

**LAND SOUTH OF GLAN USK PRIMARY SCHOOL, HERBERT ROAD
NEWPORT**

ENVIRONMENTAL STATEMENT

**VOLUME 2
CHAPTER 11: DRAINAGE**

11. DRAINAGE

INTRODUCTION

11.1 This Chapter of the Environmental Statement (ES), written by Waterman Infrastructure & Development Ltd (WIE), presents the Drainage Assessment for the proposed Development, as designed by Steve Morgan Associates (SMA). It includes the relevant:

- assessment methodology and significant criteria;
- legislation and policy;
- baseline description;
- identification of potential impacts;
- assessment of the construction and operational phases of the project;
- design / mitigation measures and
- residual impact assessment and recommendations.

11.2 The existing brownfield Site is to be developed for residential use and will be drained by new separate surface water and foul water drainage systems.

11.3 The Natural Resource Wales Flood Map and the TAN 15 Development Advice Map both indicate that part of the Site is at risk of flooding. A Flood Consequences Assessment (FCA) has been prepared by WIE, which is submitted as a stand-alone document accompanying the planning application. The findings of the FCA are summarised in Chapter 10: Flood Risk of this ES.

11.4 This Drainage Chapter sets out the drainage regimes that currently exist, and comments on the future Site drainage proposals as illustrated on the Site drainage plan provided by SMA.

11.5 This Chapter is supported by:

- Appendix 11.1: Proposed Drainage Strategy
- Appendix 11.2: Dwr Cymru Welsh Water (DCWW) sewerage records
- Appendix 11.3: Extract from Newport City Council LDP

ASSESSMENT METHODOLOGY AND SIGNIFICANCE CRITERIA

Assessment Methodology

11.6 This assessment is based on the Drainage Strategy (Appendix 11.1) provided by SMA. In order to carry out the assessment, further data has been obtained relating to:

- Dwr Cymru Welsh Water (DCWW) sewerage records;
- Ordnance Survey maps, topographical surveys, historical maps and Natural Resources Wales (NRW) floodplain and groundwater vulnerability maps.

11.7 The Soilscales dataset, produced by the National Soil Resources Institute, is presented in an interactive online map covering England and Wales. This was examined in order to provide information relating to the hydrogeology of the Site.

- 11.8 A Site Walkover verified the topographical survey and confirmed that the hydraulic model was representing the existing Site conditions appropriately.
- 11.9 A flow monitoring survey of the ordinary watercourse running through the Herbert Road Site was carried out as part of the flood study, with the aim of providing information regarding flow rates in the culverted watercourse. Refer to Chapter 10: Flood Risk of this ES for full details of the watercourse monitoring and conclusions.
- 11.10 TAN 15 requires that consideration be given for any potential for flooding to occur from surface water emanating from the developed Site. TAN 15 requires that betterment is achieved through the reDevelopment of such Sites.
- 11.11 Surface water runoff was therefore investigated to determine the effect of the Development on surface water resources and the potential risk of flooding elsewhere. Refer to Chapter 10: Flood Risk of this ES for full details relating to flood risk.

Significance Criteria

- 11.12 The relative significance of potential and residual drainage issues is outlined in Table 11.1 below, based upon professional experience and judgement.

Significance Criteria	Description of Criteria
Major beneficial	Major permanent improvement in water quality leading to upward reclassification of water quality according to national criteria Major increase in capacity of foul drainage
Moderate beneficial	Moderate permanent improvement in water quality but not leading to upward reclassification of water quality according to national criteria Moderate increase in capacity of foul drainage
Minor beneficial	Minor temporary local scale improvement in water quality Minor increase in capacity of foul drainage
Negligible	No appreciable effect on humans or surface water resources Demand for foul drainage can be met within existing capacity
Minor adverse	Moderate temporary local scale reduction in surface water quality, reversible with time Minor increase in demand for foul drainage above capacity of services
Moderate adverse	Severe temporary reduction or minor permanent reduction in quality of the surface water resource that does not affect the classification of water quality according to national criteria Moderate increase in demand for foul drainage above capacity of services
Major adverse	Permanent reduction in the quality of the surface water resource that causes downward reclassification of water quality according to national criteria

Table 11.1 Significance Criteria for Drainage Effects

LEGISLATIVE AND PLANNING POLICY FRAMEWORK

National Legislation

Water Framework Directive, 2000/60/EC

- 11.13 This Directive applies to all EU waterbodies and aims to ensure they are protected from harm, and that water quality improvements can be made. The Directive contains no specific flood risk management objectives but in general terms does place an onus on developers to protect and if possible enhance waterbodies close to Developments.

