

NORTH TRANSFER FACILITY DESKTOP FLOOD RISK ASSESSMENT

Project title: **NORTH TRANSFER FACILITY**
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NOTE:

The consultant has followed accepted procedure in providing the services but given the residual risk associated with any prediction and the variability which can be experienced in flood conditions, the consultant takes no liability for and gives no warranty against actual flooding of any property (client's or third party) or the consequences of flooding in relation to the performance of the service. This report has been prepared for the purposes of conceptual planning approval only.

1 Purpose of the Flood Risk Assessment

This Desktop Flood Risk Assessment (FRA) has been developed as part of the Detailed Design Stage works for the North Transfer Facility Project to support the Planning Application.

The primary purpose of this document is to assess the existing supplied and readily available information to provide a screening study and summary of the current flood risk at the proposed location of the North Transfer Facility building. The secondary aim of this report is to advise of any changes that the proposed development may have on flood risk in the immediate area.

This report shall make general flood risk conclusions based on the above scope and will also make reference to any further detailed studies that may be required as a result of the findings within the Desktop Flood Risk Assessment.

This FRA will utilise the proposed layout as for Preliminary Design Phase (June 2023):

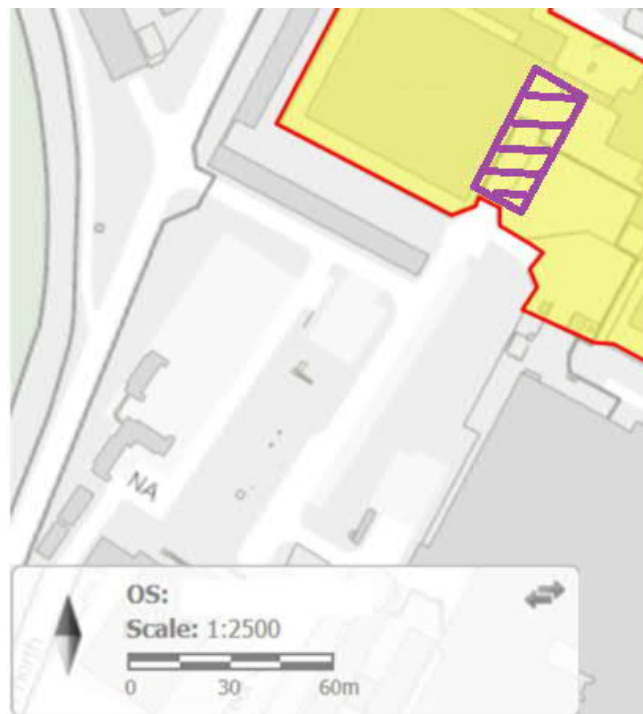
North Transfers Preliminary Design Phase Site Plan as Proposed 1 BE 3108632/B.

2 North Transfer Facility Project Background

For further details refer to the planning application document.

3 Location and Existing Development

The proposed location for the North Transfer Facility is a brownfield site within a central location on the Sellafield site situated beside an existing building and a link corridor in an existing fenced off secure compound. This location and existing site layouts are shown in the Diagrams 3a and 3b.



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Diagram 3a Site Location with Site Shown in Purple Hatching

