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HS2

High Speed Rail (Crewe – Manchester) Environmental Statement

Volume 5: Appendix WR-003-0MA08

Water resources and flood risk

MA08: Manchester Piccadilly Station

Water resources assessment

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1 Introduction

1.1 Structure

1.1.1 This report is an appendix to the water resources and flood risk assessment. It presents the water resources assessment for the Proposed Scheme in relation to the Manchester Piccadilly Station area (MA08).

1.1.2 This appendix should be read in conjunction with:

- Volume 2, Community Area reports;
- Volume 3, Route-wide effects;
- Volume 4, Off-route effects; and
- Volume 5, Appendices.

1.1.3 The water resources and flood risk assessments include both route-wide and community area specific appendices. The route-wide appendices comprise:

- a Water Framework Directive (WFD) compliance assessment (Volume 5: Appendix WR-001-00000); and
- a Draft water resources and flood risk operation and maintenance plan (Volume 5: Appendix WR-007-00000).

1.1.4 For the Manchester Piccadilly Station area, the Flood risk assessment (Volume 5: Appendix WR-005-0MA08) should also be referred to as well as the relevant Hydraulic modelling report (Volume 5: Appendix WR-006-00008).

1.1.5 Additional information relevant to this assessment is set out in Background Information and Data (BID):

- Water resources assessment baseline data (BID WR-004-0MA08)[1]; and
- Water Framework Directive compliance assessment baseline data (BID WR-002-00001)[2].

1.2 Scope, assumptions and limitations

1.2.1 The scope, assumptions and limitations for the water resources assessment are set out in the Environmental Impact Assessment Scope and Methodology Report (SMR) (see Volume 5: Appendix CT-001-00001).

1.2.2 The Manchester Piccadilly Station area covers a 1.1km long section of the Proposed Scheme. The spatial scope of the assessment is based initially on the identification of surface water and groundwater features within 500m of the Proposed Scheme. For the purposes of this assessment this spatial scope is defined as the study area.

1.2.3 The assessment considers the construction and operational features of the Proposed Scheme within this study area. These are shown on Volume 2, MA08 Map Book: Map Series CT-05 and CT-06.

[1] High Speed Two Ltd (2022), High Speed Rail (Crewe – Manchester), *Background Information and Data, Water resources assessment baseline data,* BID WR-004-0MA08. Available online at: http://www.gov.uk/government/collections/hs2–phase–2b–crewe–manchester–environmental–statement.

[2] High Speed Two Ltd (2022), High Speed Rail (Crewe – Manchester), *Background Information and Data, Water Framework Directive compliance assessment baseline data,* BID WR-002-00001. Available online at: http://www.gov.uk/government/collections/hs2–phase–2b–crewe–manchester–environmental–statement.

1.2.4 This assessment covers the potential impacts of the Proposed Scheme on existing surface water and groundwater resources, including consideration of:

- surface waters[3];
- aquifers;
- abstractions (licensed and unlicensed) and consented discharges;
- springs and other groundwater – surface water interactions with implications for water resources; and
- water dependent habitats.

1.2.5 The route-wide WFD compliance assessment (Volume 5: Appendix WR-001-00000) provides a comprehensive review of the potential impacts of the Proposed Scheme on designated WFD surface water and groundwater bodies. The WFD compliance assessment, which involved extensive walkover surveys, informed both the value attributed to relevant receptors, such as watercourses, and the assessment of impacts and effects used in this assessment.

1.2.6 The water resources assessment considers the pollution risks associated with spillage and routine discharges of runoff from all roads within the study area that are affected by the Proposed Scheme during the construction and operational phases.

1.2.7 The risk to water resources associated with accidents or spillages from trains during the operation of the Proposed Scheme are considered on a route-wide basis within Volume 3, Route-wide effects, Section 16, Water resources and flood risk.

1.2.8 Mineral resources (operational or historical) and potential impacts to groundwater quality from existing land contamination are presented in the Land quality report, Volume 5: Appendix LQ-001-0MA08.

1.3 Study area description and key features

1.3.1 The study area is entirely urban and is located within Manchester.

1.3.2 Within the Manchester Piccadilly Station area, the Proposed Scheme will be constructed mainly as viaduct (including Manchester Piccadilly High Speed station). However, the station basement will be a retained box structure and there is a small section of cutting and embankment at the eastern end of the study area. There are no tunnelled or ground level sections.

1.3.3 The main environmental features of relevance to water resources include:

- the River Medlock, Ashton Canal and Rochdale Canal;
- the Sherwood Sandstone Group and Appleby Group which are Principal aquifers;
- the Warwickshire Group which is a Secondary A aquifer;
- the Cumbrian Coast Group which is a Secondary B aquifer;
- the permeable superficial deposits Secondary (Undifferentiated) aquifers; and
- Ashton Canal (West) Site of Biological Importance (SBI) and Rochdale Canal, Stott's Lane – Ducie Street Basin SBI, that are surface water dependent habitats.

1.4 Stakeholder engagement

1.4.1 Discussions have been held with the following stakeholders to inform the water resources assessment:

- the Environment Agency;
- Canal & River Trust, with regards to existing canal assets; and
- Manchester City Council (MCC), with regard to private unlicensed water abstractions.

[3] Ponds are not included in the water resources assessment; these are assessed as ecological receptors in Volume 2.

2 Site specific surface water assessments

2.1 Summary of assessment

2.1.1 Table 1 presents the potential impacts and effects related to surface water resources and features potentially affected by the Proposed Scheme. Further baseline details for these receptors are provided in Water resources assessment baseline data (BID WR-004-0MA08). Those surface water features potentially affected by groundwater interactions are described in Section 3.1.

2.1.2 The WFD compliance assessment (Volume 5: Appendix WR-001-00000) provides a comprehensive review of the aspects of the Proposed Scheme that have potential to cause permanent impacts on water bodies, or that could constrain the future achievement of water body objectives. Temporary construction impacts, defined as those that would last less than three years, may not have implications for WFD compliance, but may nevertheless result in significant effects related to water resources. Such temporary effects have therefore been considered in this assessment, as shown in Table 1.

2.1.3 Construction compounds may have substantial water demands where they are associated with design elements, such as concrete batching plant. At these locations the construction compounds may require water abstractions to augment other supply options. Where these are required, then an assessment will include location-specific engagement with the Environment Agency and other water undertakers on the availability of water at that location.

