

Development and Environment Services
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ORKNEY
ISLANDS COUNCIL

Addendum to Stromness Strategic Flood Risk Assessment

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- 1a. Coastal Flood Map
- 1b. Drainage Flood Map
- 2 Guidance for Site Specific Flood Risk Assessment's

1.0 INTRODUCTION

1.5 Purpose of Addendum

This document is prepared as an addendum to Stromness Strategic Flood Risk Assessment September 2009 Report Reference 10146/BB/09-08/2407 prepared by Millard Consulting for Jacobs Engineering UK Ltd as part of the Stromness Urban Design Framework 2008 for client Orkney Islands Council. The item numbers used in this addendum are the same as those used in the original document.

The purpose of this addendum is to give a more accurate view of the flooding risk to Stromness using more detailed flood maps compiled by the Orkney Islands Council on the basis of local data and observation. Millard prepared the Stromness Strategic Flood Risk Assessment September 2009 using the SEPA indicative flood maps which provide only indicative information of an area's flooding risk.

2.0 DATA COLLECTION

2.4 Historical Flooding

- 2.4.4 The highest recorded tide occurred on the 12 January 2005 when the sea level in Stromness Harbour reached +3.56m OD (N). During the period of 2003-2005 the tide gauge in Stromness Harbour was removed due to works on extending the ferry terminal. The record level has therefore been calculated using a combination of GPS and photographic evidence of the event. Weather conditions at the time were strong SW to West winds with a predicted high tide level of +2.31m OD (N). This event resulted in major flooding of some properties along the sea front and minor flooding of Ness Road and properties along Albert St and Grahams Place. This tide level has been estimated by SEPA to be a 1 in 85 year event.

2.6 Tidal Records

- 2.6.1 Tidal records are available from the tide gauge installed in Stromness Harbour from 1996 onwards.

4.0 STRATEGIC FLOOD RISK ASSESSMENT

4.2 Fluvial Flooding

- 4.2.5 During the rainfall event of October 2006 the culvert and drains on Cairston Road overflowed resulting in flooding to properties in that area; however the system has since been upgraded to cope with higher flows.

- 4.2.6 Surcharging of the May Burn occurred in 2004 after a sustained period of heavy rainfall when the inlet to the culvert was blocked by debris and caused the water to flow overland towards the junction of South End and Albert Street. The water will flow towards the piers and into the harbour, therefore the risk of flooding is deemed minimal.
- 4.2.7 A visual survey was carried out on the Mill Burn which generally has a steady gradient and a well contained channel. It is considered that high flows would be contained within its banks as reflected in the detailed flood map in appendix 1b. A flood risk assessment was carried out by Millards Consulting¹ in December 2008 for the proposed new Primary School site and found no risk of flooding in the lower reaches of the burn.
- 4.2.8 A detailed 1 in 200 year fluvial flood risk map has been prepared and is attached as appendix 1b. This map is considered to supersede the SEPA indicative flood maps for the purpose of planning requirements.

4.3 Coastal Flooding

- 4.3.5 The 1 in 200 year tide level for Stromness has been calculated by using the estimated tide level of 12 January 2005 and adding the Kirkwall offset of 0.41m. This offset was calculated as the difference between the maximum recorded tide level at Kirkwall also on 12 January 2005 of +2.82m OD and the 1 in 200 year tide level for Kirkwall of +3.23m OD. This gave a 1 in 200 year tide level of +3.97m OD for Stromness.
- 4.3.6 SEPA carried out statistical analysis with the data from the Stromness tide gauge. The 1 in 200 year tide level excluding the storm surge was calculated at +3.69m OD, but when the January storm surge data was included the level was calculated at +4.17m OD. SEPA considered that due to the limited period of the data available this may be an overestimation and have agreed that a 1 in 200 year tide level of +3.97m OD would be acceptable.
- 4.3.7 A detailed 1 in 200 year coastal flood risk map has been prepared for the tide level of +3.97m OD and attached as Appendix 1a. This shows that a significant number of properties lie within the flood risk area. This map is considered to supersede the SEPA indicative flood map for the purposes of planning requirements.

4.8 Impact of Climate Change

- 4.8.4 Climate change has important implications for the assessment of flooding. The current programme to assess these implications, U.K. Climate Impacts Programme, provides results with considerable uncertainty. Current best practice is to provide an allowance for climate change impacts based on the latest predictions. Interim policy guidance provided by DEFRA in FCDPAG3 (2006)

¹ Millard Consulting; School at Stromness Harbour, Orkney. Flood Risk Assessment December 2005 Doc Ref: 10353/CH/12-08/2572

(Ref. i) suggests that the net sea level rises shown in Table 1 should be provided for in planning up to horizons of 2115 within Scotland.