Land Drainage Act, 1991

- 11.14 This Act sets out the responsibilities and powers of NRW, Internal Drainage Boards, LPAs and riparian land owners. Under the Act, NRW and the LPA have discretionary powers for management and maintenance of main rivers and ordinary watercourses respectively. However, the riparian owner, i.e. landowner through which the watercourse flows, who is ultimately responsible for its maintenance.

Water Resources Act, 1991

- 11.15 This Act relates to the control of the water environment. The main aspects relevant to Development include land drainage, flood mitigation and pollution prevention. In particular:
- NRW consent is required for any works affecting, or within 16m of, any tidal defence structure;
 - NRW consent is required for structures constructed across a 'main river' as defined by NRW maps;
 - Land drainage consent is required for surface water discharge to a main river or tidal water.

Water Industry Act, 1991

- 11.16 This Act covers a wide range of provisions that the privatised Water Companies must follow. Under the Act, discharge of effluent to the public sewer can only take place with the agreement or consent of the sewerage undertaker (i.e. water company), in this case Dwr Cymru Welsh Water (DCWW).

Water Act 2014

- 11.17 This Act updates WA 2003 and amends the WRA1991, WIA 1991, bringing about a number of changes including streamlining arrangements for flood defence organisation and funding; changes to the types of abstraction licences; new arrangements for the provision of flood insurance in high risk areas; and places a duty on water companies to conserve water and prepare for drought.

Flood and Water Management Act, 2010

- 11.18 This Act removes the automatic right of connection to public sewers, and places the onus on the LPA to adopt Sustainable Drainage Systems. Secondary enacting legislation is not yet in place (currently anticipated to be enacted in late 2014). However, LPAs and water companies currently consider the requirements of this Act when considering planning applications.

National Planning Policy

Planning Policy Wales – 9th Edition, 2016

- 11.19 Planning Policy Wales (2016) (PPW) is the overarching policy document that deals with planning matters in Wales. Chapter 4 of PPW confirms WAG's commitment to sustainable Development.
- 11.20 This is a general requirement to achieve sustainability through the Development process. Chapter 12 of PPW deals with Infrastructure and services and Para 12.1.1 explains that adequate and efficient infrastructure is crucial for the economic, social and environmental sustainability of all parts of Wales. This again is a general objective which requires local interpretation to ensure compliance with the sustainability objectives.
- 11.21 Planning Policy Wales and its associated Technical Advice Note 15 requires that consideration be given to any potential for flooding from surface water emanating from the developed Site. The reDevelopment of existing grass and woodland areas to form hard (impermeable) surfaces such as highways and buildings will cause an increase in surface water runoff rates and volumes.
- 11.22 The provision of Drainage is fundamental to any Development and in order to comply with general sustainability objectives the proposed type and level of drainage provision for any Development should be sustainable.

Local Planning Policy

Newport Local Development Plan (LDP) (2011- 2026)

- 11.23 The Newport Local Development Plan(2011 – 2026) supersedes the Unitary Development Plan (1996 – 2011) and forms the basis for land use planning in the Newport City Council administrative area.
- 11.24 LDP Strategic Policy (SP) 3: Flood Risk states that Developments will only be permitted where suitable mitigation measures and provision for the long-term maintenance of these measures are included as an integral part of the Development.
- 11.25 SP4: Water Resources states that developers will be encouraged to incorporate SuDS within all Developments to reduce any adverse effects on the water environment.
- 11.26 Newport City Council has produced a Supplementary Planning Guidance (SPG) document on Flood Risk and Sustainable Urban Drainage Systems, which was adopted in 2005. This provides further detail on the assessment required and possible mitigation measures to ensure that any proposed Development will not be adversely affected by flooding or which will worsen flood risk to third parties or put lives at unacceptable risk. However,

this SPG should be taken as indicative guidance only as the document is due to be updated between 2016-2020 as part of the LDP.

