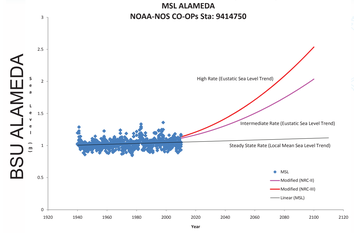
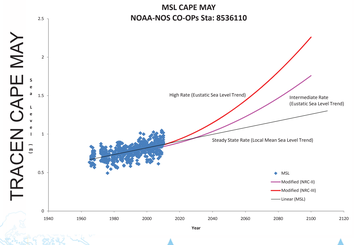
# U.S. Coast Guard
## *Climate Change Impacts Assessment*

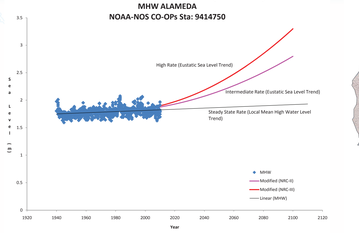
## SEA LEVEL RISE: BSU ALAMEDA & TRACEN CAPE MAY

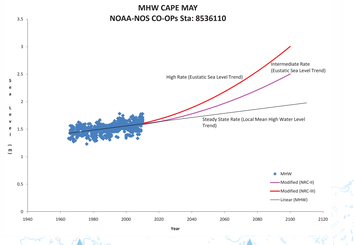
### Mean Sea Level (MSL)




### Mean High Water (MHW)



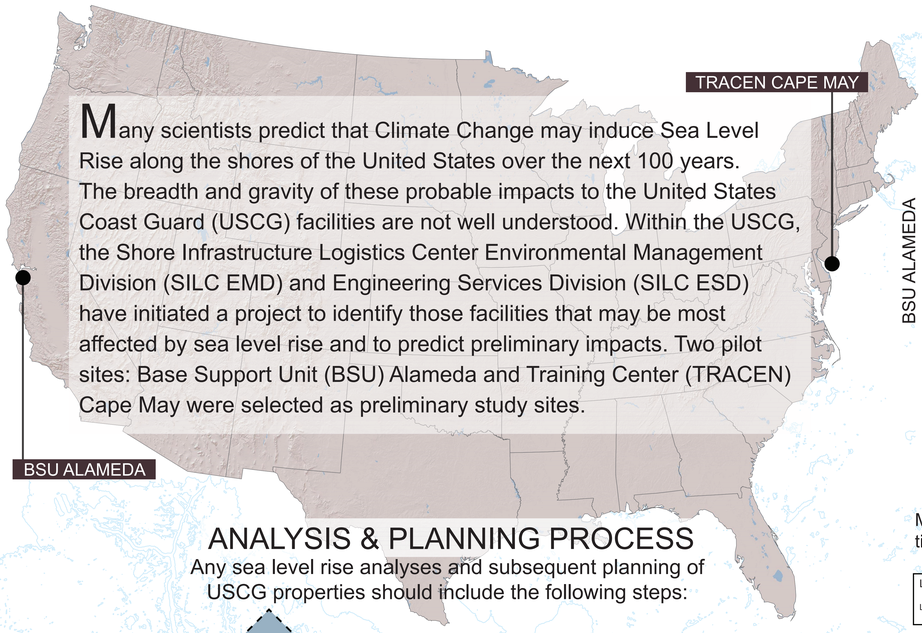

## LOCAL & EUSTATIC SEA LEVEL TRENDS

In order to effectively plan and prepare USCG sites for climate change impacts project planners and engineers must consider historic local changes as well as predicted global sea level trends. Historic local rates of sea-level (SLR) changes are best determined from tide gauge records. Preferably, records should be obtained from the Center for Operational Oceanographic Products and Services (CO-OPS) tide gauges which are operated by the National Oceanic and Atmospheric Administration's (NOAA) National Ocean Service organization (NOS). Global trend predictions are numerous; however, the US Army Corps of Engineers (2009) utilizes the following National Research Council's (NRC) curves which include global dynamics into its rate equations. These rates can be described as:

| STEADY STATE | INTERMEDIATE | HIGH |
|---|---|---|
| Based on the historic rates of sea-level change from global tide gauge records | (Modified NRC-II) which reflects the International Panel on Climate Change (IPCC) 2007 AR4 projections | (Modified NRC-III) which exceeeds the upper bounds of the IPCC 2007 estimates and anticipates a potential rapid loss of ice mass from Antarctica and Greenland |

