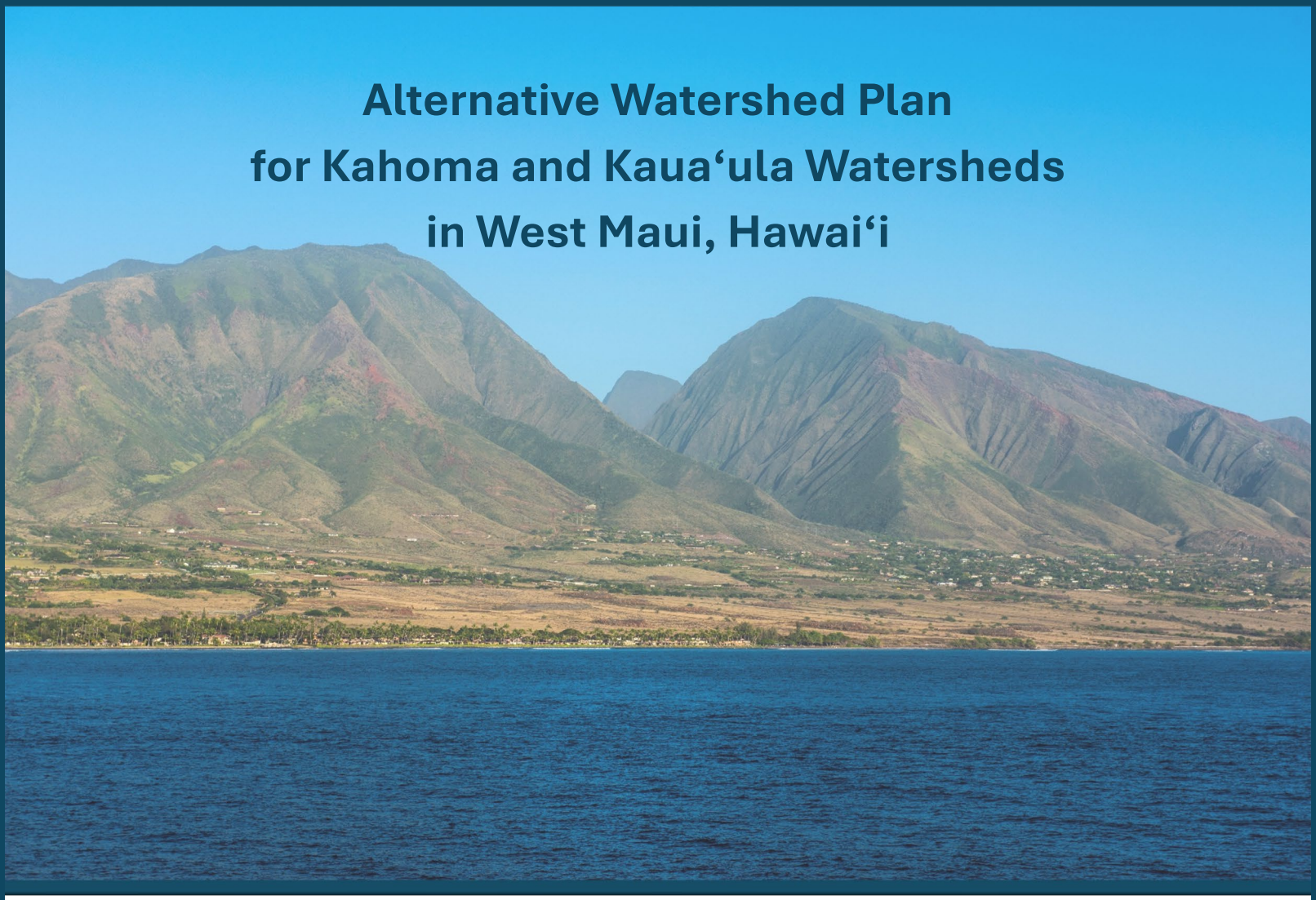
Alternative Watershed Plan for Kahoma and Kaua‘ula Watersheds in West Maui, Hawai‘i



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1.0 INTRODUCTION

1.1 BACKGROUND AND PURPOSE

The wildfires that swept through Lahaina and surrounding areas in August 2023 had significant impacts on local communities, built infrastructure, and natural ecosystems. In particular, the fires altered watershed hydrology and introduced fire-related debris, ash, sediment, and associated pollutants into waterways, coastal areas, and the broader environment. Since the immediate aftermath of the fires, targeted watershed recovery efforts have been underway to address these environmental impacts. One possible source of support for ongoing recovery efforts is the U.S. Environmental Protection Agency's (EPA's) Clean Water Act (CWA) Section 319 program, which provides funding for watershed projects—including on-the-ground practices, technical assistance, education, training, and monitoring—to assess, reduce, and mitigate the effects of nonpoint source pollution. While these projects are primarily focused on improving water quality, they often provide important co-benefits as well, such as enhanced water availability and improved flood control.

Eligible projects located within watersheds covered by an approved watershed-based plan may receive grant funding subawards under the Section 319 program. These plans must contain the nine minimum elements that EPA considers critical for addressing water quality concerns. Two of the watersheds affected by the wildfires in Lahaina—Kahoma and Kaua‘ula—do not currently have such a plan in place. However, EPA also allows for the development of alternative watershed-based plans to address nonpoint source pollution and associated public health risks resulting from emergency events. Under these circumstances, alternative plans offer a simplified and more flexible pathway to access Section 319 funding compared to the traditional nine-element watershed-based plans that are typically required. In this context, the Hawai‘i Department of Health (DOH), with technical assistance from EPA and support from its contractor (Tetra Tech), developed the *Preliminary Watershed Planning Framework for Kahoma and Kaua‘ula* Watersheds (October 2025), hereinafter referred to as the "Preliminary Planning Framework" or PPF, which is available in DOH records.

DOH views development of the PPF as a key early step toward long-term recovery and intentionally scoped it to include more detailed information than usually expected from an alternative watershed-based plan in order to leverage available technical support. This broader scope highlighted wider nonpoint source pollution concerns in the Kahoma and Kaua‘ula watersheds and provided a foundation for both: 1) this Alternative Watershed Plan

to address the water quality impacts of the Lahaina wildfire and 2) future, comprehensive watershed-based planning.

As such, DOH and its contractor (ERG) developed this *Alternative Watershed Plan for Kahoma and Kaua‘ula Watersheds in West Maui, Hawai‘i* (hereinafter “Alternative Watershed Plan”), building on the more detailed information in the PPF. Section 1.0 of the Alternative Watershed Plan provides background information, while Section 2.0 outlines the required elements of an alternative watershed plan that meets EPA criteria for Section 319 funding eligibility. Establishing funding eligibility through this process is crucial for directing resources to the Kahoma and Kaua‘ula watersheds and supporting the communities in carrying out necessary restoration and pollution reduction activities.

Goals of the Alternative Watershed Plan

- ✓ Satisfy EPA’s requirements for an “alternative watershed plan” to allow for Section 319 funding eligibility.
- ✓ Provide a succinct summary of the detailed analyses in the *Preliminary Planning Framework for Kahoma and Kaua‘ula Watersheds* (October 2025).
- ✓ Recognize and align with related restoration and planning efforts.
- ✓ Prepare for next steps in public participation to inform restoration activities that reflect community goals and objectives.

This Alternative Watershed Plan and the PPF are key resources for future planning in the watersheds. DOH developed the Alternative Watershed Plan as a flexible and adaptable document to periodically revisit and update, as appropriate through amendments, to reflect changing conditions, new information, and the evolving needs of the watersheds and communities.