Table 1

Region	Assumed vertical land movement (mm/yr)	Net sea level rise (mm/yr)				Previous allowance
		1990 - 2025	2025 - 2055	2055 - 2085	2085 - 2115	
Scotland	+0.8	2.5	7.0	10.0	13.0	4mm/yr constant

The values in Table 1 can be used to estimate net sea level rise for any period up to 2115. Guidance on how to use the values is given in FCDPAG3

It is important when planning future development to consider the whole life expectancy of the project and possible changes in flood risk. At present it is not national policy to add an additional allowance for climate change above the 0.5% probability, but planning authorities may do so if it can be justified (SPP7). In the case of tidal levels a freeboard allowance may be required in response to wave action and should be considered in a site specific flood risk assessment.

5.0 ASSESSMENT OF DEVELOPMENT AREAS

5.2 PR1 – Historic Core of Stromness

5.2.5 Sites within this area identified for redevelopment include refurbishment of the former Commercial Hotel on the corner of Church Road and Victoria Street. Redevelopment of this site will not result in any change in overland flow as the area is 100% impermeable at present. The Hotel site is at low risk from coastal and drainage flooding as it is out with both of these flooding zones.

5.2.6 This is the development zone with the largest coastal area and so the majority of properties that will be affected by a flooding event will be within this zone. A considerable number of low lying properties mainly built on piers on the east side of Alfred Street, Dundas Street, Victoria Street and South End will be at high risk from coastal flooding. There is little that can be done strategically to prevent flooding of these properties and individual solutions will be required.

5.3 PR2 – The Port and Pierhead

5.3.4 In relation to the revised flood maps for Stromness low lying properties in this zone are at high risk from coastal flooding. The coastal flood boundary runs along the pavement at the front of The Stromness Hotel, this would result in the main town square being flooded. Any new developments within this zone will

need to incorporate flood alleviation measures in its design, such as raising floor levels or locating services above the height of the +3.97m OD (N).

5.4 PR4 – North Hamnavoe

5.4.5 This zone includes two sites that have a high interest for development. The first is the site of the old auction mart along Ferry Road where a supermarket is proposed to be built; this location is within the coastal flood boundary and is deemed to be at a high risk of flooding. A topographical survey of the area showed that the site level is roughly constant at a height of +3.0m OD (N) this is significantly lower than the road at a level of +3.47m OD (N) and so any excess water from the road would flow towards the site. The strategic defence level of the Ferry Road pier wall is around +3.55m OD (N). In the 1 in 200 year storm event this would not prevent flooding of Ferry Road. Flood mitigation measures will need to be considered in the design process for any development on Ferry Road, such as raising the ground level of the site or assuring that the floor level is above the estimated flood level of +3.97m OD (N).

5.4.6 The second proposed development site is the lorry park located off Ferry Road; this site has been selected as the preferred site for the new Stromness Primary School. This location does not lie within the boundaries for flooding and so is considered at low risk from flooding. A topographical survey of the area was carried out and concluded that the site level was above the coastal flood level of +3.97m OD (N). Fluvial flooding was considered in the report prepared by Millar Consulting, reference 1, and found not to be a problem.

5.6 Other Areas within Stromness

5.6.2 PR3 is known as the Town Centre Campus and is defined as the linkage between the Primary School and the Old Academy. PR6 consists of the Garson area to the east of the harbour. This area comprises of an industrial estate and developments sites for private housing. Both these areas are outside of any identified flood zone and are not deemed to be at risk. PR7 is identified as town-wide place-making and linkage projects and is not defined as a specific area within Stromness, therefore any new development will have to be considered on an individual basis.

5.6.4 The Midgarth area of Stromness that the May Burn passes through is a marshy area with poor drainage and, as for any green field site; SUDs will have to be taken into consideration for any new development.

