



STORM WATER STRATEGIC PLAN 2023-2028

August 2023



Mayor's Message



Rick Blangiardi
Mayor of Honolulu

This Storm Water Strategic Plan comes at a pivotal time for the City and for environmental services on O'ahu. We must make sound, future-oriented investments to meet the challenges of climate change and protect the quality of the waters we treasure.

This Strategic Plan sets a vision for the future, guides long-term decision making, and increases transparency. It will become part of the ongoing conversation about how the City can best protect health, enhance economic opportunities, and protect natural resources. This Plan also recognizes that sustainable and sufficient funding for storm water services is a critical need to implement this vision.

With continued leadership from the Department of Facility Maintenance Storm Water Quality Division, which has done an exemplary job in coordinating and leading City storm water services, this Plan offers a path forward to a more sustainable and resilient future for our island and its waters.

Department of Facility Maintenance



Gene Albano
Director & Chief Engineer

The Department of Facility Maintenance (DFM) is proud to present the inaugural Storm Water Strategic Plan to guide and prioritize City storm water investments and programs. This Plan provides a road map to proactively address critical storm water needs, renew our aging systems, anticipate and reduce climate change impacts, and address localized flooding.

City storm water services are a shared responsibility among various departments. The City-wide implementation of the Plan will require everyone's involvement.

Preparation of this Strategic Plan came about through active public participation and ensures that our efforts are truly in service of the community's wants and needs.

On behalf of the DFM Storm Water Quality Division, mahalo to the many partners, community members, and City staff whose insights, feedback, and knowledge helped shape the Plan. We look forward to continuing this active and meaningful public participation to make the vision a reality.



Table of Contents

Executive Summary	1
Introduction	3
City Storm Water System	3
Long-Term Planning.....	5
Listening to the Community	6
Conditions, Trends, & Opportunities	7
O`ahu's Geography	7
Community Context.....	10
Climate Change & Sea Level Rise	13
Natural & Cultural Environment.....	14
Fresh Water & One Water Initiatives	16
Funding Sources & Constraints	17
Regulatory Requirements	19
Technology	19
S.O.A.R. Analysis	20
Strategic Direction	21
Measuring Progress	31
Moving Forward	32
References Abbreviations & Definitions	33



Executive Summary

As an island community we value our streams, beaches, and ocean waters for the recreation, sustenance, and health benefits they provide. The health of our waters depends directly on the stewardship of our 'āina. Managing storm water as a resource, and reducing its adverse impacts, has direct and tangible benefits for our waters and communities.

The Department of Facility Maintenance (DFM) of the City & County of Honolulu (City), in collaboration with other various City departments and stakeholders, has principal responsibility for managing storm water on O'ahu, including programs that install and maintain drainage infrastructure, public education, water quality monitoring, and ongoing compliance with federal and state regulations.

For nearly 30 years, the City has fulfilled its obligations under the conditions of its federal and state permits. However, the community and City have more holistic and long-term goals for O'ahu's waters and stewardship than simple compliance. This first-ever Storm Water Strategic Plan articulates a guiding vision for storm water programs and investments, charting a more specific and measurable path forward.



Components of the Strategic Plan

Introduction describes O’ahu’s storm water system, the long-term planning efforts the City is undertaking, and community feedback gathered during the stakeholder engagement process.

Conditions, Trends, and Opportunities describes the larger environmental, community, regulatory, and economic context that have a bearing on storm water investments and actions.

Strategic Direction ties the storm water program’s mission, vision, and eight long-term goals to the short-term strategies that will be used to accomplish them.

Measuring Progress outlines how the Strategic Plan will be evaluated periodically using specific measures and an adaptive management approach to adjust the program based on progress made.

The City's long-term vision for storm water management presented in this Plan will ultimately guide the development of a Storm Water Master Plan with specific infrastructure investment and island-wide operation implementation plans.

Vision

The storm water program is innovative and proactive. It continually maintains and improves the City's built and natural storm water systems through the application of technology and best practices. With continuous workforce development, its engaged and creative staff are leading by example, and responding effectively to community needs, concerns, and ideas.

LONG-TERM GOALS



Introduction

The Department of Facility Maintenance Storm Water Quality Division (DFM SWQ) is responsible for leading the City's storm water program. In all, 11 City departments are involved in providing essential services and maintaining compliance with federal, state, and local directives and regulations.

The City and County of Honolulu has legal and financial responsibility under the Federal Clean Water Act (1972) and Hawai'i law, to steward the island's extensive system of storm water infrastructure, including maintaining the 100 streams and stream sections that are publicly-owned. The City has achieved continuous compliance with its National Pollutant Discharge and Elimination System (NPDES) permit conditions since the permit first took effect in 1994.

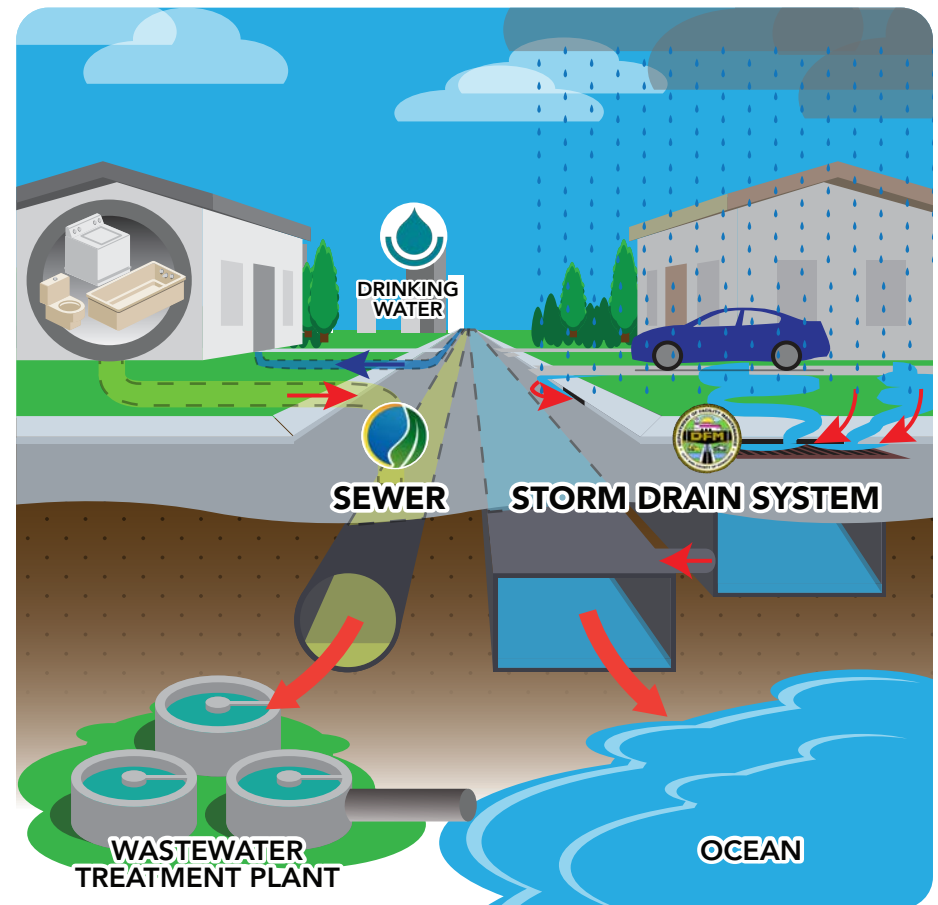
City Storm Water System

The City maintains a complex drainage system that is separate from the drinking and wastewater systems. Water from the storm drain system flows relatively untreated to our streams and ocean waters.

The City maintains nearly 28,000 catch basins and over 1,100 miles of closed (piped) and open (culverts, swales, channels and streams) storm water infrastructure that comprise its storm water system. The City also conducts erosion repair, maintains swales and ditches along City roads, opens beach mouths and cleans up encampments (since trash and waste have direct impacts on the storm water system).



The City manages nearly 28,000 catchbasins and over 1,100 miles of infrastructure, including piped systems.



Introduction

The collective annual cost of the storm water program is approximately \$97 million. The program consists of over 300 full-time equivalent City staff, plus supporting consultants, who inspect construction sites, provide outreach to businesses, conduct street sweeping, perform stream maintenance, repair and clean drains and pipes, test water quality, and engage the public through volunteer programs and community events.

Most City resources have been directed towards maintenance of the closed system in the more highly populated urban areas in order to meet specific requirements in the NPDES permit. This Strategic Plan recognizes the need for and importance of addressing open drainage systems in rural areas, as well as urban systems.