1.2 PLAN CONTEXT

This Alternative Watershed Plan recognizes the past, current, and ongoing efforts for wildfire response and recovery, particularly as it relates to nonpoint source pollution control and proactive water resource management. Specifically, it highlights the actions taken by the Maui communities and their partners in immediate response to the wildfires, including coastal water quality monitoring, hazardous material and debris removal, soil stabilization in burned areas, ash and debris containment, installation of best management practices (BMPs), community-led restoration projects, and ongoing planning efforts to improve water resource management. This Alternative Watershed Plan further supports these early efforts by emphasizing ongoing collaboration, ground-truthing, and

monitoring, to inform management decisions and actions for watershed recovery over both the short and long term. Public participation has also been integral to these activities and will continue to play a central role as recovery progresses.

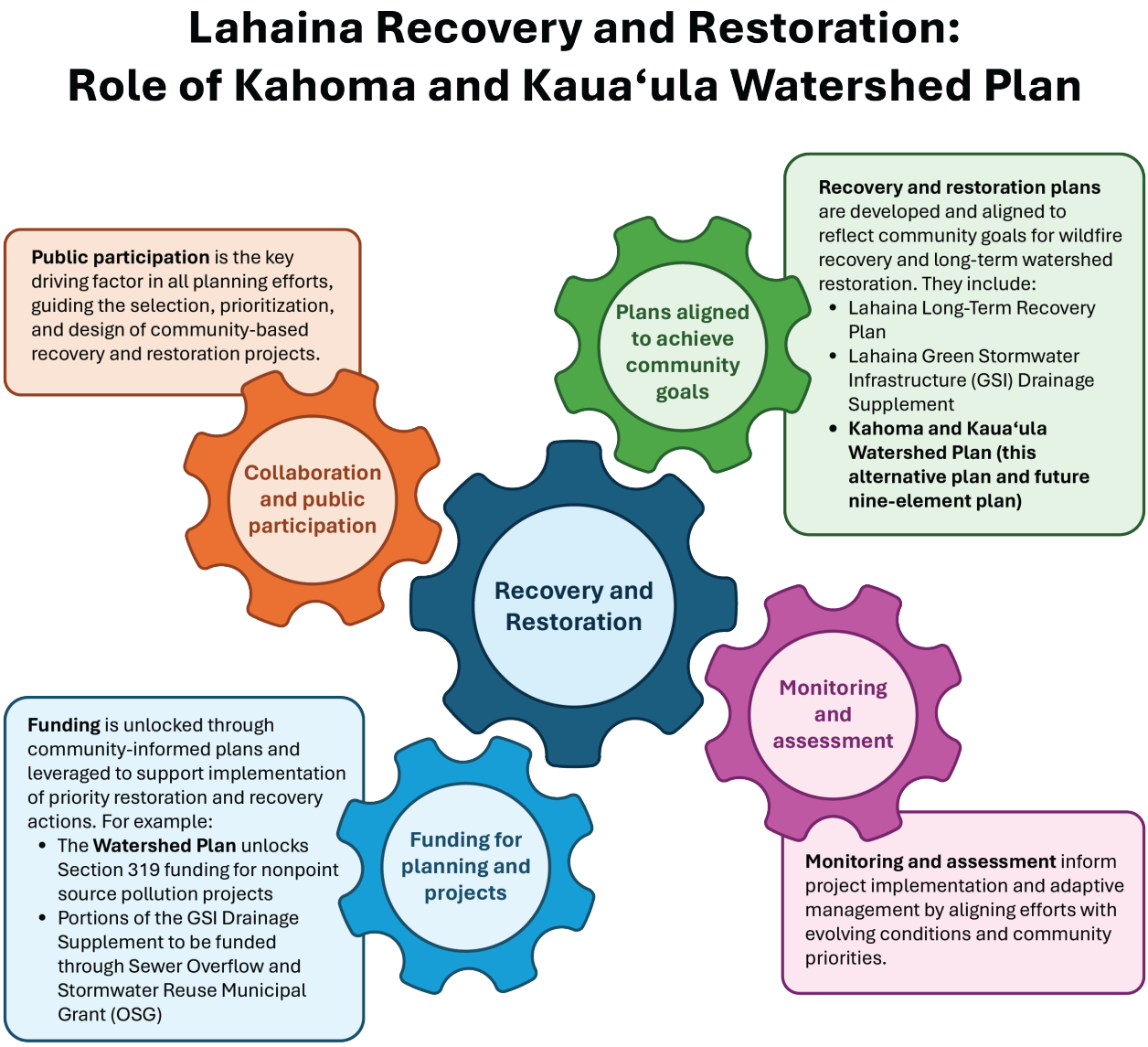

Figure 1. Role of Kahoma and Kaua‘ula Watershed Plan in Lahaina Recovery and Restoration

Figure 1 illustrates the role of watershed planning in supporting recovery and restoration efforts in the Kahoma and Kaua‘ula watersheds. The Alternative Watershed Plan is in alignment with other Lahaina recovery and restoration plans that are informed by public participation and monitoring data and supported by federal funding from various sources, including federal grants. These interconnected key elements work in concert to guide the

planning and implementation of projects that address the wide-ranging impacts of the Lahaina wildfire on the communities and natural environment of West Maui.

1.2.1 Alignment with Restoration and Planning Efforts

The goals and priorities outlined in this plan are informed by and aligned with various ongoing restoration and planning efforts, including the following:

- **Lahaina Long-Term Recovery Plan (LTRP)**:[1] This plan defines recovery for the Lahaina community, including its post-wildfire vision and goals, and was developed through extensive community engagement. Based on input from community members, Maui County and its state and federal partners identified over 40 priority projects critical to the long-term recovery effort. Projects include infrastructure assessment and improvement, stormwater resilience and flood risk management, watershed planning, revegetating and reforesting, and others that have water quality protection and restoration benefits.
- **Lahaina Green Stormwater Infrastructure Drainage Supplement**: This plan will guide Maui County’s efforts to implement green stormwater infrastructure (GSI) into stormwater drainage throughout Lahaina. This GSI Drainage Supplement updates the 2005 Drainage Master Plan in response to the community’s desire to rebuild a more resilient Lahaina. Projects within the GSI Drainage Supplement that help to reduce nonpoint source pollution include those focusing on native tree and vegetation planting, bioretention, constructed wetlands, wetland restoration, as well as implementing GSI in rebuilding at least 20 percent of single-family residential lots that were impacted by the wildfire.
- **Kamehameha Schools Recovery Efforts and Stewardship Activities**: Kamehameha Schools is actively supporting the restoration and rebuilding of the Lahaina community through plans for a new school as well as broader environmental, watershed, and cultural restoration efforts. These include the restoration of Mokuhinia wetland, upland revegetation, and ecosystem recovery, all of which align with the goals of long-term watershed health and cultural preservation.
- **One Water Approach**: Maui County promotes One Water principles that emphasize integrated management of water resources and water quality across the entire water cycle. Consistent with this approach, it will be necessary to address multiple nonpoint sources of pollution to achieve a range of interrelated community goals for water management and watershed protection and restoration in West Maui.

[1] https://www.mauirecovers.org/lahaina

- **Emergency Watershed Protection Projects**: Maui Soil and Water Conservation Districts partnered with the U.S. Department of Agriculture’s Natural Resources Conservation Service (NRCS) through its Emergency Watershed Protection (EWP) program and identified projects to mitigate imminent hazards from the wildfire such as flooding and infrastructure damage. DOH understands that EWP efforts in West Maui have been discontinued; however, DOH acknowledges the relevance to nonpoint source control of many of the projects identified through the EWP program and has included those projects in the Alternative Watershed Plan. Projects identified through the EWP that support the goals of the Alternative Watershed Plan include those that focus on revegetation, wildlife exclusion, water system restoration, and debris removal.

