

INTRODUCTION TO THE ADAPTING TO RISING TIDES EXISTING CONDITIONS AND STRESSORS REPORT

The Adapting to Rising Tides (ART) project evaluated the current condition of shoreline and community assets, and the stressors affecting them, because understanding existing conditions and stressors can inform an understanding of individual asset resilience (or lack thereof) to projected climate impacts, including sea level rise and storm events. Stressors can also provide information on current and future trends and how those trends may affect resilience. The existing conditions and stressors were analyzed and summarized for each asset category included in the ART project assessment. This analysis served as a foundation for the ART vulnerability and risk assessment, which examined asset exposure to five potential climate impacts, sensitivity of assets to these impacts, and the ability of assets to accommodate or adjust to these impacts with little financial or structural intervention.

The following Existing Conditions and Stressors report chapter includes:

- a definition of the asset category;
- a synthesis of information about current conditions and stressors; and
- discussion of these conditions through the lenses of sustainability organized by society and equity, environment, economy and governance.

The complete ART Existing Conditions and Stressors Report is available at the ART Portfolio website.

STORMWATER INFRASTRUCTURE

I. Definition

Stormwater runoff is generated when precipitation from rain and snowmelt flows over land or impervious surfaces and does not percolate into the ground (US EPA). The stormwater runoff collects in urban storm drains and eventually empties into creeks, waterways and waterbodies. Unlike Alameda County’s wastewater, which is cleaned at wastewater treatment plants before being discharged into San Francisco Bay, stormwater does not receive the same level of treatment. Aside from a basic sump that collects coarse-grained sediment, and grates that collect trash and other debris, once inside the storm drainage system, stormwater carries a host of pollutants including oil and grease, metals, bacteria, nutrients, and suspended solids into creeks and eventually San

Francisco Bay (Alameda Local Agency Formation Commission, 2005). Most of the stormwater from the cities within the ART project area drains from city-owned and maintained storm drains into the Alameda County flood control system, which consists of managed creeks, culverts, and channels. The exception is the City of Alameda, all of their stormwater drains directly to the Bay. Stormwater management and flood control differ in both the scope and in provider type;

in Alameda County, cities provide stormwater services (and the County in unincorporated areas), while the Alameda County Flood Control and Water Conservation District (ACFCWCD) provides regional flood control services.



Pre-treatment of stormwater by vegetated swales helps reduce pollutants before runoff reaches flood control channels and ultimately the Bay. Source: City of El Cerrito.

II. Locations and Physical Features

Stormwater infrastructure consists of storm drains that collect urban runoff from city streets and underground pipes that carry stormwater to regional flood control channels (see Figure 1). Stormwater services include direct maintenance, preventative maintenance, regulatory activities, and pre-treatment services.

- Direct maintenance services include removal of blockage from storm drainage and piping, cleaning stormwater inlets and basins, and repair of stormwater infrastructure. The ACFCWCD also performs direct maintenance work on its regional flood control facilities, into which stormwater eventually empties.

- Preventative services include street sweeping and inspection of inlets.
- Regulatory activities involve public outreach and education, industrial and commercial discharger permitting and inspections, development of source controls and site design for development projects, and inspection for illicit wastewater discharge. Much of this work is performed by the Alameda Countywide Clean Water Program, a collaboration of the county and all its cities to implement and enforce the provisions of the federal Clean Water Act.
- Pre-treatment involves methods to prevent polluted runoff from entering the storm drain system. These methods, which collectively are often referred to as “low-impact development” methods, include vegetated swales, surface sand filters, retention ponds, bioretention units, rain gardens, gravel wetland units, porous asphalt pavement, tree box filters, and other devices meant to naturally filter runoff pollutants *before* they enter the stormwater system. Pre-treatment is a key step in cleaning stormwater runoff before it is collected into storm drains and is a major requirement under Alameda County’s stormwater discharge permit.

Most of the runoff in the ART project area flows from the storm drain system into ACFCWCD flood control channels and eventually to San Francisco Bay. Only the City of Alameda discharges all of its stormwater directly into the Bay, bypassing the flood control district’s waterways (see Figure 2 and Table 1).

