Our Ref: KC2096 – Sandstell Road, Spittal

Kaya Consulting Limited

Hodgson+White
50 Hide Hill
Berwick-upon-Tweed,
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TD15 1AB

For Attention of Robert Hodgson

Dear Sir,

Proposed Development at Sandstell Road, Spittal
Stage 1 Flood Risk Assessment Letter

Introduction

Kaya Consulting Ltd. was commissioned by Mrs M Smith through Hodgson + White to undertake a flood risk assessment of a proposed development site at Sandstell Road in the Spittal area of Berwick-Upon-Tweed. A general site location plan is shown in Figure 1.

A flood risk assessment was undertaken in 2015; however, due to the age of the report it has been requested that the assessment is updated based on current guidance and methodologies.

This document provides an initial assessment of potential flood risks to the site and identifies key topics for discussion with the relevant authorities, which is thought sufficient to enable the planning application to be lodged.

Site Description

The site is located in the Spittal area of Berwick-Upon-Tweed. The site is brownfield, comprising warehousing and commercial storage units. The development proposals are for conversion to a residential dwelling.

The site measures approximately 0.1 ha in plan area and is bounded to the north by open ground leading to the banks of the River Tweed. Sandstell Road bounds the site to the south. A detailed location plan is shown in Figure 2.

Based on a site topographical survey undertaken specifically for the 2015 assessment, the site is generally flat, sloping up from around 3.7 m AOD (Above Ordnance Datum) at the north-east of the site to around 4.0 m AOD at the south-east corner of the site.

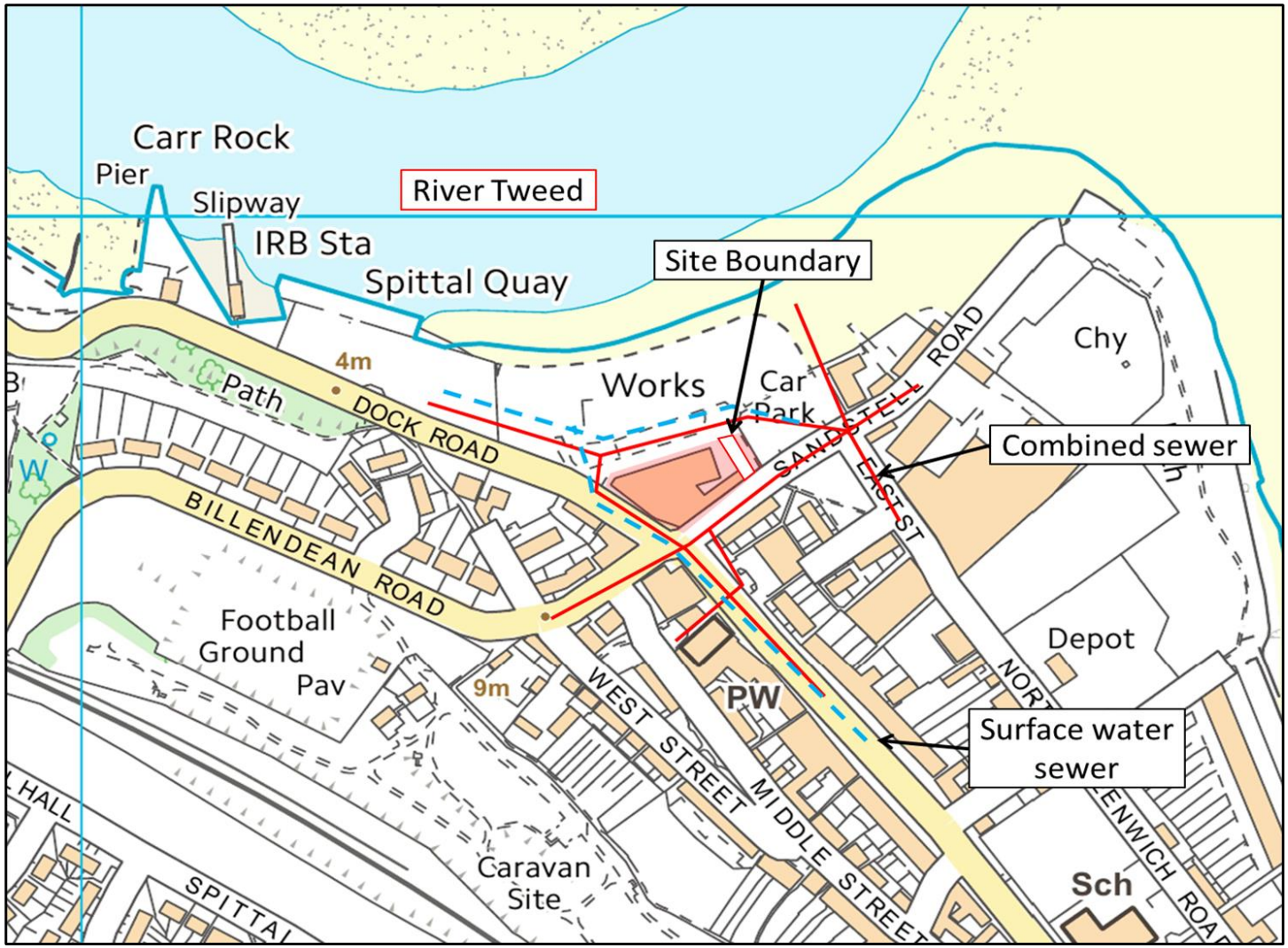
Ground levels on Sandstell Road slope north-east away from the site and levels on Dock Road generally fall to the north-west. It should be noted there is a local high point to the south-west of the site at the junction with Sandstell Road and Dock Road where ground levels reach a level of approximately 5.1 m AOD.

