from compounds and site material. It is proposed that site discharge is collected in lined lagoons and disposed of by tanker to waste treatment facilities to ensure no contamination of the water environment. Typically the largest temporary impact could be from sediment deposition and transport fuel spills. This should be considered in construction of lagoons or other temporary drainage assets. Any temporary discharges will require consultation and agreement with the Environment Agency and other managing authorities prior to construction. The magnitude of impact of discharges on the water environment would be low and the significance of effects negligible.

**Lakes and other surface water bodies**

14.105 During construction the proposed mitigation for discharges will ensure the pond to the east of the Development will be protected from contamination. During remediation and removal of contaminated land if work is undertaken in or near to groundwater on site it is likely there would be insignificant changes in water level at the pond. If dewatering of the groundwater is required further investigation should be made into the impact on the pond in consultation with the Environment Agency.

**Recreational users**

14.106 By ensuring remediation of the contaminated ground during construction and provision of restricted and attenuated discharge there is an insignificant risk that contaminants would find a pathway from this site into the River Cam where recreational use is known. The magnitude of impact of this risk is would be negligible and the significance of effects neutral.
**Water resources**

14.107 Water supply and welfare amenities will be required during construction. It is proposed where possible rain water and grey water are collected and reused on site and foul water is held in septic tanks and taken by tanker from the Site. It is proposed further clean water is provided through connection with existing mains water supply. No new abstractions or discharges to the water environment are proposed. The magnitude of impact of this risk would be negligible and the significance of effects neutral where water is reused and recycled.

**Fluvial flood risk**

14.108 None of the Development will be built on the floodplain nor will material be stored upon the floodplain during construction. Any discharges to watercourses during construction not considered as part of the operation of the Development would require consent from the Environment Agency or Local Authority prior to start of construction and would be required to ensure they do not increase fluvial flood risk. If any discharge during construction is proposed to the First Public Drain further consultation will be required with SCDC. As a minimum such drainage should be restricted up to a 1 in 100 year event to match the Greenfield Run-off Rate for the same period with a 30% allowance for increased rainfall intensity due to climate change. The magnitude of impact of this risk would be low and the significance of effects neutral.

**Pluvial flood risk**

14.109 It is likely that there may be temporary compounds or working areas with impermeable surfaces that could increase flood risk by preventing drainage of water to the ground. Increased pluvial flood risk during construction would be mitigated through the system proposed for operational drainage. If this is not possible specified drainage with restricted discharge and attenuation would be agreed with the Environment Agency, Local Planning Authority and South Cambridgeshire District Council prior to construction. The magnitude of impact of this risk is would be negligible and the significance of effects neutral.

**Groundwater flood risk**

14.110 The proposed strategy for this Development is to discharge to surface water. Where possible during construction discharge from the site compounds or working areas should ideally be retained on site. Given that the site has perched groundwater levels close to the ground surface there should be consideration as to where vehicles track across site so that where possible they avoid potentially
wet areas.. The impact of formations and foundations on groundwater level requires that provision is made during detailed design to ensure construction work does not obstruct groundwater flow. Subject to detail design, the foundations of platforms and the station building could impact on groundwater flow although it is likely there would be a low magnitude of impact of any redirection of groundwater flow due assuming a relatively small plan area of these developments relative to the area of perched water table.

14.111 No temporary discharge will be provided to ground without the consent of the Environment Agency. Groundwater monitoring has been provided as part of the Development and will help identify areas at greater risk of groundwater flooding. Typically materials and plant should not be located on any areas of the site excavated as part of the remediation proposed for the site as groundwater levels are known to be near to existing surface levels.

14.112 The magnitude of impact of construction risks on existing groundwater flood risk are considered to be negligible and the significance of effects neutral.

**Permanent effects**

14.113 Throughout the construction and operation of any Development there is the potential for permanent significant effects on the water environment. This section considers the potential for permanent effects of the Development on the water environment.