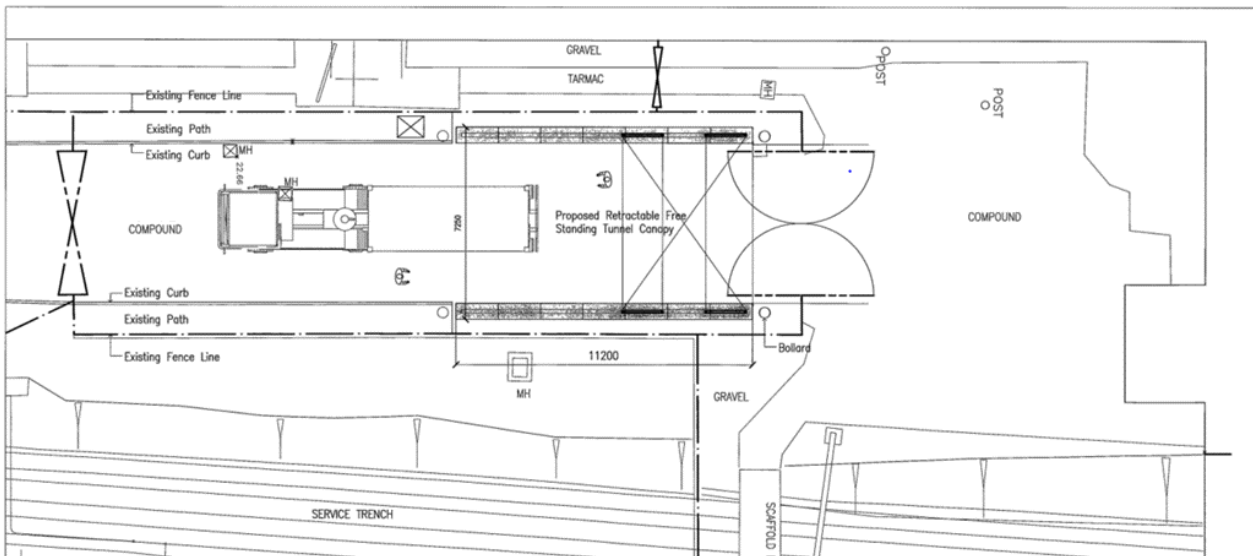


Diagram 3b: Plan As Existing

The proposed location for the North Transfer Facility is a constrained site within an existing compound area and is bound by existing building, a link corridor, a service trench and security fences and gates. Below the existing compound there are two existing drainage systems; a surface water sewer and a lagoon drainage sewer, which are indicated in Diagram 3c. Both systems run from north to south through the site with a depth to invert of around 3.5m below existing ground level.

The current ground level varies by around 0.6m across the site of the proposed North Transfer Facility. The approximate high point of 22.820m AOD occurs within the existing raised tarmac carriageway near the centre of the site. The lowest level recorded on the survey is 22.240m AOD at the corner of the link corridor and existing building. The site is bounded on the west by a service trench, which is a trapezoidal in cross section. The level information available indicates that this falls longitudinally from north to south, with trench base levels varying from 21.935m AOD to 21.540m AOD. These site levels are required to be confirmed in further detail by topographical survey as part of the ongoing Detailed Design Phase. The current surfacing within this area is asphalt, concrete and gravel and accessed is through an existing vehicle gate. There is no known roads drainage to the asphalt areas between the weather enclosure and the gate. There is, however, slot drainage ('Aco' drainage channels and gully) to the concrete slab between the existing weather enclosure and the link corridor which is believed to drain to the surface water system.

There is an existing lightweight steel framed retractable weather enclosure within the central area of the site of the proposed development. This has been sized from drawings as 6.74m wide by 11.2m long and the height is shown as 4.3m to underside of the frame; no overall height is noted. Site visits to the existing development site during October 2022 confirmed that there is no drainage or downpipe system connected to the weather enclosure and rainwater run-off from this structure is currently discharged to the surrounding surfaces.

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It is also known that an adjacent building has flood protection measures available at the existing doorway and therefore there is an expectation that there will be some flood risk in the area and that this will be required to be considered for the design of the proposed North Transfer Facility. It is understood that these installed measures are to mitigate potential flood risk from previous analysis modelling of the site.

