HMP – Climate change

 Climate change, due to global warming, is a well established fact. All the evidence – and common sense – indicates that the effects will more consequential over the next years.

 Wellfleet Harbor will see a number of consequences:

 > Sea Level Rise

 > Increase winds and storms

 > Increased rainfalls

 > Warmer harbor waters

 > More acidic harbor waters

 The consequences of warmer and more acidic harbor waters are mostly felt by the shellfishing community. These are discussed in a separate chapter.

**Sea Level Rise**

 Sea level rise will increase tidal flooding of the salt marshes of the harbor. Salt marshes are critical sources of nutrients and life for the harbor, so any loss of marshes or their efficiency would be a major concern for Wellfleet Harbor.

 Some important local research on this subject is being carried out by Dr Steve Smith at CCNS laboratories (see references). This includes methods for monitoring marsh elevation changes and consequences as a marsh meets adjoining inland dunes. The work has been tested on marshes owned by the Cape Cod National Seashore, such as Middle Meadow. This monitoring should be extended to north and east side Wellfleet harbor marshes, such as Duck Creek and Blackfish Creek.

 Normally, salt marshes maintain their elevation above sea level by retaining silt and other sediments carried by flood tides (J.Teal, ref). Fortunately, as this happens, marshes have been able to keep pace with sea level by migrating inland. Some work at CCNS has detailed the conditions under which this is feasible.

 As we have alrrady seen around Welfleet Harbor, shore line armoring by revetments prevents this.

 However, thus far, shore lines with gradual slopes have been mostly left in a natural state. The Conservation Commission is evaluating changes in regulations that will help

preserve these shorelines. These regulations deserve Town support.

 A further remediation strategy requires using harbor or other sediments to replenish or accelerate the raising of salt marsh elevations to keep pace with sea level rise. This topic directly relates to a long term dredging strategy and is discussed in that chapter.

 Finally, Wellfleet has about 1250 acres of salt marshes. Restoration of the Herring River and Mayo Creek will add about dike protected 1100 acres to this. In a sense we have an insurance policy. However, a major change in the balance between south and north harbor may produce consequences that are hard to predict.

**Wind and Storms**

 Increasing global temperatures will lead to increases in wind energy and velocity. This may manifest itself particularly in increased storm frequency and intensity. For the harbor, the main consequence will likely be increased marsh and shoreline erosion. The risk would be greatest near the south end of the harbor, such as Lt. Island and Jeremy Point.

 A program to monitor at these locations for wind and wave energy is warranted.

 Actual marsh protection using low lying breakwaters or oyster reefs to help protect against wind shoreline erosion should be kept in mind. Local examples are Provincetown and

Winthrop.

**Precipitation Increase**

 The predictions for New England are a climate change driven increase of about 10% in precipitation, primarily as rain. There are two consequences.

 First, there will be an increase in fresh water flow into the harbor from all upland sources, tending to decrease harbor salinity. Second, ground water levels in the aquifers under Wellfleet will rise. Operations of septic systems will be adversely affected, leading to potentially greater nitrogen flows into harbor waters. This issue is under consideration by the Town Health Board.