

Option: Do nothing

Indicative cost: £0

The 'Do Nothing' option would be a complete walk away scenario where no maintenance or repair would be carried out.

However, there are recommendations to improve the confidence of flooding (from office based activities), such as from a modelling and economic perspective. These include:

- (i) Additional work to try and resolve the apparent discrepancy between the observed flood history and the hydrometric data recorded at Stisted and Appleford Bridge;
- (ii) In addition to the above work, it has been recommended to the Environment Agency to continue a programme of checking both gauges in order to gain improved confidence in the data (particularly at higher flows) and to help assess the impact of season weed growth;
- (iii) Additional threshold survey of properties in Coggeshall and Kelvedon would further refine damage estimates. Information on which properties included basements would also improve the confidence in the resulting damages.

Advantages

This option would reduce the current and future maintenance cost burden on the Environment Agency.

Disadvantages

Siltation of the channel would continue, structures would block or seize and floodgates would not be operated, leading to more frequent and severe flooding. As such, it is likely that the 'post flood clean up costs' are likely to increase over time, and with the impacts of more frequent flooding and climate change.

Option: Do nothing + health and safety

Indicative cost: £50,000

This option seeks to mitigate any potential health and safety hazards, by retrospectively undertaking small works, to safely remove or 'repair' the existing system whilst it is in the 'Do Nothing' phase. This could include removing failed culverts or outfalls/trash-screens. Repairing roads or infilling collapsed systems.

Advantages

This option would reduce the future maintenance cost burden on the Environment Agency.

Disadvantages

Costs for this work cannot be fully known, and the impacts to Coggeshall, Feering and Kelvedon could mean that the local residents perceive this to be worse than just 'Doing Nothing'.

Option: Do minimum

Indicative cost: £200,000

The current cycle of maintenance on the channel would continue for the 'Do Minimum' option. This option involves weed cutting, removal of obstructions, minor dredging and maintenance and operation of the floodgates along the channel. The flooding regime of the channel would not change from the current condition. As part of the 'Do Minimum' option, emergency works would be undertaken following flooding events.

Advantages

This option would 'maintain the status quo', ensuring that the condition of the existing watercourses continued to function at today's performance levels.

Disadvantages

Current flood risk protection would be maintained but there would be no 'future flood risk' improvements, and as such the impacts and costs of future events are likely to worsen over time.

Option: Do something 1 – Flood storage reservoir

Indicative cost: £1,700,000

The 'Do Something' option would be the construction of an earth embankment dam to protect not only the properties in Coggeshall, but also those in Kelvedon and Feering. The reservoir would be located upstream of Coggeshall village, adjacent to the Coggeshall Football Club car park. An earth embankment would be constructed across the natural valley of the Blackwater at this point.

It was assumed for this Viability Report, that the reservoir should be used to restrict the flow downstream to normal river flows (i.e. the flows in the downstream channel would never overtop the banks).

The normal river flow would be conveyed by the twin culverts and restricted to a flow of $3\text{m}^3/\text{s}$ by an automated penstocks on the upstream side of the culverts. A possibility exists that higher flows could be allowed in the existing river channel downstream of the storage reservoir, and larger culverts would accommodate this.

During a latter stage of this study, the hydraulic modelling would vary the flows throughout the embankment to find the optimum flow in the channel using the existing floodplain. The final design may then use various culvert sizes and change the size of the embankment.

Advantages

This option will provide flood protection to a wider area through 'source control', removing the requirement to construct in residential and commercial areas. There is an opportunity to design and build considering current and future flood risk requirements. This option will use, where possible, the natural landform to temporarily store water during floods, so this land can be used for other purposes outside of flood events.

Disadvantages

Discussions with landowners upstream of Coggeshall (and between Coggeshall and Kelvedon) are crucial to the success of delivering such an option. Possible land compensation requirements may increase the overall delivery costs.



Example of a typical flood storage reservoir

Option: Do something 2 – Widening the channel

Indicative cost: £6,500,000

Widening the channel over its entire length (upstream of Coggeshall to downstream of Kelvedon) to increase the channel capacity and the wider Standard of Protection. This may involve creating small scale in channel storage areas, or deepening the channel, where possible.

Advantages

This option keeps the flood risk protection within the existing channel route and reduces the need to create additional flood protection measures elsewhere within the immediate River Blackwater catchment.

Disadvantages

Likely to have significant impact during and post construction in built up areas, especially where there are land restrictions and the structures along the channel that may need replacing. This option is likely to be costly, and involve all the landowners throughout Coggeshall, Feering and Kelvedon.



Example of widening the channel

Option: Do something 3 – Construction of flood walls

Indicative cost: £11,400,000

Constructing flood walls along the banks of the channel over its entire length (upstream of Coggeshall to downstream of Kelvedon) to increase the wider Standard of Protection. This may involve varying the crest levels to ensure efficient protection is given to the maximum coverage.

