CHAPTER 9: HYDROLOGY, HYDROGEOLOGY, AND FLOOD RISK

9.1 Introduction

This chapter evaluates the effects of the changes to the Proposed Development, including the extraction methodology, on the hydrology, hydrogeology and the flood risk. It is based on additional information to that presented in the ES submitted in February 2023, including the results of a further suite of chemical testing results carried out in the summer of 2023 to supplement that carried out as part of the 2021 site investigation and hydraulic modelling data obtained from the Environment Agency (EA). Furthermore, it seeks to address various comments and concerns relating to the water environment which were raised by Nottingham County Council (NCC), the Nottinghamshire Wildlife Trust (NWT), Natural England (NE) and the EA.

9.2 Legislation, Policy, and guidance

The legislation, policy and guidance detailed in the hydrology, hydrogeology and flood risk assessment in Chapter 9 of the ES remain unchanged.

9.3 Consultation Responses

Table 9.1 presents the consultation responses with respect to hydrology, hydrogeology, and flood risk.

Table 9.1: Consultation Responses related to Hydrology, Hydrogeology, and Flood Risk

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
Nottinghamshire County Council – Ecology	9th May 2023	Hydrological impacts have not been identified as a potential impact in Table 8.13 of the ES and is not assessed in Chapter 8, nor does it appear to be properly assessed in Chapter 10. It is essential that the impact of dewatering activities associated with PFA extraction are thoroughly examined, in the context of the potential for this to affect water levels within the adjacent LWS and SSSI, and I defer to Natural England and/or the Environment Agency to comment further on the latter.	An objection is not raised in these comments however the change in excavation methodology means that dewatering is no longer required. A layer of PFA would be left in situ at the base of the excavation and the PFA extracted 'wet' and therefore there would be no abstraction of groundwater. The excavation of PFA below the water table would be undertaken in such as way so as to ensure that the water levels on site are allowed to stabilise and be in equilibrium with the surrounding groundwater levels. Therefore, there would be no impact to the water levels in the SSSI or LWS from the excavation of PFA (see Section 9.4.2). As there would be no abstraction of groundwater the volume of water discharged to soakaway would be greatly reduced.
Nottinghamshire Wildlife Trust	15th May 2023	'Hydrogeology and Flood Risk is covered in the report but does not	Change in excavation methodology means that

		include the necessary level of detail with regards to hydrogeology to determine whether there would be an impact on water levels in the SSSI', '... there appears to be no hydraulic model in the ES that shows whether this has been rigorously assessed, nor the likely rate or volume of movement and what impact this would have on the SSSI' and that 'the same assessment should be made for the other LWS wetlands that may be in hydrogeological continuity with the extraction site but are outside the SSSI'	dewatering is no longer required. A layer of PFA would be left in situ at the base of the excavation and the PFA extracted 'wet' and therefore there would be no abstraction of groundwater. The excavation of PFA below the water table would be undertaken in such as way so as to ensure that the water levels on site are allowed to stabilise and be in equilibrium with the surrounding groundwater levels. Therefore, there would be no impact to the water levels in the SSSI or LWS from the excavation of PFA (see Section 9.4.2). As there would be no abstraction of groundwater the volume of water discharged to soakaway would be greatly reduced.
Natural England	24th April 2023	The Proposed Development is hydrologically linked with the SSSI although the extraction of the majority of the PFA would be above the level of the SSSI so it is unlikely to lead to changes in ground water levels as surface water run-off would be un-affected. Some of the PFA extraction may take place below the water table but an abstraction licence would be needed from the Environment Agency so any impacts upon the SSSI can be assessed as part of this application. There may also be some infiltration of pollutants into the SSSI which get leached out of the PFA as a result of the extraction and storage on site. Although if this is going to be an issue, it is something which should be already affecting the SSSI as the leaching of pollutants from the PFA into the ground water should already be occurring now. For these reasons, ground water impacts are not something to be concerned about at present but this matter can be revisited again if an application is made for an abstraction licence	An objection is not raised in these comments however the change in excavation methodology means that dewatering is no longer required. A layer of PFA would be left in situ at the base of the excavation and the PFA extracted 'wet' and therefore there would be no abstraction of groundwater. The excavation of PFA below the water table would be undertaken in such as way so as to ensure that the water levels on site are allowed to stabilise and be in equilibrium with the surrounding groundwater levels. Therefore, there would be no impact to the water levels in the SSSI or LWS from the excavation of PFA (see Section 9.4.2). As there would be no abstraction of groundwater the volume of water discharged to soakaway would be greatly reduced.
Environment Agency	2 May 2023 (EA ref: LT/2023/127709/01-L01) and its revised submission dated 19 May 2023 (EA Ref: LT/2023/127709/02-L01)	The applicant should undertake hydraulic modelling of the 'as built/works complete' scenario. The modelling shown in plate 7 looks to be the existing scenario with the placement of the retained embankments drawn on. We require results of modelling for a range of flood events to show the	A detailed desk analysis was undertaken of the EA's catchment scale hydraulic model at the locations identified in the FRA as having the potential to interact with floodwater from the River Idle in a 1 in 100 year +