The Alternative Watershed Plan will facilitate recovery projects that improve water quality in the Kahoma and Kaua‘ula watersheds. In line with EPA guidelines, the Alternative Watershed Plan focuses on projects and BMPs that can be implemented within four years of the Lahaina fire. The funding available through this plan can be leveraged to implement revegetation, soil stabilization, runoff control, and other nonpoint source pollution control projects that advance common goals for watershed recovery. The Alternative Watershed Plan complements the planning and restoration efforts led by Maui County, Kamehameha Schools, NRCS, and others, many of which have been shaped by community input. DOH intends to implement this plan in collaboration with the various entities working toward recovery across Maui’s impacted communities to maximize watershed benefits and address nonpoint source pollution.

To support long-term recovery and ensure continued eligibility for Section 319 funds beyond the time frame covered by the Alternative Watershed Plan, DOH will develop a more comprehensive nine-element watershed-based plan. That plan will build on existing plans and reflect updated water quality data, the status of restoration efforts, evolving watershed needs, and a robust public participation process to inform its goals and priorities.

1.2.2 Need for Flexibility, Adaptability, and Ground-truthing

This Alternative Watershed Plan recognizes the need for collaborative, flexible, and adaptive approaches that not only maximize benefits to the watersheds but also ensure that recovery actions remain effective and responsive to changing on-the-ground conditions. Watersheds are continuously evolving, and these changes are often exacerbated during recovery from natural disasters. After wildfires, watersheds experience rapid changes in soil stability, water quality, and overall hydrology. In the early stages of recovery, highly erodible soils with wildfire-destroyed vegetation and contamination from

burn sites (e.g., batteries, metal) have the potential to significantly impact water quality. During later rebuilding phases, other pollutants, such as those associated with ground disturbance and long-term land use changes, may emerge as new concerns. As a result, priority projects presented in this plan may need to shift over time to reflect the quickly evolving watershed conditions and pollutant sources. In addition to planning and implementation activities, additional data collection and ground-truthing may be needed to ensure information in the PPF and this Alternative Watershed Plan is site-specific and informed by on-the-ground experts. This includes information on priority pollutants, their sources, and recommended BMPs.

2.0 ALTERNATIVE WATERSHED PLAN ELEMENTS

EPA's 2024 *Nonpoint Source Program and Grants Guidelines for States and Territories*[2] specifies that an alternative plan must address five specific planning elements. Sections 2.1 – 2.5 of this plan address the planning elements specified by EPA, as shown in Table 1.

Table 1. Alternative Watershed Plan Sections Associated with EPA Requirements

Plan Section	EPA Alternative Watershed Plan Requirement
2.1: Watershed Goal	Describe watershed project goal(s) and explain how the proposed project(s) will achieve water quality goals.
2.2: Causes or Sources of Pollution and Nonpoint Source Impairments	Identify the causes or sources of nonpoint source impairments, water quality problems, or threats to healthy waters, including critical source areas addressed by the alternative plan.
2.3: Proposed Management Measures and BMPs	Propose management measures and BMPs (including a description of operation and maintenance requirements) and explain how these measures will effectively address the nonpoint source impairments.
2.4: Schedule and Milestones	Establish a schedule with milestones to guide project implementation.
2.5: Water Quality Results Monitoring	Include a water quality results monitoring component describing the processes and measures (e.g., water quality parameters, stream flow metrics, biological indicators) that will help gauge project success.

Section 2.1 provides a brief overview of the goal for water quality protection and restoration in the Kahoma and Kaua‘ula watersheds. Section 2.2 describes the documented and suspected impairments in the watersheds and associated coastal areas. Sections 2.3 and 2.4 present the plan for implementing management measures and BMPs to address the

[2] https://www.epa.gov/system/files/documents/2024-06/2024_section_319_guidelines_final_1.pdf

identified impairments, with references to additional details in the PPF and GSI Drainage Supplement. Section 2.5 summarizes ongoing and planned monitoring efforts in the watersheds and nearshore marine areas that can support evaluation of nonpoint source control efforts. Section 2.5 also outlines expectations for BMP implementation monitoring in project proposals.

2.1 WATERSHED GOAL

The overall goal for the Kahoma and Kaua‘ula watersheds is to **leverage the protection and restoration of water resources to contribute to community sustainability and resilience.**

This Alternative Watershed Plan is meant to secure and guide use of CWA Section 319 funds to support watershed recovery and restoration, with a focus on addressing immediate impacts from the Lahaina wildfire. The plan also incorporates activities that support longer-term efforts toward wildfire recovery and mitigation of nonpoint source pollution from historic and ongoing land uses.

DOH intends to meet the watershed goal by supporting watershed protection and restoration projects that are aligned with the recovery principles outlined in the Lahaina Long-Term Recovery Plan—prioritizing repopulation, protecting historic and cultural resources, honoring community, hazard mitigation and response, and rebuilding with resilience. The wildfires in Lahaina and elsewhere demonstrate the need for rebuilding and recovery efforts to be fire-wise and emphasize stormwater retention landscapes. To that end, the DOH will also implement this plan in accordance with the guiding principles set forth in the GSI Drainage Supplement; through listening to the community and local practitioners, DOH will support projects that reflect the culture of Lahaina, nurture the water system from mauka to makai, and recognize the current status and reality of fire recovery. In addition, DOH will engage in simple and effective communication about this plan that will serve the community in its efforts toward restoration.

While this document informs immediate projects to be implemented within four years of the Lahaina wildfire, these projects should be developed and implemented in a way that can support long-term restoration/recovery goals and projects. For example, near-term revegetation efforts should, to the extent possible, use species that support longer-term goals for fire resilience and restoration of native vegetation. Near-term erosion control projects should not inhibit longer-term plans for implementation of GSI runoff control measures. Immediate funding could be used for nature-based BMPs, like small-scale constructed wetlands to reduce nutrient and sediment delivery to targeted coastal areas, with a long-term goal of expanding and restoring wetlands on a larger scale. Funding under

the Alternative Watershed Plan could be leveraged for near-term implementation of GSI pilot projects that will support and inform longer-term, widespread GSI application in residential and commercial rebuilding and restoration as well as development of long-term GSI implementation programs.

2.2 CAUSES OR SOURCES OF POLLUTION AND NONPOINT SOURCE IMPAIRMENTS

This section includes a high-level summary of the causes and sources of nonpoint source pollution and threats to water quality in the Kahoma and Kaua‘ula watersheds as described in the PPF. This Alternative Watershed Plan, as part of an emergency effort to improve water quality in response to the wildfires, focuses primarily on water quality degradation resulting from the wildfires. At the same time, it recognizes non-wildfire related water quality challenges, supporting a longer-term goal to address multiple sources of nonpoint source pollution and restore water quality.[3]

2.2.1 Nonpoint Source Pollution from Wildfire

Contaminants from wildfire mobilize through the environment in a variety of ways:

- Burned items turn to ash, which is carried by wind and water into sediments, soils, streams, and coastal marine waters. Based on ash sampling in Lahaina, metals are a primary pollutant of concern.[4]
- Vegetation is burned away, leaving barren soil that erodes into waterways. The burned plant material also contributes nutrients.
- Large debris and sediment that are washed into waterways can cause further damage through increased risk of flooding and landslides, thereby impacting stream and coastal habitats.
- Potential mobilization of legacy pollutants, such as pesticides.

Beginning immediately after the Maui wildfires, DOH, along with federal, state, regional, and local partners, monitored the environment around Lahaina to understand and evaluate the wildfires’ impact on public health, infrastructure, and environmental systems.

