East Lothian Council

REPORT TO: Special East Lothian Council

MEETING DATE: 23 January 2024

BY: Executive Director for Place

SUBJECT: Update on Dynamic Coast Assessment

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1 PURPOSE

1.1 To present an update on the Musselburgh Coastal Change Assessment (2024) report prepared by Dynamic Coast and the University of Glasgow, to allow Members to read, debate and note the contents.

2 RECOMMENDATIONS

2.1 It is recommended that Council:

a) Notes the content of the Executive Summary report by Dynamic Coast and the University of Glasgow (Dynamic Coast), which is provided in Appendix A.

b) Notes the risk of coastal erosion to Musselburgh outlined by Dynamic Coast deriving from the future impacts of climate change, and that East Lothian Council (Council) updates this risk within the Council's Corporate Risk Register.

c) Agrees that further investigation is undertaken into the risk of coastal erosion to Musselburgh due to the impact of rising sea levels / climate change. This further investigation should continue the partnership working between the Musselburgh Flood Protection Scheme (the Scheme) and Dynamic Coast such that this risk, to both the town of Musselburgh and the proposed Scheme, and appropriate mitigations are fully understood.

d) Agrees that a report will be brought back to Council to fully update on the coastal erosion risk to Musselburgh and that this will include developed proposals on how this risk might be mitigated. It is currently assumed that such mitigation may be through the proposed Scheme or the proposed Coastal Change Adaptation Plan, or a combination of the two.

3 BACKGROUND

3.1 General

3.1.1 The town of Musselburgh has a very significant flood risk due to its geographic location: i.e. it has been built on the natural flood plains of the River Esk and the Firth of Forth. The level of flood risk to the town is projected to become much larger due to the impacts of climate change. The primary reason for this flood risk along the coastal foreshore is currently due to wave overtopping, but this is expected to be superseded by water flowing over the foreshore due to rising sea levels at some point between now and 2100. The Musselburgh Flood Protection Scheme (the Scheme) is being advanced by Council to develop an understanding of the flood risk to Musselburgh, and to design an approach to its mitigation. Coastal erosion had not been considered a substantial mechanism of flood risk to Musselburgh before the work undertaken by Dynamic Coast.

3.1.2 It is understood that the Musselburgh foreshore has been generally accreting (i.e. accumulating a build-up of additional sand) since the end of the last glaciation c.15,000 years ago. This is due to its location on the Firth of Forth and at the mouth of the River Esk. The town of Musselburgh has developed over time at this location, and it is understood that human interventions over recent centuries have continued to push the line of the foreshore into the Firth of Forth. In Musselburgh this line is the change point between a heavily built-up urban landscape and the natural beach / intertidal environment. In this location the natural environment is designated as the Firth of Forth Special Protection Area (SPA).

3.1.3 The Scheme is being promoted by Council under the Flood Risk Management (Scotland) Act 2009 (the Act). The scope of the project is to provide formal protection to the town of Musselburgh from a major flood event, and to consider natural, sustainable and catchment wide flood risk management options alongside traditional engineered forms of flood risk reduction. The Scheme has been undertaking its Outline Design over recent years and is presenting an update on the Outline Design to a meeting of Council in January 2024. The Scheme was not established to protect against the risk of coastal erosion in Musselburgh as the extent of this was not fully known.

3.1.4 There is now growing international recognition that some of the early obvious effects of climate change will be through increased erosion and flood impacts on the coastline. Governments and organisations around the world are undertaking risk assessments to inform new, flexible adaptive approaches to better manage these growing risks. Coastal erosion is a cross-cutting issue affecting many interests and a coordinated approach to align effort across sectors is essential.

3.1.5 The Dynamic Coast project is funded by the Scottish Government, Centre of Expertise for Waters, NatureScot, and the St Andrews Links Trust. Its aim is to provide a strategic evidence base on the extent of coastal erosion in Scotland by:

a) Improving the evidence on coastal change;

b) Improving the awareness of coastal change; and

c) Supporting decision-makers to ensure Scotland's coast and assets can adapt to our future climate.

