HERDMANFLAT MASTERPLAN
MEETING OUR CHANGING NEEDS

Appendix 10.5
Flood Risk Assessment
November 2023

East Lothian Council

Goodson Associates

53 Melville Street
Edinburgh EH3 7HL
+44 (0)131 226 2044
edinburgh@goodsons.com
www.goodsons.co

Goodson Associates
civil structural infrastructure transportation

Flood Risk Assessmer

HERDMANFLAT HOSPITAL

Aberlady Roa
Haddingtc

Client:	Hub South East Scotlan Ltd
Date:	Augu t 2023
Project No:	P14825
Document Re	P14825 - GOO- XX- XX- RP- C- 050 2

		SIGNATURE	DATE
Prepared by	Ruairidh McArthur	[redacted]	7th March 2023
Checked by	Shona Tait		7th March 2023
Version			

			DATE
Prepared by	Ella Paul		22nd August 2023
Checked by	Shona Tait		22nd August 2023
Version			

Contents

1.0 Introduction

Goodson Associates has been appointed by Hub Southeast Scotland Ltd to prepare a Stage 1 Flood Risk Assessment, in support of the planning application for the proposed re-development of the Herdmanflat Hospital in Haddington.

The following assessment has been completed in accordance with guidance presented within East Lothian Council's supplementary planning guidance document, Sustainable Urban Drainage Systems. It also takes cognisance of Scottish Planning Policy (SSP)1, the National Planning Framework for Scotland 4 (NPF4) and the Flood Risk Management (Scotland) Act 2009.

The aim of the Stage One FRA is to assess any potential flooding to the development site from all potential sources (coastal, fluvial [watercourse], pluvial [surface water] or groundwater). This is primarily evaluated through carrying out a desktop study of available data relating to site flood risk.

In relation to the reporting, Goodson Associates carried out the following work: -

- A site walkover with the view of potentially identifying flooding information not available from the desk study and confirming the results concluded during the desktop study.
- Review of any publicly available information on flood risk for the area.
- Liaised with the Local Authority to identify any available information on historical flooding in the area.
- Consultation of the SEPA NGR Flood Maps to obtain information on flood risk specific to the development site.
- Assessed the Flood Risk from all other sources.

2.0 Existing Site

2.1 General Description

The 5.96Ha site, which is located immediately adjacent to Aberlady Road in the town of Haddington, lies in the area administered by East Lothian Council (See Fig. 1).

Figure 1 Location plan showing the development boundary.

The site, which is broadly rectangular, is defined by the surrounding transport infrastructure. Aberlady Road, Lydgait, Hopetoun Mews and the A199 form the western, southern, eastern and northern boundaries respectively.

Residential developments, associated with previous expansions of Haddington, occupy much of the surrounding land. The exception to this is the narrow band of agricultural land that lies to the north of the site and separates it from the A1 trunk road.

An extensive band of agriculture land separates Haddington from the coastline associated with the Forth Estuary and the major settlements of Musselburgh, North Berwick and Dunbar.

2.2 Site Topography

The site generally falls from north-west to south-east, from approximately 77m above Ordnance Datum (AOD) in the northeastern corner to 57m AOD along the southern boundary. A steep embankment separates the site into two, gently sloping, plateaus (See App. 1).

The topography of the surrounding land is influenced by the Garleton Hills and tends to fall towards the River Tyne, which occupies a shallow valley approximately 1.0km to the south of the site and 0.5km to the east.

2.3 Ground Conditions

The existing ground conditions have been assessed using the data published by the British Geological Survey (BGS). From the relevant borehole and trial pit logs the following typical sequence of strata was identified:

1 Topsoil –varying in thickness, but generally 0.3m.
2. Glacial Till (Cohesive) –Firm to stiff, sandy, gravelly, silty clay, approximately 4.0m deep.
3. Bedrock - Rhyolite.

The presence of the notionally impermeable clay layer makes the use of traditional infiltration techniques inappropriate for the site.

