

The following questions (in bold) were submitted by Laura Runkel, a member of the Herring River Stakeholder Group (HRSG), following presentations made to the HRSG by John Portnoy and Kirk Bosma on October 11. The responses provided below were prepared by members of the Herring River Restoration Committee along with John Portnoy.

Question 1:

The models for tidal flow projections and studies for underground/fresh water appear separate from each other, in general. Beyond the wells described by John near the dike, where have the interfaces between tidal influx and the fresh water lens been studied? Could you please share any references to the interface studies, which likely go beyond what we could discuss during our short meeting last week?

Response:

The two presentations to the Herring River Stakeholders Group in October 11th provided information on separate, but related, topics. Kirk Bosma's provided a summary of modeling conducted for the Herring River Restoration project to assess changes in surface water elevations under post-restoration conditions. John Portnoy's presentation provided a summary of established science related to groundwater near estuaries. John's presentation did not include modeling information conducted for the project, though it did use data collected in the vicinity of the project to emphasize the relationship between groundwater and surface water elevations.

Several studies have been undertaken to examine the relationship between the freshwater and saltwater in coastal aquifers, and some studies have looked at these issues in the Herring River floodplain. In the next month or so the Project will have finalized a report designed to (1) review the basic science of the freshwater/saltwater relationship in aquifers on Cape Cod, addressing the potential effect of restored tidal flow in the Herring River on groundwater quality; (2) summarize the key findings of previous hydrological assessments of the effects of tidal restoration in a few private, domestic wells that are in low-lying areas within the Herring River basin and within a short distance of saltwater at high tide; and (3) present the current thinking on this topic. We will provide you with a copy of this report when it is publicly available. The report will include references to several previous studies, so that you can review those independently if you wish.

Question 2:

-For the impact of tidal flow on the water table, John showed a slide where the water table was impacted by tidal flow. It appeared to push up the water table by ~1-2 ft at a distance of ~300 ft from the tide line. What is expected for low elevation areas, such as the UPDC sub-basin and adjacent properties, where the water table is closer to the surface? For example, in the UPDC area the water table is very near the ground surface (for example, on our property near Moby Dick's sinking a shovel in the ground reveals the water table <1 foot below the surface, and our well was at 7 ft until last year).

Although the restoration is not projected to immediately impact the UPDC sub-basin, it may cause flooding by pushing up the water table at low lying areas (also at locations outside UPDC region?). Will more test wells be used to study possible impacts prior to and during Phase I?

Response:

As explained below, mean water surface elevations in Upper Pole Dike Creek will not increase from tidal restoration, storm surge or precipitation conditions during Phase 1 of the restoration. Therefore, the restoration project will not affect the water table elevation below surrounding uplands.

National Park Service scientists Larry Martin and John Portnoy studied the effect of the 9-ft tidal range just seaward of the Chequesset Neck dike on tidal range in groundwater along a transect normal to the coast (Portnoy & Martin 2007). The observed trend was, as described in the literature (Fetter 2001), an exponential decrease in tidal range within the groundwater system with distance from the coast. Thus, the 9-ft tidal range in the river was dampened to a 1-2 foot fluctuation in the water table a few hundred feet from the shoreline; with smaller tidal ranges, the groundwater fluctuation will be commensurately smaller. For example, for properties in the Upper Pole Dike Creek basin, the nearest the tide will reach is at Pole Dike Road. This is still thousands of feet from your or other residential properties or from Moby Dick's; therefore, at these sites the effects of tides at Pole Dike Road will be minuscule and likely undetectable.

As you note, no tidal restoration is proposed for the Upper Pole Dike Creek sub-basin as part of Phase 1. The dike at Pole Dike Road will be configured to prevent tidal flow into Pole Dike Creek and allow drainage only. At full Phase 1 tidal flow, the peak water level during a combination 10-year storm and 100-year precipitation event is 2.85 ft NAVD88 in Upper Pole Dike Creek, which is actually lower than existing conditions (2.93 feet) for the same event. The tide control at Pole Dike Road and improved drainage in Lower Pole Dike Creek will lower the mean water surface elevation before the storm to a lower starting point, providing more volume of water storage in Upper Pole Dike Creek than is presently available.

The Cape Cod National Seashore installed a series of wells in the Herring River basin, including one in Upper Pole Dike Creek. The test wells were intended to assess the relation between groundwater levels and tidal fluctuation under the current regime of restricted tidal flow in the basin; document water level changes in response to rainfall-recharge events; and document the magnitude of seasonal and annual water level change at each site. From May 2005 to October 2010, water levels were measured weekly or monthly. This data set provides a robust baseline describing current tidal conditions in the system. The Herring River Restoration Committee is still assessing options for post restoration monitoring. Groundwater monitoring plans will be described in the Project's Notice of Intent filing.

Question 3:

John, could you please share your presentation? It also would be great to see a copy of your publications that report on ground water/tidal interaction. If you have pdfs to share that would be great to have. The data is very in depth and it would be great to have more time a look at these and to consider them in totality.

All Power Point slides presented to the Herring River Stakeholder Group will be posted at <http://www.friendsofherringriver.org/Herring-River-Stakeholder-Group>.