3.1.6 In summer 2021 Dynamic Coast published the results of their National Coastal Change Assessment. At the same time the Scheme's project team were undertaking a series of community consultations with local area groups (known as Local Area Consultations or LAC). During one of these consultations, with the Mountjoy Area LAC, the project team were challenged on whether Council were aware of and working with Dynamic Coast such that their knowledge was properly considered within the Scheme. The project team immediately established contact with the Scottish Government's Flood Risk Management Team and the Dynamic Coast project. This partnership working arrangement has developed from there and is considered by the project team as another example of how the Scheme's consultation with the people of Musselburgh has allowed the Scheme's design to continue to evolve.

3.1.7 Dynamic Coast were formally commissioned by Council in 2023 to undertake a detailed analysis of coastal change in Musselburgh, and to consider the risk of future changes in shoreline due to projected sea level rise associated with climate change. The partnership between Council / the Scheme and Dynamic Coast has allowed data to be shared between organisations and this is considered to be a multiple benefit for both projects and their separate objectives. For Dynamic Coast it allows them to develop their 'national scale' level of understanding of coastal change at Musselburgh into a much more detailed local level of understanding. For Council it allows for detailed understanding of coastal change in Musselburgh to feed into both the Scheme and their proposed Coastal Change Adaptation Plan.

3.1.8 The Scheme's project team provided detailed topographic survey data commissioned for the Scheme to Dynamic Coast. Further topographic data was collected by Dynamic Coast using drone technology before and after Storm Babet in October 2023. These additional sources of topographic data enabled the Dynamic Coast project team to undertake a more accurate analysis of coastal change in Musselburgh than had been possible for the Scotland-wide analysis carried out previously. Dynamic Coast also obtained other national datasets to undertake multiple parallel coastal assessments.

3.1.9 The analysis and assessment by Dynamic Coast was undertaken by specialist staff from the University of Glasgow and Dynamic Coast, independently of the flood protection scheme and its consultants.

3.2 Conclusions of the Assessment:

3.2.1 The assessment concluded that erosion has dominated much of the upper beach since 2018. Future projections, based on the newly calibrated rates determined by the assessment, support earlier research from Dynamic Coast, which concluded that erosion is a current and growing concern with implications for flood risk management in Musselburgh.

3.2.2 The assessment concluded that Storm Babet, in October 2023, caused erosion of beach sediment and the vegetation edge at the upper beach, with redistribution of this sediment to the west. Some parts of Musselburgh's coast now exhibit little residual resilience within the existing natural systems.

3.2.3 As sea levels rise due to the effects of climate change, more consistent erosion of Musselburgh's coast would be expected.

3.3 Summary of Risks associated with this Assessment:

3.3.1 If no further action is taken it is likely that erosion of Musselburgh's coast in the medium to long term would have a negative impact on the built environment, the local economy, and equality for the residents affected.

3.3.2 Dynamic Coast have concluded that, specifically for Musselburgh, in the absence of any new coastal management works, that future erosion may threaten the Scheme and other assets along the town's coastal frontage.

3.3.3 It is considered by the Scheme's project team that this may have implications for the design of the coastal defences proposed as part of Scheme above and beyond the project's initial assessment.

4 POLICY IMPLICATIONS

4.1 Changes in Musselburgh's coast could have implications for Council's Local Development Plan. It could also have implications for the Forth Estuary Local Flood Risk Management Plan.

4.2 Coastal erosion could, if no further action is taken, result in loss of land and / or damage any existing infrastructure located there. It could also result in damage to infrastructure such as: the Fisherrow Harbour, existing coastal walls / defences, property, roads, parking, street lighting, public utilities, and amenity spaces. In relation to Musselburgh this report is specifically focused along the area of coast between the Brunstane Burn and the mouth of the River Esk. It is proposed that a report will be brought back to a meeting of Council at the earliest opportunity to fully update on the coastal erosion risk and the specific locations that the study has looked at. This report will include developed proposals on how this risk may be mitigated.