2.4 Natural Drainage Features

An analysis of the available Ordnance Survey data shows that the site naturally forms part of the catchment of the River Tyne (See Fig. 2).

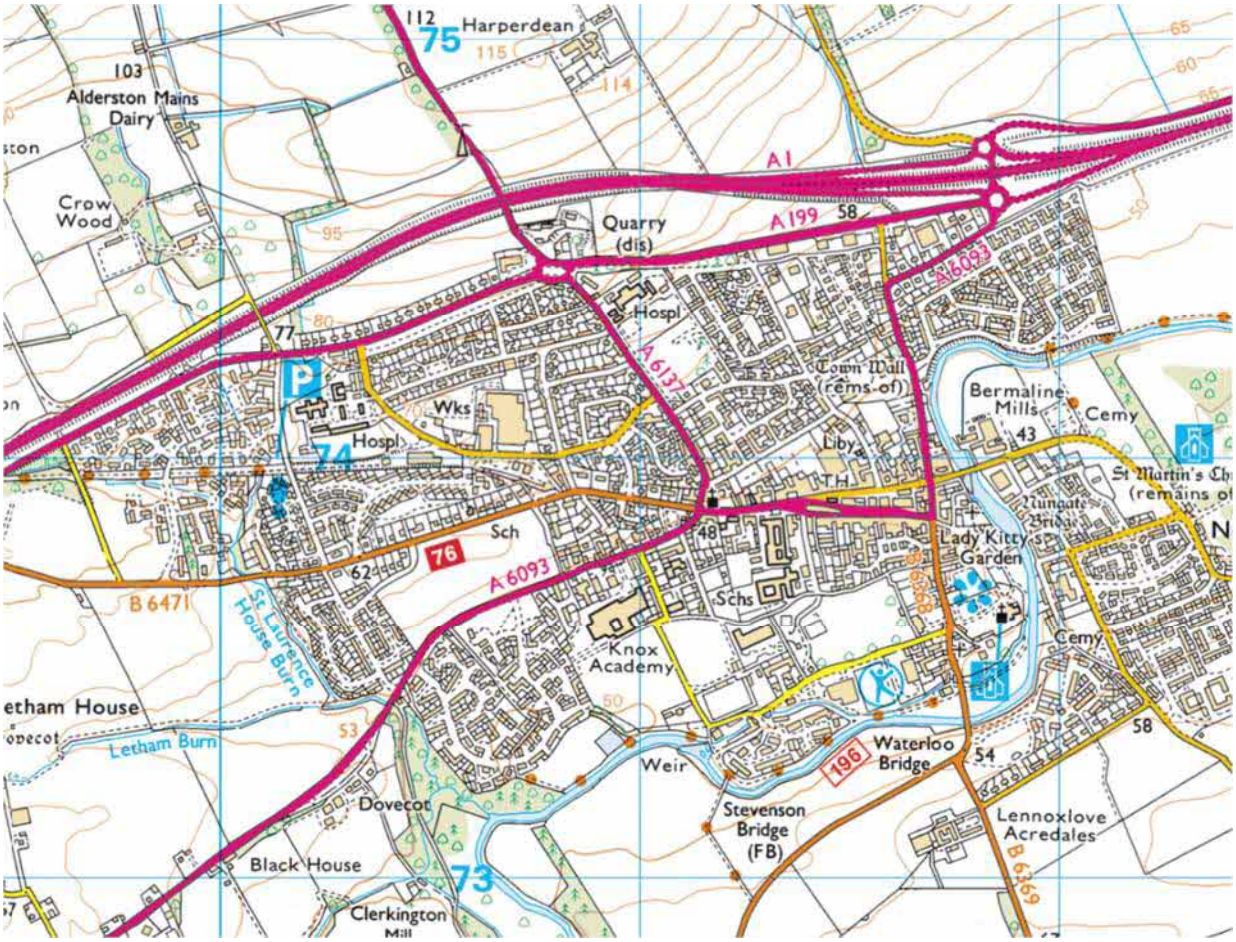

Figure 2. Map extract showing the water courses within the vicinity of the site.