4 Future Site Development for the North Transfer Facility Project

The approximate dimensions of the proposed scheme are as follows: North Transfer Facility building at 10.3m wide by 29m long; overall compound is 715m² (0.07Ha). The facility finished floor level is proposed currently as 22.550m AOD to tie into adjacent levels. It is noted that currently the site of proposed development is classed as 100% impermeable based on the 2012 SL CS&A Design Guide

5 Flood Risk

The following resources have been consulted in compiling the flood risk screening assessment at the North Transfer Facility site:

- 2023 Sellafield GIS system flood study data Surface Water Flood Risk 100 yr + 40% climate change event
- Environment Agency – Flood Map for Planning (flood-map-for-planning.service.gov.uk)

5.1 Flooding from Rivers and Sea

The current (September 2023) Environment Agency (EA) Flood Map for Planning has been consulted.

This shows that the site is located in Flood Zone 1 and as such has low annual probability of being flooded by the rivers or the sea and is therefore appropriate for developments of all flood risk vulnerability classifications according to the National Planning Policy Framework, with respect to river and coastal flood risk.

Considering the nature and flood vulnerability of the proposed development Sellafield Ltd's Safety Case requirements are to advise on further assessments for extreme events.

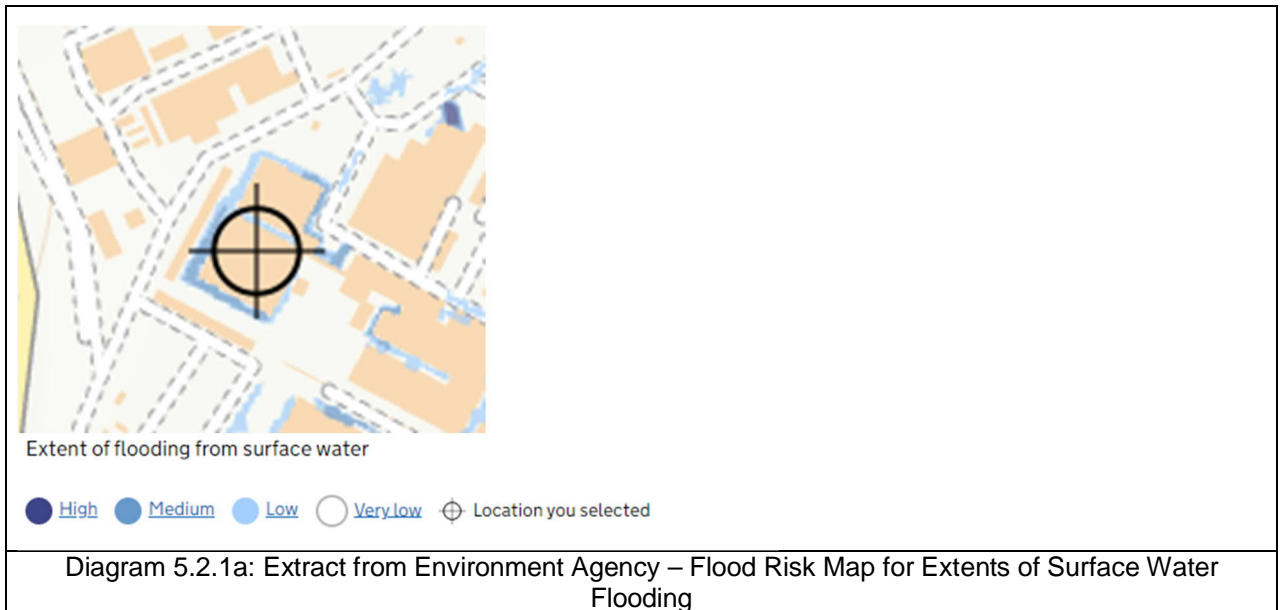
5.2 Flooding from Surface Water

This section is compiled using Sellafield Ltd supplied information, Drainage Asset Owner engagement and readily available information from the Environment Agency; the event return periods / probabilities are as noted in the sections below.

5.2.1 Flooding From Surface Water from Environment Agency Information

The current (September 2023) Environment Agency Flood Map for Planning has been consulted and the mapping for the extents of flooding from surface water sources has been extracted as seen in the diagram below, with the proposed site location marked.

