Rincon's Groundwater Screening Tool:

An Innovative Way to Evaluate Climate Change-induced Groundwater Rise on Coastal Areas and Contaminated Sites

Our innovative GIS-based tool helps cities and agencies assess how rising coastal groundwater could reactivate contamination at vulnerable sites, informing smarter resilience planning and environmental justice outcomes.

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What's Inside?

- **Understanding Groundwater Rise:** How climate change is altering subsurface conditions and increasing risks to public and ecological health.
- **The Groundwater Rise Tool AdvAntage:** Rincon's data-driven method for identifying and prioritizing contaminated sites vulnerable to groundwater rise.
- **Real-World Application:** A case study from a Confidential City showcasing how the tool informs land use, equity, and climate adaptation strategies.

Climate Change-induced Groundwater Rise

What Is Groundwater Rise?

Groundwater rise in coastal areas is a growing concern linked to climate change. Global temperatures are increasing due to greenhouse gas emissions from post-industrial human activities. As a result, glaciers and ice sheets melt, and ocean waters expand through thermal warming, contributing to sea level rise. This can elevate coastal groundwater levels, especially in low-lying shoreline areas (Figure 1). Rising groundwater may inundate some coastal environments, some of which are impacted by subsurface contamination from past industrial and commercial land uses.

Why Are Contaminated Sites of Concern?

As sea levels rise, rising groundwater can potentially mobilize contaminants in groundwater, soil matrix, and soil vapor at contaminated sites and potentially lead to new public health hazards and impact natural resources. The rising groundwater can dissolve contaminants into groundwater, and those contaminants can be transported with groundwater movement (i.e., groundwater gradients). Further, preferential flow of contaminated groundwater can be influenced by utility trenches and historical creeks that were developed over.

As redevelopment continues to support the housing needs in California, many former industrial and commercial areas are being

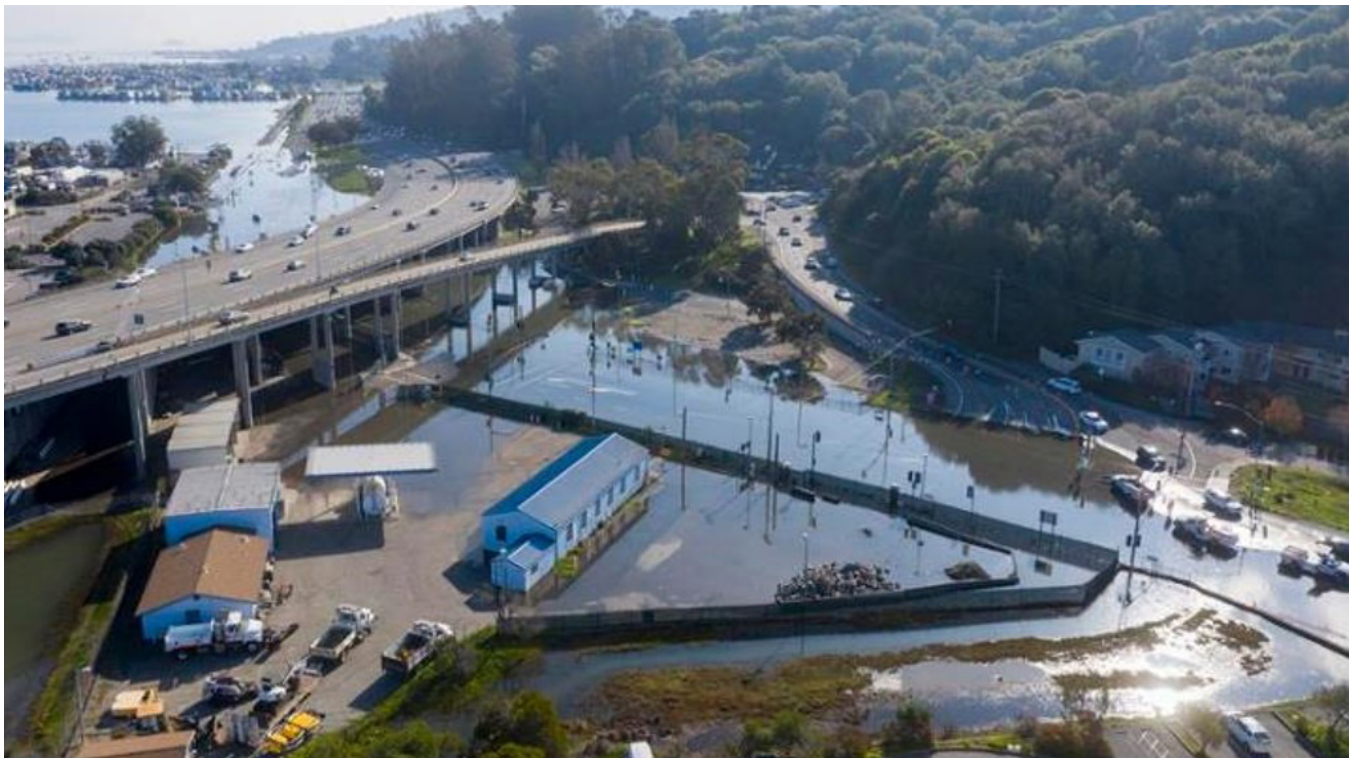
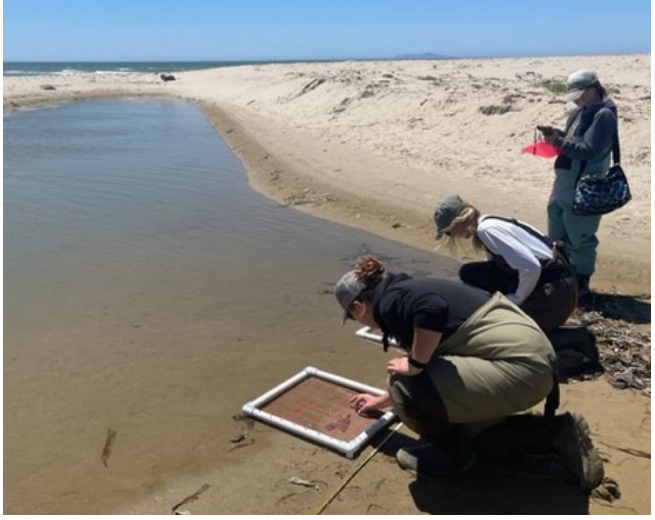