Rising in the Moorfoot Hills, near Tynehead in Midlothian, the watercourse follows a north-easterly path to Tyninghame, where it discharges to the North Sea. Although almost 1.0km from the southern boundary of the site, the watercourse meanders to the north as it passes through the eastern area of the town and approaches to within 500m of the eastern boundary.

The Letham Burn and the St Laurence House Burn are tributaries of the River Tyne that lie to the west of the proposed development site.

The Harperdean Burn rises approximately 0.8km to the north of the site, on the southern slopes of Barney Hill. Flowing south towards the River Tyne, the watercourse enters a culvert to the north of the A1 trunk road. The 900mm diameter culvert discharges to the River Tyne at Bothwell Bank. The available record drawings show that a branch of the Harperdean culvert flows south, along Victoria Park. The 300mm diameter vitrified clay culvert turns to the east at the junction with Newton Port. Increasing in diameter to 450mm as it passes Tenterfield House, the branch meets the main line at the junction between Tenterfield Drive and Hardgate (See App. 2).

The River Tyne is currently considered to be of poor water quality, however in their River Basin Management Plan SEPA have set the goal of obtaining moderate water quality by 2027. The long-term aim is to achieve good water quality.

2.5 Existing Drainage Infrastructure

The Scottish Water records show that developments adjacent to the site are served by a mixture of publicly owned combined sewers, surface water sewers and foul sewers.

A 450mm vitrified clay, combined sewer, serving the residential area to the west of the site, is present within the western section of Lydgait (See App. 2). Turning to the south at Lydgait Court the sewer follows the line of Market Court to Fortune Avenue, where it resumes it's easterly path towards Haddington Wastewater Treatment works –located 2.0km to the east of the site, adjacent to Amisfield Walled Garden.

A smaller combined sewer, that originates in the eastern portion of Lydgait, serves Hopetoun Mews. Flowing east towards Victoria Park, the sewer turns to the south and discharges to the trunk sewer at Newton Port.

The available records suggest that combined sewer overflows (CSO), that discharges to the River Tyne, are present adjacent to the Pure Malt distillery.

Small diameter foul and surface water sewers serve the properties associated with Lydgait Gardens and Market Court.

2.6 Pre-Development Discharge

The site is currently occupied by Herdmanflat Hospital, which closed in 2020 when services were transferred to the East Lothian Community Hospital. Therefore, it has been assumed that the site discharges to the adjacent sewerage network (Table 1). Consequently, the surface water discharge has been estimated using the recommendations of BS EN 752 (See App. 3).

The pre-development foul water discharge associated with the hospital has been determined using the recommendations of British Water's Flows and Loads 4.

Table 1. Existing discharge to the sewerage system.

	Surface Water (l/s)	Foul Water (l/s)	Total (l/s)
Characteristic Discharge to combined Sewer	-	0.47	0.47
Peak Discharge to Combined Se	132.7	2.82	135.52

3.0 Proposed Development

The proposed development is to consist of the construction of up to 96 sheltered housing units, the associated car parking and access roads. The area of land required for each element has been estimated using the preliminary site layout (Table 2 and App. 4).

Table 2. Land requirements

Usage	Area (ha)	Total Area (ha)	Surfacing Characteristics
Residential Roo	0.578		Im perm eable
Roads, Footpaths & Residential Parki	1218		Im perm eable
Total Impermeable Ar		*1796*	
Landscaping/Undeveloped A	4.904		Perm eable
		4.904	
Total Area Developme		*6.700*	

4.0 Flooding

4.1 General Requirements

The planning process requires that it be demonstrated that the site can be developed whilst:

1 Maintaining an acceptable risk of flooding and;
2. Ensuring that the flood risk is not increased elsewhere.

The risk framework set out in Scotland's National Planning Framework 4 (NPF4) and SEPA's complimentary document, Flood Risk and Land Use Vulnerability Guidance, uses the concept of "land-use vulnerability" to define acceptable flood risks.