2.1.4 The draft Code of Construction Practice (CoCP) (see Volume 5: Appendix CT-002-00000) sets out the measures and standards of work that will be applied to the construction of the Proposed Scheme to protect surface waters.

Table 1: Summary of potential impacts on surface water receptors

Surface water feature/receptor	Receptor value	Design element	Discussion of potential impact to water receptor	Magnitude of potential impact and effect	Avoidance and mitigation measures included in design	Magnitude of remaining impact and effect	Other mitigation measures	Residual effects	Duration of effect
Surface water bodies									
River Medlock	High	• Demolition of commercial, community and other properties • Piccadilly approach viaduct • New B6469 Fairfield Street offline overbridge • Watercourse crossing by proposed road • Utility diversion • Temporary works such as compounds, stockpiles and access routes	Uncontrolled site runoff could impact the flow dynamics and water quality of the receiving watercourse. Mobilised contaminants could typically include hydrocarbons related to fuel oils and high alkaline substances such as cement and concrete. Deterioration, loss or change to the existing water environment and the ecology supported, through the disturbance of silt or direct contamination by polluting materials.	Magnitude of impact – Minor Significance of effect – Moderate adverse, significant	Implementation of measures described in the draft CoCP	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	None required	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	Construction (temporary)
		• Piccadilly approach viaduct • New B6469 Fairfield Street offline overbridge • Watercourse crossing by proposed road • Drainage outfall from surface water attenuation tank	Deterioration, loss or change to the existing water environment, flow characteristics and morphology from the presence of the design elements.	Magnitude of impact – Minor Significance of effect – Moderate adverse, significant	Mitigation measures include avoiding the floodplain and channel. Piers are set back to remove impacts on flows. Mitigation measures include appropriate watercourse crossing and drainage design	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	None required	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	Construction (permanent)
		• Removal of the existing culvert of the River Medlock at Enterprise Park	Removal of the culvert will allow for improvement to the existing water environment and the ecology supported through the improvement of the watercourse in this area.	Magnitude of impact – Minor Significance of effect – Moderate beneficial, significant	None required	Magnitude of impact – Minor Significance of effect – Moderate beneficial, significant	None required	Magnitude of impact – Minor Significance of effect – Moderate	Construction (permanent)

Surface water feature/receptor	Receptor value	Design element	Discussion of potential impact to water receptor	Magnitude of potential impact and effect	Avoidance and mitigation measures included in design	Magnitude of remaining impact and effect	Other mitigation measures	Residual effects	Duration of effect
								beneficial, significant	
Shooters Brook Downstream	Low	• Manchester Piccadilly High Speed station • Demolition of commercial and other properties • Utility diversion • Realignment (380m) • Temporary works such as compounds, stockpiles and access routes	Uncontrolled site runoff could impact the flow dynamics and water quality of the receiving watercourse. Mobilised contaminants could typically include hydrocarbons related to fuel oils and high alkaline substances such as cement and concrete. Deterioration, loss or change to the existing water environment, through the disturbance of silt or direct contamination by polluting materials.	Magnitude of impact – Moderate Significance of effect – Minor, not significant	Implementation of measures described in the draft CoCP	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	None required	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	Construction (temporary)
		• Manchester Piccadilly High Speed station • Realignment (380m)	Deterioration or change to the existing water environment, flow characteristics and morphology. Watercourse entirely in culvert and 172m will pass beneath the front of the new station building and associated basements.	Magnitude of impact – Moderate Significance of effect – Minor adverse, not significant	Mitigation measures include appropriate 385m long watercourse realignment within culvert to avoid the station basement	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	None required	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	Construction (permanent)
Rochdale Canal Ashton Canal	Moderate	• Utility diversion • Temporary works such as compounds, stockpiles and access routes	Uncontrolled site runoff could impact the flow dynamics and water quality of the receiving watercourse. Mobilised contaminants could typically include hydrocarbons related to fuel oils and high alkaline substances such as cement and concrete.	Magnitude of impact – Minor Significance of effect – Minor adverse, not significant	Implementation of measures described in the draft CoCP	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	None required	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	Construction (temporary)
Discharges to surface water									
Discharge 016983280	Low	None	Located upstream of the Proposed Scheme, however discharging into a watercourse considered within this assessment. Therefore, the discharge has been included on a precautionary basis.	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	Implementation of measures described in the draft CoCP	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	None required	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	Construction (temporary)
Discharge 016982730	Low	• Temporary works such as compounds, stockpiles and access routes	Located within the land required for construction of the Proposed Scheme. This discharge has potential to be physically impacted by construction work.	Magnitude of impact – Moderate Significance of effect – Minor adverse, not significant	Implementation of measures described in the draft CoCP. The design of the Proposed Scheme will aim to ensure that this existing drainage outfall can be adapted to discharge into the new channel	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	None required	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	Construction (temporary)

Surface water feature/receptor	Receptor value	Design element	Discussion of potential impact to water receptor	Magnitude of potential impact and effect	Avoidance and mitigation measures included in design	Magnitude of remaining impact and effect	Other mitigation measures	Residual effects	Duration of effect
Discharge 016982729 Discharge 01MAN0162	Low	None	Located downstream of the Proposed Scheme and discharging into a watercourse considered within this assessment. Therefore, the discharge has been included on a precautionary basis.	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	Implementation of measures described in the draft CoCP	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	None required	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	Construction (temporary)
Discharge 016982994	Low	• Temporary works such as compounds, stockpiles and access routes	Located upgradient of the new station and within the land required for construction of the Proposed Scheme. This discharge has potential to be physically impacted by construction work, and potentially by the realignment of the Shooters Brook Downstream.	Magnitude of impact – Moderate Significance of effect – Minor adverse, not significant	Implementation of measures described in the draft CoCP. The design of the Proposed Scheme will aim to ensure that this existing drainage outfall can be adapted to discharge into the new channel	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	None required	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	Construction (temporary)

3 Site specific groundwater assessments

3.1 Summary of assessment

3.1.1 Table 2 presents all groundwater receptors within the study area and summarises potential impacts from the design elements of the Proposed Scheme that are relevant to the water environment. Further baseline details for these receptors are provided in Water resources assessment baseline data (BID WR-004-0MA08). Individual impact assessments for each design element are presented in Section 3.2 to 3.4

3.1.2 Construction compounds may have substantial water demands where they are associated with design elements, such as concrete batching plant. At these locations the construction compounds may require water abstractions to augment other supply options. Where these are required, then an assessment will include location-specific engagement with the Environment Agency and other water undertakers on the availability of water at that location.

