

CONSIDER SEA LEVEL RISE DURING BROWNFIELDS REDEVELOPMENT

Brownfield sites that are left unprotected from sea level rise can increase the risks and costs associated with redevelopment, as well as limit site reuse options. However, there are preventive measures that site managers and property owners can use to minimize the risks and uncertainties associated with sea level rise.

The simple tools introduced in this fact sheet explain how sea level rise can impact a coastal property and how you can screen a site for risk.

HOW DOES SEA LEVEL RISE IMPACT COASTAL PROPERTIES?

- Causes frequent flooding and potentially permanent inundation in low-lying coastal areas.
- Expands flooding during coastal storms.
- Increases shoreline erosion.
- Elevates groundwater levels.
- Mobilizes debris and contaminants.
- Impedes stormwater drainage.
- Damages critical infrastructure like roads, water and wastewater systems, telecommunication, and energy supplies.
- Damages buildings and other development investments.

WHY IS SEA LEVEL RISE ESPECIALLY DANGEROUS TO COMMUNITIES NEAR BROWNFIELD SITES?

Floodwaters, especially brackish or salty floodwaters, can release and spread site contaminants and debris, endangering human health, animals and the environment.

Brownfields often are located near minority and low-income communities. Adverse impacts due to sea level rise may increase environmental justice consequences. Consider these communities when planning for sea level rise mitigation and adaptation measures.

HOW DOES UPFRONT CONSIDERATION OF SEA LEVEL RISE IMPROVE THE BROWNFIELD REDEVELOPMENT PROCESS?

- Increases awareness of the issues, consequences and costs of inaction with an initial low- to no-cost sea level rise exposure screen.
- Reduces costs to mitigate property damage and offset risks during cleanup and redevelopment.
- Broadens the variety of response options available, if considered early.
- Strengthens resilience of the site.
- Reduces potential risk of injury and death.

WHY ARE SEA LEVELS RISING AND HOW FAST?

Due to regional factors, the rate of sea level rise is different across the United States.

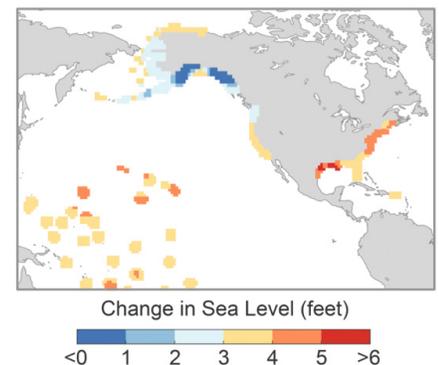
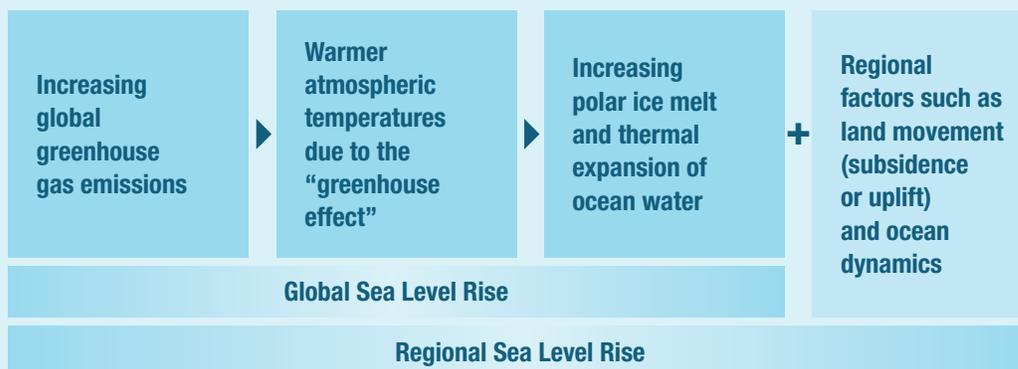


Figure 1. Projected changes in sea level by 2100 (under intermediate levels of greenhouse gas concentrations) range between 0 and 6 feet, depending on regional factors. Source: <https://science2017.globalchange.gov/chapter/12>

A FOUR-STEP EXPOSURE SCREENING PROCESS TO UNDERSTAND THE RISKS OF SEA LEVEL RISE

1

EXPLORE SEA LEVEL RISE PROJECTIONS FOR PLANNING/DESIGN SCENARIOS.

- Define the project planning/design time horizon to determine the appropriate sea level rise projection time frame. The design life of the redevelopment project or associated infrastructure may help to establish the appropriate time frame.
- Use the U.S. Army Corps of Engineers [Sea-Level Change Curve Calculator](#) to obtain the full range of future high tide local sea level rise projections.
 - » Select the closest tide gauge and the “NOAA et al. 2017” scenarios source.
- If planning for design, consider the project’s risk tolerance in order to select the most appropriate sea level rise projection scenario. For example, a highly critical project may have a low tolerance for risk and should be designed conservatively using a high sea level rise projection.



Best practice: Consider looking all the way out to 2100.



Tip: Start with exploring the Intermediate and the Intermediate-High scenarios.

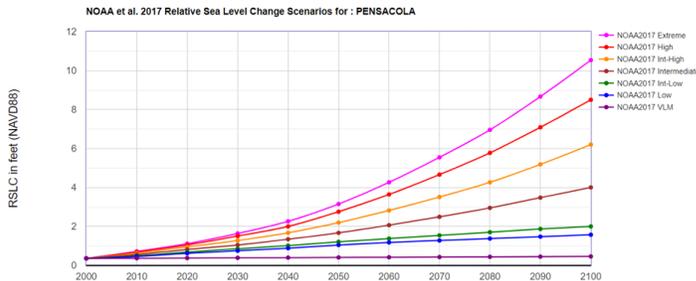


Figure 2. Example output of local sea level rise projection scenarios from Sea-Level Change Curve Calculator. RSLC = Relative Sea Level Change VLM = Vertical Land Movement

2

VISUALIZE POTENTIAL FLOODING AT THE BROWNFIELD SITE AND SURROUNDING AREA.