The site is close to Sandstell Point at the boundary between the River Tweed and the North Sea. At this location the River Tweed is tidal as it enters its final meander before discharging into the North Sea. Approximately 300 m to the east of the site, Spittal beach and the foreshore separates the site from the coast.

Local drainage infrastructure drawings show a 600 mm surface water culvert flowing along Dock Road before passing close to the site. In addition, a surface water overflow pipe connects to the combined sewer close to the north-eastern boundary of the site. A network of combined sewers surrounds the site along Dock Road, Sandstell Road and the northern boundary of the site.

Land to the south and west of the site rises to a high point of around 80 m AOD. The area between the site and the high ground is urbanised; hence, a portion of the surface water runoff from the urban area is likely to enter into the local drainage network. It is also possible that surface water runoff reaching the site could be intercepted by a railway embankment, which runs perpendicular to the slope approximately 250 m to the south-west of the site.

Figure 1: Site Location and Water Features



Flood Risk Summary

Fluvial/Coastal Source – River Tweed

The River Tweed drains a very large upstream catchment before meeting the North Sea close to the site. Due to the proximity of the North Sea, water levels within the Tweed close to the site are affected by a combination of fluvial flows and tide levels.

Due to the hydraulic interactions of the Tweed adjacent to the site, a comprehensive hydraulic model would be required to undertake a detailed assessment of the effect of water levels at the mouth of the river. Such a modelling study is out with the scope of this assessment; however, correspondence with the Environment Agency has indicated that a detailed modelling study has already been undertaken and results are now publicly available.

A flood map showing the results of the modelling study was provided by the Environment Agency and indicates that the site would not be at risk of flooding for return periods up to the 200-year return period. For larger events such as the 1000-year, the site is predicted to be at risk of flooding.

Extreme sea levels are determined by a combination of astronomical tides and storm surges caused by weather conditions offshore. Astronomical tides are created largely by the attraction of the moon and can be accurately predicted in advance. Storm surges are caused by meteorological factors (such as winds) acting on sea surface and variation in atmospheric pressure. Storm surges cannot be predicted in advance of observed sea level data which includes both astronomical tides and storm surges.

