

CHAPTER 11: HYDROLOGY

11.1 INTRODUCTION

11.1.1 This chapter of the ES Addendum Statement has been produced by PFA Consulting to review and, where necessary, update the original assessment and findings of the Hydrology assessment and the conclusions presented in the original Hydrology ES chapter and the Hydrology ES Addendum.

11.1.2 Since the production of the Flood Risk Assessment (G277-DOC01 – Issue 2 – FRA) in May 2021 the Environment Agency has updated its guidance on the use of climate change allowances as follows:

- Peak River Flow Allowances – Updated July 2021
- Peak Rainfall Intensity Allowances – Updated May 2022

11.2 CONFIRMATION OF AND UPDATES TO BASELINE ENVIRONMENT

11.2.1 The baseline position set out in the OHH ES remains unchanged.

11.3 REVIEW OF PREVIOUS ASSESSMENTS AND CONCLUSIONS

11.3.1 The OHH ES contained an assessment of the impact of climate change. Since that assessment, the guidance on Peak River Flow Allowances and Peak Rainfall Intensity Allowances has been revised. The revisions and their effects on the conclusions of the previous OHH ES are reviewed below.

Peak River Flow Allowances

11.3.2 In July 2021 the Environment Agency revised the Peak River Flow Allowances in line with the UKCP19 projections. This included linking the relevant allowances to management catchments instead of the previous river basin district approach. The revision also updated the scenarios that must be used for assessing the impacts of climate change.

11.3.3 The Wider OPA Site is located within the Test and Itchen Management Catchment and the revised peak river flow allowances are summarised in Table 11.1 below.

Table 11.1: Revised Peak River Flow Allowances for Test and Itchen Management Catchment

Epoch	Central	Higher	Upper
2020s	16%	24%	45%
2050s	17%	28%	61%
2080s	35%	56%	127%

11.3.4 The lifetime of residential development is considered to be a minimum of 100 years. Therefore, the 2080s epoch (2070 – 2125) is considered to be relevant.

11.3.5 In terms of its flood risk vulnerability classification, residential development is considered to be 'more vulnerable'. The guidance on 'Using peak river flow allowances for flood risk assessments' states that the central allowance should be used for more vulnerable development located in Flood Zones 2 or 3a. Although no residential development is proposed in Flood Zones 2 or 3a, this guidance is considered to be the most relevant.

11.3.6 The central allowance for the 2080s epoch is to increase peak river flows by +35%. The OHH ES assessed the impacts of climate change based on the guidance in place at the time. The Flood Risk Assessment that supported the ES included a review of modelled flood levels provided by the Environment Agency for the 1 in 100 year event including climate change allowances of +45% and +105%.

11.3.7 The previously assessed climate change allowances represented a higher standard of protection. It is therefore apparent that the findings and conclusions of the OHH ES and supporting documents are unaffected by the revised guidance relating to peak river flow allowances.

11.3.8 It should also be noted that the full planning application for the Chalcroft Avenue development (Application Ref: F/21/91185) included detailed hydraulic modelling of the Quobleigh Stream. The modelling was approved by the Environment Agency in August 2022 and planning permission for this application was granted in September 2022.

Peak Rainfall Intensity Allowances

11.3.9 In May 2022 the Environment Agency revised the Peak Rainfall Intensity Allowances using UKCP Local 2.2km projections and supporting research FUTURE-DRAINAGE. This included linking the relevant allowances to management catchments instead of the previous national scale approach. The revision also updated the scenarios that must be used for assessing the impacts of climate change.

11.3.10 The Wider OPA Site is located within the Test and Itchen Management Catchment and the revised peak rainfall intensity allowances for the 1% annual exceedance (1 in 100 year) rainfall event are summarised in Table 11.2 below.

Table 11.2: Revised Peak Rainfall Intensity Allowances (1% AEP) for Test and Itchen Management Catchment

Epoch	Central allowance	Upper end allowance
2050s	20%	40%
2070s	25%	45%

11.3.11 The lifetime of residential development is considered to be a minimum of 100 years. Therefore, the 2070s epoch (2061 – 2125) is considered to be relevant. The guidance on how to apply peak rainfall intensity allowances advises that the upper end allowance should be used for development with a lifetime beyond 2100.

11.3.12 The upper end allowance for the 2070s epoch is to increase the 1 in 100 year rainfall intensities by 45%.

11.3.13 The OHH ES assessed the impacts of climate change based on the guidance in place at the time. The Flood Risk Assessment that supported the ES included a surface water drainage strategy that included calculations to establish the required storage volumes for Strategic SuDS Features on the Wider OPA Site. These calculations were undertaken for return periods up to the 1 in 100 year event plus a 40% increase in peak rainfall intensity to take account of climate change.

11.3.14 As a sensitivity test, the designs of all Strategic SuDS Features have now been reviewed for a 1 in 100 year event plus a 45% increase in peak rainfall intensity to take account of climate change. The outputs of this review are shown in Table 11.3 below.

Table 11.3: Outputs of Strategic SuDS Modelling Exercise

Strategic SuDS Feature	Basin Storage Depth (m)	Max. depth of water using 1 in 100 year +45% climate change
Basin A	1.2m	0.883m
Basin B	1.2m	0.862m
Basin C	1.2m	0.929m
Basin D	1.2m	0.842m

Basin E	1.2m	0.603m
Basin F	1.7m	0.835m
Basin G	1.0m	0.694mm
Basin H	1.2m	0.846m
Basin I	1.25m	0.852m
Basin J	1.2m	0.817m
Basin K	1.0m	0.571m
Basin L1	1.2m	0.370m
Basin L2	1.2m	0.895m
Basin M	1.2m	0.770m
Basin N	1.2m	0.779m
Basin Employment	1.374m	1.044m
Highway Drain Feature 2021	1.2m	0.833m
N.Roundabout Basin	1.2m	0.827m
R+S Basin	1.2m	0.920m
R+S Swale	0.8m	0.454m
Bio Retention Swale - South	1.0m	0.512m
Bio Retention Swale - North	1.0m	0.650m

11.3.15 From the review it can be seen that all Strategic SuDS Features have capacity to accept the additional flows as a result of the increased peak rainfall intensity allowance without overtopping or causing uncontrolled discharges to downstream watercourses.