3.1.3 The draft CoCP sets out the measures and standards of work that will be applied to the construction of the Proposed Scheme to protect groundwaters. All above ground temporary works within construction compounds are included in design and mitigated by the draft CoCP.

3.1.4 The potential impacts of future ground investigations are considered negligible because of the measures outlined in the draft CoCP. As this assessment is applicable for all receptors it is not re-stated in Table 2.

3.1.5 In support of the groundwater impact assessment presented in Table 2, further detail is provided in Section 3.2 to Section 3.5 to demonstrate the methodology and assumptions used in relation to cuttings, retaining structures and viaducts and overbridges of the Proposed Scheme. The locations of these elements are shown in the Volume 2, MA08 Map Book: Map Series CT-05 and CT-06.

Table 2: Summary of potential impacts on groundwater receptors

Receptor	Receptor value	Design element	Discussion of potential impact to water receptor	Magnitude of potential impact and effect	Avoidance and mitigation measures included in design	Magnitude of remaining impact and effect	Other mitigation measures	Residual effects	Duration of effect
Hydrogeology (aquifers)									
Alluvium – Secondary (Undifferentiated) aquifer	Moderate	Above ground elements and shallow excavation (<1mbgl) including: • ground level track and roads • temporary works such as stockpiles and compounds • utilities diversions Deeper excavation (>1mbgl) including: • Piccadilly approach viaduct • offline overbridges	The temporary works have the potential to affect shallow groundwater quality, although this is likely to be localised and temporary.	Magnitude of impact – Moderate Significance of effect – Moderate adverse, significant	Implementation of measures described in the draft CoCP	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	None required	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	Construction (temporary)
			The permanent below ground features, such as viaduct piers, may alter groundwater flow (see Section 3.4).	Magnitude of impact – Minor Significance of effect – Minor adverse, not significant	None required	Magnitude of impact – Minor Significance of effect – Minor adverse, not significant	None required	Magnitude of impact – Minor Significance of effect – Minor adverse, not significant	Construction (permanent)
Glacial till – Secondary (Undifferentiated) aquifer	Moderate	Above ground elements and shallow excavation (<1mbgl) including: • ground level track and roads • temporary works such as stockpiles and compounds • utilities diversions • Ardwick embankment retaining wall • Ardwick embankment	The temporary works have the potential to affect shallow groundwater quality, although this is likely to be localised and temporary.	Magnitude of impact – Minor Significance of effect – Minor adverse, not significant	None required though the draft CoCP will be implemented throughout construction	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	None required	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	Construction (temporary)
			Temporary and permanent works are above ground or shallow and of small areal extent compared to the aquifer. The	Magnitude of impact – Negligible	None required though the draft CoCP will be implemented throughout construction	Magnitude of impact – Negligible	None required	Magnitude of impact – Negligible	Construction (temporary and permanent)

Receptor	Receptor value	Design element	Discussion of potential impact to water receptor	Magnitude of potential impact and effect	Avoidance and mitigation measures included in design	Magnitude of remaining impact and effect	Other mitigation measures	Residual effects	Duration of effect
			works should therefore not impact on recharge and groundwater flow.	Significance of effect – Negligible, not significant		Significance of effect – Negligible, not significant		Significance of effect – Negligible, not significant	
		Deeper excavation (>1mbgl) including: • Ardwick North cutting retaining wall • offline retaining walls • Piccadilly approach viaduct • offline overbridges • Manchester Piccadilly Station viaduct • Manchester Piccadilly High Speed station • Ashton Line connection	The temporary works have the potential to affect shallow groundwater quality, although this is likely to be localised and temporary.	Magnitude of impact – Moderate Significance of effect – Moderate adverse, significant	Implementation of measures described in the draft CoCP	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	None required	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	Construction (temporary)
			The permanent below ground features, including the basements including the new Metrolink below Manchester Piccadilly High Speed station, cuttings and viaduct piers, may alter groundwater flow (see Section 3.2, 3.3 and 3.4).	Magnitude of impact – Minor Significance of effect – Minor adverse, not significant	None required	Magnitude of impact – Minor Significance of effect – Minor adverse, not significant	None required	Magnitude of impact – Minor Significance of effect – Minor adverse, not significant	Construction (permanent)
			The offline retaining walls may alter groundwater flow and could lead to an increase in groundwater flood risk (see Section 3.2).	Magnitude of impact – Moderate Significance of effect – Moderate adverse, significant	None required	Magnitude of impact – Moderate Significance of effect – Moderate adverse, significant	Following site investigation, if needed drainage will be incorporated behind the retaining walls, to ensure groundwater movement is maintained.	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	Construction (permanent)
			Potential impacts from cutting dewatering are assessed as negligible (see Section 3.2).	Magnitude of impact – Negligible Significance of effect – Negligible not significant	None required	Magnitude of impact – Negligible Significance of effect – Negligible not significant	None required	Magnitude of impact – Negligible Significance of effect – Negligible not significant	Construction (permanent)
Sherwood Sandstone Group – Chester Formation – Principal aquifer	High	Above ground elements and shallow excavation (<1mbgl) including: • ground level or embankment track and roads • temporary works such as stockpiles and compounds • utilities diversions • Ardwick embankment • Ardwick embankment retaining wall	There is a significant thickness of glacial till overlying the Sherwood Sandstone aquifer. Below ground construction features will only extend into the glacial till that will protect groundwater flow and groundwater quality in the Sherwood Sandstone aquifer.	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	None required though the draft CoCP will be implemented throughout construction	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	None required	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	Construction (temporary and permanent)