Extreme still water levels are provided by “Coastal Flood Boundary (CFB) Conditions for UK mainland and islands, 2011”, with subsequent updates. The most recent update was released in 2019. the closest calculation point to the site is ‘ESTUARY_Main_3526_1’.

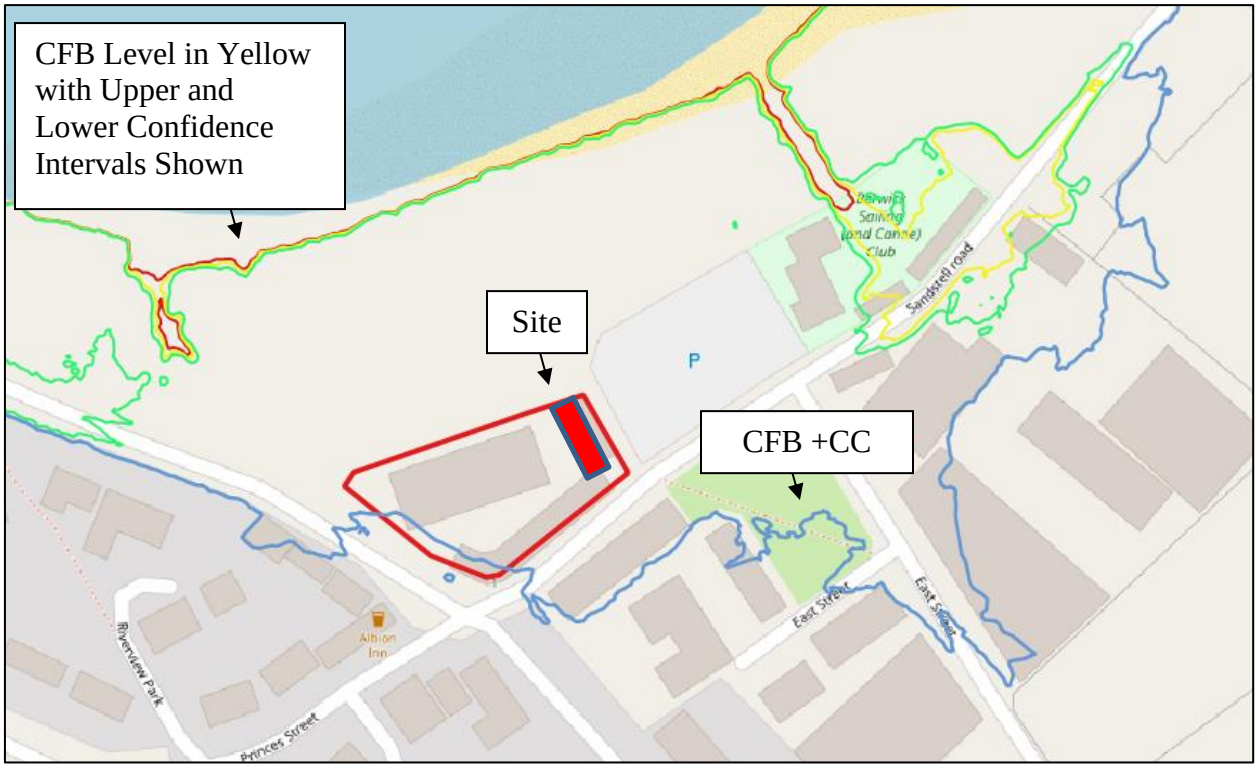
Extreme still water levels for the closest point to the site were extracted and are tabulated in Table 1. These values were adjusted for 2020 using the UKCP18 dataset. This gives a predicted mean 1 in 200-year (T200) extreme still water level of 3.78 m AOD. The results of the climate change uplift derived from the UKCP18 dataset provide a 95th Percentile 2125 1 in 200-year extreme still sea level of 4.73 m AOD, equivalent to an increase of 0.95 m by 2125.