In addition to the City's systems, federal, state, and private entities own and operate smaller separate storm water systems on O'ahu. Many of these tie into the City's systems.



Adopt-a-Channel volunteers cleaning a stream



City stream cleaning operations



Vactor truck cleaning storm water manhole



City beach mouth opening

Long-Term Planning

O'ahu residents recognize the importance of storm water management and have consistently expressed interest in a plan and vision for long-term investment. At present the City prepares a Storm Water Management Program Plan as a requirement of their Clean Water Act NPDES Permit every five years. Smaller scale plans are also prepared in response to State and City initiatives.

The Storm Water Strategic Plan provides the foundation and vision for future Storm Water Management Program Plans and the Storm Water Master Plan, hereafter referred to as the "Master Plan", to be prepared at a future date. This Master Plan will guide City resource allocations to achieve long-term storm water management goals over the next 50 years.



Storm water planning serves future generations

Specific component plans will be created under the Master Plan to address needed storm water initiatives not covered under the NPDES permit and Storm Water Management Program Plan such as local drainage and green storm water infrastructure, workforce development, asset renewal and replacement, regional flooding and watershed management, and partnership opportunities.



Listening to the Community

The Storm Water Strategic Plan reflects the insight and feedback of community members, City employees and partners who participated in an extensive stakeholder engagement process.

Preparation of this Strategic Plan stemmed directly from community meetings held in 2019 and early 2020 on the Storm Water Utility, at which participants repeatedly asked: "What's the overall vision?"

Community meetings for this Strategic Plan were held virtually in May and June of 2021 to gather input on long-term plans for storm water management across O'ahu.

Using an online survey, responses were collected on storm water values, vision, and potential investments. Key survey results are presented on this page.

Introduction

Community Visions for Neighborhood Investment: Overall Themes

Primary Theme: Flooding

Across the island, majority of respondents indicated that addressing issues of flooding is of primary importance.

Secondary Themes:

- Basic compliance ('Ewa, Central O'ahu)
- Water supply (Central O'ahu)
- Equity (Wai'anae)

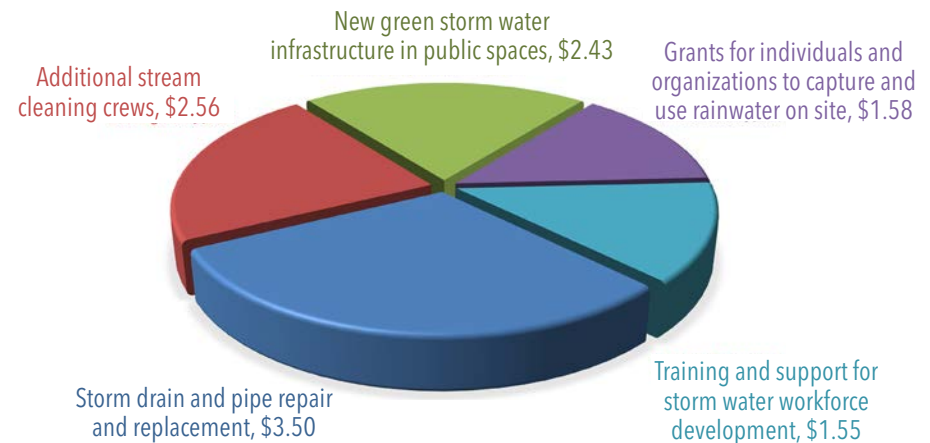
Community Storm Water Values

Survey respondents placed a relatively high importance on all listed storm water management values. Average ratings for each value are provided below (based on a scale of 1-5).

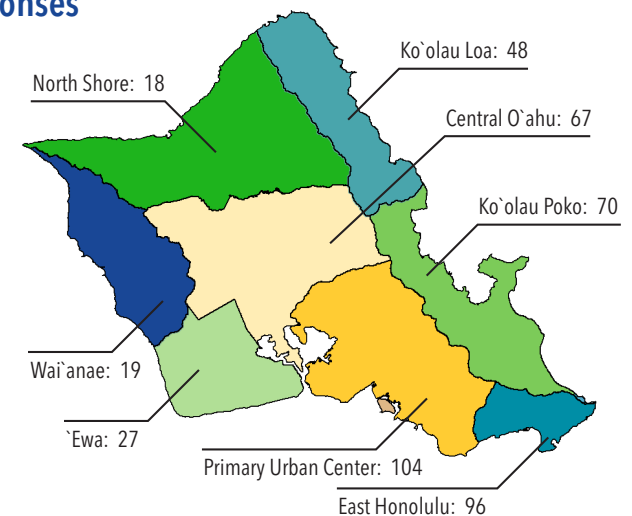
Water Quality	4.6
Financial Strength	4.5
Climate Resilience	4.4
Workforce Development	4.4
Partnerships & Collaboration	4.1
Watershed Approach	4.1
Addressing Infrastructure Needs	4.1
Public Engagement/Awareness	3.9
Flood Prevention & Public Safety	3.7
Accountability & Transparency	3.6
Equity for Underserved Communities	3.4

Storm Water Investing Strategies: How Would You Allocate \$10?

While asset renewal and replacement did not emerge as a major theme for neighborhood investment, responses to this question acknowledged the importance of storm water pipe repair and replacement.



Survey Responses Total: 449



Conditions, Trends & Opportunities

This section gives a general overview of the conditions, trends, and opportunities that can impact O'ahu's storm water system and inform the development of actions, tools, and strategies to manage storm water.

O'ahu's Geography

O'ahu's geography presents unique challenges for the management and maintenance of its natural and man-made storm water infrastructure.

Populated Areas: Urban and Rural

O'ahu's highly developed urban and suburban regions are home to the majority of the island's population. These areas have continuous impervious cover which generates large volumes of storm water runoff when rainfall is unable to soak into the ground and creates the need for storm water infrastructure. This

runoff can contain chemicals, sediments, particulates, pathogens, trash, and other debris. The storm water drainage system has been developed to convey water during storms but not to filter pollutants.

Rural areas typically have less development and impervious cover and more natural features which allow storm water runoff to be directed into the ground or stream channels. Runoff from rural areas can contain the same types of pollutants as highly-developed urban regions, although they are smaller in

quantity. Storm water concerns in rural areas tend to center on excessive sedimentation of streams and nearshore waters.

Rainfall Patterns: Leeward vs. Windward

Leeward areas experience periodic episodes of heavy rainfall, while windward areas tend to receive regular, sometimes daily, rains due to the northeasterly trade winds. Although day-to-day weather conditions may vary by geographic area, all residents need to have a functioning storm water system, especially for large storm events affecting the entire island.



Ala Wai Boat Harbor, Waikiki

Conditions, Trends & Opportunities



Ko'olau Mountains

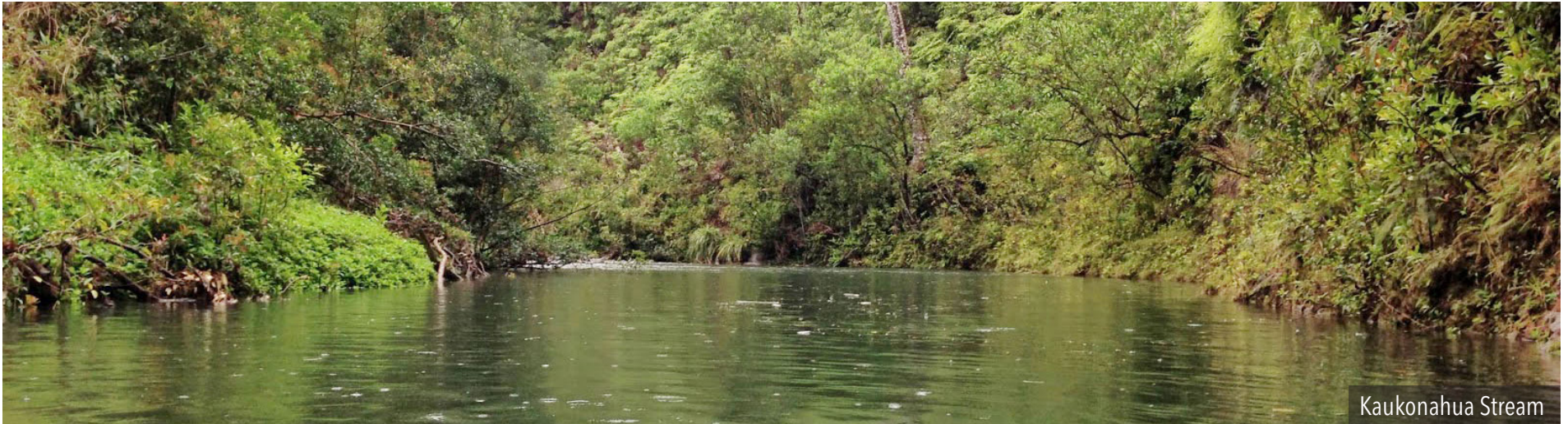
Mauka Areas

Upper (mauka) watershed areas are typically conservation lands with little to no potential for development; however, they can impact streams and nearshore waters when large quantities of sediment erode during storm events. The state Department of Land and Natural Resources (DLNR) has the authority to manage conservation lands through the administration of regulations and permitting. The state also owns significant portions of the upper watershed and is responsible for management activities in these areas.