Figure 1: Sea Level Rise in Low-lying Shores

developed into mixed use or residential housing. As a result, understanding current and future risks needs to be clearly understood to protect human and ecological health and to avoid exacerbating contamination exposure as groundwater elevations increase from sea level rise.

It is also important to understand that contaminated sites that have been previously assessed and/or remediated and are now closed by an oversight agency can still lead to impacts to human and ecological health impacts. While regulatory closure of a contaminated site typically assumes stable site conditions, it often does not account for climate-driven changes such as groundwater rise. Therefore, it is important for municipalities to understand how rising groundwater can change the sub-surface conditions that may lead to human and ecological impacts under current and future land uses. Addressing these potential issues requires coordinated efforts to evaluate the risk and prepare adaptation solutions.

Another consideration is the potential for environmental justice communities to experience increased exposure to contaminants as groundwater rises. These communities are often located near industrial sites due to historic zoning practices and systemic inequities in land use planning, which exacerbates environmental and health impacts as subsurface conditions change.



Prioritizing Sites of Concern - A Tool for Resilience Planning

Rincon's Screening Tool

Combining Rincon's expertise in coastal adaptation and resilience evaluation, environmental site assessment, equity screening, and spatial evaluation using geographic information systems (GIS), Rincon created a Groundwater Rise Screening Tool (GRS Tool). The GRS Tool combines information for contaminated site inventories, current groundwater levels, and projected future groundwater levels based on various sea level rise scenarios. The GRS Tool takes this information and prioritizes sites that pose the most significant risk to impacts to human and ecological receptors as a result of current and future conditions under different sea level rise scenarios.

How Is Our Tool Useful?

This easy to interpret GRS Tool identifies areas where risks to human and ecological receptors may currently exist and areas where risk changes into the future due to groundwater rise. This information can be used by cities, port districts, counties, and developers to