- 11.27 Reference to the Newport Local Development Plan (LDP) 2011 – 2026 (Deposit Plan, April 2012) indicates that the Herbert Road Site has been previously committed and is carried forward into the LDP.
- 11.28 The proposed Site is located within the 'Glebelands' Site H(5), which is designated as a main source of housing land within the Newport Deposit Plan 2011-2026. It is detailed in the Deposit Plan that the Glebelands Site has 'existing commitments for residential Development', to include 153 dwellings. The replacement primary school has now been constructed. This planning consent has been implemented by virtue of the construction of the primary school.
- 11.29 The Newport LDP defines the proposed Site (H(1)) as 'Housing Commitment' (refer to Appendix 11.3).
- 11.30 The Development accords with both national and local plan policies, as demonstrated in the following assessment.

BASELINE CONDITIONS

- 11.31 Reference to the Welsh Government's TAN 15 Development Advice Map, indicates that the Site is partly located within Zone C1. This risk designation suggests that the existing Site is at risk from an extreme flood event, however the Zone C1 designation signifies this part of the Site as being served by significant infrastructure including defences. There are also some areas within the Site which lie within Zone A i.e. considered to be at little or no risk of fluvial or coastal/tidal flooding. Refer to Chapter 10: Flood Risk for full details relating to flood risk
- 11.32 A topographical survey of the Site indicates that the existing ground levels in the north-east portion of the Site are at around 6.9m AOD and rise to the east to approx. 7.4m AOD. However, the levels of the Site are currently being raised in accordance with the extant consent (planning reference: 13/1279). These works are being implemented as part of the Phase 1 works.
- 11.33 The Site is located, in part, on a former industrial /domestic landfill Site. This is reflected in the topography of the main part of the Site which varies between 7.0m AOD and 8.0m AOD. The ground running immediately adjacent to the River Usk along the western boundary of the Site is generally higher, with levels rising from 9.0m AOD in the north to approx. 10.0m AOD halfway along the Site, before dropping to 9.5m AOD at the southern extent.

Hydrogeology

- 11.34 The Soilscales dataset, produced by the National Soil Resources Institute, is presented in an interactive online map covering England and Wales. This map shows the Site as being located in an area where 'Loamy and clayey soils of coastal flats with naturally high groundwater' dominate.

- 11.35 According to Natural Resource Wales data, the made ground at the Site is likely to be sufficiently permeable so as to allow the limited lateral and vertical migration of water to the underlying aquifer and off-Site receptors. The underlying strata are both classified as Secondary A Aquifers which may be capable of supporting water supplies at a local rather than strategic scale.
- 11.36 NRW data confirms the Site is not located within a Groundwater Protection Zone. The Site is deemed to be a Minor Aquifer, according to the Groundwater Vulnerability Zones.
- 11.37 Historically, the Site was operated as a landfill between the 1930s and 1960s. Imported material is known to have raised this low lying part of Newport by approximately 4m. The narrow southern strip of Development area has been elevated with man-made material to form a bund, which provides opportunity to improve the permeability of the soils by importation of granular fill material. However, based on historical industrial/landfill uses at the Site, ground conditions are unlikely to be suitable for infiltration as a method of surface water disposal due to presence of contaminated soils.

Hydrology

Fluvial Regime

- 11.38 The Site is located within the tidal reaches of the River Usk. This major watercourse rises in the mountains of Mid Wales and flows in a southerly direction through several major urban areas, including Monmouth and the eastern valley towns, to outfall into the Severn Estuary at Newport. To the north of Newport, the River Usk meanders as it flows along the river valley of relatively flat gradient.
- 11.39 At Newport, natural geological features channel the river between high ground occupied by Allt yr yn (near Newport Civic Centre) to the west of the river and Summerhill to the east. Downstream of this channel restriction, the river again meanders across formerly estuarine mud flats to the Estuary. The former mud flats extend along the coast to Caldicot in the east.