Receptor	Receptor value	Design element	Discussion of potential impact to water receptor	Magnitude of potential impact and effect	Avoidance and mitigation measures included in design	Magnitude of remaining impact and effect	Other mitigation measures	Residual effects	Duration of effect
		Deeper excavation (>1mbgl) including: • Ardwick North cutting retaining wall • offline retaining walls • Piccadilly approach viaduct • offline overbridges • Manchester Piccadilly Station viaduct • Manchester Piccadilly High Speed station • Ashton Line connection	The construction works have the potential to affect groundwater quality, although this is likely to be localised and temporary.	Magnitude of impact – Minor Significance of effect – Moderate adverse, significant	Implementation of measures described in the draft CoCP	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	None required	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	Construction (temporary)
			Potential alteration of groundwater flow may occur around viaduct piers and retaining wall piles. The viaduct piers and retaining wall piles will extend into the Sherwood Sandstone Group aquifer. However, the extent of the piling is not significant in comparison to the area of the aquifer (see Section 3.2, 3.3 and 3.4).	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	None required though the draft CoCP will be implemented throughout construction	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	None required	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	Construction (temporary and permanent)
Cumbrian Coast Group – Manchester Marls Formation – Secondary B aquifer Appleby Group – Collyhurst Sandstone Formation – Principal aquifer Warwickshire Group – Halesowen Formation – Secondary A aquifer	Moderate High Moderate	None	These units are not crossed by the Proposed Scheme in this community area. Although the units may be hydraulically connected to the Sherwood Sandstone aquifer, they are not expected to be impacted by works in proximity to the Sherwood Sandstone.	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	None required though the draft CoCP will be implemented throughout construction	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	None required	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	None
Abstractions									
There are no groundwater abstractions in the study area.									
Discharges to groundwater									
Discharge NPSWQD004449	Low	None	This discharge is not within the footprint of the Proposed Scheme and is located nearly 500m downgradient of any below ground works.	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	None required though the draft CoCP will be implemented throughout construction	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	None required	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	None
Groundwater – surface water interactions									
River Medlock	High	Above ground elements and shallow excavation (<1mbgl) including: • ground level track and roads • temporary works such as stockpiles and compounds • utilities diversions	The temporary works have the potential to affect the quality of some groundwater that discharges to the River Medlock, although this is likely to be localised and temporary.	Magnitude of impact – Minor Significance of effect – Moderate adverse, significant	Implementation of measures described in the draft CoCP	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	None required	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	Construction (temporary)

Receptor	Receptor value	Design element	Discussion of potential impact to water receptor	Magnitude of potential impact and effect	Avoidance and mitigation measures included in design	Magnitude of remaining impact and effect	Other mitigation measures	Residual effects	Duration of effect
		Deeper excavation (>1mbgl) including: • offline retaining walls • Piccadilly approach viaduct • offline overbridges • Manchester Piccadilly Station viaduct • Manchester Piccadilly High Speed station • Ashton Line connection	Potential for groundwater flow to the watercourse to be intercepted by the below ground structures of the retaining walls and viaduct piling. Considering the scale of the features compared to the River Medlock catchment, the impact of groundwater interception on the river flow is likely to be negligible (see Section 3.2 and 3.3).	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	None required but water intercepted by below ground structures of Manchester Piccadilly High Speed station will be returned to the watercourse 60m downstream of the crossing with the Proposed Scheme	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	None required	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	Construction (temporary and permanent)
Shooters Brook Downstream	Low	Above ground elements and shallow excavation (<1mbgl) including: • ground level track and roads • temporary works such as stockpiles and compounds • utilities diversions	The temporary works have the potential to affect the quality of some groundwater that discharges to the watercourse, although this is likely to be localised and temporary.	Magnitude of impact – Minor Significance of effect – Negligible, not significant	None required though the draft CoCP will be implemented throughout construction	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	None required	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	Construction (temporary)
		Deeper excavation (>1mbgl) including: • offline retaining walls • Manchester Piccadilly Station viaduct • Manchester Piccadilly High Speed station	Potential for groundwater flow to the watercourse to be intercepted by below ground structures of the retaining walls and viaduct piling. Considering the watercourse is culverted in proximity to these features, the impact of groundwater interception of river flow is likely to be negligible (see Section 3.2, 3.3 and 3.4).	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	None required though the draft CoCP will be implemented throughout construction	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	None required	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	Construction (temporary and permanent)
			A substantial section of this watercourse is located within the potential zone of influence for dewatering, assuming dewatering is required during construction of the Manchester Piccadilly High Speed station. However, the watercourse is culverted throughout its entire length, including in the vicinity of the station and it is unlikely there is substantial leakage through the culvert lining to support recharge. As such, the watercourse would not be affected by the temporary dewatering.	Magnitude of impact – Minor Significance of effect – Negligible, not significant	None required though the draft CoCP will be implemented throughout construction	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	Detailed surveys of the watercourse (culvert) may be required ahead of the watercourse realignment to understand whether leakage from the culvert contributes significantly to aquifer recharge.	Magnitude of impact – Negligible Significance of effect – Negligible, not significant	Construction (temporary)

3.2 Impact on groundwater from cuttings

3.2.1 Summary parameters for each cutting are presented below in Table 3 and Table 4.

3.2.2 Where the groundwater elevation lies above the base of the cutting the likely maximum zone of influence from dewatering of the cutting has been assessed. In the case that the groundwater level is not known, the groundwater level is assumed to be at surface and a detailed assessment is undertaken accordingly.

3.2.3 Assessment of the likely maximum zone of influence from dewatering of the cuttings has been made using Sichardt's formula as set out in the SMR Technical Note: Groundwater assessment.

3.2.4 Hydraulic conductivity values from the high end of the range, presented in literature, have been used in the assessment, to provide a conservative estimate of the dewatering zone of influence. Where groundwater levels are not known, the worst-case assumption, that groundwater is at ground level, has been used.

3.2.5 Cuttings are assumed to be open and any permanent works such as retaining walls or drainage measures do not form part of the quantitative assessment. Maximum drainage invert below track level is estimated at 3.15m.

3.2.6 Based on these precautionary assumptions, the zone of influence is likely to be overestimated. However, for the purpose of this preliminary assessment, this precautionary approach is considered to be appropriate.