**Surface water quality**

14.114 The proposal for the Development is to discharge to surface water. Any suspected contaminated land that is encountered during the construction phase will be tested and assessed for it suitability for re-use. Any material that cannot remain on site will be removed or remediated prior to discharge of water from the site to ground. Groundwater modelling will be undertaken to ensure that there is no adverse impact on the River Cam. There will be a qualitative benefit of effects on surface water quality in the River Cam and First Public Drain due to the removal of contaminants on site that may be contributing to base flow of the watercourse or the introduction of impermeable membrane that will reduce existing pollutants in soil from leaching to ground and surface waters. The magnitude of impact of this risk would be negligible and the significance of effects neutral.

**Groundwater quality**

14.115 The preferred method of discharge will be to ground which reflects the existing drainage on the site. Groundwater monitoring and detailed assessment undertaken in 2015 has indicated that
there is minimal contamination with the groundwater beneath the site and there is a negligible risk to groundwater. Further detailed assessment will be undertaken to confirm this. The magnitude of impact of this risk would be negligible and the significance of effects neutral.

**Abstractions**

14.116 Public abstractions in a SPZ will not be affected as discharges are toward surface waters and there are no SPZ within 500m of the Site. The magnitude of impact of this risk is negligible and the significance of effects neutral.

**Discharges**

14.117 The proposed discharges for the Development will be to surface waters via permeable paving. Sustainable drainage provided to treat discharge from the site will ensure there will be a negligible magnitude of impact and a neutral significance of effects of discharges on the water environment.

**Lakes and other water bodies**

14.118 It is considered the nearest existing ponds to the Development are not in connectivity with proposed drainage or water receptors that may receive water from the Development. The magnitude of impact of this risk is would be negligible and the significance of effects neutral.

**Recreational users**

14.119 There would be an insignificant reduction in the potential for contamination of the River Cam. The magnitude of impact of this risk is would be negligible and the significance of effects neutral.

**Water resources**

14.120 There will be an ongoing requirement to discharge foul water and supply clean water from the site for the purpose of welfare facilities. It is assumed this will take place through utility service providers with little or no provision of new assets that would require intrusive work. This will pose no risk to the water environment. The magnitude of impact of this risk is negligible and the significance of effects neutral.
Fluvial flood risk
14.121 The station will be located in Flood Zone 1, and will be at low risk from fluvial flooding. Discharge rates to surface waters have been agreed with Cambridgeshire County Council. The permanent effects of the Development on fluvial flood risk will be neutral.

Pluvial flood risk
14.122 Due to an increase in impermeable area, there would be an increased risk of pluvial flooding without mitigation.

14.123 Mitigation of increased pluvial flood risk in the form of source control and lined permeable paving (including attenuation storage in geocellular blocks and oversized pipes) will retain the 1 in 100 year flood peak (that will be in excess of the Greenfield Run-off Rate plus 30% increase in rainfall intensity due to climate change will provided by the Development.

14.124 The magnitude of impact of this risk is negligible and the significance of effects neutral.

Groundwater flood risk
14.125 Any development below the existing ground level has the potential to obstruct groundwater flow movements and cause an increased risk of groundwater flooding elsewhere. Proposed construction on the site including access roads, station platforms and buildings could have foundations and formation that will impact on groundwater level. There is the potential with this Development that piling may encounter and obstruct the perched groundwater table for the station buildings and platforms. This magnitude of impact of this risk is considered low if it is assumed that the relatively small plan area of groundwater that could be obstructed by the proposed station buildings and platforms is small compared to the perched water table and that the transmissivity of the superficial deposits that would allow groundwater flow to bypass the Development without raising groundwater levels. However further detailed design is required to ensure full consideration of this risk. Storm flows from the proposed site to groundwater have been considered and where required ground level will be raised to ensure the risk of groundwater flooding will not be increased.