		flood risk to the site and third parties once extractions/infills/any other amendments have been carried out. The potential third party receptors of flood risk should be clearly identified.	30% CC flood event. The results are presented in full in Appendix 9.4, Volume 3 of the ESA and summarised in Section 9.7.4 below. The desktop analysis demonstrates conclusively that there is no pathway for floodwater to enter the Site, or to bypass the Site in the direction of Bellmoor Farm or other residential properties. The EA have indicated their broad agreement with the conclusions of the desk study in email correspondence dated 18th December 2023 (included in Appendix 9.4), subject to conditioning the location and dimensions of the “SSSI bund”.
		The FRA should detail where the flood mitigation falls within the phasing of the development (i.e., will the embankments be constructed prior to the extraction works, and will the embankments remain in place post restoration?). Furthermore, additional details are required on the retained embankments. The FRA should demonstrate that they will be structurally safe and provide details of their construction for us to approve. Will they be made from retained PFA that’s there currently? We would usually require a high clay content for flood defence construction. We also require seepage calculations and an assessment of the underlying geology.	Slide 5 in Appendix 9.4 shows the locations of the existing perimeter embankments/ bunds, the bunds removed during phased excavation/ restoration works and the bunds retained post-restoration. A bund stability analysis has been undertaken, the results of which are presented in full in Appendix 9.5. The analysis demonstrates that based on conservative in-situ material parameters and a worst-case critical condition where elevated pore pressures are acting to de-stabilise the bund, the embankments would remain stable and structurally safe during the passage of a 1 in 100 year + 30% CC flood.
		It would be useful to understand the restoration plans for sections HR P1-P6 and whether the applicant is open to explore the option of opening up the floodplain further once extraction works have ceased. We understand that the purpose of the retained embankments may be to maintain a dry working area. However, it would be good to understand if there is any scope to remove or lower the embankments as to reconnect the river with the floodplain to provide potential flood risk benefit to downstream	The only area of the Amended Proposed Development that has the potential to interact with floodwater from the River Idle is the section of embankment within the Sutton and Lound Gravel Pits SSSI referred to as Area 3 in Appendix 9.4. The Amended Proposed Development would fully retain the section of the embankment within the boundary of the Site. A more detailed inspection of

		communities as well as benefits for biodiversity. This could be coupled with providing more localised, smaller embankments to protect third parties, which could require less maintenance. Given the uniqueness of this site, we are interested in having a meeting with the applicant to discuss potential options regarding the embankment flood defences and restoration proposals.	ground levels within the restored landform relative to the simulated 1 in 100 year +30% CC peak flood level in the River Idle floodplain shows conclusively that even if the embankment is removed entirely there is no pathway for floodwater to enter the Site.

