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Network Rail

Oxford Corridor Phase 2 Capacity Improvement Scheme

Environmental Impact Assessment – Non-Technical Summary

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Environmental Impact Assessment – Non-Technical Summary

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1. INTRODUCTION

- 1.1.1 The purpose of this document is to present the main findings of the Environmental Statement for the Oxford Corridor Phase 2 Capacity Improvement (known as the Scheme) in an easily understandable format.
- 1.1.2 Network Rail is seeking 'Prior Approval' for the Scheme from Oxford City Council (the local planning authority). The works fall under Permitted Development Rights, but Network Rail has agreed to carry out an Environmental Impact Assessment (EIA) to identify any environmental effects it may have. The EIA process is regulated under the Town and Country Planning (Environmental Impact Assessment) Regulations (2017).
- 1.1.3 The Environmental Statement summarised in this document is a detailed report of the findings of the EIA for the Scheme. An Environmental Statement describes the existing environmental conditions and predicts the effects that a development could have on both the man-made and natural environment. An Environmental Statement also states measures proposed to reduce or eliminate the negative effects of a scheme on the environment and enhance the positive effects where this is possible.
- 1.1.4 The complete Environmental Statement can be viewed free of charge on the Oxford City Council planning website and the Network Rail website at: <https://www.networkrail.co.uk/running-the-railway/our-routes/western/oxfordshire/>.

2. THE SCHEME

2.1.1 Oxford Station and the wider Oxford Rail Corridor allow trains to move throughout Oxfordshire, with Oxford being the main destination. The Oxford Rail Corridor is a strategic part of the Western Rail Route and is busy for both passenger and freight services. The existing infrastructure cannot accommodate the proposed growth of these services. It is this growth and existing constraints along the Oxford Corridor that have identified the need for the Scheme.

2.1.2 The Scheme has been designed to increase the capacity and efficiency of Oxford Station to allow for more services, both passenger and freight, to travel through the station. This would reduce journey times and the number of delays.

2.1.3 The main elements of the Scheme can be summarised as follows:

- A new track would be introduced through the station to the west of the existing Platform 4 including construction of a new platform (Platform 5) with associated waiting room, toilets, shops and an extended canopy to protect passengers.
- Sheepwash Bridge on Roger Dudman Way to the north would be replaced to accommodate the additional width required for the new track.
- To the west of the railway, a new western entrance building would be built to allow entry to the station from Botley Road. This would be a single-story building, 7m high, in keeping with the existing character of the area. An impression of what this building would look like is shown in Plate 1. It would include ticket machines, shops or cafe, a subway and lifts to the platforms and an outside forecourt with bicycle parking.
- Botley Road Bridge would be replaced, and a new bridge span would be installed to carry the extra track to the new Platform 5. Botley Road would be lowered to increase clearance under the bridge. Improved dedicated pedestrian and cycle routes under Botley Road Bridge would also be provided.
- Alterations would be made to Roger Dudman Way including removal of its current junction with Botley Road and creation of a new junction with Cripsey Road.

Plate 1: The proposed western entrance and Botley Road Bridge before and after (15 years later in winter)



3. CONSULTATION AND ENGAGEMENT

3.1.1 An important part of the EIA process is consultation and engagement with statutory bodies, local residents and other interested parties. Oxford City Council was formally consulted, as well as the following organisations:

- Canal and River Trust
- Highways England
- Environment Agency
- Historic England
- Control of major-accident hazards (COMAH) competent authority
- South Oxfordshire District Council
- Cherwell District Council
- Vale of White Horse District
- Garden History Society Council
- West Oxfordshire District Council
- Health and Safety Executive
- Natural England
- Oxfordshire County Council (Local Highway Authority and Flood Authority)
- Thames Water
- Thames Valley Police
- Oxfordshire Fire Service

3.1.2 In addition, Network Rail has engaged with a wider variety of local stakeholders to increase awareness and understanding of the Scheme. Table 1 provides a summary of this engagement. Due to the coronavirus pandemic, no face to face meetings have been possible. The majority of communication has therefore been via on-line meetings and events. In addition, letters have been sent to all residents and businesses within 300m of the red line boundary and a press release has been issued. Information about the Scheme is available on the Network Rail webpage at: <https://www.networkrail.co.uk/running-the-railway/our-routes/western/oxfordshire/>.

Network Rail Oxford Corridor Phase 2 Capacity Improvement Scheme

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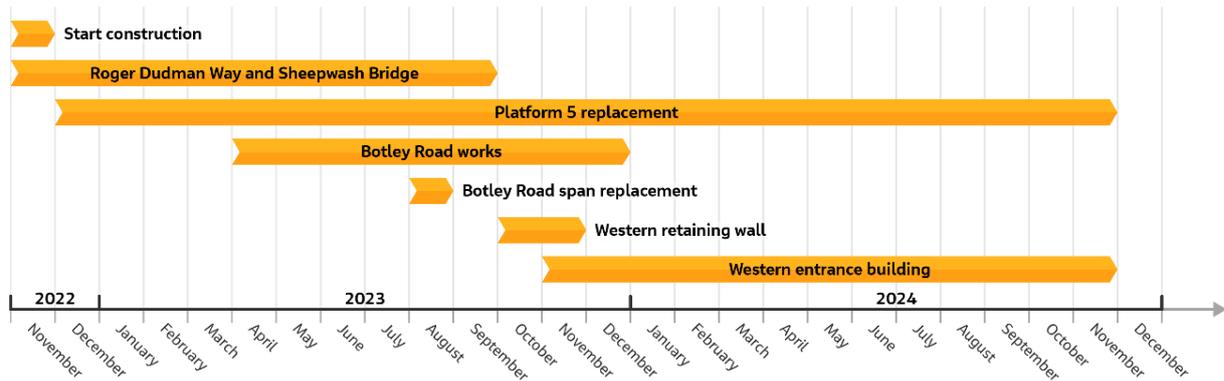
Table 1: Summary of engagement