The City's primary focus and responsibilities are in the lower (makai) portions of the watershed, where the City has authority to regulate storm water management through rules and ordinances. Recognizing the connection between the mauka and makai portions of our watersheds, the City has implemented small-scale projects to mitigate impacts of runoff in places under its jurisdiction.

There are many opportunities for greater collaboration among public agencies, City departments, and private entities to address both mauka and makai issues with a holistic watershed approach. This is further discussed in the Natural and Cultural Environment section.

Conditions, Trends & Opportunities



Kaukonahua Stream

Streams

Streams connect O'ahu's mauka conservation areas with rural and urban areas. Water quality in streams is affected by the runoff that drains into them from surrounding lands. This runoff can include sediment from rainwater running across bare soil and the erosion of stream channels.

The volume of storm water entering streams, particularly during large storm events, can cause flooding. In some cases the flow of storm water into the ocean is restricted by unmaintained beach mouths.

According to City ordinance, stream maintenance is the responsibility of each stream owner. Streams are typically owned by a combination of City, state, and private individuals and organizations. This complicated patchwork of ownership is one of the primary challenges for achieving consistency and continuity in stream maintenance. In addition, many private stream owners are either unaware of their responsibilities or unable to execute them. Government entities, including the City, have been challenged by a lack of resources to conduct regular maintenance on the streams under their ownership.



Stream cleaning operations 01/20/24

Conditions, Trends & Opportunities

Community Context

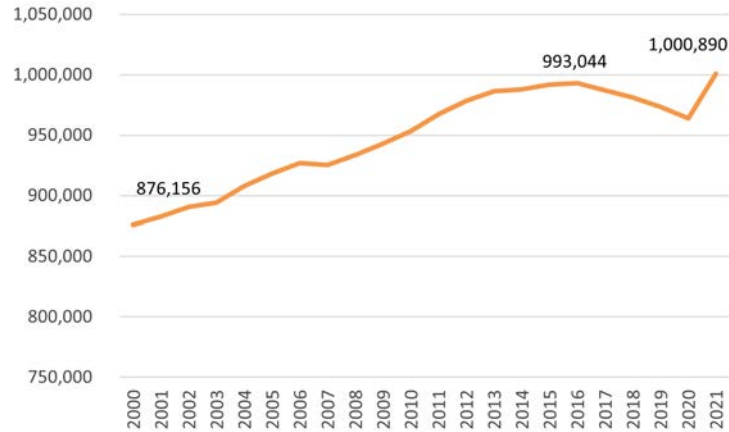
Trends in O’ahu’s development, population, labor force, and public funding for the storm water program illustrate the changing needs of the storm water system, and identify potential opportunities. Understanding these trends is essential for future storm water planning.

Population



The total number of residents in the City and County of Honolulu has grown by roughly 12 percent since 2000. The population recently rebounded from a significant dip in 2020 and peaked in 2021 at 1,000,890 residents.

City & County of Honolulu Population, 2000 - 2021



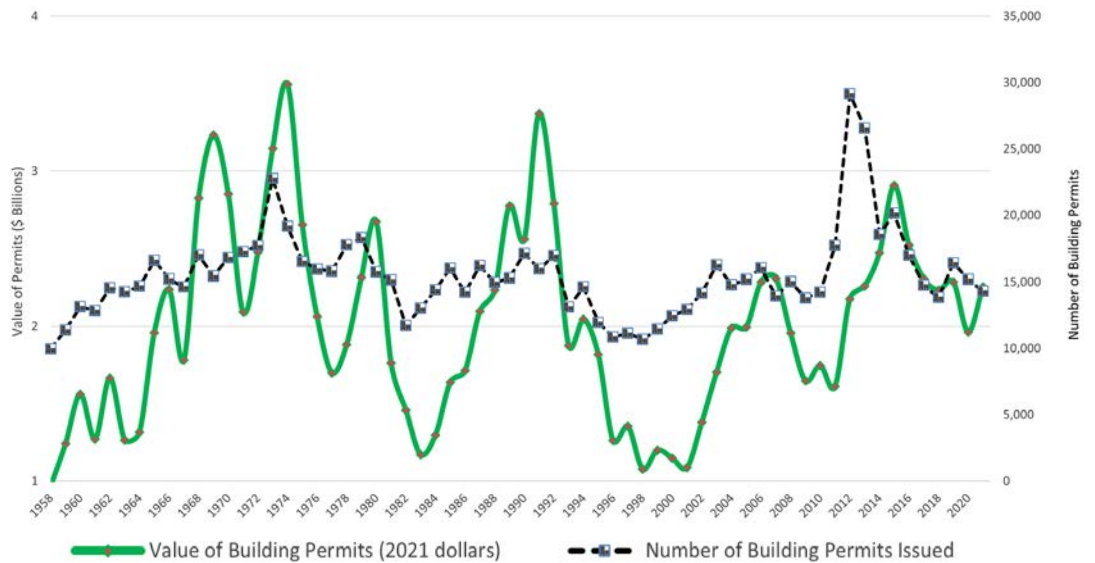
Source:
2023 State of Hawai'i Data Book

Building and Development



O’ahu has seen significant building activity and real estate investment over the past six decades with a “boom-and-bust” pattern. Beginning with Statehood in 1959, O’ahu saw waves of tremendous investment and physical growth in the late 1960s (particularly in Waikīkī), mid-1970s, early 1990s, and into mid-2010s (with the development of the ‘Ewa plain). Most of the storm water infrastructure installed during the earliest development booms has not been renewed or replaced. Maintenance support and funding have not kept pace with subsequent development. This Plan supports the development of an asset renewal plan to ensure that improvements are made to storm water infrastructure before its lifespan is exceeded.

Value and Number of City Building Permits, 1958 - 2021



The graph shows the total market value of building permits for development, adjusted for inflation (green) and the total number of building permits issued (black). The number of permits is the total number of modifications and adjustments made to real property- anything from a remodeling project to a major resort- and is another indicator of total development activity.

Source: 2023 State of Hawai'i Data Book

Conditions, Trends & Opportunities

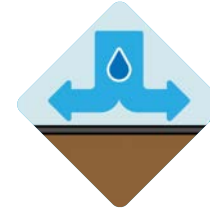
Social Vulnerability & Equity



The City assessed community social vulnerability for the development of its *O'ahu Resilience Strategy*. Socially vulnerable communities are defined as those that would be disproportionately impacted by hazards such as flooding due to socioeconomic status, household composition, minority status/ languages, housing, transportation, and hazard exposure.

Communities with greater levels of social vulnerability may have greater needs for storm water projects to mitigate flooding and other climate change impacts; however, they may not have the same capacity to partner with the City as those with less overall vulnerability. These capacity constraints can be a barrier to the equitable implementation of storm water projects across the island. City programs in socially vulnerable areas should work to overcome these barriers.

Impervious Cover

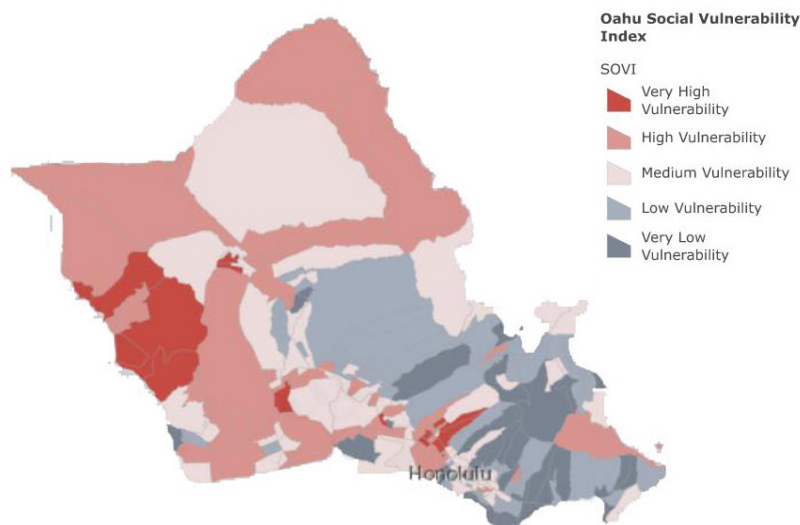


Hardened, impervious surfaces such as drive-ways, roofs, and sidewalks increase the amount of rainwater that runs off these surfaces into storm water systems, streams, and the ocean.