14.126 The magnitude of impact on existing groundwater flood risk is considered to be negligible and the significance of effects neutral.
Flood flow routing

14.127 Should the drainage system be exceeded then flooding would be expected to follow the proposed topographic levels of the Site.

14.128 In an event that exceeds the 1 in 100 yr + 30% increase in rainfall intensity for climate change it is important to know where flooding would occur first. Flooding would start first on-site north of Moss bank road at the guided busway turning circle dissipating on site. Further flooding would also occur on Fen road which would dissipate along fen road following the gradient. Neither area of flooding would jeopardise housing or critical infrastructure.

Conclusions

14.129 Receptors of the water environment variously have a high, medium or low importance including high importance of surface water quality and medium importance of groundwater flood risk. The Development will have an adverse impact on the water environment without mitigation, particularly with regard to the risk of existing contaminated land and groundwater flood risk. With mitigation, including ensuring all material remaining on site is suitable for re-use, and sustainable drainage systems, the significance of effect of the Development on the water environment is neutral.
15. CUMULATIVE AND IN-COMBINATION EFFECTS

Introduction

15.1 This chapter considers the cumulative effects from the combined effects of other committed developments at the construction or operational stage of the Development.

15.2 This chapter has been informed by other technical assessments set out within the ES.

15.3 There is no legislation outlining how cumulative effects should be assessed or determined as significant. However there is a requirement in Part 1, Schedule 4 of the EIA Regulations to consider cumulative effects.

15.4 The guidelines for Cumulative Effects Assessment (CEA) published in 1999 define cumulative effects as ‘impacts that result from the incremental changes caused by other past, present or reasonably foreseeable actions together with this project’.

15.5 If development projects are considered individually the environmental effects may appear not likely to be significant. However, the combination of effects from the Development and those caused by other permitted developments acting together may generate elevated levels of environmental effects. The combination of effects, which may occur in various ways, is regarded as constituting cumulative effects.

Cumulative Effects in Association with Other Committed Developments

15.6 As of the application date these schemes are committed development with which it is considered that effects from the Development may be cumulative are listed below. The level of assessment detail has been dependent upon the information available for each of these schemes:

- **North West Cambridge ‘NWC’ (11/11104/OUT); Land Between Huntingdon Road, Madingley Road and M11:** Proposed development comprising up to 3,000 dwellings; Up to 2,000 student bedspaces; 100,000 sq.m. employment floorspace, of which: up to 40,000 sq.m. commercial floorspace (Class B1(b) and sui generis research uses) and at least 60,000 sq.m. academic floorspace (Class D1); up to 5,300 sq.m. gross retail floorspace (Use Classes A1 to A5) (of which the supermarket is 2,000 sq.m. net floorspace); Senior Living, up to 6,500 sq.m. (Class C2); Community Centre; Indoor Sports Provision; Police; Primary Health Care; Primary School; Nurseries (Class D1); Hotel (130 rooms); Energy Centre; and associated infrastructure
including roads (including alterations to Madingley Rd and Huntingdon Rd), pedestrian, cycle and vehicle routes, parking, drainage, open spaces and earthworks.

- **Northstowe** ‘Northstowe Phase 1’ (S/0388/12/OL); Land south of Longstanton Park and Ride and adjacent to B1050 at Station Road, Longstanton and Hatton’s Road, Longstanton phase 1 of Northstowe comprising up to 1,500 dwellings; a primary school; a mixed-use local centre (including a community building, and provision for non-residential institutions, financial and professional services, shops, cafes and restaurants, drinking establishments, and hot food take-aways); leisure, community, residential institutions, cultural, health, and employment provision (business, general industry and storage & distribution) including a household recycling centre; formal and informal recreational space and landscaped areas; and infrastructure works including site re-profiling and associated drainage works, foul and surface water pumping stations, two flood attenuation ponds on land east of Hattons Road; and associated works including the demolition of existing buildings and structures.