9.4 Main Changes that Would Impact the Hydrology, Hydrogeology and Flood Risk Assessment

9.4.1 Additional Site Investigation Data

During the ground investigation completed in 2021, PFA samples were collected and stored in an off-site location. Further to recent consultation with NCC, samples from each exploratory location were identified and scheduled for a further suite of chemical laboratory analysis in summer 2023. The samples were selected from each location to provide both lateral and vertical delineation of the PFA.

The analysis of the PFA demonstrated that its constituent components are in accordance with the concentrations of a typical PFA and consistent with those previously identified, particularly in relation to the presence of heavy metals (iron, magnesium, titanium, manganese, barium, strontium, vanadium, zinc, arsenic). The analysis also confirmed the absence of any trace signature of organics (PAH, TPH, SVOC).

Leachate analysis of the PFA is comparable to the concentrations detected within the underlying groundwater and again show a heavy metal signature (magnesium, boron, strontium, titanium, arsenic, molybdenum). This is typical of a PFA whereby trace elements are mainly bound in the silica component of the ash and are therefore not readily available by leaching.

Further details of the chemical results can be found in TA 10.4 in Volume 3 within this ESA.

9.4.2 Change in the Extraction Methodology

The original assessment was undertaken assuming that:

- the excavation would be down to the top of the underlying sandstone; and
- once groundwater was encountered PFA would be extracted ‘dry’ using pumps to abstract the groundwater.

It was expected that when encountering the sandstone, upwelling of groundwater into the excavation would have occurred, and the groundwater would then have been abstracted to ensure dry working conditions. This would have included the abstraction of any perched water leaching from the surrounding PFA and rainfall or surface water run-off into the excavation. The groundwater upwelling into the excavation would then come into contact with the PFA along the sides of the excavation and mix with any perched water leaching from the PFA.

The abstracted water would then have been discharged through soakaway ponds. The abstraction and discharge of groundwater would have been undertaken subject to an Environmental Permit.

The updated extraction methodology, forming part of the Amended Proposed Development, is that the PFA would be extracted to approximately 0.2-0.5 m above the top of the underlying sandstone aquifer, with some PFA remaining at the base of the excavation to act as a confining layer (as occurs currently) over the sandstone aquifer.

When the excavation reaches the water table within the PFA the material would be stripped in thin horizons to allow the water level in the working area to reach an equilibrium within the surrounding groundwater. This would prevent a significant buildup of head and would prevent basal heave, e.g. if 500 mm of material is stripped, assuming a PFA porosity of approximately 33%, the water level within the excavation would drop by approximately 335 mm. The excavation would then be left until the water level within the excavation has stabilised (inflows from leaching through of the sides and base of the excavation, rainfall and surface water run off) and reached an equilibrium with the surrounding groundwater before taking the next strip. The exact thickness of each strip would be determined during detailed design based on local hydrogeological conditions at each phase.

Once excavated the PFA would be placed along the side of the excavation onto in-situ PFA to allow any perched water within the PFA to drain naturally back into the excavation.

The extracted PFA would be dried at the Main Processing Area in Area C of the Site. Any condensate removed from the PFA would be tested and treated, if required, before being discharged to the soakaway, sent to sewer, taken away by tanker and/or recycled for use on-site in water bowsers. Treatment prior to discharge would depend on the concentrations of contaminants recorded in the discharge water and could include treatment options such as reverse osmosis and/or ion-exchange. Provision for water treatment infrastructure has been made between the proposed filter ponds and the soakaway as part of the Amended Proposed Development. The wet working methodology is presented in Figure 5.3, Volume 2 of this ESA.

9.5 Assessment Methodology and Significance Criteria

The assessment methodology and significance criteria outlined in Section 9.3, Volume 1 of the ES remain unchanged.

9.6 Baseline Conditions

The baseline conditions detailed in Section 9.4, Volume 1 of the ES remain unchanged.