Ardwick North cutting retaining wall

Table 3: Summary of the parameters for the groundwater assessment of Ardwick North cutting retaining wall

Cutting retaining wall parameters	Parameter details
Length (m)	150
Maximum depth (m)	2.1 to top of rail (5.3 to drainage invert)
Strata intercepted	Glacial till (Secondary (Undifferentiated) aquifer)
Lowest level of drainage invert along track (metres above ordnance datum: mAOD)	43.0
Groundwater level(s) (mAOD)	There are no groundwater level data for the glacial till in the area A conservative estimate of groundwater level is 29.9mAOD (Halliday Environment Agency level monitoring borehole)
Principal receptors	Glacial till (Secondary (Undifferentiated) aquifer) Sherwood Sandstone Group – Chester Formation (Principal aquifer) River Medlock

3.2.7 The cutting would be located within the glacial till (Secondary (Undifferentiated) aquifer) and would not penetrate into the Sherwood Sandstone Group (Principal aquifer). There is no currently available information on groundwater elevations or depth to groundwater in this area for the glacial till. It has therefore been conservatively assumed that groundwater levels within the glacial till are at ground level and that groundwater flow within the glacial till may be affected by the cutting. Application of the draft CoCP will ensure that materials and fluids used during construction are managed so that there is no significant adverse effect on groundwater quality.

3.2.8 As defined above, the zone of drawdown has been calculated assuming the cutting is an open cutting without retaining walls. Assuming a hydraulic conductivity value of $3x10^{-4}$m/s for the glacial till[4], the lateral extent of drawdown (also referred to as the zone of influence) of the cutting is estimated to extend up to 160m. This is based on a maximum cutting depth of up to 5.3m from ground level to the track drainage invert, and a rest water level at ground level. The glacial till extends for 10m or more below the assumed maximum depth of the drainage for the cutting and is laterally extensive. Therefore, potential local reductions in groundwater level in the glacial till, resulting from the presence of the cutting, are assessed as negligible, leading to a negligible effect, which is not significant.

[4] On a precautionary basis, high-end sand and gravel conductivity values are assumed for glacial till to allow for potential presence of middle sands: Hydraulic conductivity from Domenico, P. A and Schwartz, F. W., (1990), *Physical and chemical hydrogeology*. John Wiley & Sons.

3.2.9 The Ardwick North cutting retaining wall will be constructed as a secant piled wall that will extend up to 10m below ground level. The retaining wall may extend into the top of the Sherwood Sandstone Group. The piled wall may obstruct the flow of groundwater in the superficial deposits and an upper section of the bedrock in the immediate vicinity of the foundations for the viaduct, although any impacts are likely to be localised. Taking into account the extent and depth of the superficial and bedrock aquifers, the impact of obstructing any groundwater flow is assessed as negligible, leading to a negligible effect, which is not significant.

3.2.10 There may be high permeability horizons within the glacial till that are also laterally extensive. Depending on the depth at which they occur, the impact on groundwater levels in any high permeability horizons might be more extensive than for other materials within the glacial till. Further ground investigation and monitoring is required to confirm groundwater levels in this location, and whether there are any high permeability horizons likely to be impacted by the cutting. This will inform the detailed design and management of groundwater during and after construction.

3.2.11 The direction of groundwater flow in the superficial deposits is likely to follow the general topography. As such, groundwater is likely to flow from the ridge at the western end of the cutting towards the River Medlock in the north-west, and approximately parallel to the line of the Proposed Scheme. Therefore, it is assessed that the impact of the cutting retaining wall on groundwater flooding from the glacial till aquifer is negligible, leading to a negligible effect, which is not significant.

3.2.12 The River Medlock is outside of the calculated zone of influence of the cutting, although the watercourse is located downstream of the proposed cutting. As a result, the watercourse may receive reduced baseflow due to the interception of groundwater by the Ardwick North cutting retaining wall. However, considering the scale and extensive upstream catchment of the River Medlock, the reduction in baseflow is unlikely to significantly affect the watercourse. This is assessed as a negligible impact, leading to a negligible effect, which is not significant.

Offline retaining walls

Table 4: Summary of the parameters for the groundwater assessment of offline retaining walls

Retaining wall parameters	Parameter details
Length (m)	Up to 200
Maximum depth (m)	Assumed to penetrate into the bedrock
Strata intercepted	Glacial till (Secondary (Undifferentiated) aquifer) Sherwood Sandstone Group – Chester Formation (Principal aquifer)
Lowest level of drainage invert along track (mAOD)	43.0
Groundwater level(s) (mAOD)	There are no groundwater level data for the glacial till in the area A conservative estimate of groundwater level is 29.9mAOD (Halliday EA level monitoring borehole)
Principal receptors	Glacial till (Secondary (Undifferentiated) aquifer) Sherwood Sandstone Group – Chester Formation (Principal aquifer) River Medlock Shooters Brook Downstream

3.2.13 The offline retaining walls would be located within the glacial till (Secondary (Undifferentiated) aquifer) and are assumed to penetrate into the Sherwood Sandstone Group (Principal aquifer). There is no currently available information on groundwater elevations or depth to groundwater in this area for the glacial till. It has therefore been conservatively assumed that groundwater levels within the glacial till are at ground level and that groundwater flow within the glacial till may be affected by the cutting. Application of the draft CoCP will ensure that materials and fluids used during construction are managed so that there is no significant adverse effect on groundwater quality.

3.2.14 The offline retaining walls surrounding Manchester Piccadilly High Speed station include A635 Mancunian Way Southbound, St Andrew's Street, Baird Street, Sparkle Street and Store Street retaining walls. It is likely that there will not be a requirement for waterproofness of the retaining walls, and, in this case, the construction of the retaining walls is likely to be contiguous pile wall. However, it is likely that some of the offline retaining walls will be constructed as cantilever piled walls. In proximity to the offline retaining walls, the glacial till is laterally extensive but the minimum thickness in proximity to the offline retaining walls is 3m. On a precautionary basis. it is assumed that these would extend into the top of the Sherwood Sandstone Group. The piled wall may obstruct the flow of groundwater in the superficial deposits and an upper section of the bedrock in the immediate vicinity of the retaining walls, although any impacts are likely to be localised. Taking into account the extent and depth of the superficial and bedrock aquifers, the impact is assessed as negligible, leading to a negligible effect, which is not significant.