Organisation engaged with	Key interest	Date
Oxford City Community Relations Officer and local Councillors for Cripsey Road and Mill Street.	Residents interests	20/1/21
Cripsey Road residents (via Residents Association)	Impact on residents along Cripsey Road	26/1/21
Mill Street residents (via Residents Association)	Impact on residents along Mill Street	12/2/21
Network Rail and Oxford design review panels	Architecture and design of the station	24/3/21
Oxford Councillors	Phase 2 and its wider strategic context	23/2/21
Built Environment Accessibility Panel (BEAP)	Accessibility issues related to the design	18/2/21
Oxford Preservation Trust	Implications for the historical context of Oxford	10/2/21
Oxford Civic Society	Implications of the Scheme for the city of Oxford	10/2/21
Oxfordshire Local Enterprise Partnership (OxLEP)	Phase 2 and its wider strategic context	20/01/21
Cherwell College	Implications for the College	17/2/21
General public	Implications of the Scheme	25/3/21
Rail Industry Stakeholder Group	Public engagement information	January 2021

4. PROPOSED CONSTRUCTION

4.1.1 The anticipated programme for the construction of the Scheme is provided below on Plate 2.

Plate 2: Construction programme

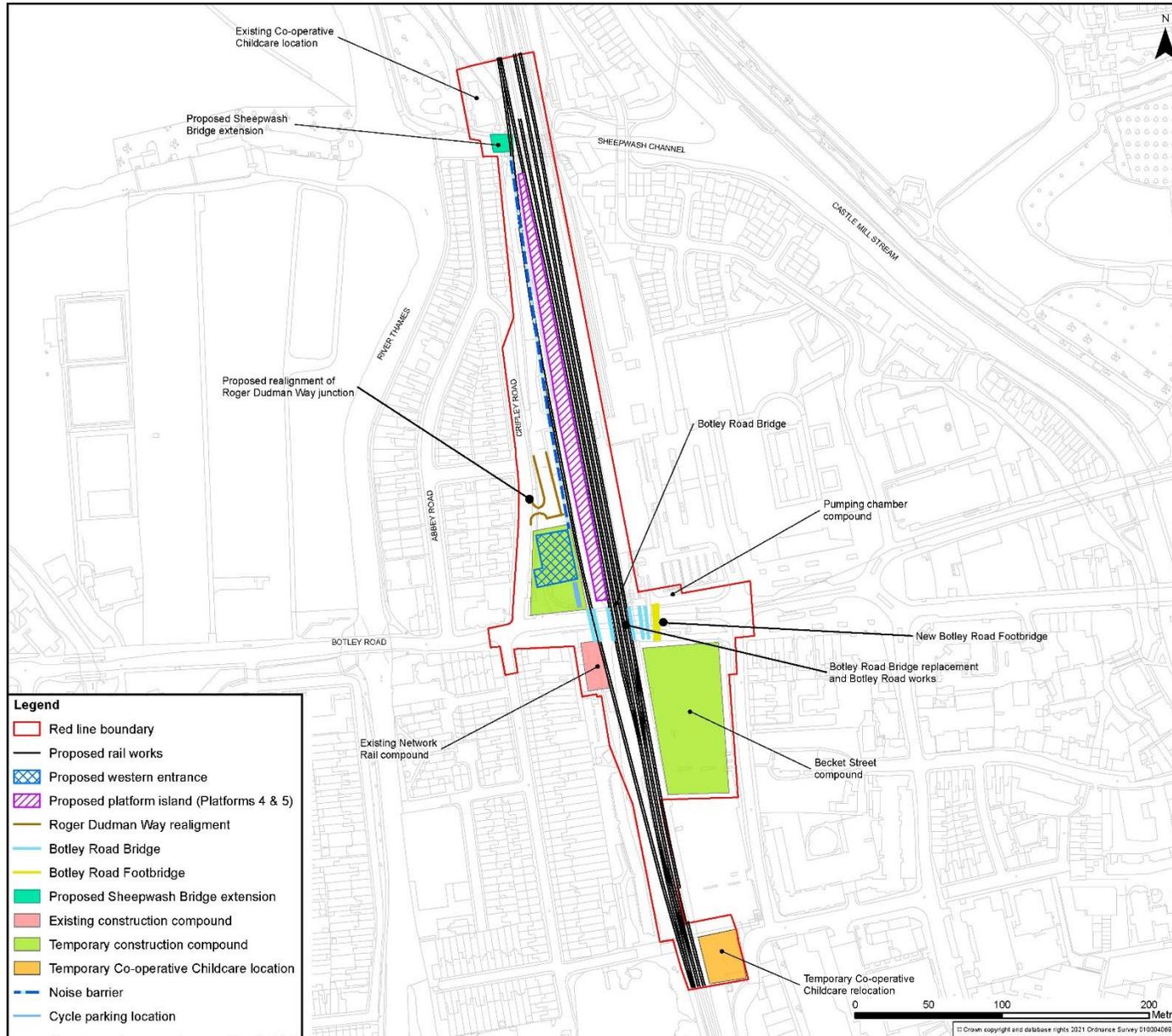


4.1.2 For the purposes of the EIA the method of construction has been devised. However, once a construction contractor is appointed to the Scheme, some ways of working may alter. However, the contractor would be under an obligation to comply with the Code of Construction Practice and to ensure that any changes to construction methods would not result any new or worse environmental effects than those reported in the Environmental Statement.

4.1.3 The extent of the Scheme is defined by the ‘red line boundary’ as seen on Plate 3. This shows the area of land to be used to deliver the Scheme including areas temporarily used during construction.

4.1.4 Before the main works begin on site there are a number of activities that would be carried out which are known as ‘enabling works’. These would include the setting up the construction compounds from which to manage construction, provide parking for vehicles and plant, to store materials and provide welfare facilities for staff. The proposed construction compounds are shown on Plate 3.

Plate 3: Location of construction compounds and key features of the Scheme





- 4.1.5 Core working hours during construction would be from Monday to Friday 07:00 to 18:00 with Saturday working limited to 07:00 to 13:00. In certain circumstances working would be required outside these times. In this case working would be agreed in advance through a Section 61 agreement with Oxford City Council, which would set out the agreed ways in which noise and vibration would be managed to reduce the effects on the environment.
- 4.1.6 Construction traffic would access the Scheme along the Botley Road to and from the west via the A34. There would be a need to close or restrict traffic during construction including in the following areas:
- Sheepwash Bridge would be closed overnight. In addition, the tow path here would be temporarily diverted.
 - Botley Road is expected to be closed to traffic for 4 days. In addition, traffic would be reduced to a single lane into Oxford for a 6-month duration.