4.3 Coastal erosion could, if no further action is taken, increase the probability of coastal flooding. This is because a reduction in the level of the shoreline

would mean that certain properties would become exposed to smaller return period floods which they are currently protected from.

4.4 The Flood Risk Management (Scotland) Act 209 (FRM) places a statutory responsibility on the Local Authority to exercise their flood risk related functions with a view to reducing overall flood risk. A key responsibility for Council is the implementation of the flood risk management actions in the Forth Estuary Local Flood Risk Management Plan. For Musselburgh this obligation is being advanced by the Scheme.

4.5 The Scheme will contribute towards the East Lothian Plan – 2017-27, focusing on health and wellbeing, safety, transport connectivity, sustainability and protecting our environment.

4.6 The Scheme will support the Council's Climate Change Strategy; however, it is highlighted that the Scheme is an 'adaptation' project due to implications of climate change on Musselburgh.

5 INTEGRATED IMPACT ASSESSMENT

5.1 The Scheme will undergo Integrated Impact Assessments during its development.

5.2 A Preliminary Environmental Appraisal Report (PEA) was undertaken during Project Stage 3 (the Outline Design), and this was included in the Preferred Scheme Report presented to Cabinet in January 2020.

5.3 The Scheme will undertake an Environmental Impact Assessment (EIA) on the Outline Design. This will be completed alongside the Outline Design before an update is presented to Council in January 2024.

6 RESOURCE IMPLICATIONS

6.1 Financial

6.1.1 All costs associated with the ongoing investigation work being undertaken by Dynamic Coast will be absorbed through the Scheme.

6.1.2 The Scheme is authorised under the Scottish Government's flood protection scheme programme. The Project Team and thereby the Council update the Scottish Government every autumn on the updated estimate for the Scheme along with its Spend Profile. From this data, and in line with the authorised programme, the Council receive 80% contribution on an annual basis as part of the capital grant settlement.

6.1.3 As possible responses to coastal change have not yet been identified, potential costs associated with this have not been established. Any response to coastal change, unless fully funded by the Scottish Government, would have financial implications for the Council. If, however, no further action is taken and coastal erosion results in negative impacts

on the built environment, this would still result in financial implications for the Council. It is expected that once the mitigation measures are determined, some of them will be deliverable within the Scheme and that others will need to be delivered through the Council's proposed Coastal Change Adaptation Plan.

6.1.4 A full update on the coastal erosion risk to Musselburgh and the determined appropriate mitigation measures and the associated costs will be reported to Council once it is available.

6.2 Personnel

6.2.1 It is anticipated that development of possible responses to coastal change will be undertaken within the existing teams of the Scheme and Dynamic Coast. Thereafter, the personnel implications for delivering the chosen response would depend upon whether it is incorporated within the Scheme or is part of the longer-term proposed Coastal Change Adaption Plan for Musselburgh's / East Lothian's coast.

6.2.2 It is anticipated that, irrespective of which, if any, response is developed, there will be a need for long-term monitoring of Musselburgh's shoreline. This would involve periodic topographic survey of the shoreline and comparison with previous datasets by external suppliers and would be managed by the Council.

6.3 Other

6.3.1 None

7 BACKGROUND PAPERS

7.1 Report to Cabinet in May 2016 – approval of the Local Flood Risk Management Plan (Forth Estuary) which included a proposed flood protection scheme for Musselburgh.

7.2 Report to Cabinet in January 2020 – approval of the 'Preferred Scheme' concept to be advanced to an Outline Design.

7.3 Report to Council in August 2022 – Musselburgh Flood Protection Scheme: Update on Scheme Development.

7.4 Report to Council in October 2022 Musselburgh Flood Protection Scheme – Update on Scheme Development.

7.5 Motion to Council in August 2023 – Request for report from Dynamic coast on expected changes to the coastline in the future.

