

# A Study of Coastal Flooding at Jarvis Creek, Connecticut

James O'Donnell, Michael Whitney and Kay Howard Strobel

Connecticut Institute for Resilience and Climate Adaptation

and

Department of Marine Sciences

University of Connecticut

August 29, 2016

## **Executive Summary**

The Town of Branford, CT, and the Branford Land Trust have reported that high water levels at Jarvis Creek Marsh, CT, have led to flooding on Leetes Island Road (RT 146) and at a field adjacent to the marsh. Exchange of water between Long Island Sound and the marsh complex is currently influenced by a tide gate and a berm at the southern end of marsh and a railway bridge that crosses the middle of the marsh. The berm had been modified by the Land Trust with funds from a grant from the Connecticut Department of Energy and Environmental Protection as part of a marsh restoration program and to improve public access. This report describes observation and the development of a mathematical model that quantitatively assesses the influence of the tide gate and the berm on the exchange with Long Island Sound and the frequency of flooding.

We deployed an array of water level, salinity, and current sensors at 8 locations in the study area between October 18<sup>th</sup> and December 28<sup>th</sup>, 2014 to observe the water level changes in a wide variety of wind and tidal conditions. We also created a gridded topography and bathymetry of the marsh complex using LIDAR and several GPS surveys to ensure that the water level measurements were referenced to a geodetic datum. We also carefully measured the geometry and water depth at the tide gate, the berm and the railway bridge. These data were used to develop and evaluate a mathematical model to link the fluctuations of water level in Long Island Sound to the mean level in the marsh north of the railway bridge.

With the best representation of the current geometry of the berm we demonstrated that the model reproduced the fluctuations observed in the upper portion of Jarvis Creek Marsh with an error in the prediction of high water of approximately 10 cm. Both observations and the model showed that the rail line crossing had no effect on the high water levels, though it did raise the level at low tide. We then used the model to assess what the water level would have been in 2014 had the berm not been substantially modified. We also simulated the effectiveness of a berm that did not permit any flow around the tide gate. We found that the effect of removing the entire berm was to decrease the high water level by approximately 10 cm and that the consequences of a more effective berm were essentially the same. This magnitude is comparable to that of the expected error in the model predictions.

We conclude that the presence (or absence) of the berm had little effect on the water levels or the occurrence of flooding at RT 146. The flow is controlled by the tide gate. If the tide gate were substantially modified, then the importance of the berm should be reassessed.

**Subject:** Branford Land Trust Responds to Medlyn Farm  
**From:** Branford Land Trust (Branford\_Land\_Trust@mail.vresp.com)  
**To:** tedells@sbcglobal.net;  
**Date:** Tuesday, January 3, 2017 7:14 AM



January 3, 2017

Dear Members and Friends of the Branford Land Trust:

Jay Medlyn has filed a lawsuit against the Branford Land Trust (BLT) concerning removal of an earthen berm that was part of a tidal gate system servicing Jarvis Creek. Mr. Medlyn claims that the removal of the berm has created salt water flooding problems on his property. While much has been reported on this issue, the BLT wants the facts to be known. Flooding in this area pre-dated the removal of the breached berm, and an independent study has confirmed that the removal of the berm had little effect on upstream flooding. The recent rising sea level, a period of high coastal storm frequency, and extended periods of drought have exacerbated the problem of coastal flooding. These factors, and not the removal of a berm, have and continue to be the main forces impacting salt water on the Medlyn site. Mr. Medlyn's unsubstantiated claims are damaging to the Branford Land Trust and the greater community as they are neither based on the facts nor reflective of the dynamic coastal ecosystem that Mr. Medlyn abuts.

According to aerial photographs, the berm in question was built prior to 1931 in conjunction with an older tidal gate. Cracks began developing in the eroded berm in the late 1990s, and by 2005, the berm was breached in multiple places. The size of the breaches continued to grow, creating a hazard for hikers who used a trail crossing the berm and connecting Stony Creek to the woods north of RT 146. On every high tide that flooded the marsh, water passed through the breach of the berm and during severe storms, water overtopped the full length of berm. In response to a 2007 request for a coastal enhancement project from DEEP's Office of Long Island Sound Projects, the BLT proposed installing a boardwalk along the footprint of the berm. Following design development that involved consultation with DEEP staff, the project was approved by state (DEEP) and federal (Army Corps of Engineers) regulators. A condition of approval was the removal of the remains of the breached berm. In 2012, a contractor working for the BLT removed the berm remnants and built the boardwalk. The project was completed in mid-September, about six weeks before Hurricane Sandy.

Following Hurricane Sandy, Mr. Medlyn began to state that the loss of the berm caused damage to various parts of his property. In response to concerns raised by Town and State officials, DEEP requested an independent study by scientists affiliated with the Connecticut Institute for Resilience & Coastal Adaptation (CIRCA) to characterize the hydrology of the system and to determine the impacts of removal of the breached berm, and potential reinstallation of a berm and tidal gate. This study, which can be found here (<http://circa.uconn.edu/projects/jarvis-creek/>), concluded "that the presence (or absence) of the berm had little effect on the water levels or the occurrence of flooding at RT 146. The flow is controlled by the tide gate. If the tide gate were substantially modified, then the importance of the berm should be reassessed."

Mr. Medlyn has also stated that the removal of the berm caused salt water intrusion into his groundwater fed irrigation pond, located directly north of the railway lines (The Sound, December 8, 2016; <http://www.zip06.com/news/20161202/three-words-save-medlyn-farm>). This pond is located at the lowest elevation of Mr. Medlyn's property and has a surface elevation of approximately 12-18 inches above the surface of the adjacent tidal wetland. Due to its low elevation and proximity to the coast, the bottom of the pond periodically connects with a salty groundwater transition zone that is a common feature along the coast in this area. The location of the transition zone depends on the balance between the pressures of salt water (higher sea level and storms move salt water to the pond) and fresh water (higher rainfall pushes salt water away from the pond). Recent droughts and repeated strong coastal storms may have exacerbated the problem.

Solutions to reduce the impact of rising sea level and coastal storms are of great import to coastal communities. The Branford Land Trust has always been, and will continue to be, committed to working with our neighbors and state and local officials to identify and implement solutions to address land-use conflicts while protecting the environment.

Pete Raymond  
 President, Branford Land Trust

---

[Click to view this email in a browser](#)