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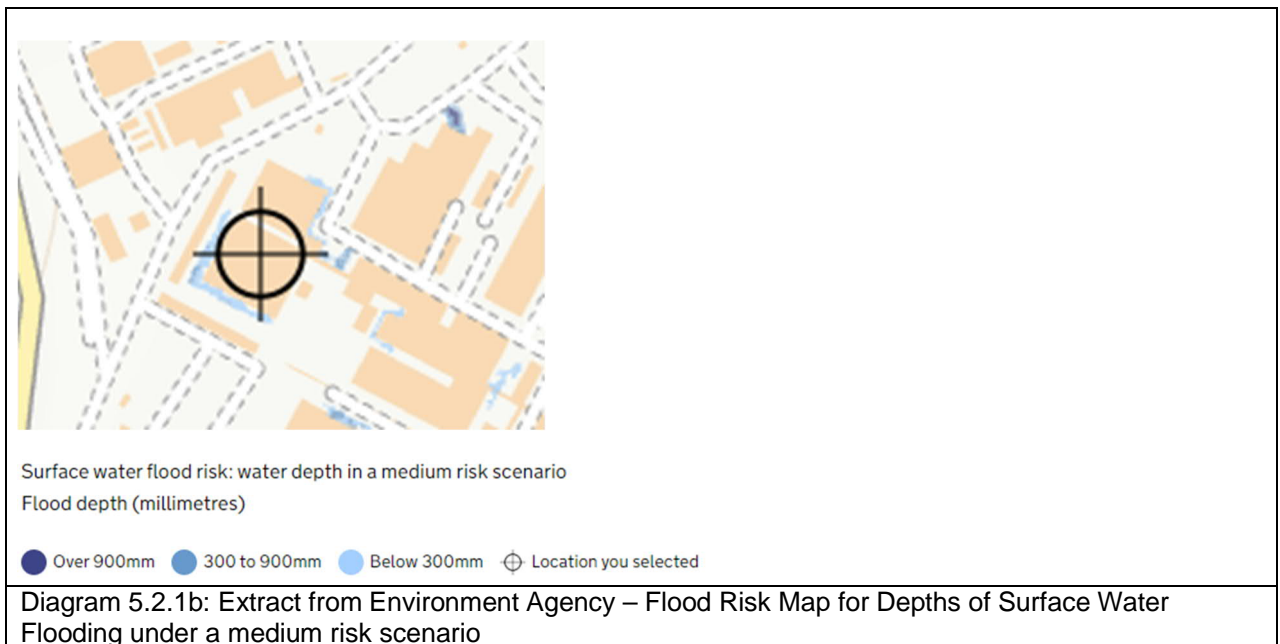


The above Diagram 5.2.1a shows that there are areas affected by surface water flooding and that these areas are categorised as Medium (1 - 3.3% annual probability) and Low Risk (0.1 - 1% annual probability) risk levels. The areas affected by surface water flooding risk are generally in the areas adjacent to the proposed development site area, including the neighbouring building and the link corridor.

The Environment Agency – Flood Risk Map for Depths of Surface Water Flooding under a low risk scenario indicates that there are surface flood risk areas noted within the site area under the low risk scenario with depths below 300mm (possibly 300mm to 900mm at the corner of adjacent building). On the perimeter of the adjacent building there is 300 to 900mm of surface water flood depth estimated.

The estimated depths for the medium risk surface water flooding are shown in the diagram below as extracted from the EA site mapping:

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The Diagram 5.2.1b indicates that there are no surface flood risk areas noted within the site area under the medium risk scenario; however on the perimeter of the adjacent building there is 300 to 900mm of surface water flood depth estimated.

It is notable that there is no coverage of the service trench within the EA maps, due to the relatively large scale and low resolution of assessment and mapping that has been applied (typically national and regional, rather than local scale mapping).