Ordinary Watercourse

- 11.40 A small watercourse flows through the Herbert Road Site. The catchment area is heavily urbanised and drains part of the residential area of St Julians to the east of the Site. The watercourse is culverted for approximately 500m between St Julians Avenue and the Site, to which it enters via a culvert beneath the railway embankment.
- 11.41 The watercourse flows through the Site in an open channel for approximately 180m before discharging into the River Usk via non-return valve of approx. 575mm diameter. Along the open channel section, the watercourse is conveyed beneath the newly constructed pedestrian access route into the Glan Usk School Site, via a circular culvert of 2m diameter.
- 11.42 It is assumed that the area to the north of the Site encompassing the 'Glebelands' and the new Glan Usk School Site drains into this watercourse, although the exact location of the connection has yet to be established.
- 11.43 The River Usk is designated as a Site of Special Scientific Interest (SSSI) and a Special Area of Conservation (SAC).

- 11.44 In order to better understand the flow regime for the ordinary watercourse, a flow monitoring survey was carried out. The flow data indicated that during dry weather the flow rate in the culvert is generally less than 5 l/s. In storm conditions, flow rates reached a maximum of 225 l/s. Refer to Chapter 10: Flood Risk for full details of the watercourse monitoring and conclusions.

Sewer Flooding

- 11.45 Existing sewer networks are noted within the Site boundary and surrounding area (refer to Appendix 11.2).
- 11.46 Correspondence with DCWW in March 2018 confirmed that there is capacity within the existing public sewerage system, however local residents have reported existing problems with sewer flooding in properties to the west of the railway line (including Orchard Street) during certain periods of rainfall. This is an existing problem for which it is understood DCWW have temporary alleviation measures in place which are activated when required.

Foul Water Drainage

- 11.47 There are currently no foul flows generated by the existing brownfield Site, although DCWW public combined sewers are present within the Development boundary, including a 2.1m trunk sewer crossing the northern part of the Development area. A plan showing DCWW's existing sewer network within the vicinity of the Site is included herewith in Appendix 11.2.
- 11.48 The existing sewers crossing the Site convey flows from adjacent developed areas and contain no known incoming connections from on-Site flow sources.
- 11.49 With regard to water quality, the preferred method of foul drainage disposal is a connection to the public sewerage network. DCWW have been consulted with regards to foul drainage for the Development and have advised that there is sufficient capacity within the system to accommodate foul flows from the Development, in addition to suitable connection points to the combined sewer throughout the Site. As such, all foul flows will be treated at the local Wastewater Treatment Works, prior to discharge to any watercourse.

ASSESSMENT OF POTENTIAL IMPACTS

Construction Phase

Surface Water Runoff

- 11.50 During the construction phase of the works and prior to the operation of the proposed Site drainage, the status quo will prevail in areas of the Site that are neither heavily tracked or paved over. In this respect, surface water runoff emanating from the existing Site will continue to infiltrate to ground and shed naturally overland to the open watercourse within the Site.
- 11.51 Construction works including earthworks and temporary Site drainage would have the potential to give rise to changes in the surface water runoff regime during storms. In the

absence of mitigation the risk of surface water flooding from overland sources could increase because discharge rates would not be controlled.

- 11.52 Stockpiled material in particular has the potential to divert surface water runoff towards third parties or otherwise adversely affect the existing regime.
- 11.53 Without mitigation the effects of construction activities on surface water runoff are considered to be **moderate adverse**.

Contamination of Surface Water and Groundwater

- 11.54 The construction process will generate an increase in the concentrations of some pollutants, in particular suspended solids, from the mobilisation of silts and sediments during earthworks and from the movement of heavy plant. Construction plant may also generate a diffuse pollution source of hydrocarbons and, to a lesser extent, heavy metals, which could leach into the sub-soil and find their way into the groundwater regime and subsequently the watercourse. The majority of these pollutants would be mobilised during surface water run-off and would enter the existing/partially completed proposed drainage system such that flows are mitigated.
- 11.55 In addition to the sources of diffuse pollution, there is also some risk of point source pollution of oils and hydrocarbons occurring from spillages or leaks, which could lead to a contamination of the surface water system and consequently the watercourse. The greatest risk of oil spillage occurs during vehicle re-fuelling.
- 11.56 Any potential piling activities in particular could introduce new pathways for any contaminants to migrate into the groundwater.
- 11.57 The risk of pollution of the downstream watercourse without the provision of suitable mitigation measures is considered to be **moderate adverse**.