Figure 1. Overview of Urban Stormwater Infrastructure

Source: Adapted from www.lastormwater.org/siteorg/general/las-trmdrn.htm



Figure 2. Map of Stormwater Infrastructure in the ART Project Area

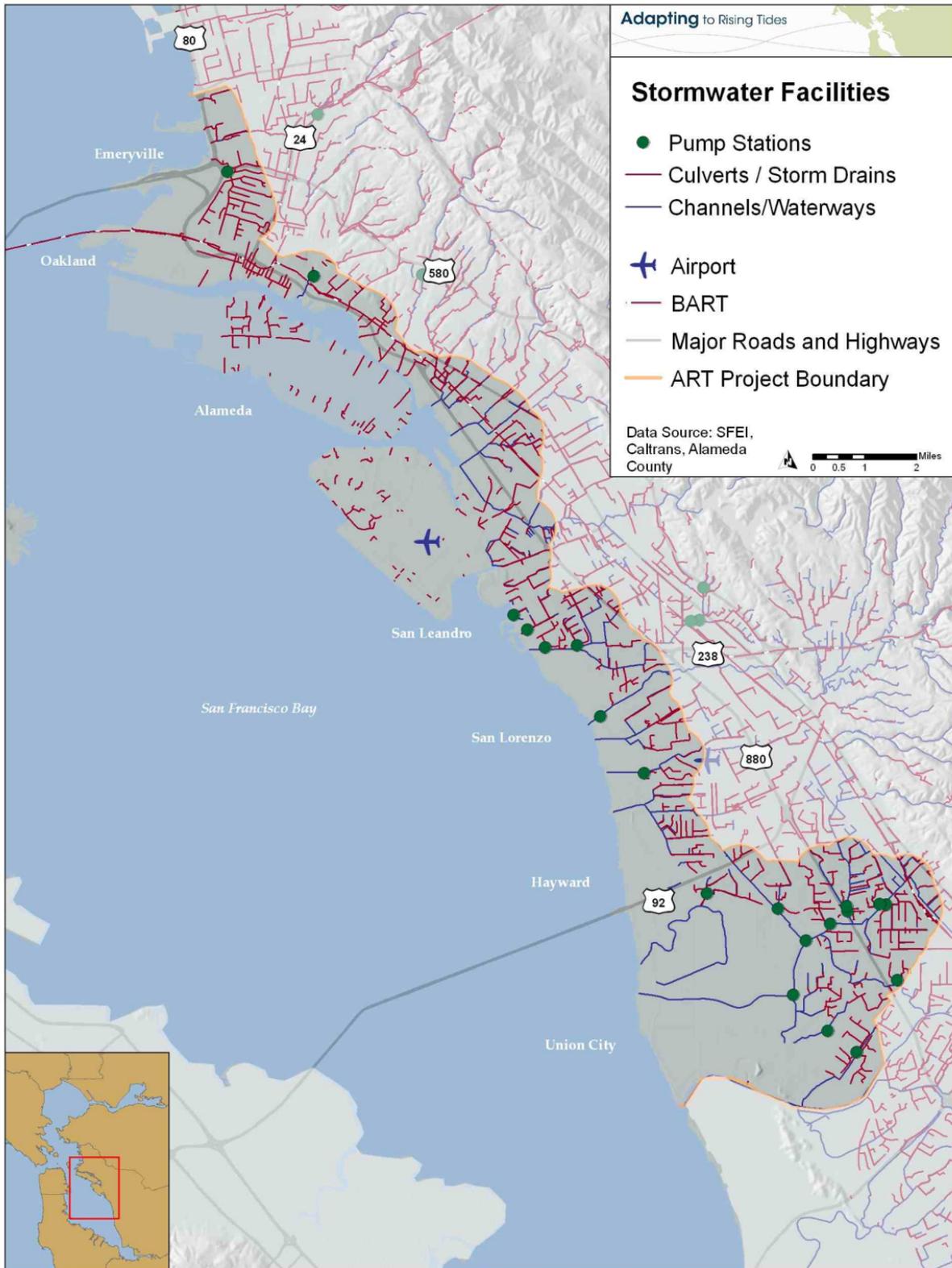


Table 1. Overview of Stormwater Drainage Systems in the ART Project Area

Area	Description
Alameda	Pipes and channels flow directly to San Francisco Bay.
Emeryville	Storm drains flow to channels and Temescal Creek and to the San Francisco Bay.
Hayward	Flows through storm drains, pipes, channels, and natural creeks including Sulphur, Ward, Ziele, and Alameda Creeks to San Francisco Bay.
Oakland	Several creeks generally flow in a southwesterly direction from the hills down to developed areas and to San Francisco Bay through culverts, channels, and creeks including Sausal Creek, Peralta Creek, Lion Creek, Arroyo Viejo, and Elmhurst Creek.
San Leandro	Pipes, Estudillo Canal, Corvalis Canal, San Leandro Creek, and San Lorenzo Creek carry water to San Francisco Bay.
Union City	Storm drains, pipes, and channels drain to Alameda Creek, Dry Creek, and San Francisco Bay.
Alameda County	The Flood Control District and the County Public Works Department manage the storm drains, which flow to the flood control system.

Source: Alameda LAFCo.

III. Governance and Regulatory Requirements

Stormwater infrastructure in the ART project area is owned and maintained by the municipalities, with service boundaries coterminous with the municipalities' respective city limits (Alameda LAFCo). Only Emeryville outsources its street sweeping and inspection services. The cities are responsible for maintenance of their stormwater facilities, including storm drains, underground pipes, and local channels. All of the cities regularly inspect and clean their stormwater infrastructure. ACFCWCD is responsible for the maintenance and upkeep of creeks and other flood control channels within each city.