[3] It will be necessary to address multiple nonpoint sources of pollution over the longer term as part of a One Water approach to water management and watershed protection and restoration in West Maui. As such, the Alternative Watershed Plan also accommodates near-term implementation of projects that support longer-term, holistic solutions to nonpoint pollutant impacts from existing and historic land uses.

[4] https://health.hawaii.gov/news/newsroom/lahaina-ash-characterization-testing-show-elevated-levels-of-toxic-substances

DOH sampled ash and debris in the burn areas of Lahaina in November 2023 to evaluate the presence of contaminants of potential concern (COPCs), including heavy metals, dioxins and furans, polycyclic aromatic hydrocarbons (PAHs), asbestos, polychlorinated biphenyls (PCBs), per- and polyfluoroalkyl substances (PFAS), flame retardants, organochlorine pesticides, and others. Based on the ash sampling results and evaluation of various other data sources, heavy metals have been identified as the main risk drivers in and around the burn area (they pose the greatest risk to people and ecosystems, and thus are COPCs).[5] Arsenic, cobalt, copper, and lead are the primary metals of concern.

Volcanic soils on Maui have high background concentrations of metals such as arsenic, cobalt, iron, manganese, and aluminum. These metals are naturally occurring and affect concentration levels in coastal waters, sediment, and other media (DOH, 2024a).[6] Naturally occurring metals may contribute to the higher concentrations identified through environmental monitoring.

Table 22 of the PPF identifies degraded waterbodies that have been affected by the wildfire. These waters have either been documented as impaired[7] or are suspected to be impaired.[8] Specifically, monitoring results have shown that multiple segments of Kahoma Stream and Kahoma and Kaua‘ula nearshore marine waters are impaired for aquatic life and recreational designated uses. The documented causes of impairment are most commonly turbidity, nutrients, and chlorophyll *a*. Sediment and metals are other potential causes of impairment. This is consistent with expected runoff from burned areas where soil is exposed to erosion, and burned materials in developed areas can contain a mix of household or industrial pollutants. The PPF clarifies that these water bodies were impaired by pollutants stemming from multiple historic and ongoing land uses and were further affected by the Lahaina wildfire.

2.2.2 Nonpoint Source Pollution from Other Sources

Table 23 of the PPF identifies documented and potential impairments in the Kahoma and Kaua‘ula watersheds resulting from non-wildfire sources. As with the wildfire-related degradation, these waters are impaired for aquatic life and recreational designated uses.

[5] Hawai‘i Department of Health (DOH) Hazard Evaluation & Emergency Response (HEER) Office. 2023. *Technical Guidance Manual (TGM)*. https://health.hawaii.gov/heer/tgm/

[6] Hawai‘i Department of Health (DOH). 2024. *Maui wildfire data: Coastal sediment*. https://health.hawaii.gov/environmental-data/coastal-sediment/

[7] A waterbody is considered impaired if water quality monitoring indicates that water quality standards are not being met. States publish a list of impaired waters every two years as part of their Integrated Report. Section 3 of the PPF describes the water quality standards, sources of water quality data, and methods used to evaluate the data that have been collected.

[8] Suspected impairments occur where waters lack sufficient monitoring data to be formally listed but show signs of being impaired.

Documented causes of impairment include turbidity (in Kahoma Stream and Nearshore Marine waters, Kaua‘ula Nearshore Marine waters, and Lahaina Harbor), chlorophyll *a* (in Kahoma Nearshore Marine waters), nitrate and nitrite (in Kahoma and Kaua‘ula Nearshore Marine waters), and ammonium (in Kahoma and Kaua‘ula Nearshore Marine waters). The PPF includes these among the potential causes of impairment where they were not already documented, along with sediment, enterococci, total nitrogen, and metals. It lists over a dozen probable sources of nonpoint source pollution, including erosion, stormwater, leaking septic systems, and agricultural runoff, contributing to both documented and suspected impairments.

Over time, the restoration needs in the watershed will evolve as ongoing monitoring contributes to improved understanding of impairments[9] and different pollutants or sources may become a higher priority. For future development of a comprehensive nine-element watershed-based plan, it will be important to incorporate adaptability in restoration efforts to accommodate these shifting priorities.

2.3 PROPOSED MANAGEMENT MEASURES AND BEST MANAGEMENT PRACTICES

The Kahoma and Kaua‘ula Alternative Watershed Plan focuses on measures that can be implemented within four years of the August 2023 Lahaina wildfire in accordance with EPA guidance for alternative plans. This section identifies priority management measures and BMPs that DOH anticipates can be implemented to support wildfire recovery and watershed restoration efforts in that time frame. Many of these management measures and BMPs support revegetation and erosion control to reduce loading of sediment and associated pollutants from burned areas to the streams and nearshore marine environments. The Alternative Watershed Plan also supports projects that incorporate green infrastructure, which reduce erosion and pollutant loading by reducing the volume and velocity of stormwater runoff to streams and coastal areas. In addition, the Alternative Watershed Plan includes management measures and BMPs that restore wetlands and native plants and other practices, including monitoring and outreach to support nonpoint source control measures.

The measures and BMPs listed in this section are a subset of those included in the PPF and the Lahaina GSI Drainage Supplement. DOH supports the measures and practices included in the PPF’s comprehensive lists (see Tables 25 – 27 in the PPF) along with the recommended projects from the GSI Drainage Supplement. However, given the time frame

[9] See, for example, Maui Wildfire Data: What We Monitor, available at https://health.hawaii.gov/environmental-data/what-we-monitor/.

covered and limited funding available, DOH has identified a subset of those practices as priorities for funding under the Alternative Watershed Plan. These priority practices address immediate impacts from the wildfire and support longer-term recovery efforts based on community priorities for watershed restoration, as DOH understands them today. DOH anticipates ongoing engagement with the community to inform project selection and fully recognizes that priorities may shift in response to changes in watershed and coastal conditions as indicated by ongoing monitoring, as well as funding availability, opportunities to leverage activity and projects implemented under related recovery efforts, and other variables that will influence practice selection and implementation.

Table 2 and the following sections group management measures according to their primary outcome (e.g., erosion control, runoff reduction), as listed below, but many of the practices also provide one or more co-benefits, including wildfire prevention:

- Revegetation and native plant restoration
- Erosion control and sediment reduction
- Runoff management through GSI as part of rebuild and recovery efforts
- Non-GSI runoff management/increased infiltration
- Wetland restoration
- Other related practices

Section headings and management measure numbers in Table 2 are hyperlinked to the corresponding text in Sections 2.3.1 - 2.3.6 below.

Table 2. Priority Management Measures and Best Management Practices

Management Measure #	Management Measure/BMP
A. Revegetation and Native Plant Restoration	
A.1	Revegetation of agricultural lands
A.2	Native forest restoration
A.3	Invasive weed management
A.4	Establishment of a local native plant nursery
A.5	Establishment of a multi-purpose irrigation system
A.6	Expansion of recycled water use
B. Erosion Control and Sediment Reduction	
B.1	Removal of downed trees from drainageways and gulches
B.2	Repair of flood control embankments
B.3	Removal of 500 feet of fill material from concrete-lined drainageway
B.4	Non-structural erosion control practices along unimproved roads
B.5	Structural erosion control for unimproved roads
B.6	Treatment of ditch outlets

Management Measure #	Management Measure/BMP
B.7	Erosion control practices on firebreaks
B.8	Rehabilitation of firebreak crossings of drainageways and gulches
B.9	Routine removal of sediment and debris deposits from culverts
B.10	Flood control embankments upgrades
B.11	Riparian buffer practices
C. Runoff Management through Green Stormwater Infrastructure	
C.1	GSI Pilot Projects
C.2	Residential GSI application
C.3	Commercial GSI application
C.4	Public lands GSI application
C.5	Constructed wetlands on public lands
C.6	Structural erosion control for unimproved roads
D. Non-GSI Runoff Management/Increased Infiltration	
D.1	Compost application to agricultural lands
D.2	Compost-based landscaping practices
D.3	Compost-based stormwater practices
D.4	Urban agroforestry
D.5	Rehabilitation of unneeded or steep firebreaks
E. Wetland Restoration	
E.1	Restoration of coastal ponds and wetlands
E.2	Restoration of traditional lo‘i kalo
F. Other Related Practices	
F.1	Monitoring and assessment
F.2	Targeted outreach to support BMP implementation
F.3	Cesspool conversion pilot project
F.4	Update the Western Maui Community Wildfire Protection Plan

The sections below provide the following information for each priority practice listed in Table 2:

- A brief description of the practice or management measure.
- The documented and suspected nonpoint source impairments that the practice will address.
- The critical source area(s) or criteria for identifying critical source area(s) for implementing the practice.
- A reference to the section(s) of the PPF or GSI Drainage Supplement that includes more detailed descriptions of the proposed BMPs or describe the sources of impairment addressed by the practice.
- Examples of typical operation and maintenance (O&M) procedures.

