

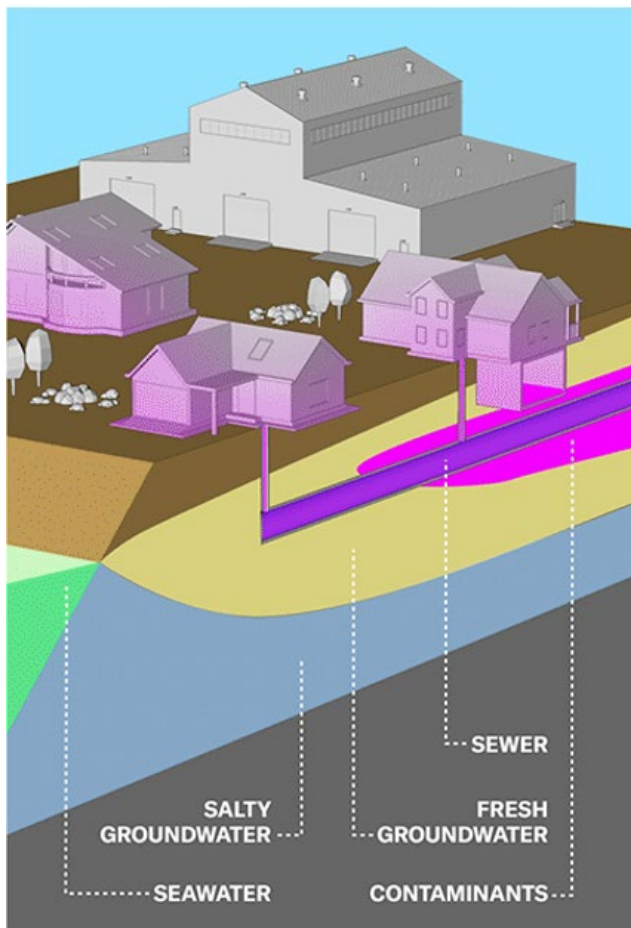


## Mapping Shallow Groundwater Response to Sea Level Rise in San Francisco Bay Shoreline Communities

**The Problem** - Shallow groundwater in low-lying coastal communities will rise as sea levels rise. This slow but chronic threat was identified as a critical data gap in climate adaptation planning by Bay Area communities and local academic, science and government experts. The issue has been the focus of news stories by [KQED](#), the [L.A. Times](#), and the [MIT Technology Review](#).

High groundwater tables occur in response to rising sea levels and heavy winter rains. Information about groundwater elevations is used in the design of roadways, foundations, utilities, and other below-grade infrastructures. As sea levels rise, this below-grade infrastructure in low-lying coastal communities may be threatened by groundwater conditions that exceed the original design criteria.

Over time, rising groundwater has the potential to damage building foundations, flood basements and other below grade structures, and infiltrate and overwhelm sewers. Ultimately it may emerge aboveground as an urban flood hazard even before coastal floodwaters overtop the shoreline.



Graphic: Courtesy of KQED

Rising sea levels in San Francisco Bay push groundwater up in coastal communities. This response can occur up to three miles from the shoreline. Rising groundwater could cause contaminants in the soil to enter homes and buildings through sewer lines and other pathways and contaminants could possibly reach the ground surface. Failure to acknowledge the threat of rising groundwater levels, particularly in low-lying, underserved Bay shoreline communities, could undermine the success of adapting to sea level rise and potentially threaten public health and the environment.

### Mapping S.F. Bay Shoreline Rising Groundwater

- To fill this gap, Pathways Climate Institute LLC (Pathways) and the San Francisco Estuary Institute (SFEI) are leading an effort to map and characterize both the existing “highest annual” shallow groundwater table elevation and its likely response to future sea level rise.

The current mapping work is funded by the California Resilience Challenge, a project of the Bay Area Council. The work builds upon a long-standing collaboration between Dr. Kristina Hill

(University of California, Berkeley), Ellen Plane (SFEI), and Dr. Kris May (Pathways). In-kind staff support and data are provided by Alameda, Marin, San Francisco, and San Mateo Counties.

Between now and August 2022, the Pathways+SFEI team will conduct local, refined mapping of the existing highest annual shallow groundwater table in the four participating Bay Area counties mentioned above. This mapping will rely on monitoring well observations reported to the State Water Resources Control Board, boring logs collected within each county's jurisdiction, and tidal water levels within San Francisco Bay and tidally influenced tributaries. It will also rely on measured, modeled, or estimated water level elevations in upstream tributary reaches, and other sources of readily available information.

**Final Product** - The mapping effort uses a Geographic Information Systems (GIS) model to represent the existing highest annual shallow groundwater surface. This is then reviewed and ground-truthed by the respective county and participating cities within the study area. When the ground-truthing effort is complete, maps of future condition highest annual groundwater table elevations will be developed and paired with existing sea level rise inundation maps.

With additional funding, a final product will be available to the public via a web-based mapping tool called the [Bay Shoreline Flood Explorer](#). This mapping tool, created by SFEI, is posted on the website of the Bay Conservation and Development Commission (BCDC).

By approximately August 2022, a public report will be issued with study findings and relevant caveats. It will be posted on the SFEI and Pathways websites. The GIS geodatabases of the existing and future condition groundwater mapping, and associated metadata, will also be made available for download.

***The Pathways+SFEI team will not provide any public statements regarding our findings until the study and report are complete.***

**Future Possible Efforts** - Pathways+SFEI, BCDC, and other regional agencies are actively collaborating to identify funding to complete additional studies to enhance regional adaptation and support further communication regarding the potential risks associated with rising groundwater.

#### **Efforts identified but not currently funded**

- Existing and future condition groundwater mapping in the remaining five Bay Area counties: Contra Costa, Napa, Santa Clara, Solano, and Sonoma.
- Incorporating the S.F. Bay groundwater mapping within the BCDC Bay Shoreline Flood Explorer.
- Analysis of known contaminated sites within the study area under the regulatory authority of the Regional Water Quality Control Board and/or the California Environmental Protection Agency Department of Toxic Substances Control
- Analysis of the potential for rising groundwater to mobilize contaminants.
- Outreach and messaging to support communities at highest risk of impacts related to rising groundwater, including vulnerable communities already facing other environmental and climate impacts.

#### **Citation**

Pathways and SFEI (estimated 2022). Shallow groundwater response to sea level rise in the San Francisco Bay Area: existing and future conditions. Pathways Climate Institute LLC, San Francisco CA and San Francisco Estuary Institute-Aquatic Science Center, Richmond CA.