From 2012-2020 approximately 19,400 new residential units were constructed on O'ahu which added to impervious cover and runoff volumes. In total, O'ahu currently has 1.6 billion square feet—nearly 35,500 acres—of impervious cover.

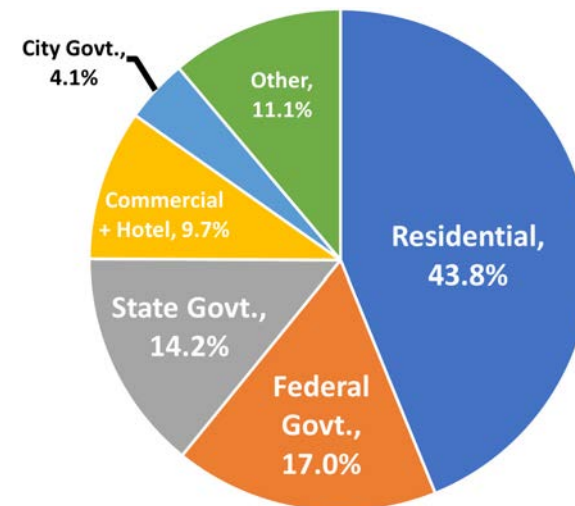
As more impervious cover is added, it increases the pressure on existing systems and sometimes requires system expansion. The additional runoff also contributes to the need for more frequent maintenance.

Social Vulnerability of O'ahu Communities



Source: City and County of Honolulu

Impervious Cover Distribution on O'ahu



O'ahu's total impervious cover was measured by satellite through the NOAA Coastal Change Analysis Program (CCAP) program in 2013.

Workforce and Wages



O'ahu's labor market, wage rates, and cost of living affect the City's ability to perform storm water management. Historically, unemployment on O'ahu was lower than the national average, except during the COVID-19 pandemic that dramatically

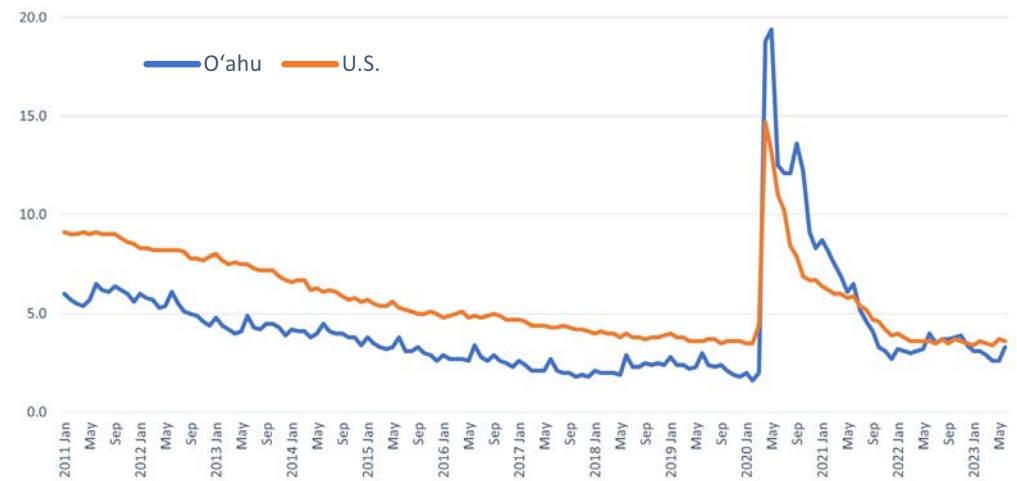
impacted the tourism sector.

The City competes with the private sector for the same limited pool of workers. This occurs in professional level jobs which require certain skill sets, particularly those in construction and engineering, and entry-level jobs that include on-the-job training. Jobs in the private sector tend to offer higher wages which reduces the appeal of City jobs even though they may have greater benefits and job security.

The City's storm water program faces challenges with retention because of internal promotion structures as well as high rates of employee turnover. The program is often viewed as the "bottom rung on the ladder" to a better paying position within the City, rather than a place to build a career.

The City is also constrained by multiple regulatory and contractual limits when hiring employees. For example, it cannot hire contractors to perform tasks that have traditionally been done by City employees thus limiting the storm water program's ability to carry out maintenance when its many laborer positions are unfilled. It is also difficult internally to modify outdated job descriptions, or to raise wages to be competitive in select sectors where hiring is problematic.

O'ahu and U.S. Unemployment Rates, 2011 - 2023



Source: 2023 State of Hawai'i Data Book and US Bureau of Labor Statistics

As storm water management technologies rapidly evolve, job description updates and staff training will be needed on a regular basis simply to keep up. Some technologies, such as green storm water infrastructure, will require further workforce development to perform ongoing maintenance.

Efforts are needed within City departments, with local labor unions, and with local, state, and federal government partners to overcome these persistent barriers and to facilitate hiring.

Climate Change & Sea Level Rise

Greenhouse gases produced by the burning of fossil fuels throughout the last century have caused a rapid warming of the Earth's atmosphere. This warming has begun to alter our global climate, weather patterns, and natural processes.

Among the impacts already being felt in the islands are rising air and water temperatures, declines in wind speeds and the predominant northeasterly trade winds, changing rainfall patterns, and rising sea levels.

The decline in Hawai'i's rainfall over the last 30 years has contributed to a reduced supply of fresh water in our aquifers, even as the



Flooding exacerbated by sea level rise

demand for water increases. Heavy rainfall events and droughts have become more common, resulting in increases in erosion, flooding, and runoff.

Meanwhile, the amount of impervious area on O'ahu has increased over time, preventing rainfall infiltration and groundwater recharge in urbanized areas, and exacerbating flood conditions.

Under the projected minimum sea level rise of 3.2 feet, nearly 25,800 acres of coastal lands across the state are expected to experience chronic flooding, erosion, and/or high wave impacts, including 18 miles of O'ahu's major roadways.

To handle increased flooding, the City will need to augment its stream cleaning operations, and repair, replace, or upgrade its aging storm water infrastructure. One solution the City is already employing is the installation of backflow prevention devices where sea water may infiltrate storm water discharge points (see image at lower right).

In its *2020-2025 Climate Action Plan* the City recognizes that bold actions are urgently needed to address the effects of

climate change. The City will use the most current information available to mitigate the forecasted impacts to O'ahu's storm water infrastructure.



Storm water outlets in low-lying coastal areas become flooded with sea water during King Tide events. High tides are increased by rising sea levels.



Tideflex duckbill valves are installed at storm water discharge points along the coast to prevent the backflow of seawater into storm flow pipes.

Natural & Cultural Environment

Hawai'i's natural resources are inseparable from its cultural resources. Every part of the island, from the forested mountain peaks to the plains and coastal zones, plays an important role in Hawaiian cultural practices.

Native Hawaiian culture is centered on the deep connections between the people, the land, and natural elements that sustain their island life. These connections are not just physical, but spiritual—in the traditional Hawaiian genealogy plants and animals are kin to humans—and this belief encourages a deep sense of responsibility and reciprocal caretaking.

As the essential life-giving element, wai (water) was considered so valuable by the early Hawaiian people that it became synonymous with wealth (waiwai). Their understanding of the "wealth" of the island's abundant water resources is reflected in the creation of the ahupua'a system of land management to support the needs of the local population, the division of which roughly corresponded to the western watershed model.

Revival of Traditional Agriculture

Traditional agricultural practices were honed over centuries to work with the land and use available water resources efficiently. Local communities are restoring and reactivating defunct and dormant lo'i kalo, or taro patches. Lo'i kalo benefits downstream areas by functioning similarly to a wetland: slowing down surface water flow, allowing

for evapotranspiration, filtering sediment, and capturing excess nutrients before they enter the ocean. The result of this sediment control is healthier reefs and fish populations. Diverting water through lo'i kalo also facilitates freshwater recharge through seepage back into the groundwater system.