9.7 Assessment of Likely Effects

The assessment of likely effects has been updated to take into account the change in excavation methodology and is summarised in Table 9.2.

Table 9.2: Source-pathway-receptor-linkage

Project Activity	Potential Source	Potential Pathway	Potential Receptor
Accidental spillages including via refuelling, washing, leakages	Hydrocarbons	Surface water runoff could provide a pathway to surface water. Infiltration could result in vertical migration into the underlying groundwater.	River Idle and down gradient receptors including nearby SSSIs. Private water abstractions, SPZ3, Superficial deposits and Chester Sandstone aquifer
Excavation, land clearance, stockpiles, material movement	Increased sediment loads	Site runoff containing elevated suspended sediment levels.	River Idle and down gradient receptors including nearby SSSIs.
Discharge of contact water/PFA	PFA	Water discharged to soakaway directly into the sandstone above permit limits.	River Idle and down gradient receptors

condensate during PFA processing			including nearby SSSIs. Private water abstractions, SPZ3, Superficial deposits and Chester Sandstone aquifer
Construction and operation of Main Processing Site	Increased contaminant concentrations in surface water run-off	Surface water run-off in this area may include PFA, oils or other contaminants.	River Idle and down gradient receptors including nearby SSSIs. Private water abstractions, SPZ3, Superficial deposits and Chester Sandstone aquifer
Construction and operation of new maintenance / haul road	Increased hardstanding with potential contamination in surface water run-off. Traffic may spread PFA or other potential contaminants along road surface.	Surface water run-off from haulage roads may impact surface water and groundwater quality.	River Idle and down gradient receptors including nearby SSSIs. Private water abstractions, SPZ3, Superficial deposits and Chester Sandstone aquifer

9.7.1 Potential Construction Effects

The potential construction effects detailed in Section 9.5, Volume 1 of the ES remain unchanged, other than there is no longer a need to construct the Temporary Processing Areas 1-3 as these have been removed from the Amended Proposed Development.

9.7.2 Potential Operational Effects

The following potential effects have been identified during operation when considering the updated extraction methodology forming part of the Amended Proposed Development:

- Potential impact to surface water and groundwater quality from accidental chemicals spills from fuel or chemical storage, refuelling, washing or leakages from plant onsite;
- Potential impact to water quality of surface water and groundwater due to discharge of contact water / PFA condensate to soakaway;
- Potential erosion / sedimentation of surface waters from excavated materials and stockpiles onsite, loading and transport of materials across the RCEP Site and/or processing of material at conveyor and processing site;
- Changes in flow and quality of flow to surface water features due to increased hard standing and changes in site drainage;
- Potential impact to groundwater quality from infiltration of contaminated surface water run-off;
- Reduced infiltration to groundwater due to increased hard standing and changes in site drainage; and
- Indirect impact on water quality at designated sites and/or groundwater abstractions downgradient of the RCEP Site due to impacts on groundwater or surface water.

9.7.3 Restoration Effects

The restoration of the RCEP Site would be progressive, meaning that restoration always follows extraction activities progressively throughout the operation of the Amended Proposed Development. It is proposed to provide a new and permanent network of unlined field ditches as the RCEP Site is progressively restored, draining to the proposed habitats. These ditches are shown on the Updated Indicative Restoration Masterplan (Figure 7.12), Volume 2 within this ESA. During operational excavation water levels within the excavations would be allowed to stabilise and reach equilibrium with the surrounding groundwater levels.

The outline design concept is presented in Appendix 8.5 in Volume 3 of the ES and is updated in Chapter 8 in Volume 1 of this ESA but is ecology led. The following potential effects have been identified:

- Removal of the PFA is likely to result in improved long term groundwater quality at the Site; and
- Improved sub-surface drainage due to the increased hydraulic conductivity of the underlying geology following removal of the majority of low permeability PFA.