7.6 Appendix A – Executive Summary report by Dynamic Coast and University of Glasgow

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DATE	15th January 2024

MUSSELBURGH COASTAL CHANGE ASSESSMENT (2024)

EXECUTIVE SUMMARY OF DRAFT REPORT (JANUARY 2024)

Dynamic Coast analysis to inform ELC Flood Scheme

DynamicCoast@nature.scot

Musselburgh Coastal Change Analysis

Craig MacDonell, Martin Hurst, Alistair Rennie, Jim Hansom & Larissa Naylor

Executive Summary

1. East Lothian Council (ELC) propose a range of flood risk management measures to address coastal change and fluvial flooding in Musselburgh. **Our report supports ELC's work** by providing an updated coastal change analysis (superseding that of Dynamic Coast, 2021) to inform assessment **of coastal erosion and erosion-enhanced flood risks**. Coastal erosion is noted within the Council's Risk Register and thus even if the Council were not proposing flood risk management works, coastal change and erosion-enhanced flooding risks are worthy of careful consideration, in support of the Council's Planning and Climate Change Act duties.
2. Updated beach surveys conducted in 2022 and 2023 show that erosion has dominated much of the upper beach since 2018. Whilst longer-term comparisons note fluctuating change along the coast future projections, based on new calibrated rates, support earlier research from Dynamic Coast (2021) that **coastal erosion is a current and growing concern. This has** implications for ELC's proposed flood risk management structures and parts of the town's coastal frontage. Musselburgh is not unique in this regard: in 2021 Dynamic Coast identified 46% of Scotland's beaches are currently eroding, and erosion enhanced flood risk is a growing risk that needs to be addressed. Recent Environment Agency work anticipates 90% increase in repair costs for coastal assets due to climate change.
3. Further to recent changes at Musselburgh, in October 2023 **Storm Babet** caused beach sediment loss and erosion of the vegetation edge at the upper beach, with longshore redistribution of beach sediment to the west. In places, this storm caused the equivalent of five years' worth of erosion over a couple of days and removed around 4,000 m^3 of sediment from the Musselburgh beaches. Whilst substantive change has occurred, fortunately this storm coincided with a neap tide. However, if such a storm had coincided with spring tides, then the impacts would be far more severe (as was evident elsewhere across Scotland the following week). Whilst Storm Babet has not significantly compromised the existing flood management structures or natural defences (dunes etc), the natural resilience of the beach has been reduced, particularly adjacent to the existing defences in the west, and adjacent to the proposed hybrid defence in the east near Mountjoy Terrace. For this reason, the evidence suggests that Council officers have **little time to waste in planning short-term coastal resilience measures**, including nature-based enhancements.
4. **Our monitoring and future modelling of the coast suggests that a wider and currently unaddressed future erosion risk** remains, and that the Council are justified to have this on their Risk Register. In the absence of any new coastal management works, as sea levels continue to rise, recent fluctuation and erosion of Mean High Water Springs is expected to be replaced by more consistent erosion that may **threaten the Musselburgh Flood Protection Scheme's proposed flood defences and other assets along the town's coastal frontage**. Under a High Emissions Scenario (the trajectory of current global emissions), enhanced coastal impacts are expected within the next ten to twenty years if no coastal management takes place. Under Low and Medium emission scenarios the anticipated impacts are less and will impact later.
5. **We suggest that the Council consider a range of coastal resilience measures be developed and appraised as part of ELC's Coastal Change Adaptation Plan** (CCAP). Whilst this report suggests management options for ELC to consider, a risk-based, dynamic adaptive approach which integrates intergenerational community interests is recommended to enhance the future resilience of the coast and enable the local coastal community to cope with substantial longer-term change (as recommended within Scottish Government Guidance). This may involve planning for the future coast to move inland in the medium to long term and to progressively plan to relocate affected coastal assets to lower risk locations.
6. We suggest that establishing a **monitoring programme for the beaches at Musselburgh is essential to inform the Council officers, so that they know when a range of erosion and flood risk adaptation options should be actioned** in the short to long-term. This would be an integral part of the proposed CCAP.