5.2.2 Surface Water 1 in 100 Year Event from Sellafield Ltd Information

The supplied 2023 Sellafield GIS system flood study data for the 1 in 100 year plus 40% climate change event has been consulted and an extract for the site is shown below in Diagram 5.2.2a. It is noted that the climate change uplift used is greater than the recommended central allowance uplift of 35% appropriate for the North Transfer Facility, which has an end of design life date earlier than 2100¹. This mapping presented is for the North Transfer Facility project site area in its current format and level.

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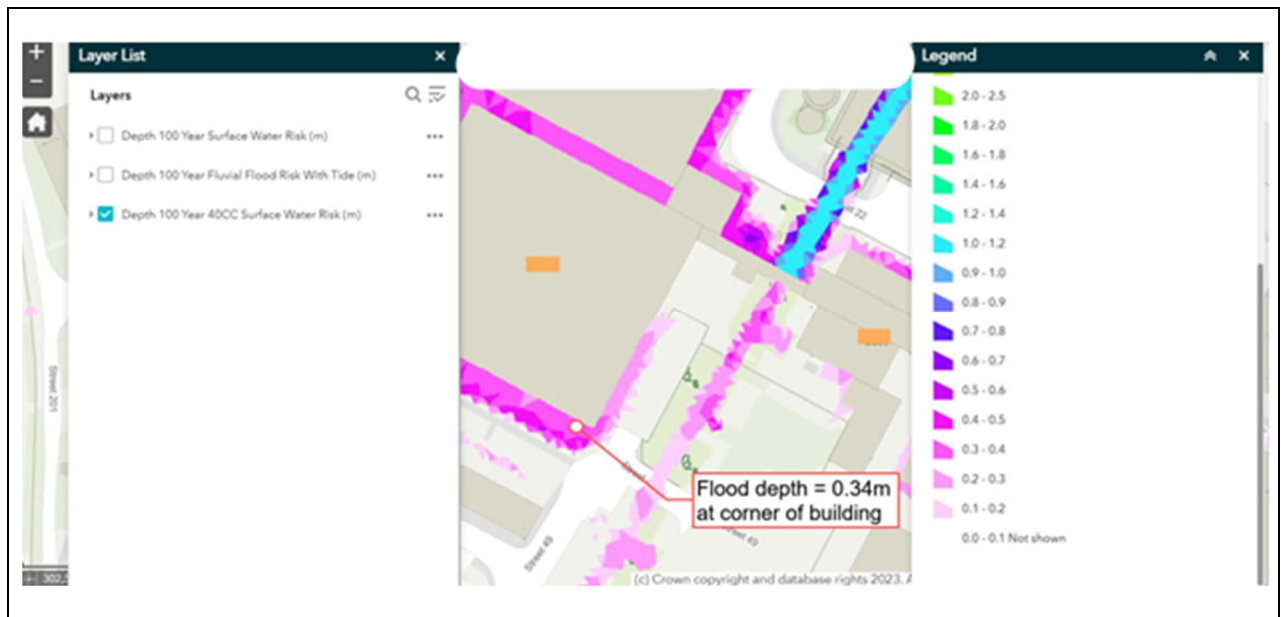


Diagram 5.2.2a: Extract from current Sellafield Ltd Flood Study GIS Viewer: Flood Mapping for 100 year + 40% Climate Change Event

The flood mapping indicates two main areas of flooding within the development site for the 1 in 100 year plus climate change event; the service trench and the footway at the southeast elevation of the adjacent building. Flood depths range from 0.1 to 0.4m within the service trench. Flood depths between 0.1m and 0.3m are predicted around the perimeter of the adjacent building. The maximum predicted flooding depth in this area (approximately 0.34m) occurs at the southernmost corner, outside the development site perimeter.

The proposed finished floor level of the North Transfer Facility building is currently 22.550m AOD. However, the flood depths from diagram 5.2.2a indicate that there is a risk that flood water along the existing adjacent building could result in ingress into the North Transfer Facility building.