- 4.1.7 Traffic diversions would be put in place and advertised well in advance.

5. CONTROL OF CONSTRUCTION PRACTICE

- 5.1.1 Activities during construction would be controlled. The Code of Construction Practice (CoCP) contains a series of general good practice measures and practices that would be required during the construction of the Scheme. These measures have been assumed to be in place during construction for the purposes of the main Environmental Impact Assessment. The CoCP has been included as Appendix 2.1 in Volume 4 of the Environmental Statement.
- 5.1.2 The CoCP measures apply to everyone working on the Scheme. Network Rail would require its contractor(s) to comply with these measures. The contractor will set out how they would comply with these measures in a Construction Environmental Management Plan (CEMP). The CEMP would include details of how the measures would be applied on-site, such as responsibilities and monitoring for effectiveness of the measures.
- 5.1.3 The CEMP would be a working document used during construction which highlights:
- general good practice measures;
 - particularly sensitive locations with specific measures to reduce impacts in these areas;
 - persons responsible for ensuring measures are implemented; and
 - methods for reporting on effectiveness of measures.
- 5.1.4 The CEMP would be produced by the contractor before the start of construction and would remain the responsibility of the contractor throughout the construction process. Some longer-term monitoring may continue once the Scheme is operational.

6. ENVIRONMENTAL IMPACT ASSESSMENT

6.1 Overview

6.1.1 The Environmental Statement has been divided into four main volumes:

- Volume 1 – Non-technical Summary.
- Volume 2 – Environmental Statement, main report.
- Volume 3 – Figures, to support both main document and appendices.
- Volume 4 – Appendices, supporting information.

6.2 Scoping

6.2.1 An exercise was undertaken to understand which areas of the environment were likely to suffer from negative (adverse) effects due to the Scheme. This process is called scoping, whereby several topics are 'scoped out', or removed from the EIA as they are unlikely to be significantly affected by the Scheme. The results of this process were recorded in a Scoping Report which was submitted to Oxford City Council (Network Rail 2020). The Scoping Report is available to view on the Network Rail website. The final written response to the Scoping exercise was received from Oxford City Council in a letter dated 5th January 2021.

6.2.2 The topics taken forwards for further study within the EIA were as described here.

6.3 Air Quality and Odour

6.3.1 The effects of the Scheme on the air quality of Oxford are discussed in more detail in Chapter 6 of Volume 2 in the Environmental Statement. This includes assessment of oxides of nitrogen (NO_x), nitrogen dioxide (NO₂) and particulate matter (PM₁₀ and PM_{2.5}). Air quality also refers to dust and odour. A dust risk assessment is contained within Volume 4 – Appendix 6.2.

6.3.2 An initial air quality survey was carried out, but it had to be finished early due to COVID-19 restrictions. Therefore, the chapter relies on background air quality provided by Defra and records of dust and odour complaint from Oxford City Council.