The Clean Water Act (CWA) is the primary federal law that regulates stormwater management. Adopted in 1972, CWA requirements have subsequently become more stringent. To reduce runoff pollution, the CWA directs states to adopt and enforce water quality standards, to establish maximum allowable pollution levels for water bodies called TMDLs (total maximum daily loads), and to monitor and regulate discharges into water bodies through the establishment of National Pollution Discharge Elimination System (NPDES) permits. In California, the State Water Resources Control Board (Water Board) has overall responsibility for water quality and the authority to regulate point source discharges, such as municipal stormwater discharges, and the administration of NPDES permits. The SWRCB delegates the responsibility to its regional boards. The San Francisco Bay Regional Water Quality Control Board (Regional Board) is the agency in charge for water quality permitting activities for the ART project area. Each of the cities and certain industries known to contribute to stormwater runoff pollution are regulated by NPDES permits. In Alameda County, each of the 14 cities, the unincorporated area and the two flood control districts all share one NPDES permit through a

consortium of 17 agencies called the Alameda Countywide Clean Water Program (ACCWP). ACCWP has been issued NPDES municipal stormwater permits since 1991. The NPDES permits outline the requirements that jurisdictions must adhere to for the improvement and protection of water quality within their jurisdictions (Alameda County Public Works Agency, 2005). The NPDES Permit provides requirements and standards for categories such as municipal maintenance, public outreach, illicit discharge controls, industrial and commercial discharge controls, and new development discharge controls. For example, as part of its compliance with the NPDES permit, the City of Emeryville requires new and redevelopment projects on lots greater than 10,000 square feet to incorporate Best Management Practices (BMPs) to minimize discharge of pollutants to the storm drain system (City of Emeryville, 2005). These BMPs are listed in the State of California’s Stormwater Best Management Practices Handbook and include detention/retention ponds, wetlands, vegetated swales, sand filters, and other impervious surfaces. Stormwater regulations for unincorporated Alameda County require vegetated swales, filters, and wetlands to be sized and engineered to ensure that runoff is treated from a rain event of 0.2 inches per hour in intensity (Alameda County, 2004).