9.7.4 Flood Risk

None of the changes to the Proposed Development would result in any new, different, or removed flood risk effects when compared to those detailed in Chapter 9 of the ES.

In response to the specific matters raised by the EA's letter, submitted on 2 May 2023 (EA ref: LT/2023/127709/01-L01) and its revised submission dated 19 May 2023 (EA Ref: LT/2023/127709/02-L01), Hive have engaged in a series of clarification meetings with the EA and provided supplementary information on potential interactions with the River Idle and its floodplain (included as Technical Appendix 9.4 of Volume 3 of this ESA) together with a supporting bund stability analysis (included as Technical Appendix 9.5 of the ESA) that address the EA's concerns.

The two documents contain supplementary plans, sections and diagrams that explain the restoration strategy together with site specific information from a detailed analysis of the EA's updated catchment scale flood model in the vicinity of the RCEP Site clarifying that:

- The restoration would only use dedicated fill material that is available on-site, with only engineering material, such as clay, and possible some soil imported if required;
- There would be no development and no alteration to land levels outside the red line boundary of the RCEP Site;
- This means using the approximately 1.5 million cubic metres of soil, sand and sandstone located on top of the former lagoons; and in the lagoon embankments themselves to fill the extraction void (excluding the embankment within the SSSI which would be retained at its full height);
- The only area of the Amended Proposed Development that has the potential to interact with floodwater from the River Idle is the section of embankment within the Idle Valley Nature Reserve SSSI referred to as Area 3 in Appendix 9.4, Volume 3 of this ESA;
- The embankment in this area would be retained in its current condition as shown in Chapter 8, Volume 1 of this ESA, Figure 8.4, Volume 2 of this ESA and slides numbered 10 and 21 in Appendix 9.4, Volume 3 of this ESA;
- The 'as built / works complete scenario' would therefore not hydraulically connect to the River Idle or its floodplain, alter existing flow paths or introduce new flow paths for flood water to interact with third party receptors;

- The flood risk to the RCEP Site and to adjacent land uses and buildings would therefore remain unchanged once extractions/ infilling and progressive restoration has been carried out; and
- Based on conservative in-situ material parameters and a worst-case critical condition where elevated pore pressures are acting to de-stabilise the bund, the embankments would remain stable and structurally safe during the passage of a 1 in 100 year + 30% CC flood.

9.8 Cumulative Effects Assessment

The assessment of cumulative effects detailed in Section 9.7, Volume 1 of the ES remains unchanged.

9.9 Mitigation and Residual Effects

9.9.1 Embedded Mitigation

Measures to avoid or reduce potential effects on sensitive receptors have been incorporated into the design of the Amended Proposed Development ('embedded mitigation'). This includes 'mitigation by design' whereby aspects of the Amended Proposed Development have been re-designed to avoid or reduce effects. Embedded mitigation is taken into consideration when undertaking the assessment of significant effects. If significant effects are predicted further mitigation is detailed.

The updated excavation methodology (i.e. wet working when working below groundwater) would ensure that there is no change to the current pathway between perched water within the PFA and groundwater within the underlying sandstone.

9.9.2 Site Drainage

As part of the embedded mitigation, drainage would be managed to ensure no significant impacts to surface water and groundwater quality and flow from changes to the Site drainage. Changes in the drainage system detailed in Section 9.7, Volume 1 of the ES are presented below.

9.9.3 Groundwater Drainage

Dewatering of groundwater would no longer be undertaken. Therefore, a groundwater drainage system is no longer required.

9.9.4 Surface Water Drainage

There are no changes to the surface water drainage of the Main Processing Area or maintenance / haul road to those detailed in Section 9.7, Volume 1 of the ES. Direct rainfall and run-off from active areas would remain in or be allowed to drain into the open excavation.