6.3.3 Chapter 6 addresses potential changes to air quality during construction including from construction traffic. The likely effects of construction emissions on human health and local ecosystems were assessed. It also assesses operational train emissions.

- 6.3.4 Consideration of operational road traffic at Oxford Station (and consequent air quality changes) was scoped out of the assessment because it is unlikely that the Scheme would lead to an increase in road traffic. The Scheme does not provide any additional car parking or road capacity and increases the capacity for bicycle parking at the western entrance.
- 6.3.5 There is a risk of dust impacting the local area. Good practice measures have been included within the CoCP including the need for a dust management plan. Measures proposed as a result of the geology and soils assessment are also relied upon such as the use of targeted watching briefs and risk assessments to monitor and control gas movement particularly towards the northern end of Roger Dudman Way.
- 6.3.6 Calculations presented within Chapter 13 – Traffic and Transport indicate that the numbers of construction vehicles would be too low to trigger an air quality assessment. This is partly as Network Rail would use the railway for deliveries and wastes disposal where practicable. Therefore, after consideration of the traffic numbers and guidance, the assessment of construction traffic was scoped out of Chapter 6 – Air Quality and Odour as there would not be likely to be significant effects on human health or nearby ecosystems.
- 6.3.7 One of the objectives of the Scheme is to increase the efficiency of Oxford Station. As a result, there is not expected to be a change in train traffic on the up-carriage sidings (those to the east). There is expected to be a decrease in trains accessing and waiting on the down-carriage sidings (alongside Roger Dudman Way) before changing direction. There would therefore not be a significant negative effect from diesel as a result of the Scheme and there may be a minor improvement here (although this has not been quantified in this report).
- 6.3.8 There would be no significant effects on air quality or odour as a result of the Scheme and no additional mitigation measures are proposed.

6.4 Geology and Soils

- 6.4.1 The effects of the Scheme on the underlying geology and soils of Oxford are discussed in more detail in Chapter 7 of Volume 2 in the Environmental Statement. This study also looks at the existing contamination in the area and its potential effects to human health and water (surface and groundwater). This chapter should be read in conjunction with the Water Resources and Flood Risk chapter (Volume 2 – Chapter 14).
- 6.4.2 Soils and geological designations were scoped out of the assessment in agreement with Oxford City Council.

- 6.4.3 The 500m study area shows an industrial heritage centred around the railway and its associated uses. Three (or potentially four) historic landfill sites are located within 500m of the red line boundary, with potential to release contaminated materials if disturbed.
- 6.4.4 The underlying geology is typical of the Thames Valley, being of sands and gravels overlying Oxford Clay. The sands and gravels contain layers that can contain groundwater (Secondary A aquifer) suitable for water supply and important to maintain river levels. Several ground investigation reports have been consulted which give more detail regarding local ground contamination and groundwater levels.
- 6.4.5 There are several issues that would likely cause a significant risk of pollution or risk to human health if not addressed. These include: landfill gases being released from the surrounding landfills; contamination in the area of Botley Road Bridge being disturbed, contaminating groundwater and/or being a risk to human health; and contamination at Sheepwash Bridge being disturbed causing the release of ground gas or contaminants into surface water or groundwater and/or being a risk to human health.
- 6.4.6 Following the good practices contained within the CoCP, the risks to groundwater, surface water and human health would be reduced. These good practices include the production of a targeted contaminated land risk assessment at the Becket Street station car park; a piling risk assessment; and targeted watching briefs in areas considered to be of high risk of contaminant release.
- 6.4.7 In addition to these measures, a ground investigation to include groundwater monitoring would be carried out in the areas of Botley Road Bridge and Sheepwash Bridge. As a result of these findings, further mitigation measures may be carried out.
- 6.4.8 As a result of good design, good construction practices and additional ground investigations, there would not be likely to be any significant risks of contamination from construction or operation of the Scheme.

6.5 Historic Environment

- 6.5.1 The EIA has looked at the effects of construction on the built heritage, archaeology and the historic landscape. Operational impacts on archaeology have been scoped out but effects on built heritage and the historic landscape have been included. Visual impacts across the city are covered within Chapter 8 – Landscape and Visual.

- 6.5.2 There are a total of 117 historic assets within the 200m study area boundary. These consist of 31 historic buildings (including three Conservation Areas), 71 archaeological sites, 11 historic urban character areas and one Grade II* Registered Park and Garden. Of these, 13 have been assessed to be of high value and 12 of medium value.
- 6.5.3 There are three historic buildings where there could be an impact from the Scheme. The Botley Road pedestrian tunnel south of Oxford Station is a feature of low local historic interest. However, as it would be completely removed during the realignment of the bridge, it would suffer a moderately significant effect. Network Rail has committed to historically recording the features of this tunnel prior to removal to address the impact of its loss.
- 6.5.4 The Toll House on Botley Road and the Former Castle Hotel would not be physically affected by construction. However, the presence, noise and movement of construction equipment would be noticeable in their settings. Good practice measures to reduce noise and dust would result in a negligible effect at both these locations.
- 6.5.5 The only archaeological site of medium value is the site of Osney Abbey precinct to the south of the Scheme. The new track has been aligned to avoid this asset so that there would be no impact on the site. The Sheepwash Channel in the north of the Scheme would be affected by construction. It is however, considered to be of low value, and replacement of the bridge spanning it would only result in a negligible effect.
- 6.5.6 It is likely that there are unknown archaeological remains across the Scheme footprint. Network Rail has committed to allow for investigations to confirm whether there are remains on site and record them as necessary. The impacts on these remains will be unknown until those investigations are undertaken.
- 6.5.7 There would not be likely to be any significant effects on the historic landscape of the city. In addition, there would likely be no effects once the Scheme has been built on any historic assets.