Sewer Flooding

- 11.58 Several public combined sewers including a deep large bore tunnel sewer are present within the Development area. Any blockage or malfunction of the existing sewers within the Development area due to construction activity will potentially adversely affect neighbouring existing residents, unless appropriate mitigation measures are implemented.
- 11.59 It should be noted that the precise nature of the existing sewer problem affecting Orchard Street and the surrounding area is not known and as such it cannot be stated with any certainty that the proposed Development will exacerbate this particular existing problem. Furthermore, DCWW has not raised any existing sewer problems during discussions regarding proposed foul connection points for the new Development.
- 11.60 Without appropriate mitigation the potential risk of damage to the sewers during the construction process is considered to be **moderate adverse**.

Operational Phase

Surface Water Runoff

- 11.61 Given that there will be an increase in impermeable surfaces as a result of the Development proposals, it is inevitable that there will be an increase in the rate and volume of surface water runoff.
- 11.62 The ordinary watercourse outfall to the River Usk is tidally dominated at this location. Due to the tidal nature of the outfall and the very large capacity of the Usk, the proposed unattenuated discharge of Site surface water drainage to the ordinary watercourse will not affect downstream properties.
- 11.63 As such, the impact of the Development (i.e. increased rate of runoff) on the existing hydrological regime is considered to be **negligible**.
- 11.64 Notwithstanding the above, an appropriately designed surface water drainage scheme with an appropriate disposal strategy and details will be required to mitigate against flooding of the sewers/drainage system.
- 11.65 The system will also need to be designed to cater for exceedance and emergency blockage scenarios. Exceedance occurs when agreed design rainfall parameters are exceeded, and is typically mitigated by the incorporation of appropriately routed overland flow-paths within the layout.
- 11.66 Overland flowpaths as part of the 3D modelling exercise will need careful consideration at detailed design stage in parallel with Development of the drainage design to ensure that flooding due to blockages anywhere within the network can be safely conveyed away from and have minimal impact on the proposed Development.

Water Quality

- 11.67 The operational phase will generate an increase in the concentrations of some pollutants. It is however unlikely that the Development would generate any diffuse pollution sources, which could leach into the sub-soil and find their way into the groundwater regime and subsequently the watercourse.
- 11.68 There is some risk of point source pollution of oils and hydrocarbons occurring from spillages or leaks, particularly from the car parking areas, which could lead to a contamination of the surface water system and consequently the watercourse. The risk of pollution of the downstream watercourse without the provision of appropriate mitigation measures is considered to be **moderate adverse**.

Sewer Flooding

- 11.69 Any blockage or malfunction of the existing sewers within the Development area will require unrestricted maintenance access in perpetuity to prevent potential problems for both new Development residents and neighbouring existing residents when the Site is developed.

11.70 It should be noted that the precise nature of the existing sewer problem affecting Orchard Street and the surrounding area is not known and as such it cannot be stated with any certainty that the proposed Development will exacerbate this particular existing problem. Furthermore, DCWW has not raised any existing sewer problems during discussions regarding proposed foul connection points and have advised that there is capacity within the existing sewerage network.

11.71 Without appropriate mitigation, the risk of sewer flooding due to lack of maintenance/appropriate mitigation measures is considered **moderate adverse**.

Foul Water Drainage

11.72 The most sustainable method of disposal of foul water discharge from the Development is via the existing mains sewerage network.

11.73 Due to topographical constraints and the requirement to avoid pumping, three points of connection to the existing sewer network are proposed:

Phase 1

- i) Flows from the apartment blocks will drain into the existing 150mm sewer adjacent to the southern boundary, subject to agreement with DCWW.