- **Northstowe** ‘Northstowe Full Scheme’ (S/7006/07/O); to NW of Cambridge to the East of Longstanton & to the North of Oakington: New town with residential development, approx 9500 dwellings, employment development (knowledge based and other businesses, research and development and light industry) community uses and non-residential institutions, research institutes, retail, showrooms, financial and professional services, restaurants, snack bars and cafes, drinking establishments, hot food takeaways, hotel and guest houses, assembly (including places of worship and conference facilities), entertainment and leisure (including casino, cinema and nightclubs), education (including nursery, pre-school, primary, secondary and post 16 education), health, library, cultural facilities (including art centre), residential institutions, open space including town park and town square, sport and recreational facilities, public transport routes, footpaths and cycle ways, landscaping, cemetery / burial ground, allotments, tree nursery, household waste recycling facilities and all related infrastructure (including roads, car and cycling parking, electricity and power generation plant and equipment, gas facilities, water supply, telecommunications, drainage systems, foul and surface water, flood plain compensation (including pumping station) and lighting).

- **National Institute of Agricultural Botany 1** ‘NIAB 1’ (CCiC 07/0003/OUT); Land Between Huntingdon Road and Histon Road, Cambridge: Mixed use development comprising up to
1593 dwellings, primary school, community facilities, retail units (use classes A1-A5) and associated infrastructure including vehicular, pedestrian and cycleway accesses, open space and drainage.

- **Orchard Park** (S/7006/07/O); Kings Hedges Road, Cambridge: Development comprising residential, employment, leisure, social/community uses, open space, educational facilities and associated transport infrastructure.

- **Southern Fringe** (07/0620/OUT, 06/0795/OUT, 08/0048/OUT); Trumpington Meadows, Glebe Farm and Bell School: 4,000 homes, educational facilities, community uses, associated transport infrastructure.

- **CB1** (08/0266/OUT); Cambridge Station Area: 331 residential units - inclusive of 40% affordable homes, 1250 student units, 53560m2 of Class B1a (office) floorspace, 5255m2 of Class A1/A3/A4 and/or A5 (retail) floorspace, a 6658m2 polyclinic, 86m2 of D1 (art workshop) floorspace, 1753m2 of D1 and/or D2 floorspace - gym, nursery, student/community facilities, a 7466m2 hotel, a new transport interchange and station square, including 30 taxi bays and nine bus stops - two of which are double stops providing 11 bays in total - a new multi storey cycle and car park including accommodation for about 2750 cycle spaces, 50 motorcycle space and 652 car parking spaces, highway works including improvements to the existing Hills Road/Brooklands Avenue junction and the Hills Road/Station Road junction and other highway improvements, along with an improved pedestrian/cyclist connection with Carter Bridge - and works to create new and improved private and public spaces.

15.7 The following paragraphs identify the cumulative effects of the Development with other developments, such as those listed in 15.6 above, which have been considered as significant within this ES.

**Air Quality**

15.8 None of the additional developments would be likely to give rise to cumulative effects on air quality. The cumulative effect is likely to be negligible.
Ecology
15.9 The design and implementation of mitigation and enhancement measures with regards to various habitats will be set out in an EMP for the Development. This will include habitat gains of new native hedgerow and trees and species rich meadow grassland. Loss of open mosaic habitat will be offset through the creation of new invertebrate/reptile habitat areas and through green roofs. Enhancements will also be made to Bramblefields with contribution towards management plans for the LNR and the Station Interchange Area.

15.10 There is potentially scope for movement of certain protected species from suitable habitats within those developments listed above to new or existing habitats within the Development. However, each of the developments will have satisfactorily addressed the protection or enhancement of site-specific ecological issues and together with the mitigation and enhancement measures provided with the Development, it is considered likely that the cumulative effects will be negligible.

Ground Conditions
15.11 Cumulative impacts are not anticipated with regards to contamination. The Development is not expected to result in adverse impact during construction or operation if mitigation measures are implemented.