6.6 Landscape and Visual

- 6.6.1 The landscape and visual effects of the Scheme are discussed in more detail in Chapter 9 of Volume 2 in the Environmental Statement. The study has looked at the likely effects of the Scheme on the landscape character of Oxford and on the views towards the Scheme, both near and further away. It assesses effects during construction, at the time of opening of the Scheme (year 1) and after 15 years when the landscape planting would have had time to mature.

- 6.6.2 The views selected and the methods used to assess the landscape and visual effects were both agreed in advance with Oxford City Council.
- 6.6.3 The character of the immediate area is dominated by the Oxford Station infrastructure which is connected to roads and car parks. There are several commercial buildings to the east, but the western side of the area mainly consists of terraced housing. The area benefits from mature trees lining Cripsey Road and Botley Road, some of which have a Tree Preservation Order (TPO) to protect them.
- 6.6.4 Two main surveys were carried out during 2020: a visual survey to identify key views that could be affected by the Scheme (the results of which can be found in Volume 4 – Appendix 9.5); and a tree survey (the results of which can be found in Volume 4 – Appendix 9.2).
- 6.6.5 The design of the Scheme has been developed specifically to fit in with the local area both in size and finish. The materials used would mirror those used in Frideswide Square to the east using natural limestone and a dark roofing finish as shown in Plate 1. The measures set out in the CoCP would protect the trees that would remain and ensure that replacement trees and vegetation would thrive.
- 6.6.6 Replacement trees and shrubs would be planted along Cripsey Road and Botley Road. In addition, some of the western entrance roof would be planted to become a ‘green roof’, and a ‘living wall’ would be created on the western side of the building and within the forecourt. The wall surrounding the plaza to the west would be planted on top with nectar-producing plants.
- 6.6.7 At the time of opening of the Scheme there would be several significant negative effects, mainly due to the loss of vegetation and the fact that the replacement vegetation would still be immature. The effects would be to the local landscape character but also to views from Cripsey Road and Botley Road.
- 6.6.8 Once the replacement vegetation had grown and with the sensitive design of the building, most of these negative effects would have become non-significant. There would still be a significant negative effect due to the loss of the five mature trees with a Tree Preservation Order and part of a TPO group containing a further two mature trees. There would however be a significant positive effect on views from Botley Road and the western approach into Oxford city.

6.7 Noise and Vibration

- 6.7.1 The effects of the Scheme on noise and vibration levels are discussed in more detail in Chapter 10 of Volume 2 in the Environmental Statement. The study has looked at the effects of construction, construction traffic and operational railway noise on the local area. Noise and vibration during construction would be controlled by the measures as set out in the CoCP. This contains good practice measures including the need to implement Best Practicable Means as defined in Section 72 of the Control of Pollution Act 1974 and section 79 of the Environmental Protection Act 1990. The Scheme would also make use of Section 61 notices to agree maximum noise levels with Oxford City Council.
- 6.7.2 There are not expected to be any significant negative noise or vibration effects during construction.
- 6.7.3 The study of operational railway noise for the Scheme has identified a likely major negative effect in terms of changes in noise levels for the residents along Cripsey Road and moderate negative effects along Mill Street, Abbey Road and at the Co-operative Childcare building.
- 6.7.4 To reduce these increases in noise levels, a 2.2m high environmental barrier would be installed for 250m alongside the railway from the north of the western entrance to Sheepwash Bridge. This would reduce predicted noise levels at Cripsey Road, Abbey Road, Mill Street and Co-operative Childcare.
- 6.7.5 The remaining (residual) railway noise increases are shown in Table 2. Noise levels at all these locations would remain below the Significant Observed Adverse Effect Level (SOAEL) as defined within the Noise Policy Statement for England (Defra, 2010).

Table 2: Residual increases in railway noise

Location	Increase in noise daytime dB	Increase in noise night-time dB	SOAEL
Cripsey Road	6.0	6.5	Below SOAEL
Abbey Road	-1.7 (reduction)	- 2.4 (reduction)	Below SOAEL
Mill Street	1.3	1.0	Below SOAEL
Co-operative Childcare	1.2	N/A	Below SOAEL

6.8 Population

- 6.8.1 The effects of the Scheme on the local population are discussed in more detail in Chapter 11 of Volume 2 in the Environmental Statement. The study has looked at the effects of the Scheme on access to facilities, businesses and residential properties in the area, the general amenity value of the area, land

take and any effect on the local job market or economy. As the Scheme was designed to avoid third party land where practicable,