11.3.16 It is therefore apparent that the findings and conclusions of the OHH ES and supporting documents are unaffected by the revised guidance relating to peak rainfall intensity allowances.

11.4 ASSESSMENT SUMMARY

11.4.1 From the review of the changes to the Environment Agency's guidance related to peak river flow allowances and peak rainfall intensity allowances, it is apparent that the findings and conclusions of the OHH ES and associated documents are unaffected by the revised guidance. Table 11.4 summarises the impacts and effects, mitigation and residual effects of the Proposed Development on flood risk, surface water drainage and surface water quality, and this remains unchanged from the summary presented in the OHH ES (Table 11.7).



11.4.2 Table 11.5 below summarises the proposed additional mitigation and how it is to controlled, implemented and verified. This remains unchanged from the mitigation presented in the OHH ES (Table 11.8).

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Table 11.4: Hydrology Assessment Summary

Environmental Effect	Sensitivity of Receptor	Nature of Impact	Impact Magnitude	Significance	Additional Mitigation	Residual Impact Magnitude	Residual Significance of Effect
WIDER OPA							
CONSTRUCTION EFFECTS							
<u>Flood risk to downstream persons and property</u> A CEMP containing site management measures and through the phasing of the delivery of the surface water drainage and flood mitigation measures will minimise effect on site drainage.	Very High	Temporary	Negligible to Very Low Adverse	Neutral to Moderate Adverse	-	Negligible to Very Low Adverse	Neutral to Moderate Adverse
<u>Surface Water Quality</u> Adoption of best practice construction site management with adequate contingency planning, following the principles of pollution prevention will be formalised and incorporated into a CEMP to reduce the risk of a pollution event occurring from potentially polluting construction activities.	Medium to Very High	Temporary	Negligible to Low Adverse	Neutral to Moderate Adverse	Surface water quality monitoring and management plan	Negligible to Low Adverse	Neutral to Moderate Adverse
OPERATION EFFECTS							
<u>Flood risk to downstream persons and property</u>	Very High	Permanent	Negligible to Medium Beneficial	Neutral to Major Beneficial	-	Negligible to Medium Beneficial	Neutral to Major Beneficial

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Provision of a surface water drainage system based on SuDS principles to attenuate and release runoff at controlled rate and sequentially designed site layout							
<u>Surface Water Quality</u> Surface water drainage system based on SuDS principles to intercept and provide pollution treatment	Medium to Very High	Permanent	Negligible to Low Adverse	Neutral to Moderate Adverse	Surface water quality monitoring and management plan	Negligible to Very Low Adverse	Neutral to Moderate Adverse
<u>Nutrients</u> Connection to public sewer draining to Peel Common WwTW and delivering on-site and off-site nutrient mitigation.	Very High	Permanent	Negligible to Medium Beneficial	Neutral to Major Beneficial	-	Negligible to Medium Beneficial	Neutral to Major Beneficial
Cumulative Effects							
Effect	Description				Mitigation		Significance
Flood risk to downstream persons and property	Effect of multiple schemes on runoff rates and resultant flood risk.				All schemes incorporate appropriate mitigation measures consisting of attenuation SuDS and flow control or infiltration drainage.		Neutral
Surface Water Quality	Effect of multiple schemes on downstream surface water and environmental quality primarily from fine sediment and nutrients.				Implementing a CEMP and delivering nitrite neutral development and discharging foul water to Peel Common WwTW.		Neutral
Impact of Climate Change							
Effect	Description				Mitigation		Significance
Increase peak river flow and peak rainfall intensities	The design of flood risk and drainage mitigation measures take into account the effects of climate change and are designed to continue to function throughout the lifetime of the development.				Sequential site layout design + SuDS		Negligible

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Surface water quality in designated sites	The effect of climate change on water quality and overall resilience of an aquatic ecosystem is complex is very likely to become increasing sensitive over time. The mitigation measures proposed are considered to be resilient to the effects of climate change and are designed to continue to function throughout the lifetime of the development.	SuDS + surface water quality monitoring and management	Negligible
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Table 11.5: Mitigation Implementation

Mitigation Measure	Implementing Agent(s)	Legal Instrument	Compliance Target	Implementation Timescale
Wider OPA				
CEMP	Principal Contractor	Planning Condition	Compliance with WFD assessment criteria	Construction Phase
SuDS	Developer/Principal Contractor	Planning Condition	Surface water quality monitoring and management feedback loop	Lifetime of development / Phased delivery
Appropriately designed watercourse crossings	Developer/Principal Contractor	Planning Condition / Environmental Permit /Land Drainage Consent	Compliance with Environmental Permit /Land Drainage Consent	Construction Phase
Surface water quality monitoring	Developer/Principal Contractor	Planning Condition	Compliance with WFD assessment criteria	Construction Phase through to Operation
Connection to Peel Common WwTW	Developer	Planning Condition / S106 / S98	Compliance with Planning Condition on Foul Water Drainage Strategy	Lifetime of development / Phased delivery

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