5.7 Site Specific Flood Risk Assessment

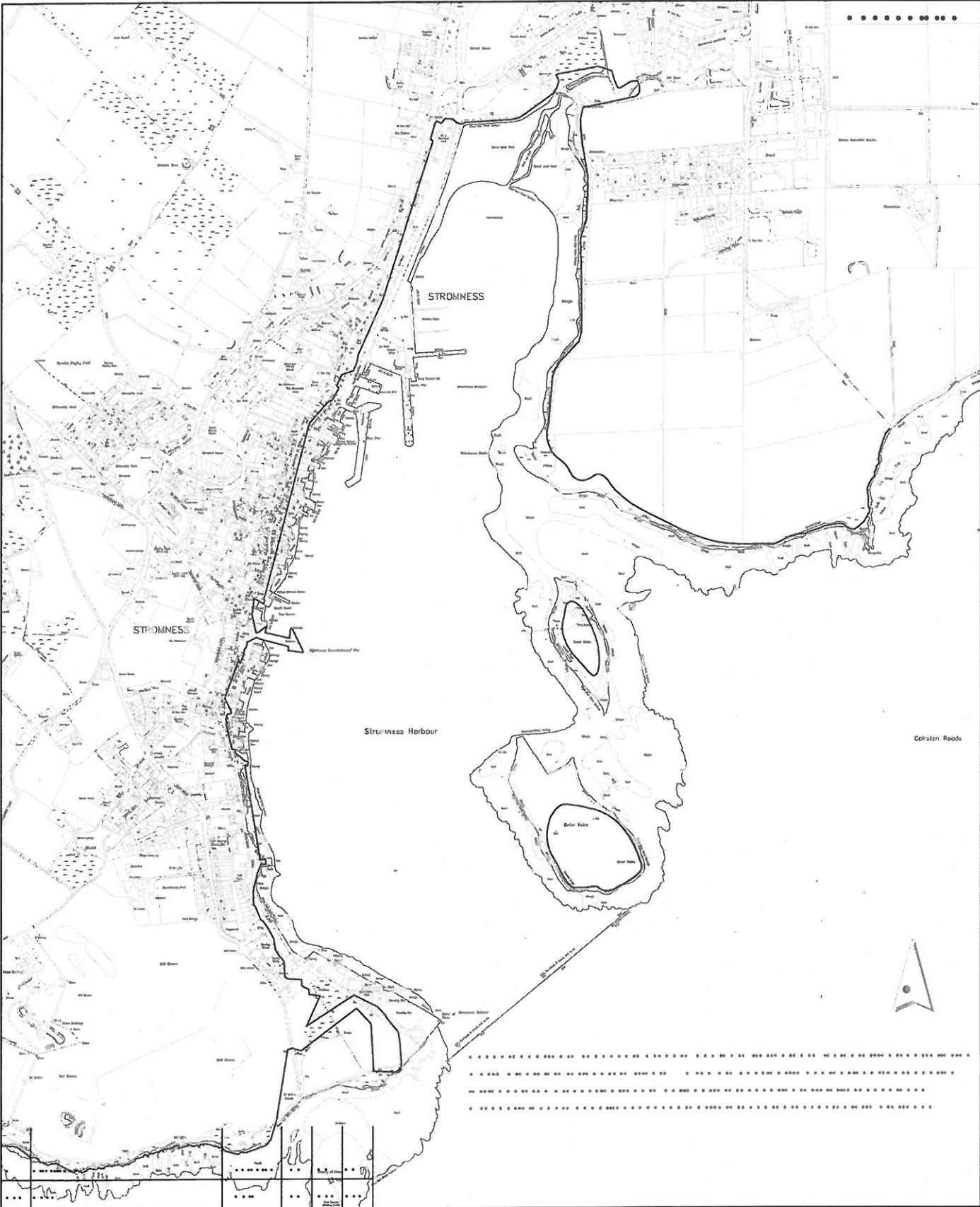
5.7.1 Requirements for a site specific flood risk assessment can be found in Appendix 2.