Advantages

This option keeps the flood risk protection within the existing channel route and reduces the need to create additional flood protection measures elsewhere within the immediate River Blackwater catchment.

Disadvantages

This option would be challenging and costly due to the topography of the area. To be effective the flood walls would have to cross roadways and various public accesses.



Example of the construction of flood walls

Option: Do something 4 – Upgrade existing drainage systems

Indicative cost: £28,200,000

Renew and increase the capacity of both the Coggeshall and Kelvedon drainage systems to create in-pipe storage capacity that can not only take surface water, but also fluvial peak event flows.

Advantages

This option would put flood events 'below ground' away from residential and commercial properties. It may be possible to work with water companies to obtain localised upgrades at their expense.

Disadvantages

Large capacity will be required and will need extensive maintenance regime, which is likely to require large capital expenditure and operational expenditure costs. Furthermore, potentially 'mixing flood sources' could reduce the Environment Agency's ability to control flows. Long term climate change would need to be accounted for to guarantee future capacities.



Example of upgrading existing drainage systems

Option: Do something 5 – Evapotranspiration (tree planting)

Indicative cost: £1,700,000

Planting trees and other flora/fauna to reduce the impact of groundwater around the watercourse. This will also disrupt the flow and limit the flow through Coggeshall and Kelvedon.

Advantages

Planting trees will provide a boost to the local habitat, and it will be seen as a green development that has significant funding opportunities.

Disadvantages

Extensive land is required (thus likely to be costly), to ensure that the tree coverage will provide sufficient flood protection.



Example of Evapotranspiration

Option: Do something 6 – Sustainable Drainage Systems (SUDS)

Indicative cost: £5,500,000

There are a large variety of SUDs that can be implemented in and around Coggeshall and Kelvedon. They can be used to limit surface run-off or increase infiltration.

Advantages

Developing underground storage in car parks/open spaces, conveyance channels with reeds/grass and water butts/green roofs/greywater recycling are all options to be considered. Although these solutions can be expensive, there is significant potential for third party funding. It may be possible to work with property development companies to obtain localised implementation, at their expense.

Disadvantages

Cumulative effects are required as individual measures cannot deal with extreme events. Needs extensive community buy in otherwise there is no guarantee of success.



Example of Sustainable Drainage

Option: Do something 7 – In channel ‘log jams’

Indicative cost: £250,000

These are a proposed sustainable flood risk solutions that will use felled timber from the local commercial processes to produce ‘vegetated dams’ within the channel that will maintain base flows, but will hold back extreme flows in order to reduce the impact of peak flows converging at the same time. This option will need to be hydraulically modelled to ascertain wider catchment impacts.

Advantages

Extensive environmental benefits for the local area. Will improve water quality and sedimentation movements to reduce build ups where flood risk will be exacerbated. Will rely on sourcing sustainable timber, ideally from local commercial interests.

Disadvantages

Likely to work better as part of a hybrid option rather than as a single long term flood protection option.



Example of In-channel ‘log jams’

Coggeshall, Feering & Kelvedon flood risk management

Development of the options

Following on from this initial analysis of costs it is clear that some measures would not be cost efficient as a single solution. However if a strategic partnership approach is adopted with a hybrid scheme that utilises measures where they are efficient and low cost, this may enable a more viable proposal.

For example, whilst the construction of flood walls to protect all of the affected areas would be a very high cost, there may be some outlying areas that could be protected by low key measures which would be more cost efficient than attempting to reduce flood flows by the use of a remote flood storage scheme.

The table below sets out a potential permutation and guidance for use within a potential budget. The budget is constrained by the level of grant that can be obtained through the current Partnership Funding Policy and is dependent on the value of reducing risk from flooding in the future. The table illustrates how various partners can contribute to an Environment Agency scheme, comprising of elements of the options. The indicative costs in the table illustrate how a strategic combined approach alters the standalone costs presented with each option. By obtaining contribution agreement with potential partners, the Environment Agency’s own funding requirements can be revised to incorporate efficiencies.

CFK ftrategy component	Potential partners/funding	Indicative programme					Indicative costs	Primary funding organisation
		2015	2016	2017	2018	2019		
SuDs and Development Control	Essex County Council, S106, CIL	As opportunities arise					TBC	Developers
Channel maintenance, widening, flow controls and tree planting	Landowners, Water Framework Directive (WFD)	Design	Implement		Maintain		£900,000	EA
Flood storage	Landowners, WFD, Defra	Design		Implement		Maintain	£1,800,000	EA
Localised defences	Defra, Essex County Council, residents, S106, CIL	As opportunities arise					£100,000	EA
Upgrade drainage	Water company, Essex County Council	As opportunities arise					TBC	Water companies

Coggeshall, Feering & Kelvedon initial flood risk mitigation options and indicative costs