The building layout, floor level and surface water drainage to the compound along with the external levels will be reassessed as part of the ongoing Detailed Design stage. The impact of the final design on current flood protection measures for the adjacent building will be assessed by the Sellafield Ltd flood risk team, with any additional mitigation measures required developed as part of the proposals for the North Transfer Facility. It is noted that currently the site of proposed North Transfer Facility is classed as 100% impermeable based on the 2012 Sellafield Ltd CS&A Design Guide. On this basis the proposed site configuration will not increase the risk of network flooding.

5.3 Drainage Network Flooding

The current data on the GIS system does not include information regarding historic flooding at the site of the proposed development. Email correspondence with the drainage systems Asset Owner confirmed that there are no known records of drainage network related flooding issues in this area. Discussions with the Asset Owner highlighted that records of localised flooding due to inlet capacity or operational defects such as blockages may be recorded separately by the respective building managers. However, without supporting corresponding records of trunk sewer flooding issues of this type would not indicate network sensitivity to flooding.

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5.4 Groundwater Flooding

From the Project Desktop Study localised perched groundwater within the glaciofluvial deposits can be expected. One historic borehole within the vicinity of the site indicated a groundwater strike at 5.5m below ground level (bgl), rising to 4.90m bgl, with another borehole indicating a possible groundwater strike at 9.4m bgl. Groundwater monitoring in 2009 identified the presence of the groundwater table between 10.5 and 12m AOD.

At the time of preparing revision B of this report, the drillers log for one of two boreholes locations within the proposed development site has been provided by Sellafield Ltd as part of ongoing ground investigations. The recorded data for BH10817 indicates no groundwater strike up to 8.0m bgl.

Based on the data gathered to date the risk of groundwater flooding affecting the proposed North Transfer Facility is considered low. Results of the remaining Ground Investigation for the development site will be used as part of ongoing analysis for the Detailed Design phase of the project. The type of foundation being used for the North Transfer Facility will also influence this risk.

6 Drainage Impact Assessment

It is proposed that the surface water from the building roof and external hardstand areas for the proposed development will be collected by a new subsurface drainage system and discharged into the existing surface water drainage pipe running through the proposed site.

Calculations have been prepared as part of the ongoing Detailed Design Phase to locally divert the lagoon and surface water drainage systems, minimising interaction with the new building. This follows initial engagement with the Sellafield Ltd Drainage Asset Owner (see Appendix A) during the Detailed Design phase to agree the proposed drainage strategy for new proposed North Transfer Facility site.

It is noted that currently the site of the proposed development is classed as 100% impermeable based on the 2012 Sellafield Ltd CS&A Design Guide. On this basis the proposed site configuration will not increase the risk of network flooding and could contribute to improved management of exceedance flows due to introduction of positive drainage systems in areas which currently have no confirmed drainage provision.

Further discussions with Sellafield Ltd are required to determine if protection measures currently in place at the adjacent building will necessitate additional measures to be applied to the North Transfer Facility building as a result of further return period analysis for the project and follow on design work.

7 Access and Egress

Following the completion of the proposed development project, the vehicle and pedestrian access arrangements in this area are expected to be largely unchanged; however, this will be further reviewed and developed during the ongoing Detailed Design Phase. The access and egress design for the proposed building will include the assessment of any residual flood risk at, and immediately surrounding, the development site and determine in the developing design that safe emergency access can be provided during periods of flooding.

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8 Conclusion and Recommendations

Based on existing data at the Detailed Design stage, flood risk to the existing North Transfer Facility site is considered low and would not increase due to proposed site development in the case of coastal and river, drainage network or groundwater flooding. Assessment of surface water flood risk will be undertaken as part of the ongoing Detailed Design Phase.

It is recommended that the impact of any additional or updated data relevant to any flood risk category should be considered throughout the Detailed Design Phase.