- 6.8.2 Chapter 11 draws heavily on other chapters within the Environmental Statement. Good practice measures and additional mitigation measures proposed within these chapters were assumed to be in place prior to the assessment of effects on the population. With these measures in place, there would likely be temporary and permanent changes in access and amenity, some job creation as a result of construction and operational activities and some temporary land take. There would also be access to wider employment opportunities as a result of improved efficiencies at Oxford Station.
- 6.8.3 There was found to be one significant effect. This was a significant benefit to the amenity of the area around Oxford Station once the Scheme is complete. None of the other effects identified (positive or negative) were found to be significant

6.9 Human Health

- 6.9.1 The effects of the Scheme on human health are discussed in more detail in Chapter 12 of Volume 2 in the Environmental Statement. The study looks for changes in the baseline environment that could result in an effect on human health in the local population. It particularly looks at the potential for vulnerable groups to be unfairly affected by the Scheme and also considers whether health inequalities would increase as a result.
- 6.9.2 Chapter 12 draws heavily on other chapters within the Environmental Statement. Good practice measures and additional mitigation measures proposed within these chapters were assumed to be in place prior to the assessment of effects on the population.
- 6.9.3 General health and life expectancy in Oxford is largely good when compared with the national averages. Oxford also rates highly in terms of health deprivation and disabilities. However, one area, Oxford 008B within Carfax Ward, is ranked within the lowest 10% for health and disability. This area is located to the southeast part of the Scheme.
- 6.9.4 There were found to be two likely significant effects. There was found to be a significant positive effect on landscape amenity and access to green/open space due to the improvements to the public realm surrounding the western entrance and along Botley Road. There was also found to be a significant benefit to human health due to the improved transport network and usage including the infrastructure improvements for cycling and walking, promoting the use of active travel. None of the other effects identified (positive or negative) were found to be significant.

6.10 Traffic and Transport

- 6.10.1 The effects of the Scheme on traffic and transport are discussed in Chapter 13 of Volume 2 in the Environmental Statement. More detailed information is included within the Transport Assessment (Volume 4 – Appendix 13.1). The study looks at the effects of construction traffic on the local road network, specifically along the main construction traffic route from the A34 along the B4044 West Way and the A420 Botley Road to the Scheme. The study didn't look at Roger Dudman Way, Cripsey Road and Becket Street due to a lack of traffic data.
- 6.10.2 Due to the COVID-19 pandemic travel restrictions, Oxford County Council traffic data from 2018 were used. This only covered a small number of junctions. Collection of new data during the pandemic was not possible and would not have been representative of usual traffic levels.
- 6.10.3 The impacts of operational traffic were scoped out in agreement with Oxfordshire County Council. The Scheme was considered unlikely to increase traffic levels in the area as no additional parking would be provided and there would be improved pedestrian and cycling provision.
- 6.10.4 Chapter 13 considered the likely effects of alterations in traffic on severance, driver delay, non-motorised users delay, amenity and accidents and safety.
- 6.10.5 The good practice measures included within the CoCP include for provision of a Construction Traffic Management Plan (an outline of which is included within Appendix 13.1 of the main Environmental Statement).
- 6.10.6 Based on expected waste and materials calculations and data from Phases 0 and 1 of the Scheme, it has been estimated that there would be an average of six construction vehicle movements per day over the two years' construction period. This would not constitute a significant impact on the road network.
- 6.10.7 There would be several road restrictions that may have an impact on traffic and access including at the Sheepwash Bridge. Here there would be a five-day night closure. An alternative access route has been suggested from the north, but this would be progressed during detailed design. Botley Road would be subject to a four-day full closure, and a six-month one-lane closure. Direction from Oxfordshire County Council and the lack of current traffic data means that the effects of the closures have not been assessed. Any impacts would be of a temporary nature and full diversion routes would be in place.
- 6.10.8 Once the Scheme is operational, it is not expected that there would be an increase in motorised vehicles, as no additional parking would be provided.

The effects of operational traffic have therefore not been quantitatively assessed (in agreement with Oxfordshire County Council). However, due to the improved cycle-lane and footpath provision and improved train and bus services, sustainable travel is expected to increase in this area.

6.11 Water Resources and Flood Risk

6.11.1 The effects of the Scheme on water resources and flood risk are discussed in Chapter 14 of Volume 2 in the Environmental Statement. More detailed information is included within Appendices 14.1 and 14.2. The study looks at the effects of the Scheme on flood risk, surface water quality and groundwater quality and levels.

Flood Risk

6.11.2 Part of the footprint of the Scheme is located within the Environment Agency's Flood Zone 2, with the Botley Road and part of the western entrance forecourt being located within the higher risk Flood Zone 3. These flood zones are associated with flooding from the River Thames to the west of the Scheme, and the Sheepwash Channel which runs through the north of the Scheme. The Environment Agency's River Thames hydraulic model also shows that the western side of the Scheme is at risk of flooding. Groundwater flood risk is largely linked to the risk of river flooding and so they are considered together.

6.11.3 In addition, the Botley Road is currently at high risk of surface water flooding, i.e water runoff from hard surfaces such as roads as a result of rainfall.

6.11.4 Included in the good practice measures within the CoCP is a commitment to sign up to the Environment Agency's 'Floodline' to warn of potential flood events, and organising construction compounds to be flexible in areas at risk of flooding.