Grant funding awarded under the Section 319 program cannot be used for long-term operation and maintenance of BMPs; however, practices that are implemented using Section 319 funding must be properly operated and maintained to ensure continued effectiveness over the life of the practice. DOH recognizes that the specific operation and maintenance needs of a BMP may vary based on the location, size, and other design details and anticipates that project proposals will include more detailed plans for ensuring BMPs will be properly operated and maintained to achieve the expected water quality outcomes. The example operation and maintenance requirements for each practice below are based on existing practice standards[10] or guidance for similar types of practices. The included examples can help project proponents understand the general types of operation and maintenance procedures DOH expects for those BMPs. However, DOH does not intend for the examples to imply a requirement that the BMPs must meet the practice standard(s) referenced or to limit the BMPs that may be proposed.

This section includes a range of measures and practices that have potential to help achieve the watershed goals. Actual implementation of BMPs and other nonpoint source control measures in the Kahoma and Kaua‘ula watersheds will depend on stakeholders taking action, in cooperation with DOH, to identify and propose projects for funding, as well as the availability of funding to support the proposed projects. To the extent that project proposals exceed the funding available through the Nonpoint Source Program, DOH anticipates project selection will give precedence to:

- Priority projects identified by the Lahaina community through ongoing outreach and public participation associated with implementation of the Lahaina GSI Drainage Supplement and Lahaina Long-Term Recovery Plan.
- Projects that address documented nonpoint source impacts identified through on-the-ground verification and/or water quality monitoring.
- Projects that leverage funding for public education and to facilitate and promote community participation in watershed protection and restoration.

Finally, the caret symbol (^) appears on certain practices in the sections below to denote management measures and BMPs that have been or are being implemented in the Kahoma and Kaua‘ula watersheds and/or neighboring watersheds impacted by the 2023 wildfire (see Section 5.1 and Table 24 in the PPF). Where appropriate, there may be opportunities to leverage Section 319 funding to supplement or expand existing projects for improved nonpoint source pollution reduction.

[10] Many of the operation and maintenance examples are based on NRCS Conservation Practice Standards for Hawai‘i and the Pacific Islands Area, which can be found in Section IV of the NRCS Field Office Technical Guide for Hawai‘i and the Pacific Islands Area at https://efotg.sc.egov.usda.gov/#/.

2.3.1 Revegetation and Native Plant Restoration Practices (A)

Management Measure	**A.1 Revegetation of agricultural lands**^; seeding with grass species to stabilize soils, preferably native species
Impairment(s) Addressed	Sediment, Turbidity, Nutrients, Metals, Persistent Organic Chemicals (POCs)
Critical Source Area(s) for Implementation	Burned agricultural lands, with precedence for acreage that experienced moderate to high severity burning
PPF Reference	5.2.1.2
Typical O&M Requirements (Source: NRCS Conservation Practice Standard [CPS] Code 327, Conservation Cover)	Multiple BMPs can be used for revegetation and are often used in concert with each other. Typical O&M activities might include: • Protect the cover from irreversible damage by traffic, implements, and herbicides. • Mowing and harvest operations in a perennial crop system (such as orchards, vineyards, berries, and nursery stock), will be accomplished in a manner that minimizes the generation of particulate matter. • Mowing may be needed during the establishment period to reduce competition from weeds. • Control noxious weeds and invasive species. • If wildlife habitat enhancement is a purpose, maintenance practices and activities will occur during periods of the day or season to minimize negative impacts of disturbance. • If wildlife habitat is a purpose, include the procedures necessary to conserve the cover’s wildlife habitat functions. • To support insects eaten by grassland nesting birds, spot treat noxious weeds to protect other forbs and legumes that benefit native pollinators and other wildlife. • Revegetate bare spots when they occur.

Management Measure	**A.2 Native forest restoration**^; follows improvement of soil health
Impairment(s) Addressed	Sediment, Turbidity, Nutrients, Metals
Critical Source Area(s) for Implementation	Mid-elevation (e.g., wetter) agricultural lands owned by the State of Hawai‘i and Kamehameha Schools that were historically de-forested
PPF Reference	4.2.1.1, 4.2.1.8
Typical O&M Requirements (Source: Updated Management Measures for	Typical O&M activities might include:

Hawai‘i’s CNPCP [Site Preparation and Reforestation] and NRCS CPS Code 612, Tree-Shrub Establishment)	• Manage competing vegetation (including Federal or State Invasive Species and Noxious Weeds), as needed, until the desired trees and shrubs are established without competing for sunlight, water, or nutrients. • Maintain the health of the established plant community with appropriate management techniques including periodic mowing, herbicide treatments, or prescribed burning, as needed. Do not conduct maintenance practices and activities during the primary reproductive period of wildlife. • Control access by vehicles and equipment during or after tree-shrub establishment to protect new plants and minimize erosion, compaction, and other site impacts. • Inspect the site at appropriate time intervals following planting, seeding, or natural regeneration to determine whether the survival rate for trees and shrubs meets the intended practice purposes and client objectives. • Periodically inspect established trees and shrubs and protect them from adverse impacts of insects, diseases, competing vegetation, fire, livestock, wildlife, nonfunctioning tree shelters, weed barriers, etc. • Apply nutrients to maintain vigor of desirable trees-shrubs, as needed.

Management Measure	**A.3 Invasive weed management^**
Impairment(s) Addressed	Sediment, Turbidity, Nutrients, Metals
Critical Source Area(s) for Implementation	Requires further assessment; project proposals should include details that link the area(s) for implementation to the targeted impairment(s) and watershed goals.
PPF Reference	5.2.1.2
Typical O&M Requirements (Source: NRCS CPS Code 315, Herbaceous Weed Treatment)	Typical O&M activities might include: • Develop a safety plan for individuals exposed to chemicals. • Evaluate regrowth or reoccurrence of target and desired species after sufficient time has passed to monitor the vegetation and gather reliable data. Length of evaluation periods depend on the herbaceous weed species being monitored, proximity of propagules (seeds, plant materials, and roots) to the site, transport mode of seeds (wind or animals), and methods and materials used. • Complete spot treatments of individual plants or areas needing retreatment when weed vegetation is most vulnerable to desired treatment procedures. Review and

	update the herbaceous weed treatment plan periodically to incorporate new integrated pest management technology, respond to grazing management and complex weed population changes, and follow cooperative extension service guidance to avoid the development of weed resistance to herbicide chemicals.