Kānewai Lo'i, University of Hawai'i at Mānoa



Invasive Albizia trees in Mānoa Valley

Watershed Forest Management

The upper watershed areas of O'ahu's Ko'olau and Wai'anae Mountains are home to the remaining native forests, which have evolved to effectively absorb precipitation, keep soil intact, and filter water back into our aquifers. Invasive plants and abundant, wild ungulate populations threaten these ecosystems by reducing native plant cover and creating barren areas which become oversaturated and cause erosion. This can result in the sedimentation of streams and the loss of aquatic life.

Local watershed partnerships have established agreements with landowners in the remote upper watersheds to control and remove invasive species and promote native species recovery. By extension, the partnerships' work improves aquifer replenishment rates and reduces erosion and runoff as water and sediments are captured and filtered by healthy native forest ecosystems.

Partnerships focused on the conservation of native forest ecosystems and the preservation of traditional Hawaiian agricultural practices may be avenues for the City to attain its storm water quality goals with added benefits.



Invasive Albizia control in Mānoa Valley

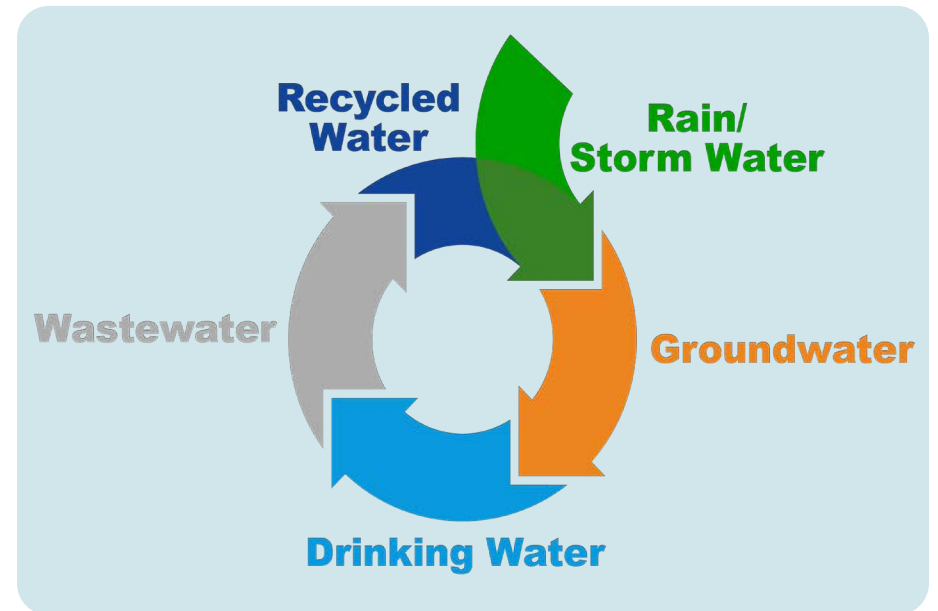
Fresh Water & One Water Initiatives

In 2013 the Hawaii Community Foundation launched *Wai Maoli: Hawai'i Fresh Water Initiative* to address long-term water security in Hawai'i.

The Initiative convened a Fresh Water Council representing water-related interests to research, strategize, and implement actions to protect the quality and supply of our available freshwater resources.

Efforts around this Strategic Plan are consistent with the One Water approach: a nationally recognized policy framework meant to accelerate and scale up solutions to water management problems by viewing water holistically and by integrating the management of freshwater, wastewater, storm water, and conservation resources.

The City recently adopted an ordinance to solidify the use of the One Water approach to address issues of water sustainability on O'ahu. Under this framework, eight City departments will coordinate to integrate their existing plans and inform capital improvement projects. This Strategic Plan will be part of the ongoing One Water coordination effort.



The One Water framework promotes the use of a holistic water resources approach to find sustainable solutions to significant water management issues.

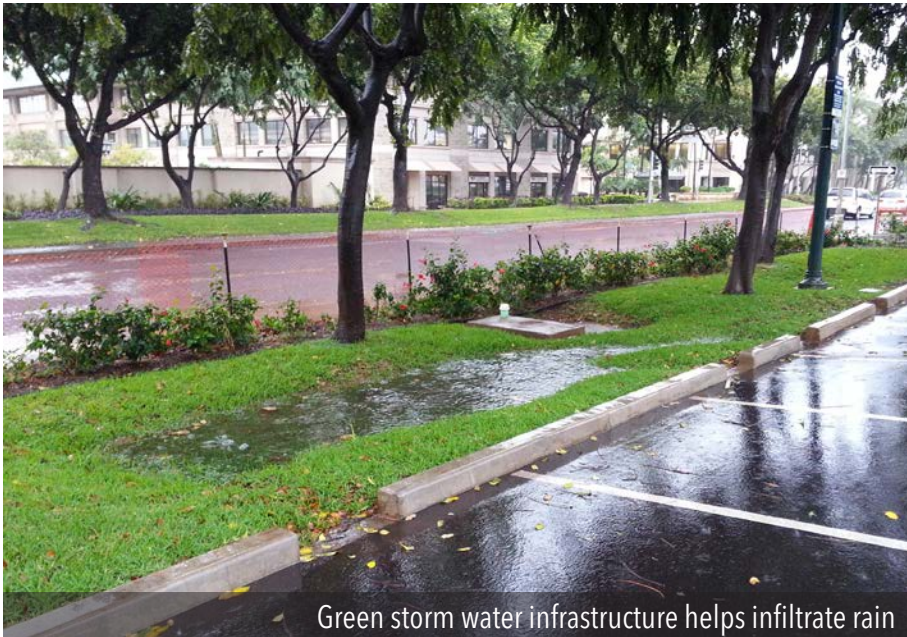
Funding Sources & Constraints

Current Funding

The total annual budget for the City's storm water program is approximately \$97 million. Roughly \$77 million comes from property taxes, appropriated annually by the City Council. The remaining \$20 million comes from the State Highway Fund (gas tax). Storm water-related expenses represent roughly 2% of the City's typical annual spending and are split nearly evenly between operating and capital expenses.

Unlike the City's sanitary sewer and water services, the storm water program does not benefit from a dedicated source of funding. The

storm water program budget is based on the annual appropriations from the City's general fund rather than revenue received from rate payers. Year-to-year allocations do not allow the program to carry over funds which limits access to external grants and revenue bond funding. Storm water capital projects such as the construction of green storm water infrastructure must compete with other City projects for limited general obligation (GO) bond funding to finance much needed repairs and upgrades and the construction of green storm water infrastructure.



Green storm water infrastructure helps infiltrate rain



City street cleaning operations

Storm Water Utility Evaluation

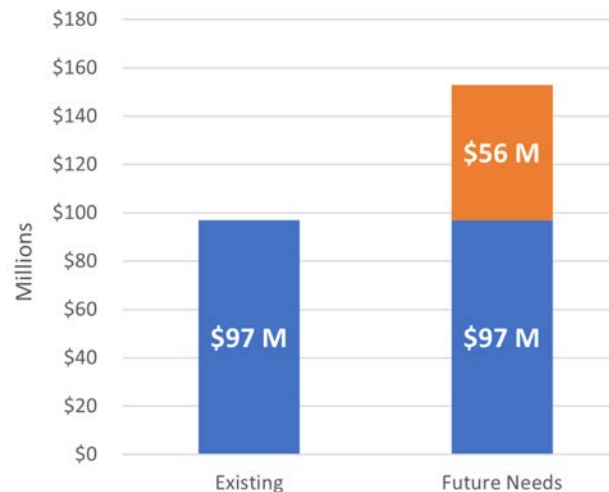
A feasibility study was conducted from 2019-2020 to investigate changing the program's funding mechanism from property taxes to a fee-based system called a "storm water utility." The results of this study were published in the *O'ahu Storm Water Utility Feasibility Study Summary Report (2020)*.

Storm water utilities have been successfully adopted by over 2,000 municipalities in the U.S. and Canada. Storm water utilities provide stable funding and allow funds to be carried over from year to year. Carryover funds can be used as a match for federal grants and would also provide the ability to issue revenue bonds for capital improvement projects.

The proposed fee could also "right size" the program to begin addressing the backlog and ongoing need for asset renewal and replacement, stream maintenance, and climate change mitigation.