Table 1: T200 based on the 95th Percentile Time-mean sea level anomaly from UKCP18 and varying confidence CFB still sea levels

Year	Confidence Interval		
	100%	50%	0.01%
2019	3.68 m	3.78 m	3.92 m
2125	4.63 m	4.73 m	4.87 m

A static flood extent map shows the 50% confidence level floodplain is shown in Figure 2.

Figure 2: Coastal Flood Risk



Surface water runoff

High ground rises to the south of the site and Main Street has a history of surface water flooding. To assess surface water flooding a Flood Modeller Pro (FMP) 2D mathematical model was constructed. Catchment descriptors were extracted from the FEH online webservice, which were used to generate 1hr and 3hr rainfall hyetographs using ReFH2 software.

The standard percentage runoff was altered to represent the adjacent urban area, which was estimated to have a runoff percentage of 70%. An allowance of 12 mm/hr is assumed to represent local drainage infrastructure.

New LiDAR topographic data processed in 2019 was used to represent the ground terrain (the 2015 report used historical LiDAR which has since been superceded). A topographical survey of the site and surrounding areas was undertaken by Mick McWilliam Chartered Land Surveyors. When compared to the LiDAR data of the study area, it compared favourably and was not required to be included in the new DTM.

In addition, buildings close to the site were made impervious to flow allowing more accurate representation of flow pathways.

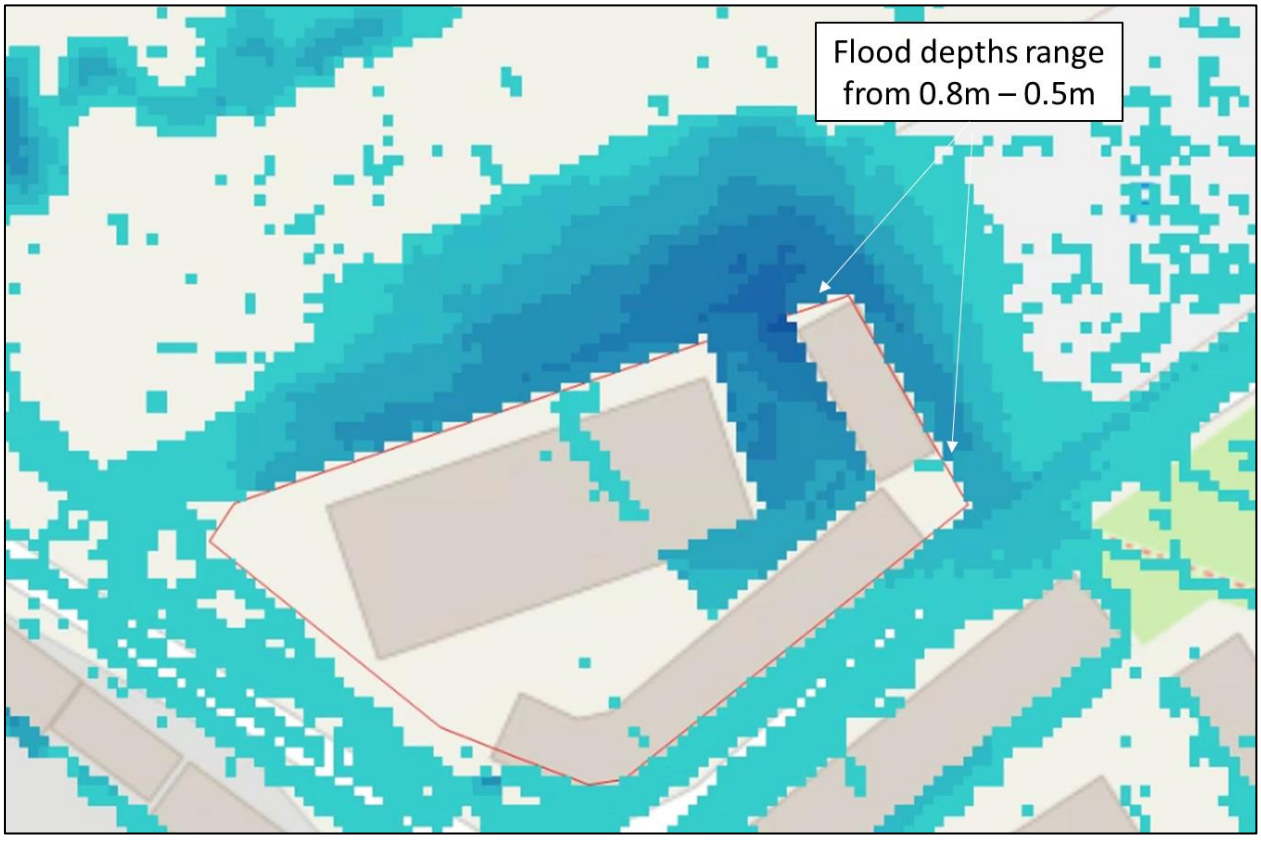
The model was run for the 100-year and 100-year plus climate change ("Upper-end" allowance – 30%) events.