9.9.5 Additional Water Management

The PFA would be dried to ensure that moisture content is reduced to approximately 20% (for conditioned PFA or less than 1% (for dry PFA). The amount of moisture within the extracted PFA would depend on the time of year and whether the PFA was extracted above or below the perched groundwater level. During the temporary optimisation works (estimated at between 6 to 24 months) testing would be undertaken to determine the quality of the moisture removed. If required, condensate water from the drying process would be treated prior to discharge to soakaway. Onsite treatment options, if necessary, include reverse osmosis or ion exchange and provision for onsite water treatment infrastructure between the filter and soakaway ponds, and/or at the Main Processing Site, has been made. The location of the filter and soakaway ponds, and onsite water treatment plant are presented in Figure 9.3a, Volume 2 of this ESA.

There is no change to the office and welfare facility drainage system as detailed in Section 9.7, Volume 1 of the ES.

9.9.6 Water Environmental Management Plan

There is no change to the Water Environmental Management Plan as detailed in Section 9.7, Volume 1 of the ES.

9.10 Summary of Effects

9.10.1 Summary of Operational Effects

Table 9.3 provides a summary of effects from operation as detailed within this chapter. There are no changes to the potential effects from construction as detailed in Table 9.11 in Volume 1 of the ES. Table 9.4 in Volume 1 of the ES submitted in February 2023 provides the framework for the assessment of the significance of effects. The lowest magnitude of impact that it is possible to assign to a potential effect is 'negligible'. If a receptor sensitivity has been assessed as high or very high, the overall effect can never be less than minor even if the impact is assigned as negligible. Effects predicted to be of minor significance are not considered to be 'significant' in the context of the EIA Regulations.

Table 9.3: Summary of Operational Effects

Receptor (sensitivity)	Potential Effect	Magnitude of impact with embedded mitigation	Justification	Significance of Effect	Additional Mitigation Proposed	Residual Significance
Operational Phase						
River Idle (very high)	Water quality	Negligible	CEMP/WEMP would ensure minimal spillage and a good spill response plan and drainage design to ensure no pollution impact to the River Idle. A regular groundwater and surface water monitoring regime would be established throughout the lifetime of the Amended Proposed Development. Monitoring of discharge from the filter ponds to the soakaway would be undertaken to ensure that discharge consent limits are not exceeded. If exceedances are noted, discharge would cease until the issue is rectified and additional treatment would be added, such as reverse osmosis and/or ion-exchange.	Minor, negative	None	Minor, negative
River Idle (very high)	Sedimentation/erosion	Negligible	Surface water runoff captured by site drainage system and subject to a testing regime. Site drainage measures and SuDs would be designed to	Minor, negative	None	Minor, negative

			maintain natural site drainage as much as possible and reduce sedimentation/erosion of the River Idle			
Chester Sandstone Principal aquifer – includes SPZ3 and private water abstractions (high)	Water quality	Negligible	CEMP/WEMP would ensure minimal spillage and a good spill response plan and drainage design would ensure no pollution impact to groundwater. A regular groundwater and surface water monitoring regime would be established throughout the lifetime of the Amended Proposed Development. Monitoring of discharge from the filter ponds to the soakaway would be undertaken to ensure that discharge consent limits are not exceeded. If exceedances are noted, discharge would cease until the issue is rectified and additional treatment would be added, such as reverse osmosis and/or ion-exchange.	Minor, negative	None	Minor, negative
Chester Sandstone Principal aquifer – includes SPZ3 and private water abstractions (high)	Water quantity	Negligible	Site drainage measures and SuDs would be designed to maintain natural site drainage and infiltration as much as possible.	Minor, negative	None	Minor, negative
Sutton and Lound Gravel Pits SSSI (very high)	Water quality	Negligible	CEMP/WEMP would ensure minimal spillage and a good spill response plan and drainage design would ensure no pollution impact to the SSSI. A regular groundwater and surface water monitoring regime would be established throughout the lifetime of the Amended Proposed Development. Monitoring of discharge from the filter ponds to the soakaway would be undertaken to ensure that discharge consent limits are not exceeded. If exceedances are noted, discharge would cease until the issue is rectified and additional treatment would be added, such as reverse osmosis and/or ion-exchange.	Minor, negative	None	Minor, negative