Storm water utilities typically charge a rate based on the amount of impervious area per parcel, with impervious area serving as a measure of how much storm water runoff is generated by a site, and thus the site's demand on the storm water system. A storm water utility provides opportunities for credits and rebates for permanent features that capture or reduce storm water runoff on site. Hardship provisions may be provided for low-income households and small nonprofits.

Annual Storm Water Program Budget



Source: City and County of Honolulu

Right-Sizing the Program

The 2020 Feasibility Study, and subsequent updates of the City's cost of services, found that as of 2023 an additional \$56 million per year is the minimum amount needed to fund the storm water program, including the replacement of aging infrastructure, the ability to fill vacancies, additional stream maintenance crews and equipment, match funding to obtain grants, and capacity to address future regulatory requirements. The City's annual storm water budget would need to increase to an average of \$153 million to "right size" the program.

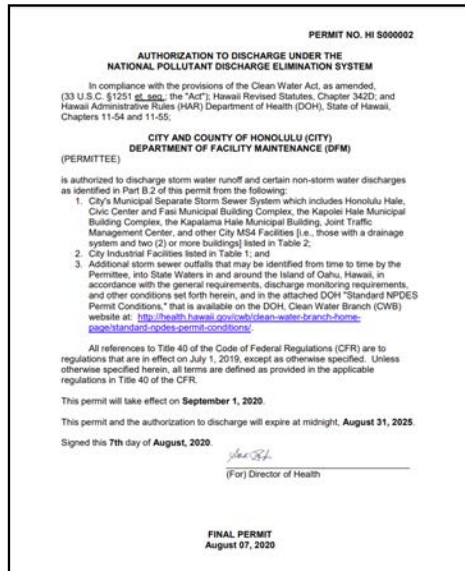
A storm water fee analysis is being conducted to determine a utility rate that can fund this budget.

Regulatory Requirements

The City's storm water program is subject to both local and federal regulatory requirements.

Every five years under the NPDES permit program, the U.S. Environmental Protection Agency (EPA) issues new, and increasingly strict, requirements for municipal jurisdictions under the Federal Clean Water Act. In recent permit cycles the EPA has shifted its focus to restoring water quality rather than prescribing specific metrics for managing the urban system. As a result, storm water quality programs can make greater investments in a broader set of solutions such as installing more green storm water infrastructure, monitoring for pollutants, and looking at a holistic approach through the restoration of important natural areas.

Locally, the Honolulu City Council also requires specific storm water management actions in addition to those imposed by the NPDES permit. Notably, City Council has charged the storm water program with responsibility for managing trash and debris, and for storing belongings for people experiencing homelessness when encampments are abated.



Honolulu's NPDES permit outlines the City's specific responsibilities under federal law.

Technology

The City is employing the use of contemporary technologies and software to increase efficiencies within its Storm Water Quality program operations.

The City uses Cityworks, an asset and information management system, to track data, create work orders, compile data for the annual NPDES report, and make periodic adjustments to programs and operations.

Closed-circuit television (CCTV) cameras are planned to be used to assess the City's closed drainage system to avert emergency situations, and to optimize asset renewal and replacement planning. Other emerging technologies that provide in situ asset renewal, such as pipe coating or lining, are also planned.

In addition to technological advances in program management, the City is exploring strategies for field monitoring, such as the use of drones for identifying stream erosion and blockages, and the use of sensors for flood management, an important area of innovation for coastal communities.

S.O.A.R. Analysis

Employees of the Storm Water Quality Division and allied divisions completed a SOAR analysis in fall 2021. This summary reflects their collective experiences in providing City storm water services. The detailed responses informed the development of an overall vision for storm water services and specific strategies and measures.



The greatest **STRENGTHS** of the Storm Water Program are **resourcefulness** and **successes in the face of limitations and challenges**; its **well-defined aspirations** for the future; and the **actions underway today** that are laying groundwork for a better program.



The Storm Water Program can move towards its goals by taking advantage of **OPPORTUNITIES** to **stabilize staffing** and **enhance staff training**, which improves performance and morale; **work more effectively across departments and divisions**; and **improve performance in key program areas** with high public benefit – particularly stream cleaning, asset renewal, enforcement, and near-shore water quality.



The Storm Water Program **ASPIRES** to be an **innovative, proactive program** that is **solution driven, leads by example**, and is **responsive to the needs of O'ahu's unique communities**. We strive to keep our **resourceful and positive work ethic**. And, with sufficient resources, we aspire to build out the programs and plans we are developing today.







The desired **RESULTS** are represented as measures in the following section and will be used as benchmarks to track and quantify program progress.

Strategic Direction

The Strategic Direction section is the heart and soul of this Plan. Highlighted in this section are the mission and vision of the City's multi-department storm water program. The long-term program goals and the short term (3-4 year) strategies and measures respond to current trends, local context and the strengths and opportunities highlighted in the SOAR Analysis section. Overall, this direction addresses the City's current challenges to ensure continued success in storm water operations and management.

Mission

The City storm water program's mission is to work for:

-  Clean water by managing storm water runoff, improving water quality, and preventing pollution;
-  Healthy and safe environment through mauka to makai conservation, managing stream channels, and protecting ocean waters;
-  Community involvement in deciding how funds are spent, ensuring accountability, and meeting local needs; and
-  Shared responsibility where the City departments work together and with residents and businesses, so that everyone makes a difference.

Vision

The storm water program is innovative and proactive. It continually maintains and improves the City's built and natural storm water systems through the application of technology and best practices. With continuous workforce development, its engaged and creative staff are leading by example, and responding effectively to community needs, concerns, and ideas.

Goals

Eight strategic goals were developed for the storm water program (see following page). These goals set the priorities for the program direction and the allocation of financial resources and workforce capacity. The goals are intended to anchor the long-term direction of the storm water program.

Strategies & Measures

Strategies and measures were developed for each goal. The strategies build upon existing efforts by addressing data and knowledge gaps, and some are brand new initiatives. Corresponding measures were identified for each strategy to define and benchmark progress.

Strategies and measures will be reviewed and updated every 3-4 years using the adaptive management framework and process laid out in the Measuring Progress section.

Strategic Direction

GOALS



Support better water quality island-wide using a mauka to makai (watershed) approach, furthering partnerships, and implementing coordinated and sustained monitoring efforts.



Minimize flooding by reducing the volume and peak rate of storm water runoff through a mix of natural (green) and constructed (gray) solutions at different scales.



Develop an effective plan for storm water infrastructure that can be used to prioritize, fund, and implement capital projects to further community goals and avoid costly emergency repairs.



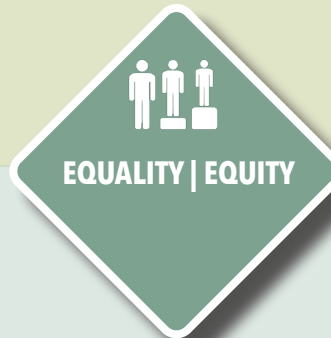
Maintain strong fiscal management and provide accountability through transparent and thorough financial reporting to the community.



Ensure community awareness and engagement by providing effective, meaningful, and varied opportunities and information pathways.



Maximize the program's community impact by leveraging resources and funding through external partnerships as well as inter- and intra-agency coordination, guided by O'ahu's One Water approach.



Engage with partners in O'ahu's socially vulnerable communities to assess and actively remedy storm water-related deficiencies by investing in multi-benefit solutions such as green storm water infrastructure.



Become an employer of choice by recruiting and retaining talent, recognizing excellence, and aligning goals of diversity, equity, and inclusion in employee and overall workforce development.



ENHANCED WATER QUALITY

Support better water quality island-wide using a mauka to makai (watershed) approach, furthering partnerships, and implementing coordinated and sustained monitoring efforts.

STRATEGIES	MEASURES
1. Apply strategies to enhance effectiveness of regular street sweeping and drain cleaning activities.	<ul style="list-style-type: none"> Strategies implemented to supporting efforts such as restricted parking requirements.
2. Develop a watershed-based approach framework that involves stakeholders in water quality focused initiatives.	<ul style="list-style-type: none"> Successful pilot of a watershed-based approach using a water quality baseline, BMPs implemented, and water quality monitoring for effectiveness.
3. Characterize water quality efficacy of green storm water infrastructure Best Management Practices.	<ul style="list-style-type: none"> Pollutant monitoring installed and completed on 1-2 green storm water infrastructure Best Management Practices.
4. Establish guidance on water quality sampling methodology and protocols for partnering organizations.	<ul style="list-style-type: none"> Partnership(s) established with 1 or 2 organization(s).
5. Explore potential on-island water quality testing.	<ul style="list-style-type: none"> On-island water quality testing explored and, if possible, established.
6. Investigate other monitoring approaches, such as biocriteria, surrogate testing, and monitoring technologies.	<ul style="list-style-type: none"> Report to the Storm Water Of O’ahu Stakeholder Hui (SWOOSH) on options and technologies.
7. Investigate water quality credit trading programs for non-point sources in Total Maximum Daily Load (TMDL) or other key areas.	<ul style="list-style-type: none"> Report on water quality credit trading feasibility study completed through coordination with Department of Health on potential implementation options.
8. Increase impact of outreach programs with businesses and private dischargers.	<ul style="list-style-type: none"> Number of businesses inspected annually.