15.12 The Development is expected to produce beneficial impacts during operation due to improvements in Site drainage which would ensure that run-off cannot directly enter the surface water receptors on and off-site.

15.13 In removing a significant amount of contamination from the Site, and by improving drainage, there may be neutral/minor beneficial impacts to groundwater beyond the Site, although the distance between the Site and the developments identified is likely to limit the significance of this. The cumulative effect is likely to be negligible.

Heritage
15.14 The developments are considered to have no direct relationship with the heritage assets assessed, and are considered to be too far away to contribute to any cumulative effect on heritage assets in the vicinity of the Development. The cumulative effect is likely to be negligible.
Landscape and Visual Impact

15.15 The developments are considered to have no direct relationship with the landscape and visual assets assessed, and are considered to be too far away to contribute to any cumulative effect on landscape and visual assets in the vicinity of the Development. The cumulative effect is likely to be negligible.

Lighting

15.16 The developments are considered to be too far away to contribute to any cumulative lighting impacts sets in the vicinity of the Development. The cumulative effect is likely to be negligible.

Noise and Vibration

15.17 On-site construction works at the developments listed are too distant from the Site for there to be any significant cumulative effects during the construction phase for the Development. Furthermore, it is likely that some of those developments (including Northstowe and Marshalls) are unlikely to have commenced substantial construction activities during and upto the completion of commencement for the Development. The cumulative effect is likely to be negligible.

15.18 Noise associated with Construction HGV traffic from the Development is unlikely to generate significant harm in terms of cumulative impact with other developments. The Construction traffic will be routed via Cowley Road, Milton Road and onto the A14, and is therefore unlikely to materially interfere with construction-related traffic for any of the other developments.

15.19 The cumulative effect is likely to be negligible.

Transport

15.20 There is currently significant pressure on the A14, and the capacity issues are such that only Phase 1 of Northstowe can be delivered (rather than the full 10-12,000 homes) without major upgrading of the A14. Other developments, such as NW Cambridge and NIAB, will make substantial contributions towards physical highway improvements and expanding the options for sustainable choices e.g. Busway, footpath/cycleway improvements/creation of new routes.

15.21 The Development will expand the choice of sustainable travel options within and around Cambridge, providing a new train station in the north of the city, an extended bus route from the Busway, and new footpath and cycleway connections across the Site to surrounding areas. The
option of a high quality interchange in this location will provide a strong incentive to those that currently travel by car, and is expected to reduce the pressure on the A14. In terms of cumulative impacts, it is therefore considered that the Development will have a slight beneficial impact upon the developments listed.

15.22 In terms of CB1, for instance, there are platform capacity issues at the Cambridge station which will be relieved through provision of the Development. This will ensure that there is greater capacity for those trips that require coming into the south/centre of Cambridge rather than those current trips that come into Cambridge station and then have to travel northwards to get to the CSP/CBP/SJIP (for instance).

Waste

15.23 The waste management mitigation measures described divert an estimated 98% of the waste arisings generated by the Development to landfill/disposal. The overall impact of the waste generated by the Development will have a neutral effect on waste management arisings and infrastructure capacity within the region.

15.24 It is expected that the committed developments listed have fully considered, and had approved, waste management strategies on a site-specific basis through Site Waste Management Plans (as the Development has), and the cumulative effect of the Development’s waste impact is likely to be negligible.

Water Quality, Flood Risk and Drainage

15.25 There is no committed development on the Northern Fringe that has any impact on the water environment. No other cumulative effects have been identified either during temporary or permanent for the water environment. The cumulative effect is likely to be negligible.
16. CONCLUSIONS

Air Quality
16.1 There are no AQMAs on the Site, which suggests good air quality in the vicinity.

16.2 During construction, mitigation measures to control emissions (particularly dust) will be set out in a CEMP in order to reduce impacts upon those receptors which lie within 350 m of the Site.