7.0 CONCLUSIONS

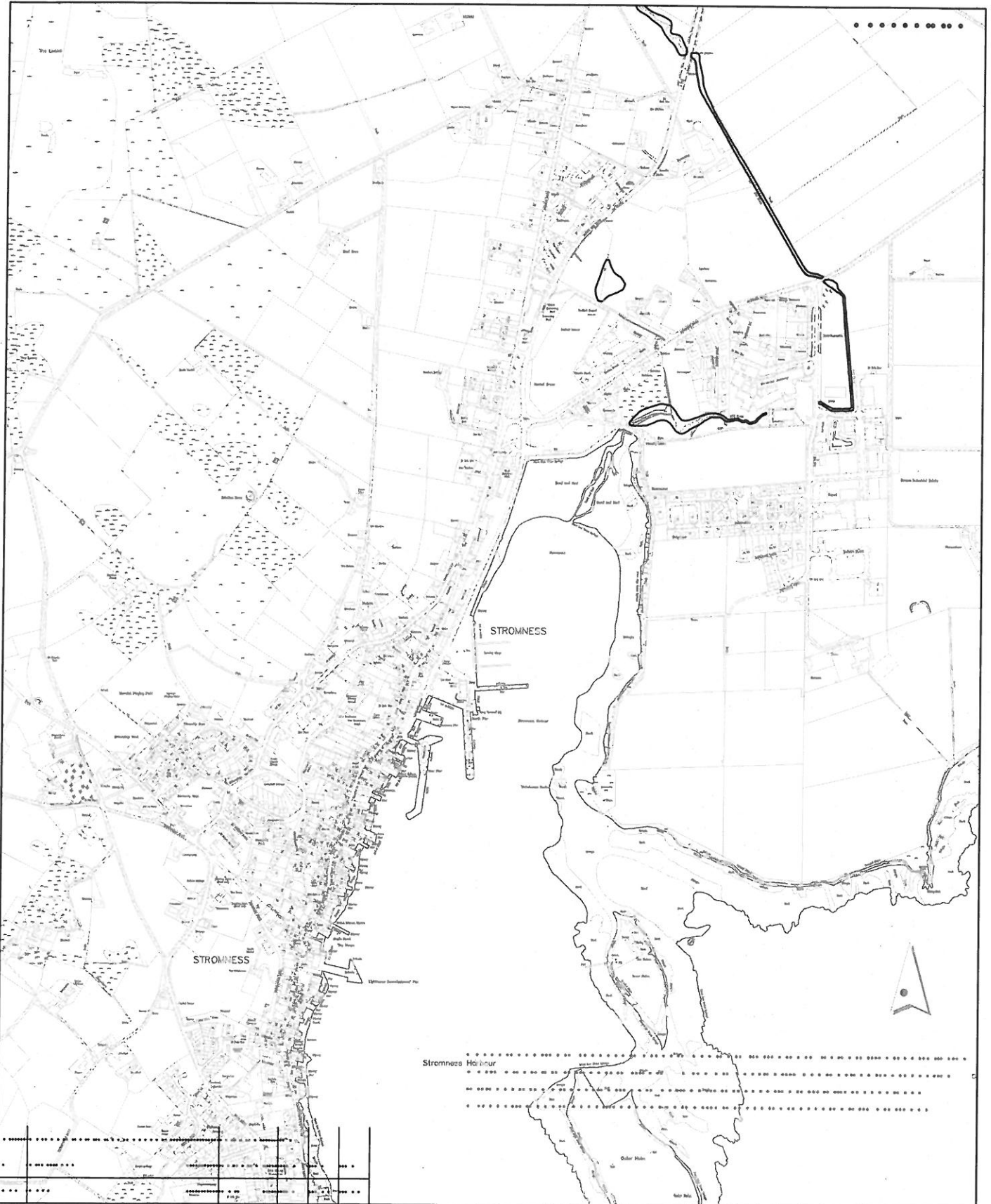
7.1 Flood Risk Assessment

- 7.1.2 The revised flood maps give a good indication of which areas are at risk from flooding. It shows that a significant proportion of the historic core of Stromness will be at risk from coastal flooding in a 1 in 200 year event, the Pierhead and Ferry Road area will also be affected. It might be possible to raise the height of the sea wall at Ferry Road to restrict the ingress of sea water at this location, but it may be more efficient to consider land raising or raised floor levels for individual sites. All new developments within the flood zone must consider flood alleviation methods at the design stage.
- 7.1.3 Sites within the updated coastal and fluvial flooding boundaries will require site specific flood risk assessments to demonstrate that the risks associated with flooding are managed accordingly. Of the developments considered in this report both the current lorry park and the refurbishment of the old commercial hotel are deemed to be at low risk from flooding and would not require a site specific flood risk assessment. Redevelopment of brownfield sites or existing developments within the coastal and fluvial boundaries may be appropriate but new development within a flood boundary would require careful consideration.

Appendix 1



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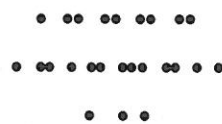
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Appendix 2

GUIDANCE FOR SITE SPECIFIC FLOOD RISK ASSESSMENTS

With the Strategic Flood Risk Assessment in place for Stromness, developers will still require site specific flood risk assessments. The guidance below shows the information that would be expected in a site specific flood risk assessment given the information available in the SFRA.

- Sites at risk of coastal flooding:
 - i. Topographic site level information relative to Ordnance Datum of ground and floor levels, both existing and proposed;
 - ii. Consideration of wave action, climate change and freeboard allowances required to determine a design level for the development;
 - iii. Outline of measures proposed to alleviate the risk of flooding to the development (in accordance with Scottish Planning Policy);
 - iv. Consideration of the risk of flooding to access and egress of the property during extreme flood events;

- Sites at risk of fluvial flooding:
 - i. Topographic site level information (either to Ordnance Datum or a temporary bench mark) including levels of bed and banks of nearby watercourses (usually including cross-sections through the watercourse);
 - ii. Estimate of the 1 in 200 year flood level using industry standard flow estimation and modelling methods;
 - iii. If alleviation measures are required (suitable for brownfield sites only) outline of the measures to be used and compensatory flood storage arrangements to mitigate any adverse impact of the development. Alternatively, revise design to ensure all development is outwith the flood risk area (the only appropriate action for greenfield sites).

- Sites at risk of surface water/pluvial flooding:
 - i. Outline of measures to manage the risk of surface water flooding to the development ensure there would be no adverse impact elsewhere from such measures.

