

Option number	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7 / 8	Option 9A	Option 9B	Option 10	Option 11	Option 12
Option name	Do Nothing	Do Minimum	Rock armour apron	Seawall buttressing	Stepped concrete revetment	Rock fillet	Rock groyne (option 7) with reduced rock fillet (Option 8)	Shingle nourishment	Shingle nourishment and rock groynes	Rock berm at cliff	Fish tail groyne	Offshore breakwaters
												
Short Description	No repair or maintenance works would be undertaken. Baseline option to compare benefits of other options.	Patch and repair works to the seawalls as at present. No large scale repair works and consequently limited design life.	Rock armour structure in front of the toe, similar to existing rock armouring. Rock expected to be brought to site by sea.	Construction of new near vertical mass concrete wall in front of the existing walls.	Construction of new stepped seawall in front of existing walls.	Smaller scale rock armour solution.	Small rock groyne at Cobble Dump headland. Rock armour along defences as option 6 but reduced length.	Gravel beach material brought to site by dredger and pumped to form a new beach in front of existing wall.	New gravel beach stabilised with around 6 rock armour groynes.	Construction of rock berm to prevent out-flanking of northern end of defences.	Construction of a large rock groyne to the north of the existing defences.	Construction of a series of 4 breakwaters in the bay to protect the seawall.
Technical Issues	Would not protect the village.	Would only protect village until storm event causes major damage to wall. Does not provide long term protection.	Provides long term protection. Rock armour good at reducing wave reflection and overtopping. Flexible and less susceptible to scour.	Need to transport large quantity of concrete for insitu casting. Increased wave reflection, spray and overtopping. Susceptible to foreshore scour.	Difficult site access for transporting large precast concrete units. Greater issues with onsite casting than for mass concrete wall.	Reduced performance compared to option 3. Would require greater maintenance to existing upper walls.	Length of groyne required would need optimisation. Although groyne may reduce wave action from the north it will also reduce potential for sediment supply from the north.	High cost of transporting shingle to site by pipeline from dredger. Difficulty sourcing coarse dredged gravel. Large ongoing costs for beach maintenance and recycling.	Less beach management costs than open beach Option 9A, but other issues similar.	Would not protect or extend life of seawalls, would need to be included with other options.	The groyne would not fully prevent wave attack to the rest of the defences, which will require ongoing maintenance. It would need to be combined with another option such as 9A.	Large quantities of rock required. Would provide high degree of protection to the village frontage, but not fully eliminate need to maintain existing defences.
Environmental Issues	Potential to revert to a more natural coast in long term. Short term pollution due to erosion damage to sewerage infrastructure and properties. Smothering of seabed habitats with debris from erosion.	Delay to do-nothing issues, which will be the same but occur later.	Do - nothing issues removed.	Potential for pollution incidents with wet concrete during construction.	Same as option 4.	As option 3, but less impact as smaller scale.	Similar to option 6, but groyne may cause positive or negative impacts on the wider bay.	Fine sediment fraction from gravel may be dispersed in wider bay.	Lower impacts than Option 9A	Similar to options 1 and 2 unless combined with another option.	As there is only partial protection the issues with options 1 & 2 could still occur.	Submerged portion of reefs would provide valuable sheltered rocky habitat. However, there may be wider impacts on sediment transport in the wider bay which would need to be investigated.
Social issues	Loss of up to 128 residential properties in long term would cause major stress and disruption to the community	Loss of properties is only delayed, but this allows community time to adapt to the eventual need to relocate / abandon village.	Long term future of coastal defences assured. Risk of loss of village due to erosion delayed by up to 100 years. Reduced stress to community. Rock armour covers foreshore and limits access.	As option 3, but more similar to existing situation.	Steps may have greater amenity potential than rock or vertical walls, but marine growth may cause significant H&S risks.	Similar to option 3. Possible H&S risks related to people climbing on rocks.	Similar to option 6.	Regular beach management works required may cause disruption. H&S risks related to rock armour and concrete steps reduced.	As Option 9A, but less beach management, but potential H&S risks with rock armour groynes.	As option 1 and 2.	Stress and anxiety due to only partial protection.	Stress and anxiety due to partial protection to erosion risk. Navigation issues for fishermen and sailing club.
Carbon Footprint from construction: (Tonnes Fossil CO2e)	N/A		8,770	1,550	3,000	3,760	6,460	2,610	6,160	N/A - see recommendation	Much greater than Option 7/8	25,100
Initial estimate of total costs in todays prices (£)	0	396,000	2,090,000	2,550,000	3,720,000	1,280,000	2,510,000	6,970,000	3,290,000	948,000	7,850,000	13,100,000
Initial Estimate of Present Value Cost (£)	N/A	94,700	1,710,000	2,200,000	3,240,000	889,000	1,640,000	2,130,000	2,270,000	561,000	6,690,000	11,600,000
Initial Estimate of Present Value Benefits (£)	N/A	9,350,000	20,200,000	20,200,000	20,200,000	20,200,000	20,200,000	20,200,000	20,200,000	N/A	N/A	20,200,000
Benefit Cost Ratio (BCR)	N/A	99.0	12.0	9.0	6.0	23.0	12.0	10.0	9.0	N/A	N/A	2.0
Recommendations	Needs to be considered as baseline option.	Does not meet project objectives beyond short term but needs to be considered as alternative baseline option.	It is recommended that this option is taken forward for further appraisal. Rock is a very effective form of defence and it can be readily scaled according to need. In addition it has already been used successfully in the bay.	Following an initial assessment including the cost assessment it is considered that this option should not be taken forward for further appraisal. Technically it is considered to offer a lesser performance than a rock apron for an additional cost of £0.5 million. In addition it has no redeeming aesthetic or amenity features.	Stepped concrete revetments have been used successfully at a number of coastal locations in the UK. At Runswick Bay this could be used to provide a high level of protection to all or part of the existing seawall. It is recommended that this option is taken forward for further appraisal although the costs are considerably higher than for example the rock armour apron.	Less effective than option 3 but significantly lower costs. It is recommended that this option is taken forward for further appraisal. If selected for further detailed appraisal, this option could be fine tuned in the future at relatively low cost, i.e. in response to overtopping calculations.	Similar or slightly enhanced protection to Option 6, but almost twice the costs. Recommended for more detailed consideration.	There is a high level of uncertainty over the performance of the beach and, i.e. the frequency and cost associated with future topping-up campaigns. Given high capital cost and uncertain future costs, it is not recommended that this option is considered further as a stand-alone option. However, it would warrant further appraisal in conjunction with other measures such as rock groynes (refer to Option 9B).	Not recommended for further consideration. Rock groynes combined with shingle nourishment could provide an effective option, but this is considered an expensive and unsustainable solution.	Option would not meet project objectives unless it formed part of another option for the seawall. Therefore not recommended for further consideration on its own.	Would not meet the main project objective unless combined with another option, such as 9a. However, it would be ruled out on cost grounds as the capital cost of this option is relatively high. In addition, there is uncertainty associated with environmental impacts. It is recommended that this option is not considered in any more detail.	Due to the high capital cost of this option, the limited scope for reversing the effects and/or removal of the structure and the likely impact on the down-drift shoreline, it is recommended that this option is not considered in any more detail.