16.3 During operation, modelling indicates both very small increases and decreases in concentrations of NO₂ and PM₁₀ along various routes into and out of Cambridge City Centre as a result of changes in numbers of vehicles.

16.4 It has been assessed that the Development is unlikely to result in material harm to Air Quality conditions within the Site or the surrounding area.

Ecology
16.5 The Site’s location on the edge of the City provides a linkage between residential and commercial areas and the wider rural environment. It contains the public part of Bramblefields LNR which is valued for its wildlife. The Site includes various habitats, including open mosaic habitat (a UK BAP priority habitat) together with protected species (reptiles, breeding birds, invertebrates and flora).

16.6 Construction of the Development will result in a loss of existing habitat, mainly dense scrub and open mosaic habitat which will be within the Station/Interchange Area. Vegetation will be retained, where possible and where not required for construction purposes, in order to minimise impacts. Loss of habitat is mitigated and offset through the creation of new habitat and enhancement of Bramblefields. New habitat areas include the reptile/invertebrate habitat areas in the Station/Interchange Area and at Nuffield Road, provision of green roofs, species rich grassland, native hedgerow and trees, and creation of wetland/pond areas. Although the overall amount of habitat that will be lost, is greater than that the habitat created/retained, the production of Ecological Management Plans for the Station/Interchange Area and Bramblefields LNR will ensure that these remaining habitats are managed in a way beneficial to biodiversity and remain permanent, therefore providing a link between habitats in the wider sidings area.
16.7 Operational activities, following the implementation of mitigation, are unlikely to give rise to negative effects based on fragmentation and direct mortality and have the potential to add beneficial value.

16.8 The mitigation measures proposed will minimise certain and probable negative effects and in addition, maintain and enhance the biodiversity value of the Site as a result of the Development. The ecological mitigation and enhancement measures have been designed to ensure legal compliance and help maintain its importance locally.

Ground Conditions

16.9 It is anticipated that there would be a neutral impact from the construction of the Development, assuming mitigation measures are implemented. It is expected that there would be a neutral to moderate beneficial impact from the operation of the Development.

16.10 Neutral impacts during operation are considered likely because although contaminated material would have been removed from site during construction, the operation of the Development would introduce increased sources of potential contamination which could impact on receptors, so some level of risk would remain.

16.11 Beneficial impacts during operation are associated with leaching of contaminants to groundwater and direct contact of property receptors to contaminants because of removal of potential contamination from historical activities and are associated with entrainment of contaminants in surface water run-off to surface waters from improvements in site drainage which would ensure that run-off cannot directly enter the surface water receptors on and off-site.

16.12 Gas monitoring is being undertaken at the Site on completion of the ground investigation to establish the level of potential gases at the Site and confirm, or otherwise, the low risk from gas that has been assumed in the baseline, construction and operational CSMs for the Site.

Heritage

16.13 There are no Conservation Areas, listed buildings, Registered Parks and Gardens, Registered Battlefields, or World Heritage Sites within the Site, although listed buildings and conservation areas are located within 1km. However, potential impact from the Development is considered to be negligible given the distance from the Site, the scale of the Development, and the intervening vegetation and buildings.
16.14 No preserved archaeological deposits were recorded from 30 boreholes. A programme of archaeological works will be carried out at the construction stage to ensure there is no detrimental impact upon archaeology.

Landscape and Visual Impact

16.15 The Site has little visual connection with the wider Fen landscape to the north and east of the Site. It has an urban fringe location and is scenically of no outstanding merit. Its landform and low lying nature means that it is visually discrete and makes no significant contribution to the scenic value of the wider area. The Development would not result in the loss of any defining characteristics of the landscape or features.

16.16 There are no significant views of the Site from any public rights of way in the LVI Study Area. There are only two clear views of the Site from roads (the level crossing and bridge over the A14).