FLOODING ADAPTATION & PREVENTION

Minimize flooding by reducing the volume and peak rate of storm water runoff through a mix of natural (green) and constructed (gray) solutions at different scales.

STRATEGIES	MEASURES
1. Stream cleaning, as needed based on individual stream conditions for flooding and pollutant reduction.	<ul style="list-style-type: none"> • Miles of streams cleaned. • Tons of sediment and vegetation removed.
2. Continually reassess stream maintenance operations for streams with limited access and with flooding issues.	<ul style="list-style-type: none"> • Number of stream segments assessed for changes in maintenance protocols.
3. Provide guidance on privately-owned stream maintenance options.	<ul style="list-style-type: none"> • Guidance developed and disseminated.
4. Use hydrologic modeling to identify hydrologic choke points and chronic flooding and assess capacity of stream network to handle flows.	<ul style="list-style-type: none"> • Dataset with hydrologic choke points, chronic flooding and stream capacity identified.
5. Focus on cost-efficient mauka conservation strategies in flood-prone areas.	<ul style="list-style-type: none"> • Acres and linear feet addressed through conservation planning and projects with watershed partnerships.
6. Partner with federal agencies on possible projects.	<ul style="list-style-type: none"> • Number of meetings/consultations with federal agencies.
7. Focus on completing and enabling green storm water infrastructure projects on private and public land to address local nuisance flooding, ensuring that City codes, ordinances, and standards promote use on private property.	<ul style="list-style-type: none"> • Number of green storm water infrastructure and multi-benefit projects planned and completed. • Impervious area reduced or treated with green storm water infrastructure for increased infiltration or storage. • Amendments made to City codes, ordinances, or standards to facilitate use of green storm water infrastructure.
8. Incentivize, expand, and fund tree planting/replacement programs to promote infiltration.	<ul style="list-style-type: none"> • Trees planted through cooperative efforts. • Tree canopy maintained or increased.
9. Undertake a prioritized assessment of flood resilience options for all low-lying City roadways, storm drain systems, and other flood prone areas.	<ul style="list-style-type: none"> • Number of flood and flowpath assessments conducted.
10. Assess ecosystem-based opportunities for creating connected networks to manage water and regulate temperature (including connecting existing park and open space networks) to provide cooling corridors and other benefits.	<ul style="list-style-type: none"> • Connective network and restoration projects identified and initiated.



TIMELY & CONSISTENT ASSET RENEWAL

Develop an effective plan for storm water infrastructure that can be used to prioritize, fund, and implement capital projects to further community goals and avoid costly emergency repairs.

STRATEGIES	MEASURES
1. Maximize the use of technology and data management systems in planning for asset renewal and replacement.	<ul style="list-style-type: none"> • New technologies and techniques consistently evaluated in asset renewal projects and used where effective.
2. Ensure the use of cost-effective technologies and approaches for asset renewal.	
3. Complete the Storm Water Master Plan and Functional Plan, ensuring that all areas are addressed (flooding, green infrastructure, water quality, recharge, sea level rise and asset renewal).	<ul style="list-style-type: none"> • Storm Water Master Plan and Functional Plan completed. • Number of projects and dollars spent in planning and implementation progress in functional areas (flooding, green infrastructure, water quality, recharge, sea level rise and asset renewal).
4. Complete planned condition assessment.	<ul style="list-style-type: none"> • Number of emergency situations related to asset condition. • No increase in the number of structures rated as critical.
5. Ensure climate and precipitation projections are incorporated in asset renewal and replacement plans.	<ul style="list-style-type: none"> • Design criteria actively account for projected climate and large storm conditions.



FINANCIAL ACCOUNTABILITY & TRANSPARENCY

Maintain strong fiscal management and provide accountability through transparent and thorough financial reporting to the community.

STRATEGIES	MEASURES
<ol style="list-style-type: none"> 1. Implement sound financial and accounting policies and procedures. 2. Conduct regular financial audits. 3. Create and execute annual storm water financial report. 	<ul style="list-style-type: none"> • Detailed annual financial report on revenue and expenditures available to public. • Funding reserves and financial resources sufficient for desired program borrowing.
<ol style="list-style-type: none"> 4. Ensure effective and judicious fiscal management of operating and capital funds. 	<ul style="list-style-type: none"> • Financial audits indicate no material weaknesses in internal controls.
<ol style="list-style-type: none"> 5. Create more stable funding for the storm water program. 	<ul style="list-style-type: none"> • Storm water utility established.
<ol style="list-style-type: none"> 6. Maximize funding opportunities. 	<ul style="list-style-type: none"> • Amount of funding received from external sources.
<ol style="list-style-type: none"> 7. Benchmark expenditures and hires against the Storm Water Master Plan. 	<ul style="list-style-type: none"> • Report reviewing expenditures and hires shared with the Storm Water Of O’ahu Stakeholder Hui (SWOOSH) and the public.
<ol style="list-style-type: none"> 8. Maximize use of low-cost financing including federal sources and potentially public/private investment. 	<ul style="list-style-type: none"> • Total dollar amount of funds leveraged.



COMMUNITY ENGAGEMENT

Ensure community awareness and engagement by providing effective, meaningful, and varied opportunities and information pathways.

STRATEGIES	MEASURES
1. Understand and appropriately engage audiences.	<ul style="list-style-type: none"> • Number of people participating in storm water programs and activities. • Expand diversity partnerships and provide focused outreach (internal and external) for specific groups.
2. Empower staff and communities to be storm water ambassadors.	<ul style="list-style-type: none"> • Number and total hours committed by storm water ambassadors (staff and resident volunteers).
3. Raise public awareness of the value of the City’s storm water work and encourage public involvement.	<ul style="list-style-type: none"> • Number of updates to Neighborhood Boards. • Reach of social media, website visits, media reach for public service announcements.
4. Continue the role of the Storm Water Of O’ahu Stakeholder Hui (SWOOSH).	<ul style="list-style-type: none"> • Number of Storm Water Of O’ahu Stakeholder Hui (SWOOSH) meetings.
5. Develop and express consistent storm water program branding and messaging.	<ul style="list-style-type: none"> • Audiences recognize storm water branding and have positive response.



PARTNERSHIPS & COORDINATION

Maximize the program's community impact by leveraging resources and funding through external partnerships and inter-/intra-agency coordination guided by O'ahu's One Water approach.

STRATEGIES	MEASURES
1. Engage with Ko'olau and Wai'anae Mountains watershed partnerships.	<ul style="list-style-type: none">• Number of Memorandums of Understanding (MOUs) established with watershed partnerships.
2. Create a formal structure for intra-City department coordination on elements of the Strategic Plan.	<ul style="list-style-type: none">• Participate in the One Water Panel and integrated planning efforts.
3. Work towards critical government agency partnerships, including execution of MOUs, where desirable.	<ul style="list-style-type: none">• Number of agencies actively participating in inter-agency discussions.
4. Continue and expand beneficial partnerships with the business community and environmental organizations.	<ul style="list-style-type: none">• Number of partnerships and initiatives with community (including schools), businesses, and environmental organizations.



EQUALITY | EQUITY

Engage with partners in O’ahu’s socially vulnerable communities to assess and actively remedy storm water-related deficiencies by investing in multi-benefit solutions such as green storm water infrastructure.

STRATEGIES	MEASURES
1. Track City investments by storm water maintenance district.	<ul style="list-style-type: none"> • Activities and investments (estimated or where available) by maintenance district.
2. Use City equity/social vulnerability indices and overlay with storm water data to assess the relative impacts on communities and develop an adaptive process for guiding investments.	<ul style="list-style-type: none"> • Storm water equity impacts and opportunities data layer created and used to guide investments in one or more program and capital project areas.
3. Work with organizations in identified key communities to help make investment and implement projects.	<ul style="list-style-type: none"> • Partnership project or program initiated in one community with a high social vulnerability index with at least one new partner organization.
4. Ensure information and opportunities (i.e., mini-grants, credits, fee determinations) are shared through effective information pathways and in multiple languages and formats as applicable for accessibility.	<ul style="list-style-type: none"> • Leaders and/or key members of socially vulnerable communities and populations engaged at the beginning and throughout the outreach process. • Key materials disseminated in multiple languages and formats as applicable.