Management Measure	**A.4 Establishment of a local native plant nursery**^ to support urban agroforestry and native plant community restoration on agricultural and conservation lands *Note: At least one native nursery, Re-Landscape Hawai‘i, and the nonprofit organization Treecovery Hawai‘i already exist to provide native plant and tree varieties to support Maui wildfire recovery. Section 319 funding could not be used to support ongoing operations of a native nursery, but a nursery or seed bank could be a component of an eligible revegetation project.*
Impairment(s) Addressed	Sediment, Turbidity, Nutrients, Chlorophyll *a*, Enterococci, Metals, POCs
Critical Source Area(s) for Implementation	N/A
PPF Reference	5.2
Typical O&M Requirements	N/A – not fundable as a stand-alone project; O&M requirements would be based on associated project that includes establishment of a native plant nursery as a component.

Management Measure	**A.5 Establishment of a multi-purpose irrigation system** that can be used for green firebreaks and revegetation projects. Preference for systems that also support expansion of recycled water use.
Impairment(s) Addressed	Sediment, Turbidity, Nutrients, Chlorophyll *a*, Metals, POCs
Critical Source Area(s) for Implementation	Burned agricultural lands, revegetation projects, native plant restoration projects
PPF Reference	5.2.1.4, 5.2.1.5
Typical O&M Requirements (Source: NRCS CPS Code 320, Irrigation Canal or Lateral)	Typical O&M activities might include: • Performing periodic and post-storm inspections to detect and minimize damage to the canal or lateral. • Performing prompt repair or replacement of damaged components. • Removing debris and foreign material that hinder system operation. • Maintaining recommended vegetative cover on all slopes and watercourses. When possible, mowing or other

	disturbance of vegetation should be scheduled outside of the primary nesting season for grass-nesting species.

Management Measure	**A.6 Expansion of recycled water use** for agriculture, landscaping irrigation, re-vegetation, and irrigated firebreaks
Impairment(s) Addressed	Nutrients, Chlorophyll *a*
Critical Source Area(s) for Implementation	Requires further assessment; project proposals should include details that link the area(s) for implementation to the targeted impairment(s) and watershed goals.
PPF Reference	4.2.2.2, 5.2.1.2
Typical O&M Requirements (Source: DOH's 2016 *Reuse Guidelines Volume II: Recycled Water Projects*)	Typical O&M activities might include: • Recycled water should be applied at a rate appropriate to plant uptake and evapotranspiration rates. • Controls should be adjusted and other measures taken to prevent direct or indirect runoff from the approved use area to outside areas such as streets, right-of-ways, sidewalks, parking lots, storm drains, gutters, and water bodies such as streams, ponds, and oceans. • The area should be checked for any vector issues arising from the use of recycled water. If recycled water impoundments attract mosquitoes, rodents, or other vectors, a vector control plan should be developed and implemented. • The irrigation system should be examined for any maintenance issues; any necessary repairs or maintenance should be performed immediately. Cross-connection testing should be performed on a regular basis, as appropriate.

2.3.2 Erosion Control and Sediment Reduction Practices (B)

Management Measure	**B.1 Removal of downed trees from drainageways and gulches**, followed by stabilizing banks adjacent to channels
Impairment(s) Addressed	Sediment, Turbidity, Nutrients, Metals
Critical Source Area(s) for Implementation	Drainageways and gulches that intersect roadways downstream
PPF Reference	5.2.2
Typical O&M Requirements (Source: NRCS CPS Code 320, Irrigation Canal or Lateral)	Typical O&M activities might include: • Performing periodic and post-storm inspections to detect and minimize damage to the canal or lateral. • Removing debris and foreign material that hinder system operation.

	• Maintaining recommended vegetative cover on all slopes and watercourses. When possible, mowing or other disturbance of vegetation should be scheduled outside of the primary nesting season for grass-nesting species.

Management Measure	**B.2 Repair of flood control embankments** removed or modified during fire response, removal of any temporary silt fencing
Impairment(s) Addressed	Sediment, Turbidity, Nutrients, Metals
Critical Source Area(s) for Implementation	All locations where flood control embankments were removed or modified
PPF Reference	5.2.2.1
Typical O&M Requirements (Source: NRCS CPS Code 356, Dike and Levee)	Typical O&M activities might include: • Inspection of the dike or levee and any appurtenant structures annually and following large storm events to ensure there is no damage and that the dike or levee is operating properly. • Removal of any woody material, debris, or growing timber that compromises the efficient operation or structural integrity of the dike or levee. • Repairs to the dike or levee as soon as possible after observing damage. • Reestablishment of vegetative cover on the dike or levee where erosion has removed established vegetation.

Management Measure	**B.3 Removal of 500 ft of fill material from concrete-lined drainageway** that connects to the concrete-lined reach of Kahoma Stream.
Impairment(s) Addressed	Sediment, Turbidity, Nutrients, Metals
Critical Source Area(s) for Implementation	Section of concrete-lined drainageway that connects to the concrete-lined reach of Kahoma stream immediately east of the Kaiāulu O Kupuohi community.
PPF Reference	5.2.2.2
Typical O&M Requirements (Source: NRCS CPS Code 320, Irrigation Canal or Lateral)	Typical O&M activities might include: • Performing periodic and post-storm inspections to detect and minimize damage to the canal or lateral. • Removing debris and foreign material that hinder system operation.

Management Measure	**B.4 Non-structural erosion control practices along unimproved roads**; seeded compost blankets, compost filter socks, and compost berms; could include a variety of organic soil amendments including multiple compost sources or biochar
Impairment(s) Addressed	Sediment, Turbidity, Nutrients, Metals
Critical Source Area(s) for Implementation	Sites along unimproved roads with low to moderate erosion and a direct hydrologic connection to drainageways and stream gulches
PPF Reference	5.2.1.3
Typical O&M Requirements (Source: Updated Management Measures for Hawai‘i’s CNPCP [Road Management] and NRCS CPS 560, Access Road)	Typical O&M activities might include: • Maintain vegetated areas in adequate cover to meet the intended purpose(s). • Keep culverts, flumes, and ditches functional before and during the rainy season to diminish danger of clogging and the possibility of washouts. This can be done by clearing away any sediment or vegetation that could cause a problem. Provide for practical and scheduled preventative maintenance programs for high risk sites that will address the problems associated with high intensity rainfall events. • Fill low areas in travel treads and regrade, as needed, to maintain road cross section. Repair or replace surfacing materials as needed. Conduct road surface maintenance as necessary to minimize erosion of the surface and subgrade. • During operations, keep the road surface crowned or outsloped, and keep the downhill side of the road free from berms except those intentionally constructed for protection of fill. • Avoid using roads during wet periods if such use would likely damage the road drainage features. • Water bars should be inspected after major rain storms and damage or breeches should be promptly corrected.

Management Measure	**B.5 Structural erosion control for unimproved roads** using GSI or LID principles; riprap, check dams, and vegetation establishment
Impairment(s) Addressed	Sediment, Turbidity, Nutrients, Metals
Critical Source Area(s) for Implementation	Sections of unimproved roads that contribute measurable loads of sediment to drainageways and streams
PPF Reference	4.2.1.12, 5.2.1.3

Typical O&M Requirements (Source: EPA’s National Menu of BMPs for Stormwater Post-Construction)	Typical O&M activities might include: • Maintenance of aboveground bioretention and bio-infiltration features, such as swales and infiltration trenches, largely entails maintaining established vegetation. Depending on locations and designs, removal of accumulated sediment and debris is also typically necessary.