Phases 2,3 & 4

- ii) Manhole B2 to the north of the on-Site watercourse
- iii) Manhole D to the south of the on-Site watercourse

11.74 These connection points have been discussed and agreed in principle with DCWW.

11.75 DCWW have confirmed that there is capacity within the local sewer network and wastewater treatment works to accommodate foul flows from the proposed Development.

11.76 As such, it is considered that the Development would give rise to a **negligible** effect in terms of foul drainage.

MITIGATION MEASURES

11.77 This section provides a description of the proposed mitigation measures which have been designed into the scheme to reduce / minimise adverse environmental effects.

11.78 The general philosophy of approach to the Development of the Site layout has been to create proposals which are sympathetic to the Site topography and environmental setting.

11.79 The proposed Site drainage plan (Dwg 1176242-001 Rev B) is included herewith as Appendix 11.1. This plan shows the Site layout and drainage strategy for the proposed Development.

11.80 The surface water drainage strategy comprises two distinct disposal methods.

11.81 The lower road section, located at the southern Site boundary, is to be drained via conventional kerb drainage and conveyed to a geo-cellular attenuation tank situated

within a parcel of land adjacent to the proposed roundabout. Attenuated water will then pass through a petrol/oil separator before discharging to the River Usk.

- 11.82 The remainder of the Development is to be discharged via piped surface water drainage system to the existing on-Site watercourse at four separate points. Discharge to the watercourse is unattenuated with no inherent flow controls on the basis that downstream properties will not be affected due to the tidal nature of the existing outfall to the River Usk, in addition to the large capacity of the river at this location.
- 11.83 Notwithstanding the above, the watercourse is to be locally widened and re-shaped as part of the Development landscaping proposals to provide a wetland area. In addition to the enhanced ecological and amenity value afforded by this area, the additional flood storage provided will help to mitigate future flood risk in storm conditions.

Construction Phase

Surface Water Runoff

- 11.84 During the construction phase, protocols would need to be put in place to ensure that any surface water runoff risk is not exacerbated. This would include the appropriate siting of stockpiled material to avoid the potential diversion of floodwaters and any subsequent exacerbation to third party flooding that may occur.
- 11.85 The contractor should be required to produce a method statement detailing any dewatering, temporary land drainage installations, and other contingencies deemed necessary to facilitate the necessary earthworks movement and terrace formation works.
- 11.86 Care should also be taken to avoid the release of construction materials into the drainage systems, as this material may have the potential to block the downstream system.
- 11.87 These measures should be developed as part of a CEMP and the appropriate construction methods should be implemented in line with current PPGs to mitigate against any impact on pluvial (surface water) flood risk.

Contamination of Surface Water and Groundwater

- 11.88 Construction measures to mitigate against the pollution of the water environment should be employed to reduce the likelihood of contaminated runoff leaving the Site and reduce the treatment burden upon public sewage infrastructure.
- 11.89 For example, a Construction Environmental Management Plan (CEMP) should be developed highlighting the necessary mitigation measures that should be put in place. This should be carried out in line with guidance set out by the Construction Industry Research and Information Association (CIRIA).
- 11.90 Recommendations should be made with respect to temporary SUDS and drainage measures such as check dams, sediment traps, filtration systems, etc. to minimise and control the risk of contaminated runoff discharging from the Site.
- 11.91 Fuels and oil should be stored in line with the relevant Pollution Prevention Guidelines (PPGs) within a secondary containment system such as a drip tray or bund and an emergency contingency plan should be put in place to address the cleaning up of small

spillages as well as emergency incidents. Absorbent materials such as sand and spill granules should be kept on Site.

- 11.92 The use of prefabricated structures, wherever possible, would reduce the likelihood of on-Site construction works contaminating runoff.
- 11.93 A piling risk assessment will ensure that any piling would be conducted in a way that minimises introduction of pathways to the groundwater.
- 11.94 Groundwater quality should also be monitored during construction works.
- 11.95 Construction protocols relating to the protection of water quality and surface water management in general would include, amongst many other measures, the following:
- The provision of temporary storage areas and stilling basins;
 - It is recommended that a temporary petrol interceptor be incorporated into the proposed system (downstream of proposed trafficked areas) as early as possible during the construction programme;
 - Mitigation of point source pollution such as oil spillage or leakage will be achieved by provision of designated storage and refuelling areas, with storage areas provided with adequate bunding to prevent spillages.