3.2.15 There may be high permeability horizons within the glacial till that are also laterally extensive. Depending on the depth at which they occur, the impact on groundwater levels in any high permeability horizons might be more extensive than for other materials within the glacial till. The direction of groundwater flow in the superficial deposits is likely to follow the general topography. Assuming that groundwater flow in the glacial

till follows topography, it would flow from north to south towards the River Medlock. The offline retaining walls will be located at an angle to the assessed groundwater flow direction, particularly the A635 Mancunian Way Southbound retaining wall that will be constructed perpendicular to estimated groundwater flow. This is assessed to be a moderate impact, leading to a moderate effect, which is significant on potential groundwater flood risk from the glacial till aquifer. Further ground investigation and monitoring is required to confirm groundwater levels in this location, and whether there are any high permeability horizons likely to be impacted by the cutting. This will inform the detailed design and management of groundwater during and after construction. If required drainage would be incorporated behind the retaining walls where cantilever pile walls are constructed, and between the architectural facing and piles where contiguous pile walls are constructed. Following application of appropriate mitigation, the impact would be reduced to negligible, leading to negligible effect, which is not significant.

3.2.16 The River Medlock is located downgradient of the offline retaining walls. As a result, the watercourse may receive reduced baseflow due to the interception of groundwater by the offline retaining walls. However, considering the scale and extensive upstream catchment of the River Medlock, the reduction in baseflow is unlikely to significantly affect the watercourse. This is assessed as a negligible impact, leading to a negligible effect, which is not significant.

3.2.17 Shooters Brook Downstream is located adjacent to Sparkle Street and Store Street retaining walls and so is located within the potential zone of influence for dewatering, assuming dewatering is required during construction of the offline retaining walls. However, the watercourse is culverted throughout its length in the vicinity of the retaining walls. Unless there is substantial leakage through the culvert lining, the watercourse would not be affected by the temporary dewatering. However, assuming that there may be some leakage, on a precautionary basis this is assessed as a minor impact on this low value receptor, leading to a negligible effect, which is not significant.

3.3 Impact on groundwater from Manchester Piccadilly High Speed station, Ashton Line connection and car parks

3.3.1 A basement to be used for Metrolink platforms is located below Manchester Piccadilly High Speed station over much of the length of the station. As part of the metrolink station, there is a length of track extending to the south-west in order to futureproof the station design for potential extension of Metrolink facilities (known as the Ashton Line connection). This is located within the station basement and extends south-east from the basement level to ground level over approximately 250m.

3.3.2 The floor of the Manchester Piccadilly High Speed station basement is at a level of 33.5mAOD. Existing ground level in the same area ranges from approximately 39–45mAOD, with the base of the superficial deposits (glacial till) estimated to be at 35 to 38mAOD. The basement below the station will penetrate fully the glacial till aquifer over a length of approximately 510m. The total area of the basement is approximately 28,500m^2. Data from two Environment Agency observation boreholes in the study area indicate that the groundwater level in the bedrock aquifer is likely to be between 28–30mAOD. Thus, excavation for the basement is not expected to intercept groundwater in the Sherwood Sandstone Group aquifer.

3.3.3 Two car parks, that include up to four floors constructed below ground level, are located on the north side of the Manchester Piccadilly High Speed station. The below ground levels of the car park are estimated to extend up to approximately 14m below ground level (approximately 31mAOD). As with the station basement, the below ground levels are expected to fully penetrate the glacial till aquifer, although they are unlikely to intercept the groundwater in the underlying Sherwood Sandstone Group aquifer. The below ground levels of the car parks are much less extensive than the Manchester Piccadilly High Speed station basement, with a total footprint of approximately 5,300m^2 for the two car parks.

3.3.4 The Ashton Line connection is part of the installation of the Metrolink systems in Manchester Piccadilly High Speed station, constructed below the line of the existing Metrolink tram route towards Ashton. The Ashton Line connection will be constructed as a cut-and-cover tunnel that emerges as a retained cutting before reconnecting to the existing track. The piles are currently expected to extend up to 20m below the track level and to fully penetrate through the glacial till into the underlying Sherwood Sandstone aquifer. As such, the Ashton Line connection is expected to intercept the groundwater in the underlying Sherwood Sandstone aquifer. The bedrock extends more than 50m below the Ashton Line connection and is laterally extensive. Therefore, potential local changes in groundwater level are assessed as negligible, leading to negligible effect, which is not significant in terms of impact on this aquifer.

3.3.5 It is assumed that temporary dewatering will be required during construction of the station basement and below ground levels in the car parks. Assuming that the groundwater in the glacial till needs to be drained entirely in the vicinity of the excavations, the calculated zone of influence created during dewatering could extend in the glacial till to a maximum distance of approximately 240m outside the excavations. The calculation of the zone of influence assumes a hydraulic conductivity value of 3x10^{-4}m/s for the glacial till[4], and a rest water level at ground level. No dewatering is expected to be required during the construction of the Ashton Line connection as the methodology during construction is currently assumed to be internal dewatering only by pumping to a suitable temporary discharge point.

3.3.6 Depending on the direction of any groundwater flow within the glacial till, the substantial length of the basement below the station, including the extended length of track, could form a significant barrier to groundwater movement in the local area. Assuming that groundwater flow in the glacial till follows topography, it would flow from north to south, approximately perpendicular to the 510m length of the station basement. As a result, groundwater levels could rise on the north side of the station, potentially giving rise to groundwater flooding at the surface at times of high groundwater levels, or groundwater flooding of existing basements. The Ashton Line connection is aligned north-east to south-west, perpendicular to the estimated direction of groundwater flow within the glacial till. As such, it could also form a barrier to

groundwater flow in the superficial aquifer. The impact and effect of a potential change in groundwater levels on groundwater flood risk is presented in the: Manchester Piccadilly Station Flood risk assessment report, Volume 5: Appendix WR-005-0MA08. As the area of glacial till affected by the basement and the Ashton Line connection is small in comparison to the overall extent of the aquifer in Manchester Piccadilly Station area and surrounding areas, the impact on the glacial till as a whole would be minor, leading to a minor effect, which is not significant.

3.3.7 The River Medlock is within the potential calculated zone of influence of dewatering. As a result, the watercourse may temporarily receive reduced baseflow due to the interception of groundwater during the dewatering for the Manchester Piccadilly High Speed station. However, considering the scale and extensive upstream catchment of the River Medlock, the temporary reduction in baseflow is unlikely to significantly affect the watercourse. This is assessed as a negligible impact, leading to a negligible effect, which is not significant. Long-term baseflow to the River Medlock may be reduced from interception by permanent below ground structures. Track drainage from the Manchester Piccadilly High Speed station will be diverted and discharged to the River Medlock 60m downstream of the crossing with the Proposed Scheme, that will mitigate some reduction in baseflow to the watercourse. However, considering the scale of the features compared to the River Medlock catchment, the impact of permanent groundwater interception on the river flow is likely to be negligible, leading to a negligible effect which is not significant.