The appropriate risk classifications have been determined using the Flood Risk Matrix, in conjunction with the land-use vulnerability classification. In accordance with NPF4, the relevant climate change allowance should also be considered.

Table 3. Land-use classification and acceptable flood risk

Land Use	Vulnerability Classification	Little or No Risk (<1:1000)	Low to Medium Risk (1:1000 to 1:200)	Medium to High Risk (>1:200)
Dwellings	Highly Vulnerabl	No Constraints	Generally Suitable	Generally not suitabl [1]

Notes

1. Generally not suitable for development unless one of the following apply:

a. Redevelopment of an existing building, including changes of use to an equal or less vulnerable use to the existing use.
b. Redevelopment of a previously developed site where it involves the demolition of existing buildings and/or erection of additional buildings within a development site, and the proposed land use is equal or less vulnerable than the existing land use.
c. Where the principle of development on the site has been established in an up-to-date, adopted development plan or the National Planning Framework and flood risk issues were given due consideration as part of the plan preparation process and our assessment of risk has not changed in the interim.
d. The site is protected by a flood protection scheme of the appropriate standard that is already in existence and maintained, is under construction, or is planned for in a current flood risk manag

It should be noted that the flood risk classification does not relate solely to flooding from natural watercourses, but rather to all potential sources of flooding relevant to the development site –each of which is discussed below.

4.2 Historical Flooding

From the Forth Estuary, Flood Risk Management Strategy, there is no indication of any prior flood events on the proposed development site.

4.3 Coastal Flooding

The site lies 7.5km from the shoreline of the Forth Estuary, therefore it is not directly affected by the daily fluctuations of the tide.

A study of the effect of extreme surge tides on the East Coast of Scotland, commissioned by The Scottish Environment Protection Agency (SEPA), suggests that the 1 in 200-year sea level within the Forth Estuary can be expected to be 4.2 m Above Ordnance Datum (AOD). Supplementing this with the analysis contained within the UK Climate Change Projections 2009 (UKCP09), the maximum tidal level that can reasonably be expected, when adjusted to account for climate change, is 4.69m – considerably lower than the likely lowest boundary level of approximately 57.0 m.

The risk of tidal flooding is, therefore, considered to be negligible.

4.4 Fluvial Flooding

In accordance with East Lothian Council's Flood Prevention Guidelines it must be demonstrated that the development does not have a detrimental impact on the 1:200 year return period floodplain.

The SEPA Indicative River and Coastal Flooding Map, which is based on a probability of flooding of 0.5%, or the 1 in 200-year return period, indicates that the River Tyne is susceptible to flooding along its length.

Superimposing the flood extents on to the available Ordnance Survey level data suggests a peak flood water level of approximately 45m at the closest point to the site.

The lowest boundary level of the proposed development site is 57m AOD, which provides a significant factor of safety against flooding from the nearest watercourse.

The Haddington Flood Study, commissioned and published by East Lothian Council, also suggests that the proposed development site lies outwith the 1:200-year flood plain.

The risk posed by fluvial flooding is therefore considered to be negligible.

4.5 Pluvial Flooding

Overland flooding may be generated by three sources:

1 Over-topping of the onsite drainage system.
2. Flash run-off from adjacent ground or the public highway –typically caused by blocked drainage inlets or extreme rainfall events.
3. Over-topping of the adjacent publicly owned sewerage system or other infrastructure.

The drainage system constructed to serve the site, is to be designed in accordance with East Lothian Council's requirements, therefore it will:

1 Provide sufficient attenuation to accommodate a 1:200-year (plus 40% climate change) return period storm event.
2. Limit the peak discharge rate from the site.