- Access the National Oceanic and Atmospheric Administration (NOAA) [Sea Level Rise Viewer](#) or a local data source and zoom in on the brownfield site.
- Review exposure to projected daily high tide flooding.
 - » Adjust the slider bar on the viewer to the daily high tide sea level rise projection scenario(s) identified in step 1.
- Review exposure to storm scenarios.
 - » On the viewer, add several feet to the scenario(s) from step 1 to screen for flooding from coastal storms.



Best practice: The past can be indicative of future impacts. Search online for news of past flood events in the neighborhood to understand the local impacts.



Tip: Click the arrows on the NOAA [Extreme Water Levels site](#) to obtain local 100-year storm surge elevation.



Figure 3. Daily inundation with 1 foot of sea level rise from the NOAA Sea Level Rise Viewer.

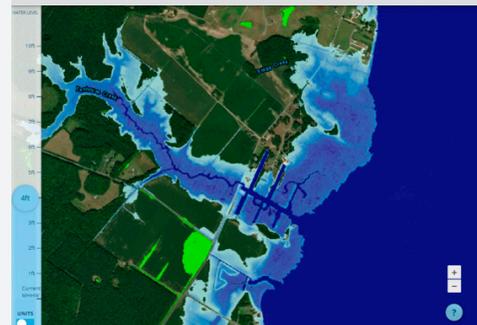


Figure 4. Daily inundation with 4 feet of sea level rise from the NOAA Sea Level Rise Viewer.

A FOUR-STEP EXPOSURE SCREENING PROCESS TO UNDERSTAND THE RISKS OF SEA LEVEL RISE

3

DETERMINE IMPACTS OF POTENTIAL HIGH TIDES AND STORMS AT THE BROWNFIELD SITE USING THE FOLLOWING QUESTIONS:

- Based on step 2 projections, will the site experience daily flooding? Will the site be subject to flooding during a storm event?
- How might inundation, groundwater table rise and erosion affect use of the site?
- Does the site have many impervious surfaces (such as parking lots) that would exacerbate flooding?
- Will nearby assets (e.g., roads) be impacted? How might that affect use of the site (e.g., limited access)?
- How will populations in the surrounding area be affected by the impacted site (e.g., public health)?
- How will the environment in the surrounding area be affected?
- Will the salt or brackish water from sea level rise and storm surge events increase corrosion?

4

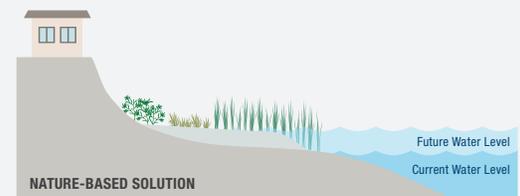
INCORPORATE FINDINGS INTO DECISIONS ON CLEANUP AND REDEVELOPMENT PLANNING.

Example adaptation strategies:

- Prioritize the cleanup process of the brownfield site to mitigate consequences from sea level rise.
- Monitor for mobilization of contaminants as sea levels rise.
- Site or relocate new buildings/infrastructure out of harm's way.
- Consider resilient uses for the site (e.g., floodable park).
- Employ nature-based solutions along the shoreline (e.g., marsh) and leave room for them to migrate inland.
- Harden the shoreline (e.g., install a seawall). Though keep in mind that practices are changing, and past emphasis on hardening has changed given the wider adoption, greater acceptance by infrastructure managers, and proven success using nature-based shorelines.
- Elevate physical improvements above projected water levels.
- Ensure proper design of drainage.
- Proactively plan, design and budget for increasingly frequent flood event operations.
- Conduct public outreach to surrounding communities about potential impacts and solicit local knowledge of historical floods.
- Coordinate with surrounding sites on adaptation.



Best practice: Consider a range and/or combination of potential strategies.



WHEN SHOULD YOU CONDUCT THIS SEA LEVEL RISE SCREENING?

- Prior to key decision points such as:
 - › Site assessment prioritization.
 - › Cleanup level determination.
 - › Reuse visioning and planning.
 - › Site design.



Tip: Early in the brownfield assessment and redevelopment process is ideal.



WHO SHOULD BE ENGAGED?



The **public**, especially in affected neighborhoods, for equitable resilience of the surrounding community.



Local and regional planning agencies, to ensure adaptation strategies at the site are compatible with city- or region-wide adaptation strategies.



Infrastructure owners (e.g., utilities) in the surrounding area who may also experience sea level rise impacts to their assets and services to the site.

WHAT ARE THE NEXT STEPS TO ADDRESS SEA LEVEL RISE?

1. Conduct follow-up studies, such as hydrologic and hydraulic modeling, that consider sea level rise and/or analysis of groundwater table rise and saltwater intrusion.
2. Select and implement adaptation strategies.
3. Monitor sea level rise impacts and performance of adaptation strategies over time.



Tip: Also consider and address impacts to the brownfield site from other climate change stressors like rising temperatures and changes in precipitation.

RESOURCES

[U.S. EPA: Climate Smart Brownfields Manual](#)
[Brownfield Revitalization in Climate-Vulnerable Areas](#)
[CREAT Risk Assessment Application for Water Utilities](#)

[Checklist: How To Address Changing Climate Concerns in an Analysis of Brownfield Cleanup Alternatives \(ABCA\)](#)