Management Measure	**B.6 Treatment of ditch outlets**; riprap, check dams, and vegetation establishment
Impairment(s) Addressed	Sediment, Turbidity, Nutrients, Metals, POCs
Critical Source Area(s) for Implementation	Irrigation ditches that route water to drainageways and stream gulches, focusing on the area within 200 ft of ditch outlets.
PPF Reference	5.2.1.4
Typical O&M Requirements (Source: NRCS CPS Code 320, Irrigation Canal or Lateral)	Typical O&M activities might include: • Performing periodic and post-storm inspections to detect and minimize damage to the canal or lateral. • Performing prompt repair or replacement of damaged components. • Removing debris and foreign material that hinder system operation. • Maintaining recommended vegetative cover on all slopes and watercourses. When possible, mowing or other disturbance of vegetation should be scheduled outside of the primary nesting season for grass-nesting species.

Management Measure	**B.7 Erosion control practices on firebreaks** to be maintained as firebreaks or roads; drainage features such as water bars
Impairment(s) Addressed	Sediment, Turbidity, Nutrients, Metals
Critical Source Area(s) for Implementation	Firebreaks with steep slopes (e.g., > 2% slope)
PPF Reference	5.2.1.5
Typical O&M Requirements (Source: Updated Management Measures for Hawai‘i’s CNPCP [Road Management])	Typical O&M activities might include: • Keep culverts, flumes, and ditches functional before and during the rainy season to diminish danger of clogging and the possibility of washouts. • Conduct road surface maintenance as necessary to minimize erosion of the surface and subgrade. • During operations, keep the road surface crowned or outsloped, and keep the downhill side of the road free from

	berms except those intentionally constructed for protection of fill. • Avoid using roads during wet periods if such use would likely damage the road drainage features. • Water bars should be inspected after major rain storms and damage or breeches should be promptly corrected.

Management Measure	**B.8 Rehabilitation of firebreak crossings of drainageways and gulches**; removal of soil deposits from channels, repair of channel banks, and stabilization of firebreak path and banks adjacent to channels
Impairment(s) Addressed	Sediment, Turbidity, Nutrients, Metals
Critical Source Area(s) for Implementation	All crossings
PPF Reference	5.2.1.5
Typical O&M Requirements (Source: NRCS CPS Code 320, Irrigation Canal or Lateral)	Typical O&M activities might include: • Performing periodic and post-storm inspections to detect and minimize damage to the canal or lateral. • Performing prompt repair or replacement of damaged components. • Removing debris and foreign material that hinder system operation. • Maintaining recommended vegetative cover on all slopes and watercourses. When possible, mowing or other disturbance of vegetation should be scheduled outside of the primary nesting season for grass-nesting species.

Management Measure	**B.9 Routine removal of sediment and debris deposits from culverts**
Impairment(s) Addressed	Sediment, Turbidity, Nutrients, Metals
Critical Source Area(s) for Implementation	All culverts
PPF Reference	5.2.2
Typical O&M Requirements	N/A

Management Measure	**B.10 Flood control embankments upgrades** for embankments not constructed to NRCS standards
Impairment(s) Addressed	Sediment, Turbidity, Nutrients, Metals
Critical Source Area(s) for Implementation	Four embankments south of Lahaina (and potentially additional locations)
PPF Reference	5.2.2.1
Typical O&M Requirements (Source: NRCS CPS Code 356, Dike and Levee)	Typical O&M activities might include: • Inspection of the dike or levee and any appurtenant structures annually and following large storm events to ensure there is no damage and that the dike or levee is operating properly. • Removal of any woody material, debris, or growing timber that compromises the efficient operation or structural integrity of the dike or levee. • Repairs to the dike or levee as soon as possible after observing damage. • Reestablishment of vegetative cover on the dike or levee where erosion has removed established vegetation.

Management Measure	**B.11 Riparian buffer practices**; stacked practices including ripping, terraforming, micro-basins, key lining/ripping on contour, vetiver eyebrows in kickouts, contour planting vetiver, native plant establishment, hydro-mulching, and check dams
Impairment(s) Addressed	Sediment, Turbidity, Nutrients, Metals
Critical Source Area(s) for Implementation	Requires further assessment; project proposals should include details that link the area(s) for implementation to the targeted impairment(s) and watershed goals.
PPF Reference	5.2.3.4
Typical O&M Requirements (Source: NRCS CPS Code 580, Streambank and Shoreline Protection)	Typical O&M activities might include: Periodic inspections and prompt repair or replacement of damaged components. • Periodic inspections and prompt repair of erosion. • Procedures for maintaining healthy vegetation, when required. • Controlling undesirable vegetation.

2.3.3 Runoff Management through Green Stormwater Infrastructure (C)

Measures C.1 through C.5 below are recommendations of the Lahaina GSI Drainage Supplement. The Sewer Overflow and Stormwater Reuse Municipal Grant (OSG) awarded to Maui County will be the primary source of funding for these projects. DOH anticipates, however, that there may be opportunities to support pilot projects with a combination of OSG and Section 319 funding. Proposals for these projects should demonstrate consistency with the detailed recommendations of the Lahaina GSI Drainage Supplement.

Management Measure	**C.1 GSI Pilot Projects** that demonstrate practical applications of bioretention, permeable pavements, tree trenches, and constructed wetlands; projects could include those described in the GSI Drainage Supplement or similar projects at other sites that achieve this objective
Impairment(s) Addressed	Sediment, Turbidity, Nutrients, Chlorophyll *a*, Enterococci, Metals, POCs
Critical Source Area(s) for Implementation	Lahaina Aquatic Center, Lahaina Recreation Center, Prison Street Public Parking lot, Front Street at Mokuhinia, along Kelawea Street, West Maui Senior Center, David Malo Circle Apartments, Papalaua Street and Front Street, Lahainaluna Road and Front Street, as described in the GSI Drainage Supplement
GSI Drainage Supplement Reference	3.1
Typical O&M Requirements (Source: NRCS CPS Code 336, Soil Carbon Amendment)	Specific O&M requirements will depend on the practice(s) selected. Detailed O&M descriptions for a variety of GSI practices are included in the *Low Impact Development Practitioner's Guide for Hawai'i* (December 2023).[11]

Management Measure	**C.2 Residential GSI application** such as native tree/vegetation planting, permeable pavement, rain barrels, and cisterns.
Impairment(s) Addressed	Sediment, Turbidity, Nutrients, Chlorophyll *a*, Enterococci, Metals, POCs
Critical Source Area(s) for Implementation	20% of single-family residential lots
GSI Drainage Supplement Reference	3.2

[11] https://files.hawaii.gov/dbedt/op/czm/ormp/ormp_implementation/2023LIDPractitionersGuide.pdf

Typical O&M Requirements (Source: NRCS CPS Code 336, Soil Carbon Amendment)	Specific O&M requirements will depend on the practice(s) selected. Detailed O&M descriptions for a variety of GSI practices are included in the *Low Impact Development Practitioner's Guide for Hawai‘i* (December 2023).[11]

Management Measure	**C.3 GSI application for commercial developments** such as permeable pavement, underground infiltration chambers, infiltration basins and trenches, bioretention with or without underdrains, and tree trenches.
Impairment(s) Addressed	Sediment, Turbidity, Nutrients, Chlorophyll *a*, Enterococci, Metals, POCs
Critical Source Area(s) for Implementation	100% of lots ≥1 acre; 50% of lots <1 acre
GSI Drainage Supplement Reference	3.2
Typical O&M Requirements (Source: NRCS CPS Code 336, Soil Carbon Amendment)	Specific O&M requirements will depend on the practice(s) selected. Detailed O&M descriptions for a variety of GSI practices are included in the *Low Impact Development Practitioner's Guide for Hawai‘i* (December 2023).[11]