Based on the LiDAR data, model results for the current 100-year 1 hour rainstorm indicated that Dock Road falls north-west close to the southern boundary of the site; hence, any significant flooding of the road would result in flood waters flowing towards the site and entering from the west. In addition, Billendean Road falls towards the junction with Dock Road, so there is a significant risk of surface water entering the site from south. There is a flooding risk to the north-east part of the site and land to the north of the site, with flood depths of > 0.6m within part of the site.

It has not been possible to accurately predict the depth of flooding over time due to the limitations of the surface water modelling technique used. Recent guidance suggests that urban drainage can accommodate 12 mm/hr and this has been modelled by removing this inflow from the model; however, a 600mm surface water sewer runs close to the northern boundary and the network may have more capacity. A detailed 1D sewer network model with 2D linkages would be required to obtain the likely duration flood waters are estimated to pond at the site. Such an assessment is out with the scope of this assessment and would have prohibitive costs disproportional to the size of the development.

A flood map showing the predicted 100-year flood map based on surface water runoff is provided in Figure 3. Flood levels at the site are predicted to reach approximately 4.27 m AOD and up to 4.38 m AOD for the 100-year plus climate change level.

Figure 3: 1hr-100 Year Surface Water Flooding



It is recommended that Finished Floor Levels of properties are raised at least 600 mm above the 100-year plus climate change predicted flood levels; however, it is understood that Finished Floor Levels (FFL's) are constrained based on existing levels. If FFL's cannot be raised then it is recommended that property level protection measures are included within the redevelopment of the site. The extent of such measures should be discussed and agreed with the Local Authority once final site levels are known.

During extreme events, vehicular access to the development may be limited, it is also recommended that a Flood Action Plan is prepared to reduce potential flood damages to the residence and adjacent vehicles.

Conclusions and Recommendations

Kaya Consulting Limited was commissioned Mrs M Smith to update a Flood Risk Assessment to support proposed development at Sandstell Road, Spittal. This document provides an initial assessment of potential flood risks to the site and identifies key topics for discussion with the relevant authorities, which is thought sufficient to enable the planning application to be lodged.

The results of the assessment suggest that there is potentially a significant flood risk to the site from the Tweed and from surface water runoff; however, measures to mitigate against pluvial flooding may also negate potential flooding from the sea. Mitigation measures are suggested in this report and should be discussed and agreed with the Local Authority once final property levels are known.

During extreme events, vehicular access to the development may be limited, it is also recommended that a Flood Action Plan is prepared to reduce potential flood damages to the residence and adjacent vehicles.

Yours faithfully,

Callum Anderson

Technical Director