Sutton and Lound Gravel Pits SSSI (very high)	Water quantity	Negligible	Site drainage measures and SuDs would be designed to maintain natural site drainage and infiltration as much as possible. The excavation of PFA below the water table would be undertaken in such as way so as to ensure that the water levels on site are allowed to stabilise and be in equilibrium with the surrounding groundwater levels. Therefore, there would be no impact to the water levels in the SSSI from the excavation of PFA.	Minor, negative	None	Minor, negative
River Idle Washlands SSSI	Water quality	Negligible	CEMP/WEMP would ensure minimal spillage and a good spill response plan and drainage design would ensure no pollution impact to the SSSI. A regular groundwater and surface water monitoring regime would be established throughout the lifetime of the Proposed Development. Monitoring of discharge from the filter ponds to the soakaway would be undertaken to ensure that discharge consent limits are not exceeded. If exceedances are noted, discharge would cease until the issue is rectified and additional treatment would be added, such as reverse osmosis and/or ion-exchange.	Minor, negative	None	Minor, negative
River Idle Washlands SSSI	Water quantity	Negligible	Site drainage measures and SuDs would be designed to maintain natural site drainage and infiltration as much as possible. The excavation of PFA below the water table would be undertaken in such as way so as to ensure that the water levels on site are allowed to stabilise and be in equilibrium with the surrounding groundwater levels. Therefore, there would be no impact to	Minor, negative	None	Minor, negative

			the water levels in the SSSI from the excavation of PFA.			
Mission Line Bank SSSI (very high)	Water quality	Negligible	CEMP/WEMP would ensure minimal spillage and a good spill response plan and drainage design would ensure no pollution impact to the SSSI. Monitoring of discharge from the filter ponds to the soakaway would be undertaken to ensure that discharge consent limits are not exceeded. If exceedances are noted, discharge would cease until the issue is rectified and additional treatment would be added, such as reverse osmosis and/or ion-exchange.	Minor, negative	None	Minor, negative
Mission Line Bank SSSI (very high)	Water quantity	Negligible	Site drainage measures and SuDs would be designed to maintain natural site drainage and infiltration as much as possible.	Minor, negative	None	Minor, negative

9.10.2 Summary of Restoration Effects

The restoration of the Site comprises a series of phases whereby restoration follows extraction activities progressively throughout the operation of the Amended Proposed Development. It is proposed to provide a new and permanent network of unlined field ditches as the Site is progressively restored draining to the proposed habitats. These ditches are shown on the Updated Indicative Restoration Masterplan (Figure 7.12), Volume 2 within this ESA.

The outline design concept is presented in Appendix 8.5, Volume 3 of the ES, and is updated in Chapter 8, Volume 1 of this ESA which is ecology led. The following potential effects have been identified:

- Removal of the PFA through the operation of the Amended Proposed Development is likely to result in improved long term groundwater quality at the Site; and
- Improved sub-surface drainage due to the increased hydraulic conductivity of the underlying geology following removal of the majority of low permeability PFA.

9.10.3 Summary of Cumulative Effects

There are no changes to cumulative effects as detailed in Section 9.8, Volume 1 of the ES.

9.11 Statement of Significance

The change in excavation methodology (wet working when below groundwater) means that there is no change to the current pathway between the PFA and the underlying groundwater. Therefore, there would be no increase in contamination of groundwater due to the Amended Proposed Development. Following the removal of PFA there is likely to be an improvement of long-term groundwater quality due to the removal of the current source.

The new methodology would mean that groundwater abstraction would not be required and the volume discharged to soakaway would be greatly reduced. Therefore, there would be no significant impact to groundwater or nearby surface water quality or elevations.