On this basis the internal drainage system will not expose the development site to the risk of pluvial flooding within the relevant design return period. In the event of the system malfunctioning, due to blockage, the road corridors would act to channel water away from the proposed buildings.

The site occupies an area at the base of the southern slope of Barney Hill. Consequently, a long, steep slope extends from the northern boundary to the summit of the circular hill. Although the existing vegetation and the topsoil act to intercept overland flow during short return period rainfall events, there remains the potential for overland flow during more intense storms.

Any overland flow generated by the south-western quadrant of Barney Hill is currently intercepted by the highway drainage system serving the A1 trunk road and the A199, which act to convey water towards the lower ground to the east.

The site is therefore considered to be at low risk of pluvial flooding.

4.6 Ground Water Flooding

The preliminary assessment of the ground conditions suggests that any groundwater encountered will be either:

1. Perched within the cohesive sub-soils.
2. Flowing through fractures in the underlying bedrock.

As the proposed earthworks are unlikely to lead the complete removal of the cohesive deposits, this impermeable layer will continue to act as an effective barrier to the upward migration of ground water.

While the impermeably surfaced areas will prevent percolation of rainwater into the underlying soils, the soft-landscaping will allow some percolation to occur –although plant-life will reduce this through interception and absorption.
As the proposed development is to retain the basic topography of the site, any groundwater flow will continue to make its way, towards the lower ground to the south-east of the site.

The risk of flooding from this source is therefore considered to be low.

4.7 Climate Change

Although the effects of climate change will vary at a regional level, throughout the UK more frequent short-duration, high intensity rainfall and more frequent periods of long-duration rainfall are to be expected.

In compliance with East Lothian Council Flood Risk Requirements the development will be designed to ensure that it is not at risk of flooding from the relevant return period event, with a 40% uplift to account for climate change.

The proposed surface water drainage network shall be designed to contain flood flows generated up to and including the 1 in 200 years plus climate change storm events within the site, without damage to buildings, essential services, or neighbouring developments.

5.0 Conclusions

The type 1 flood risk assessment presented above confirms that the site is at low risk of flooding from coastal, fluvial, pluvial and groundwater sources. The site can therefore be deemed suitable for the type of development proposed, without the need for a more detailed, type 2 or type 3 study.

APPENDIX 1 TOPOGRAPHIC SURVEY

APPENDIX 2 SCOTTISH WATER RECORDS

herdmanflat

SCALE: 1:1,323

Plotted By: shona@goodsons.com
Date Plotted: 06/03/2023

The representation of physical assets and the boundaries of areas in which Scottish Water and others have an interest does not necessarily imply their true positions. For further details contact the appropriate District office.

The Bridge
6 Buchanan Gate
Stepps
Glasgow
G33 6FB
Tel No: 08000 778 778

APPENDIX 3 PRE-DEV. FOUL & SURFACE WATER DISCHARGE

Goodson Associates	Consulting Civil and Structural Engineers	Contract	Herdmanflat Hospital, Haddington		
		Prepared by	R McA	Date	Mar 23
		Ref No	P14825	Sheet No	FW 1 Rev

Title: Pre-Development FW Discharge

Use the population method to estimate the pre-development foul discharge, in accordance with the recommendations of Sewers for Scotland (4th Edition), BS EN 752 and British Water Flows and Loads 4

Development Details and Characteristic Flow Rate

The site was previously occupied by a Herdmanflat Hospital, which provided mental health services and geriatric care. At the time of closure:

Patients - 100

Staff - 65

Flow Characteristics

From British Water, Flows and Loads 4:

Patients - 350 l/hd per day (Residential old people / nursing)

Staff - 90 l/hd per day

Characteristic Discharge (For Assessment of Impact upon Scottish Water Waste Water Treatment Works)

Total Discharge -

Patients	= 100 x 350	= 35000
Staff	= 65 x 90	= 5850
Total		= 40850 l/day

$Q_{WW\ Char.}$ = 40850 / (24 x60 x 60)