Sewer Flooding

- 11.96 As part of the construction methodology of the proposed Development, any existing drainage infrastructure that is not proposed for removal should be suitably protected to ensure that its current operation is maintained during the construction process. Clear plans should be provided to the construction team showing all existing infrastructure and emphasising “No dig” zones. Barriers to keep any traffic away from the line of existing sewers should be considered. Heavy materials and machinery should not be stored or parked over drains or sewers.
- 11.97 The developer has agreed with DCWW that a piling strategy is to be submitted within the future Section 104 agreement, demonstrating that the existing public sewer will not be adversely affected. As such, all foundation details and construction methods will be agreed prior to construction and will accord to best practice guidance, therefore preventing increases in sewer flood risk as a result of the construction phase of the Development.

Operational Phase

Water Quality

- 11.98 The use of kerb drainage and oil interception in the piped surface water system will mitigate the pollution risk throughout the Development.
- 11.99 In addition, a carefully designed wetland area, into which the surface water discharges, will have an inherent filtration function to assist the breakdown of contaminants

Sewer Flooding

- 11.100 The layout has been designed to ensure maintenance access to the existing public sewers within the Site, with the exception of the large bore tunnel sewer crossing the northern part of the Development.
- 11.101 Additionally, the developer has agreed with DCWW that a piling strategy is to be submitted within the future Section 104 agreement, demonstrating that the existing public sewer will not be adversely affected as a result of the Development.

RESIDUAL EFFECTS

- 11.102 This section provides a description of the residual impacts which will remain following implementation of the mitigation measures described in the previous section.
- 11.103 The residual impact is considered in order to identify a deterioration or improvement in the environmental impact.

Construction Phase

Surface Water Runoff

- 11.104 With the effective implementation of the controls described in the previous section, the residual impact of the construction phase of the proposed Development on the existing hydrological regime is considered to be **negligible**.

Contamination of Surface Water and Groundwater

- 11.105 With mitigation in place as described in the previous section, the risks in relation to groundwater and surface water contamination would be considered **negligible**.

Sewer Flooding

- 11.106 With mitigation as described in the previous section, the risks in relation to the existing sewers would be considered **negligible**.

Operational Phase

Water Quality

- 11.107 With mitigation as described in the previous section, the risk of pollution of the downstream watercourse is considered to be **negligible**.

Sewer Flooding

- 11.108 With mitigation as described in the previous section, the risks in relation to the existing sewers would be considered **negligible**.

SUMMARY

- 11.109 The proposed Development incorporates a range of conveyance, treatment and attenuation SuDS features located throughout the Site which, as a whole, provide an effective drainage system that ensures all local planning policies and design standards are met.
- 11.110 Based upon the findings of this assessment, it is considered that the proposed Development is unlikely to lead to any significant adverse residual effects in relation to drainage.
- 11.111 The potential effects, mitigation measures and likely residual effects of construction and operational use of the Development on drainage, are summarised in Table 11.2 below.

Description of Effect	Potential Effect / Significance	Mitigation	Likely Residual Effect / Significance
Construction			
Surface Water runoff increase	Moderate adverse significance	CEMP, Method statement for temporary works, appropriate siting of stockpiled material	Negligible
Surface Water and groundwater contamination	Moderate adverse significance	CEMP, Piling risk assessment, groundwater monitoring, designated storage and refuelling areas	Negligible
Sewer flooding	Moderate adverse significance	Method statement and details for foundation construction/piling strategy to be agreed with DCWW.	Negligible
Operation			
Surface Water runoff increase	Negligible	None required	Negligible
Surface Water quality	Moderate adverse significance	Incorporation of trapped gullies, oil interception and a well-designed wetland area.	Negligible
Sewer flooding	Moderate adverse significance	Agreed easement strips to ensure maintenance access. Method statement and details for foundation construction to be agreed with DCWW.	Negligible
Foul drainage	Negligible	None required	Negligible

Table 11.2 Summary of Potential Effects, Mitigation and Residual Effects