IV. Existing Stressors

The ability to convey, treat and discharge stormwater is affected by the amount of precipitation, pervious and impervious surfaces, and the overall condition of infrastructure (Alameda LAFCo). Rainwater can be dispersed by infiltration into the soil, reducing the volume and intensity of runoff into local creeks and channels. However, the amount of rainwater infiltrated decreases dramatically by the expansion of impermeable surfaces such as paved streets, sidewalks, driveways, building footprints, and parking lots.

While most cities have facilities that are in fair to good condition, some cities’ systems either are very old or have insufficient capacity to handle current peak flows. Future population growth and the associated urban development or redevelopment can increase the demand on stormwater services. This increased demand will likely translate into not only additional conveyance capacity, but the need for detention, retention and water quality treatment.

V. Economy

All of the cities within the ART project area, except Emeryville and Oakland, levy service charges and assessments to finance stormwater services (Alameda LAFCo). The city of Alameda also levies a stormwater-related development impact fee on construction projects. General fund revenues are used to supplement the fees and assessments charged to residents or as the sole source of financing. Assessments used by some cities to finance stormwater service are based on the square footage of impervious surface or parcel size; however, the Cities of San Leandro and Union City charge a flat rate for residential property, regardless of size. The assessment rates may differ between residential and commercial properties. In Alameda County, the average city receives approximately \$35 per parcel in assessments and the unincorporated area assessment is only \$7 per parcel. In all cases, the amount is eroded over time by inflation and increasing costs of complying with new regulatory requirements.

- **Alameda:** The city finances stormwater service primarily with stormwater assessments. Although stormwater assessments are inflation-indexed, they do not fully cover service costs, leaving a small portion of stormwater costs to be financed by general fund revenues.
- **Emeryville:** The city finances stormwater service with general fund revenues, and does not levy a stormwater assessment.
- **Hayward:** The city charges a stormwater assessment. The assessment is calculated by multiplying parcel size (square feet) by run-off factor. The charge for an average single family home is \$28.56. There is a higher rate for commercial or industrial properties.
- **Oakland:** Stormwater services are financed by sewer fund assessments and a general fund. There is currently no stormwater assessment, but the city plans to pursue a ballot measure in the near future for stormwater assessments.
- **San Leandro:** Primary funding comes from stormwater assessments, with some general fund support. Residential assessments are a flat fee levied per unit. An average single family home is assessed \$26.33. Non-residential rates are calculated by parcel size (acres).
- **Union City:** The primary funding source is a stormwater assessment fee. Residential properties are charged a flat fee, while commercial and industrial properties are assessed a percentage of their solid waste charge.

The most significant constraints on the financing of stormwater services are legal requirements that limit property taxes and require voter approval of new taxes and tax increases. Several cities do not levy stormwater assessments and instead finance services from their general funds. Stormwater assessments are considered property-related fees under California’s Proposition 218, and are subject to two-thirds voter approval requirements for imposition of new or increased assessments.

VI. Equity and Environment

Equity is a large concern in the financing of stormwater infrastructure. Flat fees are regressive financial burdens that will typically affect poorer homeowners more than wealthier families. Local governments may decide to tier their fees on the basis of property value, or grant waivers to those who are less able to pay, in order to create a more progressive financing structure (University of South Carolina, 2007). Other ways to tier finance systems are on residential lot size, with larger residential lots paying more than



During heavy rains runoff can quickly overwhelm aging, undersized, or poorly maintained stormwater infrastructure. Source: US EPA.

small lots. A fee can also be tiered so that those with more impervious surfaces pay a greater amount.

Older neighborhoods within the ART project area are home to low-income communities. These areas have older infrastructure that is more susceptible to leaking and breaking, which increases the likelihood and risks of flooding (US EPA, 2011). Older infrastructure is not designed to handle heavy rainfall in addition to growing urban populations and industrial discharges. As a result, stormwater can overflow from storm drains into waterways, or back up into city streets or basements of homes.

Lastly, stormwater runoff from urban streets and construction sites can carry pollutants such as sediment, metal, oil and grease, acid, chemicals, toxic materials, and industrial waste into surface waters, threatening public health and environmental quality.

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