16.17 The Development aims to retain existing features, where possible, and in particular along boundary edges. There would be an overall strengthening of these landscape features as a result of the Development with a large gain in the amount of native trees and hedges planted. The landscape would also be improved through the creation of new wetland swales, amenity shrub areas and wildflower grassland. In addition, there would be management and enhancement of the existing ponds the watercourse along Cowley Road and Bramblefields LNR.

16.18 The Development has been carefully planned and designed to avoid and reduce adverse effects and the landscape treatments proposed would be consistent with adjacent landscape character; The majority of the Site is not protected by any national or local designations. The only part of the Site which is designated, Bramblefields, would be retained, extended and enhanced under these proposals. As such there would be no direct impact on designated landscapes.

Lighting

16.19 There are 30m high lighting towers are present on the Site that can be used by Network Rail at any time if required.

16.20 Street lighting exists outside the Site in residential areas to the South and commercial areas to the west and north.
16.21 New lighting will be installed and have an impact on the immediate Site and to a lesser extent on its surroundings. The receptors likely to receive the most significant impact are local residents, however with good lighting design practice and appropriate mitigation any impact should be insignificant to the daily living of the residents.

16.22 This will include:

- Design of the station lighting design such that the illumination in any area will not exceed the appropriate level for the function of that environment.
- All luminaires selected to emit downward light only, i.e. they shall emit no light above the horizontal.
- Use of lower columns for the platforms due to the proximity of high voltage NR overhead line equipment and in the vicinity of adjacent properties to ensure minimal light spill to residents.

Noise and Vibration

16.23 The Site is currently used for storing and distributing aggregate, and the noise from these operations can increase the ambient noise levels by up to 17dB at the nearest noise sensitive properties, when compared with the lowest measured ambient noise levels at the Site. Facilities for stockpiling aggregate for distribution via freight trains are permitted to operate at any time of the day or night.

16.24 During the construction the Development is predicted to cause a small impact at some of the nearest noise sensitive receptors. Properties on Discovery Way and Long Reach Road could be affected by the noise from the car park, and the noise from the Buses by 1 to 3dB, when compared with the lowest measured noise levels. A noise increase of this magnitude is likely to be a perceptible, but negligible.

16.25 Two noise barriers are proposed to address potential impact issues to receptors.

16.26 PA announcements on the platforms assumed that the announcements will not occur during the night time hours of 23:00 to 05:30 and that for all daytime impacts were considered neutral.

16.27 Additional trains are unlikely to significantly increase the noise or vibration levels at the nearest noise sensitive receptors.
Transport and Access

16.28 The location of Development will promote sustainable modes of travel by its very nature and encourage existing Cambridge Station passengers, currently travelling by private car or other travel modes, to avoid the city centre by offering an attractive alternative option to Cambridge City Centre Rail Station. The Development will include sufficient cycle parking storage for passengers to encourage sustainable travel to/from the station, a sufficient number of car parking spaces to meet necessary demand without over provision, appropriate access for disabled passengers, a direct link to the Busway and safe & convenient cycle & pedestrian access.

16.29 There are a number of existing pedestrian and cycle links close to the Site including Cowley Road, along the Busway and informal routes through Bramblefields, which will be linked into the Site. The Development will facilitate connections though into the station building, it will provide 1,000 secured covered cycle spaces (which is a higher ratio of stands per passenger than at Cambridge Station).

16.30 A number of buses run along Milton Road (Citi 2, 9 and 99). Citi 2 will be diverted into the Site via Cowley Road, where they will run along a new internal route that links the extended stretch of the Busway, with a turning head at the end. A bus service every 10 minutes is considered to be likely.

16.31 The Development includes initial provision for 450 car parking spaces, split between free short-stay waiting and a pay-per-hour system for longer stays. On street parking exists along both sides of Cowley Road and the future potential for parking was raised during consultation. The applicant recognises that there are concerns about on-street parking and will monitor parking within before and after the opening of the new station. If it is found that problems are arising from on-street parking then any necessary controls will be developed and introduced in consultation with local residents and business.