= 0.47 l/s

Goodson Associates	Consulting Civil and Structural Engineers	Contract	Herdmanflat Hospital, Haddington		
		Prepared by	R McA	Date	Mar 23
		Ref No	P14825	Sheet No	FW 2 Rev

Title: Pre-Development FW Discharge

Peak Discharge (For Assessment of Impact upon Scottish Water Waste Water network)

A peaking factor of 6 is typcally used to estimate the design flow, therefore:

$Q_{WW\ Peak}$ = 0.47 x 6

= 2.82 l/s

Goodson Associates	Consulting Civil and Structural Engineers	Contract	Herdmanflat Hospital, Haddington		
		Prepared by	R McA	Date	Mar 23
		Ref No	P14825	Sheet No	PASD 1 Rev

Title: Pre-Development SW Discharge

Consider the existing drainage system to have been designed in accordance with BS EN 752, therefore determine the pre-attenuated surface water discharge in accordance with its recommendations.

Rainfall Intensity

Consider that Ponding can be tolerated during heavy rainfall and for a few minutes afterwards.

Therefore:

Consider Risk Category 1

Design Rainfall Frequency = 1 in 1 year(s)

Therefore:

Fig. NA 2

Rainfall Intensity = 36.0 mm/hr

Impermeable Area

Impermeable Area = 1.362 ha

Peak Discharge

$Q = 2.78 \times C_v \times C_r \times r \times A$

$= 2.78 \times 0.75 \times 1.3 \times 36.0 \times 1.36$

$= 132.7$ l/s

Goodson Associates	Consulting Civil and Structural Engineers	Contract	Herdmanflat Hospital, Haddington		
		Prepared by	R McA	Date	Mar 23
		Ref No	P14825	Sheet No	PASD 1 Rev

Title: Pre-Development SW Discharge

Consider the existing drainage system to have been designed in accordance with BS EN 752, therefore determine the pre-attenuated surface water discharge in accordance with its recommendations.

Rainfall Intensity

Consider that Ponding can be tolerated during heavy rainfall and for a few minutes afterwards.

Therefore:

Consider Risk Category 1

Design Rainfall Frequency = 1 in 1 year(s)

Therefore:

Fig. NA 2

Rainfall Intensity = 36.0 mm/hr

Impermeable Area

Impermeable Area = 1.796 ha

Peak Discharge

$Q = 2.78 \times C_v \times C_r \times r \times A$

$= 2.78 \times 0.75 \times 1.3 \times 36.0 \times 1.80$

$= 175.6$ l/s

APPENDIX 4 PROPOSED DEVELOPMENT PLAN

KEY 1:1000

RED LINE BOUNDARY

LANDSCAPE PRINCIPLES

1. Orchard and community garden
2. Formal terrace
3. Primary Area of community open space
4. Recreational space with pétanque pitches
5. Private terrace - 3m strip
6. Semi-private spaces
7. Green corridor - succession planting and paths Woodland - succession planting, paths and incidental play
8. Protected tree line avenues with succession planting
9. Wet meadow creation linked to SUDS
10. Private gardens for complex care use
11. Existing boundary wall retained
12. Active travel routes connecting site to wider area - 3m wide

Iss	Date	Description	Drn	Chk	App
P01	16.09.22	First Issue	AB	LS	SM

Scale 1:1000

0 10 20 30 40 50m

Do not scale from this drawing
All dimensions are to be verified on site
© Drawing & design copyright LUC

LUC
Bristol
Edinburgh
Glasgow
London
Manchester
landuse.co.uk

Project
Herdmanflat Hospital

Client
Hub South East Scotland

LUC Job Nr	Scale @A1	Status
11288	1:1000	Planning

Drawing Title
Landscape General Arrangement
Illustrative

Drawing Nr	Issue
11288-LD-PLN-101	P01