6.11.5 The main source of flooding is thought to be from the River Thames. A hydraulic model was used to see what areas would flood both with the Scheme and if it wasn't built. It looked at flooding from fluvial (river) sources. The model was run for events that are expected to occur on average once in every 100 years ie have a 1% chance of happening each year. This is known as a 1 in 100-year event. Due to the expected effects of climate change over the coming years, a 70% increase in flood volumes was applied due to the expected increase in severity of these events in the future (as per Environment Agency guidelines).

6.11.6 Flooding is predicted to occur on Botley Road and at the western entrance both with and without the Scheme. For the 1 in 100 year and more extreme

events the Botley Road would be unsafe to use and would be closed to traffic. This impact of flooding on infrastructure would be of major significance. The western entrance building would also flood during such events. However, given the size of the flood, many surrounding roads would also be flooded making access to and from the station difficult.

- 6.11.7 The presence of the Scheme is not expected to significantly increase the effects of flooding elsewhere in the area. However, due to a potential risk that the current drainage proposals could not accommodate surface flooding for a flood event worse than that expected every thirty years, the drainage for the Scheme would be further developed during detailed design.

Water Quality

- 6.11.8 The closest watercourses are the River Thames, Sheepwash Channel and the Castle Mill Stream. There would be no in-channel working connected with the Scheme. In addition, the CoCP measures would reduce the risk of contaminants entering the watercourses. As a result, there are not expected to be any decreases in surface water quality as a result of the Scheme.

Groundwater

- 6.11.9 The groundwater under the Scheme is defined as of medium to low vulnerability (to pollution) and is classed as being a Secondary A aquifer (i.e. groundwater that could be used for local water supplies and may be supplying nearby watercourses). There is currently a groundwater pump operating to reduce groundwater levels under the Botley Road Bridge.
- 6.11.10 Due to the possibility of contamination, there would likely be a moderately significant effect on groundwater quality and levels both during construction and operation. Good practice measures within the CoCP such as silt and oil traps would limit the risk of contaminants entering groundwater. As an additional measure it is proposed to carry out ground investigations which would give more information regarding groundwater levels and conditions. Acting on the information gained during the ground investigations, for example installation of additional treatment, any remaining (residual) effects would be minor.
- 6.11.11 Without any mitigation, there would likely be a moderate effect on groundwater levels at Botley Road Bridge. Further ground investigations would identify current water levels. Further pumping or drainage as required would reduce this effect to negligible.

6.12 Biodiversity and Net Gain

- 6.12.1 Biodiversity (also known as ecology) as a topic was scoped out of the Environmental Statement as there are unlikely to be any significant effects on plants or animals as a result of the Scheme. This was based on the results of a preliminary ecological appraisal, Habitats Regulations Assessment (HRA) screening and ecological surveys. These documents have been updated and the results can be found in Appendices 4.1 to 4.4 of the main Environmental Statement.
- 6.12.2 Biodiversity refers to the variety of living species in a given area, including plants, animals, bacteria, and fungi.
- 6.12.3 Network Rail has also undertaken a Biodiversity Net Gain exercise, the detail of which is presented in Appendix 4.5. Net Gain provides a measurement of whether there would be an increase or decrease in biodiversity as a result of a development.
- 6.12.4 To calculate net gain, the total amount and quality of vegetation within the red line boundary was calculated to form the baseline without the Scheme. Then a similar calculation was made of the total and quality of vegetation expected once the Scheme is completed (including that retained and newly planted). The Net Gain was then calculated.

$$\begin{array}{rcccl} \text{Biodiversity expected} & & \text{Biodiversity without} & & \text{Net Gain /} \\ \text{with the Scheme} & - & \text{the Scheme} & = & \text{Net Loss} \end{array}$$

- 6.12.5 To improve the potential for Net Gain for the Scheme, an indicative planting scheme was proposed which would be detailed at the next stage of design. This included replacement of all mature trees to be lost, with additional planting of shrubs. In addition, it is proposed to incorporate a 'green roof' and a 'living wall' into the design of the western entrance. With all of these measures incorporated, the Scheme would achieve a 42% increase in biodiversity.
- 6.12.6 Other biodiversity elements have also been incorporated into the design, which do not count towards biodiversity Net Gain (please see Plate 4 for examples). These include:
- One bird nesting site;
 - Fourteen bat roost sites;
 - One bug hotel; and
 - Nectar rich landscaping species such as lavender around the forecourt.

Plate 4: Examples of bird boxes**6.13 Cumulative Effects**

6.13.1 The cumulative effects of the Scheme on the environment are discussed in Chapter 15 of Volume 2 in the Environmental Statement. Cumulative effects can occur when several effects arising from the Scheme affect one receptor (known as intra-project cumulative effects) or when several developments interact to cause a significant effect (known as inter-project cumulative effects). For each type, the residual effects after mitigation were used from each of the topic chapters.

Intra-project Cumulative Effects

6.13.2 The residual effects from each topic chapter were used to form a matrix of which receptors (e.g., houses, watercourses) were likely affected by the Scheme. If two or more topics identified the same receptor as having effects, there was a cumulative effect. Professional judgement was then used to decide whether the effect would be significant.