16.32 A taxi and drop off/pick up area (100m long) will also be provided as part of the Development.

16.33 Traffic generated from the Development will be greater during its operational phase than during construction. Mitigation measures will apply to both construction (as described in the CEMP) and operation due to the different function of the traffic.
16.34 Construction and operational traffic generated by the Development has been assessed as being of neutral significance.

16.35 Overall the Development is envisaged to generate a slight beneficial benefit effect on local transport infrastructure. Taking into account the very nature of the development being a interchange station as well as the reduction in car trips within the city centre, the Development is envisaged to generate a positive impact in transport terms.

Waste
16.42 The waste management mitigation measures would divert an estimated 98% of the waste arisings generated by the Development from landfill/disposal.

16.43 The remaining residual waste amounts to 0.01% of the CD&E waste arising within Cambridge and Peterborough. The assessment concludes that the overall impact of the waste generated by the Development will be neutral effect on waste management arisings and infrastructure capacity within the Region.

16.44 The sustainable waste management measures detailed will be implemented through the SWMP which provides a living document to plan, track and record the management of waste arisings.

16.45 The estimated waste arisings produced during the demolition phase was dominated by ballast, which contributed 80% towards waste being recycled offsite. The steel from the track removal and track relay and mixed C&D waste from building demolitions is anticipated to be recycled off-Site. The timber sleepers are expected to be the only waste produced during the demolition phase to be reused off-Site without prior treatment.

16.46 The estimated waste arisings produced during the excavation phase comprise inert soil and stones. A contamination level of 10% has currently been assumed, therefore 90% of the excavated material will be available for reuse on-site (6662 tonnes) with 10% being recycled off-site (treatment).
16.47 Prior to construction all contaminated land will require to be remediated or removed from this site in line with a methodology and specification to be developed/agreed with the Environment Agency.

16.48 Materials may be reused if testing shows no residual contamination following treatment/remediation. Should there still be residual contamination it will require to be disposed of at a hazardous waste site.

16.49 On this basis there is an assumption that 90% of the land/materials arising will be treatable and 10% will require to be recycled/removed from Site.

16.47 The estimated waste arisings produced during the construction phase is 262 tonnes. Of the waste to be recycled off-site, bitumen/asphalt contributes to 50% of materials. 33 tonnes of geotextile membrane will be reused on-site for under tracking and the station area. The remaining 33 tonnes of geotextile membrane will be sent for disposal along with 2 tonnes of plastic packaging.

Water, Drainage and Flood Risk

16.48 The Site lies within Flood Zone 1 (low risk of flooding as defined by the Environment Agency) and is shown on the CCIC Strategic Flood Risk Assessment (SFRA) as an area that has not experienced flooding. There is no tidal flood risk. Pluvial and groundwater flooding risk is considered to be medium based on the SFRA.

16.49 The importance of groundwater quality is considered to be low for the majority of the Site, but high in the south east of the Site. The Site is not an SPZ.

16.50 All receptors of the water environment have a medium or low importance including medium importance of surface water quality and groundwater flood risk. The Development will have an adverse impact on the water environment without mitigation, particularly with regard to the risk of existing contaminated land and groundwater flood risk. With mitigation, including removal of contaminated land, raising of ground levels and sustainable drainage systems, the Development will have a positive impact upon the water environment.

16.51 The Development will:
- Not discharge to surface waters.
- ensure sediment and soluble pollutants are treated before discharge to groundwater through provision of source control and an infiltration blanket
- provide sustainable drainage methods, including source control and swales, which would meet local and national standards

16.52 Climate change (plus 30% increase in rainfall intensity due to climate) to mitigate an increase risk of pluvial flood risk (owing to the increase in impermeable site area). Detailed design will ensure full consideration of groundwater flood risk.

16.53 There are likely to be improvements to surface water and groundwater quality as a result of the Development.
17. APPENDICES