3.3.8 A section of Shooters Brook Downstream is located within the north-west corner of the area of the proposed Manchester Piccadilly Station basement, and a substantial section of this watercourse is located within the zone of influence for dewatering. However, the watercourse is culverted throughout its length in the vicinity of the station, and it is unlikely that the watercourse would be affected by the temporary dewatering. However, assuming that there may be some leakage, on a precautionary basis this is assessed as a minor impact on this low value receptor, leading to a negligible effect which is not significant.

3.4 Impacts to groundwater quality and flow from overbridge and viaduct piling

3.4.1 Piling can affect groundwater quality where the works have hydraulic connection to an aquifer or are in the aquifer itself. Potential impacts may occur from, for example, losses of drilling circulation fluid, turbidity resulting from the breakdown of in-situ aquifer material, and possible contamination by hydraulic fluids and greases from machinery. There is likely to be a more rapid transfer of these materials through fracture or fissure flow if present. If within a catchment for a groundwater abstraction, then degraded groundwater quality may render the abstraction unsuitable for use. Catchments for groundwater abstraction are indicated by the source protection zone (SPZ)1 and SPZ2 areas and are defined by the Environment Agency around all licenced abstraction sites. However, there are no SPZ in the Manchester Piccadilly Station study area.

Overbridges

3.4.2 The following overbridges are located within the Manchester Piccadilly Station area:

- Piccadilly offline access ramp; and
- B6469 Fairfield Street offline overbridge.

3.4.3 There is a possibility that groundwater quality and flow in the alluvium, glacial till and Sherwood Sandstone Group may be impacted by the construction of overbridge piles. While the depth of the piles is not currently known, it is assumed that the piles will penetrate through the superficial deposits into the bedrock. The potential loss of grout during piling can be mitigated using bentonite in the process to reduce fluid loss. Therefore, the impact from the construction of overbridges is expected to be localised and temporary and of minor extent in comparison to the areal extent of the superficial and bedrock aquifers. Thus, the impact is assessed as negligible, leading to a negligible effect which is not significant.

3.4.4 The River Medlock is crossed by the two offline overbridges. There is the potential for localised adverse impacts on baseflow to the River Medlock as the below ground structures have the potential to partially obstruct groundwater flow towards the watercourse. However, any groundwater flow affected by the overbridges should still discharge into the River Medlock in the vicinity of the overbridges. Also, considering the scale of the overbridges compared to the River Medlock catchment, permanent effects on River Medlock would be negligible, leading to a negligible effect which is not significant.

Piccadilly approach and Station viaducts

3.4.5 This assessment considers the impact to groundwater flow and groundwater quality of the Piccadilly approach viaduct and the Manchester Piccadilly Station viaduct. Much of the Proposed Scheme in the Manchester Piccadilly Station area will be on viaduct. The assessment considers the impact of the construction of the viaducts, including the impact of permanent pile foundations. It also takes into account the separate assessment of the impact of the Manchester Piccadilly Station basement presented in the previous section.

3.4.6 The Piccadilly approach and Manchester Piccadilly Station viaduct foundations will comprise bored piles with pile caps below the viaduct piers. The piles are currently expected to be up to 16m deep and to extend up to 10m below the level of the basement floor in the area of the station. The pile density for the viaduct is based on a total of 49 separate sets of piles; each pile is expected to be 0.9m in diameter. Piles will be installed in sets, two to three piles wide, beneath a 4m–6m wide pile cap, at approximately 16m–20m spacing in most areas. They are expected to penetrate through alluvium and glacial till, and into the underlying

Sherwood Sandstone Group. The piles may obstruct the flow of groundwater in the superficial deposits and possibly in the uppermost section of the Sherwood Sandstone Group in the immediate vicinity of the viaduct and could impact on local groundwater levels. However, as already discussed, the station basement will form an impermeable barrier to any groundwater flow in the glacial till. Piling is therefore unlikely to have any additional impact on the glacial till over and above the impact resulting from the basement in the vicinity of the proposed station.

3.4.7 In an assumed worst-case scenario, in which the entire aquifer section below each pile cap is reduced to an impermeable condition as a result of the piling, the pile caps will effectively reduce the total area of the aquifer available for groundwater flow beneath the viaduct piers by approximately 20%, although this is considered to be a highly precautionary assessment.

3.4.8 The changes in groundwater levels around the Piccadilly approach viaduct could potentially lead to a localised increase in groundwater flood risk in the superficial deposits. The assessment of impacts on groundwater levels applies Darcy's Law to determine changes in groundwater level due to the reduction in aquifer width and area caused by the piles for the viaduct piers. Groundwater flow in the glacial till in the vicinity of the viaduct is expected to be approximately perpendicular to the route. It is expected that the alluvium and glacial till are in hydraulic continuity in the area.

3.4.9 Due to the construction of the Proposed Scheme, the maximum increase in groundwater level that could occur on the upgradient (north) side of the viaduct piers equates to the difference between the change in water level across the viaduct piers, post-construction, and the change in water level across the area proposed for the viaduct piers in the baseline condition. A possible rise in groundwater level in the range 0.4m to 0.9m is estimated immediately upgradient of the proposed station basement. With a smaller number of piles proposed for the Piccadilly approach viaduct between the station and the River Medlock, the maximum potential rise in groundwater level is estimated at approximately 0.14m immediately upgradient of the viaduct piers. The impact on groundwater levels will reduce with distance from the piers on the north side of the viaduct. On the east side of the River Medlock the alignment of the Piccadilly approach viaduct is approximately parallel to the topographic gradient, hence any impact on groundwater levels in the superficial deposits should be negligible, leading to a negligible effect which is not significant.

3.4.10 The impact and effect of this potential change in groundwater levels on groundwater flood risk is discussed in the: Manchester Piccadilly Station Flood risk assessment report, Volume 5: Appendix WR-005-0MA08.

3.4.11 It is important to note, however, that these estimated impacts are a conservative assessment as a result of assumptions that include:

- the groundwater flow in the area of the Piccadilly approach viaduct will remain the same before and after construction; and
- there will be no additional discharge to the River Medlock on the upgradient side of the viaduct.

