JBLE-Langley Case Study: Increasing Adaptive Capacity through Natural and Engineered Solutions

Kandi Brown (kbrown@nuglobalsolutions.com) (NuGlobal Solutions, LLC, Knoxville, TN)
Daphne Williams (ddwilliams@nuglobalsolutions.com), Theodore Kyriakopoulos (Tkyriakopoulos@nuglobalsolutions.com), and Brian Wellington (bwellington@newfields.com) (NewFields Companies, LLC, Atlanta, GA)
Robert Barrett (robert.barrett@us.af.mil), Anhthu Nguyen (anhthu.nguyen@us.af.mil), Kevin Rasmussen (kevin.rasmussen.6@us.af.mil), and Alicia Garcia (alicia.garcia.4@us.af.mil) (JBLE-Langley)

Background/Objectives. Joint Base Langley Eustis (JBLE)-Langley faces significant challenges from sea level rise (SLR) having experienced one of the largest documented changes in the world over the past 100 years. The biggest challenge anticipated over the next decade is the 1 to 1.7 foot (ft) of projected SLR and the nuisance flooding it will exasperate. In response to SLR, JBLE-Langley has identified vulnerable assets and evaluated alternatives to enhance their resilience. Proposed best management practices (BMPs) adaptively support future expansion and include five seawalls, two tidal gates, and increasing the installation's wetlands inventory by approximately 27 acres. Conservative design approaches employed by the installation reduce the potential for waste when dealing with climate change uncertainty and align with adaptive design and risk management principles.

Approach/Activities. The suitability and performance of all existing and proposed BMPs were evaluated by modeling the impacts of varying rainfall events, increasing storm surge, and SLR scenarios using U.S. Army Corps of Engineers Hydrologic Engineering Center's - River Analysis System (HEC-RAS) Model. Moderate Representative Concentration Pathway (RCP) 4.5 outcomes and events experienced within the past 10 years were used to develop modeling input. Existing BMPs include stormwater sewers, pumping stations, and outfalls; existing berms; seawalls; and living shorelines. All existing BMPs were inventoried and visualized on the ArcGIS platform. Proposed BMP design will be based on existing physical and hydrological site features and subsurface conditions. The variability of the subsurface conditions for the five different wall locations was examined using piezo cone penetration testing (CPTu)/seismic cone penetration testing (SCPTu) results for tip resistance, pore pressures, the corresponding soil behavior type, and calculated geotechnical parameters. During the geotechnical field investigation surficial groundwater was variable from 1.3 ft to 5 ft below ground surface and observed to be dictated by the tides. All factors will be considered in the 100% design package scheduled for completion in Summer 2022.

Results/Lessons Learned. The JBLE-Langley mission will be enhanced, and the adaptive capacity of the installation bolstered by two gates, five walls, increased wetlands as well as routine rehabilitation and maintenance of the existing stormwater management system. Innovative, strategic planting of native, salt-tolerant species may also be implemented as a basewide strategic effort. Utilizing climate change facilitators across multiple civil engineering, environmental, and public relations efforts will assure all opportunities to address adaption are maximized. This investment will reap a significant return on asset over the next 10-year horizon.