Coastal and River Flooding

From the Environment Agency information this site is situated in Environment Agency Flood Zone 1 and is a low risk of flooding from rivers and the sea. It can be concluded that as this site is in Flood Zone 1 then it is appropriate for the nature of the development proposed with respect to coastal and river flooding sources.

Surface Water Flooding 1 in 100 Year Event and Drainage Impact

The 1 in 100 year surface water flood event is understood currently to be the required event for assessment of the design for the North Transfer Facility project. The information provided by Sellafield Ltd includes a 40% uplift for climate change. Discussion with the Lead Local Flood Authority, Cumberland Council, confirmed that this is greater than the 35% required for new developments with an intended lifespan not exceeding the year 2100

The Sellafield Ltd and Environment Agency surface water flood data are relatively similar in their outcomes i.e. that they both show potential surface water flooding in the area of the proposed development site for the 1 in 100 year event. It is anticipated that the details of the Sellafield Ltd flood extent and depth data would be more accurate as the Sellafield Ltd flood mapping has been completed specifically for the overall site.

Both the Sellafield Ltd and EA surface water flood risk mapping considers parts of the proposed site to be at risk of flooding from surface water to depths of the order of 0.1m – 0.3m within the site boundary and deeper depths in the vicinity of the site and neighbouring buildings. Flood protection measures are currently in place at the neighbouring buildings and the details of these measures are believed to have been determined based on an historic Sellafield Ltd flood assessment.

There is a potential risk to the proposed North Transfer Facility building based on the provided Sellafield Ltd Flood Study flood depths and the proposed Finished Floor Level (FFL) (refer to section 5.2.2 above). Further assessment will be necessary as part of the design development process, particularly to consider and assess the footprint, groundworks and finished floor level of the proposed building and how these design elements would impact and mitigate surface water flood risk to the development and other existing buildings/assets, including allowances for freeboard for provision of uncertainty in the flood levels.

Groundwater Flooding

There is currently a low risk to the project from groundwater; this will be confirmed as part of the further intrusive ground investigation works and will be fed into the Detailed Design stages of the project.

Drainage Impact Assessment

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Discussions with the Sellafield Ltd Drainage Asset Owner confirmed that there are no recorded instances of sewer flooding in the vicinity of the proposed North Transfer Facility. Development of the North Transfer Facility site will involve diversion of the two sewer systems however due to site constraints it is anticipated that one access chamber for each system will have to be located within the footprint of the North Transfer Facility. Assessment of the network impact associated with the proposed diversions will require to be undertaken by Sellafield Ltd based on the sitewide hydraulic model, with requirements for any mitigation (e.g. sealing of covers within the new facility) an outcome of this assessment based on the change in freeboard within each system.

Drainage inlet provision for road and roof areas will be increased based on the current arrangements, which will result in improved dispersal of surface water flows. As noted above, confirmation by Sellafield Ltd that the surface water system can accommodate the projected flows from the scheme (or required attenuation measures where this is not the case) will be required as part of the scheme drainage.

Follow-on Recommended Actions

Based on the current understanding of flood risk at the proposed North Transfer Facility site the following recommendations are made in order to conclude the Detailed Design Phase:

- Confirmation through project requirements (e.g. Safety Case) of any additional flood events required for assessment.
- Confirmation of the climate change uplift to be applied to the final North Transfer Facility site layout for purpose of determining the change in surface water flood risk.
- Review of the type, location, dimensions and design basis for the neighbouring existing flood defences.
- Completion of the planned Ground Investigation works to confirm groundwater flood risk.
- Details of the proposed finalised groundworks, layout and elevations of the proposed North Transfer Facility building to develop further understanding as to how the design of the building integrates with the flood risk characteristics from all flood sources.
- Consideration of the proposed surface water drainage design for the development.
- Review and justification for the finished floor levels in relation to surface water flooding and the provision of flood risk mitigation measures (with freeboard allowance as set by Sellafield Ltd) in the building design where required.