6.13.3 Intra-project effects were found for users of the Co-operative Childcare business, residents along Cripsey Road and Abbey Road and users of the Botley Road. Combined effects of increased noise, dust, visual intrusion would be experienced during construction. These would be temporary effects however, lasting a maximum of two years, and less in specific locations (see Plate 2).

6.13.4 There would likely be a negative effect during operation of the Scheme along Cripsey Road due to the increase in noise levels from the railway, combined with the removal of trees and vegetation in this location. Whilst this may be significant in the first few years of operation, the growth of new vegetation would reduce this so that it would no longer be significant.



Inter-project Cumulative Effects

- 6.13.5 Relevant Local Planning Authority planning websites were used to draw up a long list of developments within 2km of the Scheme that could interact with the Scheme to produce a cumulative effect. This list was then shortened to remove those developments where construction dates would not overlap with the Scheme, there were no environmental impacts expected or where consent had already been refused. The short list consisted of 17 developments which could be built at the same time as the Scheme.
- 6.13.6 Further detail was then obtained for the short list of developments and an assessment by each topic area was carried out to see whether it was probable that there would be a cumulative effect from the Scheme for that topic. Six developments were identified which could act in combination with the Scheme and result in cumulative effects. These mainly consist of combined vegetation removal, increased gas risk in contaminated areas and noise increases in the vicinity of the Sheepwash Bridge. Although there may be some short-term construction effects, with the mitigation proposed for all developments, it is not likely that any of these inter-project effects would be significant in the longer term. Potential inter-project cumulative effects are shown in Table 3.

Table 3: Potential inter-project cumulative effects

Other Scheme ID Code	Receptor(s)	Assessment of cumulative effect with the Scheme
PA1 Lucy Faithful House	Western Fringe Town Character Area	A combined loss of vegetation and general construction effects.
	Users of Raleigh Park	Combined visual intrusion.
PA5 Tumbling Bay	Human health and water resources	Combined effects from dust deposition.
	Human health and water resources	Additional release of pollutants to groundwater and surface water due to underlying contamination.
	Residents on Abbey Road	Combined increases in noise from PA5 and the Sheepwash Bridge works.
	Oxford Green Blue Infrastructure Network	Localised tree and vegetation removal. Also combined positive effects due to mitigation planting and improved accessibility and recreation.
	Public right of way and Botley Park	Combined effects on views during construction, mitigated by planting.
PA9 Castel Hill House	Properties to the south of New Road	Combined build-up of ground gas released by demolition.
PA19 Jericho Canal Side	Groundwater and surface water north of the Sheepwash Bridge	Release of contaminants by both developments.
	Residents to the northeast of the Scheme	Combined construction noise and dust deposition from the two developments.
PA20 Osney Power Station	Multiple viewpoints	Combined general construction effects.
PA21 Dragon School	Oxford Green and Blue Infrastructure Network	Combined removal of protected trees at both developments. Replanting would reduce the combined effect
PA26 Fairfield House	Oxford Green and Blue Infrastructure Network	Large tree loss when developments combined. Mitigated by planting

7. CONCLUSIONS

- 7.1.1 The main negative impacts of the Scheme would occur during construction due to the visual intrusion and road closures/restrictions. These effects would only be localised and of a temporary nature.
- 7.1.2 Once operational, there would be a residual negative noise effect for the residents of Cripsey Road, Abbey Road, Mill Street and at the Co-operative Childcare building partly due to the removal of intervening buildings and moving the track closer. To mitigate this, an environmental noise barrier has been proposed alongside the railway to reduce the effects. Noise levels would still be higher than now along Cripsey Road but would not rise above the Significant Observed Negative Effect Level.
- 7.1.3 There would also be a short-term negative effect on some views and the landscape character surrounding Oxford Station due to vegetation removal. However, once the vegetation has matured, this effect would reduce and, in some locations, become positive. There would be a significant loss of trees with a TPO which cannot be mitigated. This degree of tree loss is a worst-case scenario; Network Rail is committed to investigate retention of these trees through detailed design.
- 7.1.4 The area around Botley Road would see a significantly positive effect, due to the replacement of old buildings with the western entrance and new planting. There would also be a positive increase in cycling and pedestrian access to the station, bringing significant amenity and health benefits. The Scheme is expected to achieve a 42% increase in biodiversity.
- 7.1.5 The full Environmental Statement can be found on the Network Rail website at: <https://www.networkrail.co.uk/running-the-railway/our-routes/western/oxfordshire/>.



REFERENCES

Department for Environment, Food & Rural Affairs (Defra). (2010). *Noise Policy Statement for England*.

ACRONYMS

Acronym	Definition
BEAP	Built Environment Accessibility Panel
CEMP	Construction Environmental Management Plan
CoCP	Code of Construction Practice
COMAH	Control of Major Accident Hazards
EIA	Environmental Impact Assessment
NO ₂	Nitrogen Dioxide
NO _x	Oxides of Nitrogen
OxLEP	Oxfordshire Local Enterprise Partnership
PM ₁₀ & PM _{2.5}	Particulate Matter
SOAEL	Significant Observable Adverse Effect Level
TPO	Tree Preservation Order

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