By graphing this combination of sea level rise trends planners will have a more holistic view of the possible sea level rise changes at USCG sites.

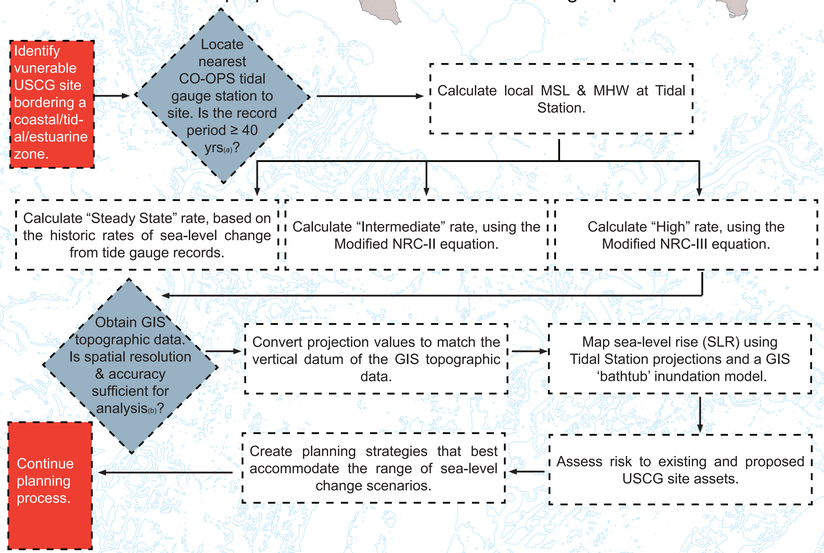
Footnotes:
a) Close proximity of a USCG site to a CO-OPS tidal station does **not** necessarily indicate that the station is an ideal data source for a site analysis. Vertical land movement and regional tidal differences should be examined at both the gauge station and the USCG site to determine if the data can be used. In the case of the two pilot study sites, it was already determined that the gauge data was adequate for representing site tidal behavior.
b) Vertical and horizontal spatial resolution should be as high as possible. Dataset should also be hydro-enforced (i.e. 'bare earth'), cleaned of any artifacts, and checked for accuracy. As a general rule of thumb, the vertical & horizontal accuracy should meet FEMA's DEM requirements for floodplain modeling (i.e. accuracy at the 95% confidence level, 1.96 X RMSE).




Many scientists predict that Climate Change may induce Sea Level Rise along the shores of the United States over the next 100 years. The breadth and gravity of these probable impacts to the United States Coast Guard (USCG) facilities are not well understood. Within the USCG, the Shore Infrastructure Logistics Center Environmental Management Division (SILC EMD) and Engineering Services Division (SILC ESD) have initiated a project to identify those facilities that may be most affected by sea level rise and to predict preliminary impacts. Two pilot sites: Base Support Unit (BSU) Alameda and Training Center (TRACEN) Cape May were selected as preliminary study sites.