WORKFORCE EXCELLENCE

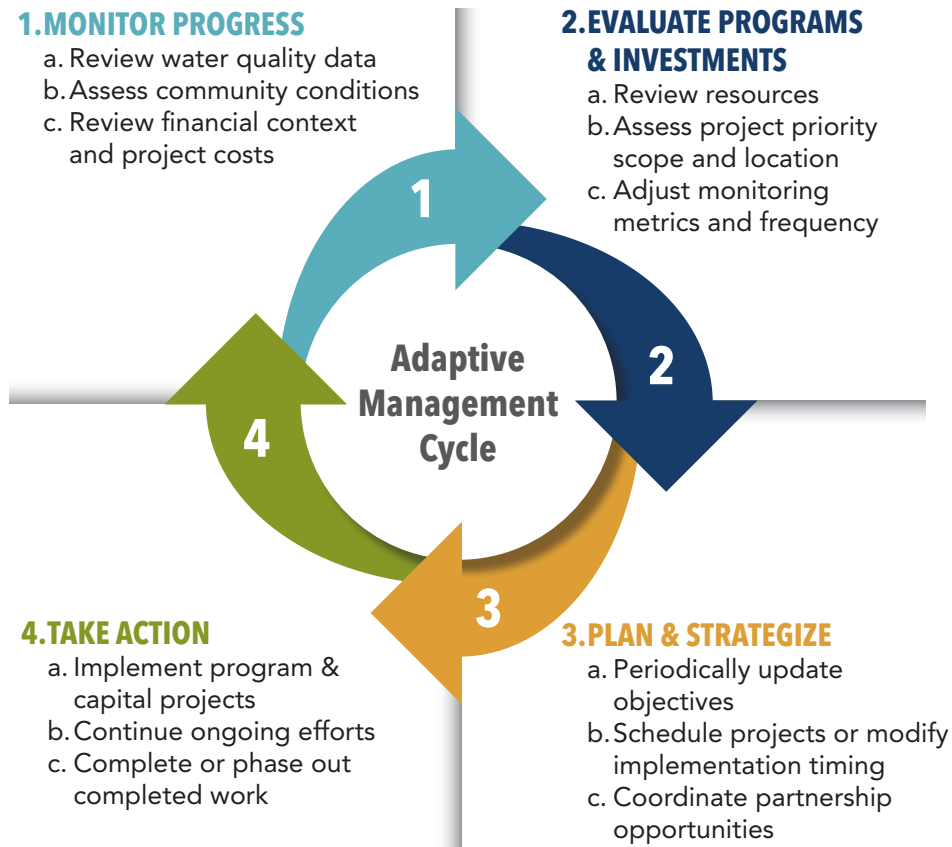
Become an employer of choice by recruiting and retaining talent, recognizing excellence, and aligning goals of diversity, equity, and inclusion in employee and overall workforce development.

STRATEGIES	MEASURES
<ol style="list-style-type: none"> 1. Work to reduce the number of vacant positions filled by the temporarily assigned staff and fill qualified essential services positions. 2. Broaden the pool of qualified applicants by providing assistance in completing position applications. 	<ul style="list-style-type: none"> • Budget for salaries. • Percent of positions vacant.
<ol style="list-style-type: none"> 3. Explore retention incentives to improve workforce stability. 	<ul style="list-style-type: none"> • Employee retention rate.
<ol style="list-style-type: none"> 4. Build capacity for installing and managing green storm water infrastructure. 	<ul style="list-style-type: none"> • Partnerships established for green storm water infrastructure mentoring and training. • Number of persons trained in green storm water infrastructure.
<ol style="list-style-type: none"> 5. Provide a stable and safe workforce environment. 	<ul style="list-style-type: none"> • Number of days without accidents.
<ol style="list-style-type: none"> 6. Incorporate leadership/management training and development for succession planning. 	<ul style="list-style-type: none"> • Number of in-department promotions.
<ol style="list-style-type: none"> 7. Ensure position descriptions match current jobs and account for future technological changes. 	<ul style="list-style-type: none"> • Number of updated position descriptions.

Measuring Progress

Building an effective and responsive storm water program requires a process of benchmarking and evaluation. As part of its NPDES permit compliance actions, the City utilizes an adaptive management approach to review the data it collects and make program adjustments on an annual basis. This approach can be broadened to further the goals and strategies of this Plan.

The premise of the adaptive management concept is repeatedly adjusting management decisions and actions based on new knowledge – and learning by doing.



This Storm Water Strategic Plan will be updated every 3 to 4 years to reflect the adaptive management process and assess the City's overall progress towards its long-term vision and short-term strategies.

The diagram below shows the adaptive management framework and how it is applied at each step. Several types of adjustments can be anticipated and may include:

1. Adding new projects or programmatic actions
Additions are based on the results of completed studies, community input, synergies with other projects, or the availability of grant funding.
2. Modifying the scope or scale of projects and programs
Example modifications include increasing the implementation of programs found to have greater benefit or cost-efficiency than originally modeled.
3. Reducing or eliminating projects or programs
Reductions can be implemented for programs found to have outcomes that are environmentally ineffective, inefficient, or inconsistent with the City's equity and community goals.
4. Modifying implementation plans, project priority, and implementation schedules
Modifications may occur if major permitting, physical, or financial limitations arise (e.g., storm damage to infrastructure; rate increases are not approved by City Council; permits denied for projects).
5. Modifying the implementation schedule
Modifications may reflect permit directives, opportunities, limitations, new project or resource identification, or reprioritization.

Using this approach will ensure that the City's long-term storm water planning efforts remain relevant to the overall goals and strategies of the storm water program.



Moving Forward

This Storm Water Strategic Plan will serve as the foundation for future growth and evolution of the City storm water program. This living document will bring investments and actions in line with desired outcomes through consistent evaluation and program updates. It will also be the ‘umbrella’ for an upcoming, multi-year, master planning effort. The development of a Storm Water Master Plan and sub-plans will incorporate this Strategic Plan’s goals and objectives. City efforts to change to a more stable method of funding its storm water program would also be guided by this Strategic Plan.

Preparing this Strategic Plan was a new and proactive step for the City's storm water program. By putting its long-held values, goals, and objectives in writing, the City's storm water program will become more accountable internally, and to the community served, as they work towards healthier waters and a more climate ready island.

References

City and County of Honolulu, *Climate Action Plan, 2020-2025*

City and County of Honolulu, *Climate Change Brief, 2018*

City and County of Honolulu, *O'ahu Resilience Strategy, 2019*

City and County of Honolulu National Pollutant Discharge and Elimination System (NPDES) Permit

City and County of Honolulu, *Sea Level Rise Guidance, 2018*

City and County of Honolulu, *Storm Water Utility Feasibility Study Summary Report, 2020*

Hawai'i Water Environment Association (HWEA), *Wai Maoli: Hawai'i Fresh Water Initiative, 2013*

Metropolitan Water Reclamation District of Greater Chicago, *Strategic Plan, 2021-2025*

Milwaukee Metropolitan Sewerage District, *Strategic Plan, 2019-2021*

National Oceanic and Atmospheric Administration Coastal Change Analysis Program (NOAA CCAP), 2013

NOAA Sea Level Rise Viewer

State of Hawaii Data Book, 2023

US Bureau of Labor Statistics

Abbreviations & Definitions

Acronyms

CCTV Closed-circuit television

DFM Department of Facility Maintenance (City)

DLNR Department of Land and Natural Resources (State)

GO General Obligation bonds

Definitions

City means the City and County of Honolulu.

Green Storm Water Infrastructure means systems and practices that use or mimic natural processes that result in the infiltration, evapotranspiration or use storm water in order to protect water quality and the aquatic habitat.

NOAA CCAP means the National Oceanic and Atmospheric Administration Coastal Change Analysis Program.

NPDES Permit refers to the National Pollutant Discharge and Elimination System Permit.

S.O.A.R. Analysis means a Strengths, Opportunities, Aspirations, Results Analysis.

Storm Water Utility means a dedicated, fee-for-service based funding of a community's defined storm water management program. Storm Water Utilities charge a periodic fee to each parcel based on the parcel's measure square feet of impervious area.