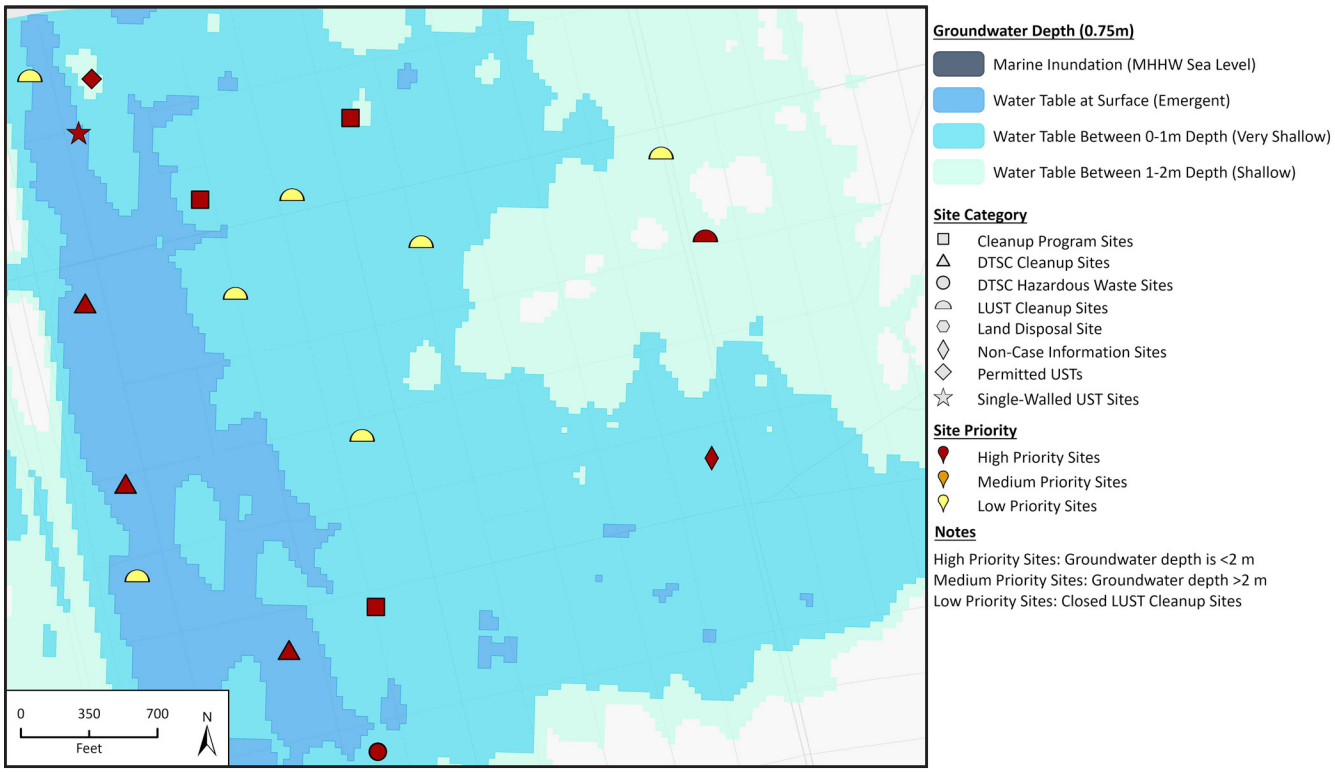


Figure 2: Contaminated Sites Identified by GSR Tool

consider mitigation measures for capital improvements projects adjacent to or near high priority contaminated sites to reduce potential exposure of contaminants to human and ecological receptors.

Case Study

Rincon is currently updating a confidential client's (City) Safety Element and creating a new Environmental Justice Element of the General Plan. The General Plan serves as a guide for all policies, programs, and decisions related to how land is used. As part of this effort, Rincon conducted an analysis using the GRS Tool to identify sites of concern where groundwater rise may put current or future sites at risk of contamination, and are assisting the City in developing strategies to mitigate this impact.

Findings

A total of 427 contaminated sites were identified within the City limits using the GeoTracker and EnviroStor databases. Rincon used the site categories in the GeoTracker database to group the contaminated sites and rank the sites based on current and future risk under different (Sea Level Rise) SLR scenarios. Under current conditions, of the 427 contaminated sites within the City (open and closed), 100 are ranked as high priority, 100 as medium priority, and 227 as low priority (closed LUST sites) (Figure2). Under projected SLR scenarios, only two sites changed from medium priority to high priority. Based on this analysis, Rincon was able to provide the City prescriptive recommendations to minimize current and future risks as a result of groundwater rise near coastal areas.

To better understand the implications of these findings, the City overlaid its designated priority census tracts (areas identified as having high cumulative social vulnerability) onto the contaminated site and groundwater rise analysis. This spatial overlay revealed where communities facing social vulnerability are most at risk from the mobilization of contaminants due to rising groundwater levels. A handful of census tracts emerged as areas of concern, where shallow groundwater depths intersect with high-priority contaminated sites and populations already burdened by systemic inequities. This approach enabled the City to identify where environmental and social vulnerabilities compound, helping to guide future mitigation strategies, targeted engagement with affected communities, and investments toward protecting the health and safety of communities most at risk.

Applicability in Urban Planning and Resilience

Rincon's GRS Tool has provided critical information that allows the City to manage current and future risks related to subsurface contamination and SLR. Specifically, Rincon's GRS Tool can support cities, counties, public agencies, and developers with:

- **Land use planning to inform decisions on appropriate future use of land and/or necessary mitigations to minimize health and environmental justice concerns**
- **Capital improvement projects, such as installation of engineered trench dams, elevating infrastructure, or retrofitting utility systems, that can be designed and constructed to reduce future risks as a result of SLR**

- **Understanding potential impacts to beneficial use of groundwater and surface waters**
- **Prioritize cleanup efforts of high priority sites**

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Rincon Consultants has **30+** years of experience in California's regulatory environment, helping agencies and clients respond to new climate and environmental regulations.

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