## ANALYSIS & PLANNING PROCESS

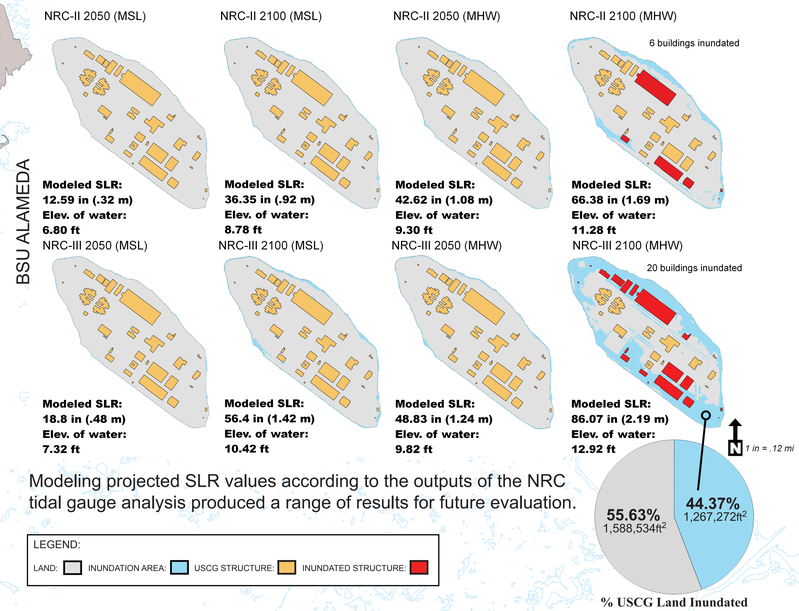
Any sea level rise analyses and subsequent planning of USCG properties should include the following steps:





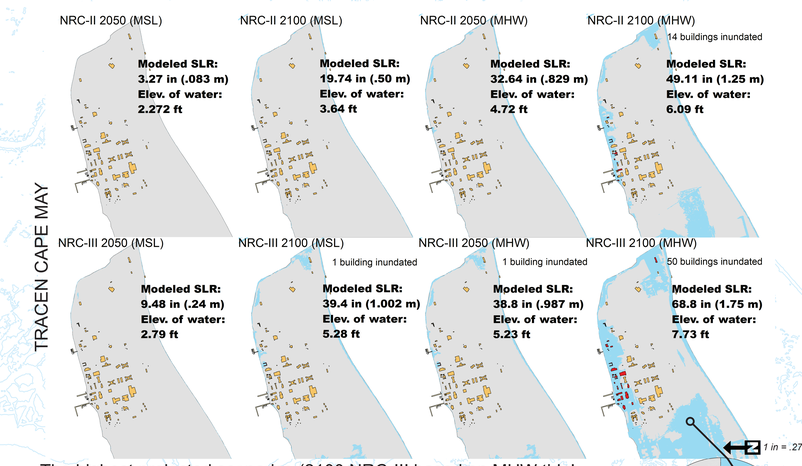
References:
1) BCDC. 2009. Living with a Rising Bay: Vulnerability and Adaptation in San Francisco Bay and on its Shoreline. San Francisco Bay Conservation and Development Commission.
2) Cooper, M. M. Beevers, M. Oppenheimer. 2008. The Potential Impacts of Sea Level Rise on the Coastal Region of New Jersey, USA. Climatic Change 90: 475-492.
3) National Research Council.1987. Responding to Changes in Sea Level: Engineering Implications. National Academy Press: Washington, D.C.. http://www.nap.edu/catalog.php?record_id=1006.
4) USACE. 2009. Incorporating sea level change considerations in Civil Works projects. Engineer Circular 1165-2-211. U.S. Army Corps of Engineers. http://140.194.76.129/publications/.
[a] Alameda 2007 LiDAR dataset developed by the Alameda County Public Works Agency and provided by FEMA as 5-ft bare earth DEM's. Cape May 2008 LiDAR dataset developed by USGS and New Jersey Dept. of Environmental Protection, and provided by the Cape May County Planning Department as 6.56-ft bare earth DEM's.


## CONCLUSIONS




Modeling projected SLR values according to the outputs of the NRC tidal gauge analysis produced a range of results for future evaluation.

LEGEND:
LAND: INUNDATION AREA: USCG STRUCTURE: INUNDATED STRUCTURE:




The highest projected scenarios (2100 NRC-III based on MHW tidal data) showed a substantial number of USCG assets and real property being impacted by rising sea levels.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