3.4.12 Based on the observed water levels in the two Environment Agency observation boreholes in the study area, the groundwater levels in the Sherwood Sandstone Group in the area are expected to be below 30mAOD. The minimum ground level in the study area close to the viaduct is approximately 33mAOD, along the River Medlock. The calculations indicate that the presence of the piles could, in theory, raise the observed water level by a maximum of 0.14m near the River Medlock. Thus, any such change in water level would not be expected to increase the risk that groundwater in the Sherwood Sandstone Group could discharge at the surface and produce groundwater flooding close to the river.

3.4.13 As the groundwater flow is altered rather than impeded, there should only be a localised impact due to the installation of viaduct pile foundations. Therefore, the viaduct is assessed as having a negligible impact on the glacial till and the Sherwood Sandstone Group aquifers overall, leading to negligible effects, which are not significant. As the Sherwood Sandstone Principal aquifer is a high value receptor, this assessment will, however, be reviewed following ground investigation works. If needed, mitigation measures will be developed in consultation with the Environment Agency.

3.4.14 The viaduct piles will cross the width of the alluvium outcrop along the River Medlock. This is assessed to be a minor impact, leading to a minor adverse effect, which is not significant.

3.4.15 The River Medlock passes under the Piccadilly approach viaduct. There is the potential for adverse impacts on baseflow to parts of the River Medlock. As a result, small-scale localised changes to baseflow in the River Medlock will be expected upgradient and downgradient of the viaduct piles. However, the overall total contribution to the River Medlock baseflow is not expected to change.

3.4.16 The potential water quality impacts associated with the use of concrete from construction piling can be mitigated (for example by using bentonite) in the process to reduce fluid loss. Many methods of piling can also be facilitated by the use of temporary casing, that is generally more useful to stop losses to immediately adjacent watercourses. Implementation of the draft CoCP will ensure that materials that may come into contact with groundwater will be selected, and method statements developed, to control any potential contaminants.

3.5 Impacts to groundwater from borrow pits

3.5.1 There are no borrow pits within the Manchester Piccadilly Station area.

4 Site specific water dependent habitats assessment

4.1 Summary of assessment

4.1.1 Table 5 summarises the potential hydrological impacts (for example, changes to flow, level, regime, or quality) related to surface water dependent habitats. Further details of the ecology of these sites and the assessment of the local level ecological effects arising from water impacts, are provided in Volume 5, Ecological register of local level effects, Appendix EC-015-0MA08. Where there are significant effects, the ecological effects and associated mitigation are reported in Volume 2, Community Area report: Manchester Piccadilly Station (MA08), Section 7, Ecology and biodiversity.

Table 5: Summary of potential water dependent habitat impacts

Receptor	Design element	Discussion of potential impact to water receptor
Surface water dependent habitats		
Ashton Canal (West) SBI	• Temporary works such as compounds, stockpiles and access routes.	Ashton Canal (West) SBI is likely to be regulated by sluices and is unlikely to be dependent on periodic inundation from the River Medlock. However, it has been included here on a precautionary basis. The River Medlock flows from north-east to south-west. There are no surface water design elements affecting the River Medlock before it flows through the SBI. The Ashton Canal is located outside of the construction buffer and any construction works in proximity to the canal will be managed through the application of the draft CoCP. There are no surface water design elements affecting the Ashton Canal. Any potential for impacts on water quality during the construction phase is therefore limited. There is considered to be a negligible impact on water flow and quality at this site.
Rochdale Canal, Stott's Lane – Ducie Street Basin SBI	• Temporary works such as compounds, stockpiles and access routes.	Rochdale Canal, Stott's Lane – Ducie Street Basin SBI supports regionally important aquatic habitat and species. The Rochdale Canal is located outside of the construction buffer and any construction works in proximity to the canal will be managed through the application of the draft CoCP. There are no surface water design elements affecting the Rochdale Canal. Any potential for impacts on water quality during the construction phase is therefore limited. There is considered to be a negligible impact on water flow and quality at this site.

5 Site specific highways drainage assessments

5.1 Introduction

5.1.1 Roads are designed to drain freely to prevent the build-up of standing water on the carriageway whilst avoiding exposure to or causing flooding. Contaminants deposited on the road surface are quickly washed off during rainfall. Where traffic levels are high, the level of contamination increases and therefore the potential for unacceptable harm being caused to the receiving water also increases. There are many circumstances in which runoff from roads is likely to have no discernible effect, however a precautionary and best practice approach indicates the need for the assessment of the possible impact of pollutant discharges on the water environment from roads affected by the Proposed Scheme. These effects can either be through spillage and routine runoff pollution from new roads that are used during the construction and operational phases or changes in traffic movements on the existing road network.

5.1.2 The Proposed Scheme makes provision for two methods for draining new sections of highway: direct runoff to soakaway and drainage via an attenuation pond to an existing watercourse. Where changes in traffic volumes have been identified along the existing road network, steps have been taken to identify the type of drainage in place and an assessment has been made of whether the highway works proposed have implications for pollution risk within the Manchester Piccadilly Station area.

5.2 Methodology and assessment criteria

Routine runoff pollution risk

5.2.1 Where highway drainage is discharged to local watercourses, the assessment for determining whether routine runoff is likely to have a detrimental impact on water quality uses the Highways England Water Risk Assessment Tool (HEWRAT)[5]. Where highway realignments are to discharge to kerb side ditches that do not have a permanent baseflow, the Groundwater Assessment (Appendix C)[5] has been used.

5.2.2 The significance of the impact of the predicted effects on surface water and groundwater receptors has been assessed in accordance with the methodology described in the SMR.

Spillage pollution risk

5.2.3 In addition to assessing the potential for adverse effects of routine surface water runoff from highways, an assessment of the potential spillage risk to water quality has been undertaken for highway realignments. The methodology for assessing spillage risk follows the Spillage Risk Assessment (Appendix D)[5].

5.3 Detailed assessment

Screening results

5.3.1 A screening exercise has not identified the need for a routine runoff and pollution risk assessment or a spillage pollution risk assessment in the Manchester Piccadilly Station area during the construction or operational phases.

[5] Standards for Highways (2020), *Design Manual for Roads and Bridges (DMRB) – LA 113 Road Drainage and the Water Environment Revision 1.* Available online at: https://www.standardsforhighways.co.uk/prod/attachments/d6388f5f-2694-4986-ac46-b17b62c21727?inline=true.