Management Measure	**C.4 GSI application on public lands** such as permeable pavement, underground infiltration chambers, infiltration basins and trenches, bioretention with or without underdrains, and tree trenches.
Impairment(s) Addressed	Sediment, Turbidity, Nutrients, Chlorophyll *a*, Enterococci, Metals, POCs
Critical Source Area(s) for Implementation	100% of public parcels; 20% of public rights-of-way
GSI Drainage Supplement Reference	3.2
Typical O&M Requirements (Source: NRCS CPS Code 336, Soil Carbon Amendment)	Specific O&M requirements will depend on the practice(s) selected. Detailed O&M descriptions for a variety of GSI practices are included in the *Low Impact Development Practitioner's Guide for Hawai‘i* (December 2023).[11]

Management Measure	**C.5 Constructed wetlands on public lands**, including lo‘i kalo.
Impairment(s) Addressed	Sediment, Turbidity, Nutrients, Chlorophyll *a*, Enterococci, Metals, POCs
Critical Source Area(s) for Implementation	100% of large areas with shallow groundwater or springs that are publicly owned or historic areas (see mapped areas in Figure 26 of the GSI Drainage Supplement)
GSI Drainage Supplement Reference	3.2
Typical O&M Requirements (Source: NRCS CPS Code 336, Soil Carbon Amendment)	Specific O&M requirements will depend on the practice(s) selected. Detailed O&M descriptions for a variety of GSI practices are included in the *Low Impact Development Practitioner's Guide for Hawai‘i* (December 2023).[11]

Management Measure	**C.6 Structural erosion control for unimproved roads** using GSI or low impact development (LID) principles
Impairment(s) Addressed	Sediment, Turbidity, Nutrients, Metals
Critical Source Area(s) for Implementation	Sections of unimproved roads that contribute measurable loads of sediment to drainageways and streams
PPF Reference	4.2.1.12, 5.2.1.3
Typical O&M Requirements (Source: EPA's National Menu of BMPs for Stormwater Post-Construction)	Typical O&M activities might include: • Maintenance of aboveground bioretention and bio-infiltration features, such as swales and infiltration trenches, largely entails maintaining established vegetation. Depending on locations and designs, removal of accumulated sediment and debris is also typically necessary.

2.3.4 Non-GSI Runoff Management/Increased Infiltration (D)

Management Measure	**D.1 Compost application to agricultural lands** to improve soil health; could include a variety of organic soil amendments including multiple compost sources or biochar
Impairment(s) Addressed	Sediment, Turbidity, Nutrients, Metals, POCs
Critical Source Area(s) for Implementation	Burned agricultural lands, with precedence for acreage that experienced moderate to high severity burning
PPF Reference	5.2.1.1
Typical O&M Requirements (Source: NRCS CPS Code 336, Soil Carbon Amendment)	Typical O&M activities might include: • Calibrate application equipment to ensure accurate distribution of material at planned rates.

	• Inspect and evaluate surface applied amendments after the first heavy precipitation event to ensure the material is stable and does not impact non-target areas. • Evaluate the effectiveness of the amendment (application, amount of cover provided, durability, etc.) and adjust future management or type of amendment to better meet the intended purpose(s).

Management Measure	**D.2 Compost-based landscaping practices**; seeded compost blankets where revegetation is needed, compost topdressing of turf where revegetation is not needed, compost mulch around new and existing trees/shrubs, and compost applications to ornamental and edible gardens. Could include a variety of organic soil amendments including multiple compost sources or biochar.
Impairment(s) Addressed	Sediment, Turbidity, Nutrients, Chlorophyll *a*, Enterococci, Metals, POCs
Critical Source Area(s) for Implementation	All urban parcels, with priority for parcels located within the contributing area of flood-prone areas and stormwater sewers
PPF Reference	5.2.3.2
Typical O&M Requirements (Source: NRCS CPS Code 336, Soil Carbon Amendment)	Typical O&M activities might include: • Inspect and evaluate surface applied amendments after the first heavy precipitation event to ensure the material is stable and does not impact non-target areas. • Evaluate the effectiveness of the amendment (application, amount of cover provided, durability, etc.) and adjust future management or type of amendment to better meet the intended purpose(s).

Management Measure	**D.3 Compost-based stormwater practices**; compost filter socks, compost berms, and compost blankets, compost incorporated into green infrastructure projects including bioretention units, bioswales, green roofs, rooftop gardens, rain gardens. Could include a variety of organic soil amendments including multiple compost sources or biochar.
Impairment(s) Addressed	Sediment, Turbidity, Nutrients, Chlorophyll *a*, Enterococci, Metals, POCs
Critical Source Area(s) for Implementation	Urban parcels and roadways located within the contributing area of flood-prone areas and stormwater sewers, with priority for parcels undergoing construction and around storm drains
PPF Reference	5.2.3.2
Typical O&M Requirements	Typical O&M activities will depend on the specific practices selected.

Management Measure	**D.4 Urban agroforestry**^; planting fire-resilient native plants and canoe plants
Impairment(s) Addressed	Sediment, Turbidity, Nutrients, Chlorophyll *a*, Enterococci, Metals, POCs
Critical Source Area(s) for Implementation	All urban parcels, with priority for parcels located within the contributing area of flood-prone areas and stormwater sewers
PPF Reference	5.2.3.3
Typical O&M Requirements (Source: EPA National Menu of BMPs for Stormwater-Post-Construction, Urban Forestry)	Typical O&M activities might include: • Maintenance considerations for urban forests may include fringe landscaping, trash pickup, watering and even removal. • Municipalities can minimize maintenance efforts by using native vegetation and keeping the area as natural as possible.

Management Measure	**D.5 Rehabilitation of unneeded or steep firebreaks**; soil decompaction, increasing soil roughness, and seeding
Impairment(s) Addressed	Sediment, Turbidity, Nutrients, Metals
Critical Source Area(s) for Implementation	Firebreaks with steep slopes (e.g., > 2% slope), with priority for slopes > 10%
PPF Reference	4.2.1.2, 5.2.1.5
Typical O&M Requirements (Source: NRCS CPS Code 654, Road/Trail/Landing Closure and Treatment)	Typical O&M activities might include: • Periodic monitoring and weather event-based patrolling of completed sites to determine adverse environmental effects and the condition of vegetation established on disturbed areas. Dying or dead vegetation must be replaced as necessary. Control of nuisance, noxious, or invasive species will be continued. • Initial monitoring and patrolling must be conducted during water and/or wind erosive period(s) as needed until the site is determined to be stable. Stabilizing measures and additional treatment will be applied when and where necessary.

2.3.5 Wetland Restoration Practices (E)

Management Measure	**E.1 Restoration of coastal ponds and wetlands**
Impairment(s) Addressed	Sediment, Turbidity, Nutrients, Chlorophyll *a*, Metals
Critical Source Area(s) for Implementation	Loko o Mokuhinia and Moku‘ula^; as described in “Creation of a Cultural Corridor and Restoration of the Moku’ula and Loko o Mokuhinia Complex,” a long-term priority project in the Lahaina Long-Term Recovery Plan. Loko o Nalehu Loko o Kalua‘ehu
PPF Reference	4.2.1.6
Typical O&M Requirements (Source: NRCS CPS Code 657, Wetland Restoration)	Suggested practices related to the protection of wetlands and riparian areas: See EPA’s *National Management Measures to Protect and Restore Wetlands and Riparian Areas for the Abatement of Nonpoint Source Pollution*. Typical O&M activities might include: • Maintenance requirements for water control structures, or other structural practices critical to maintaining the target conditions. • Maintenance related to sedimentation. • The timing and methods for the use of fertilizers, pesticides, or mechanical treatments. • Actions which specifically address any expected problems from invasive or noxious species. • Conditions which indicate the need to use haying or grazing as a management tool, including timing and methods.

Management Measure	**E.2 Restoration of traditional lo‘i kalo** (irrigated terraces in stream valleys for growing kalo)
Impairment(s) Addressed	Sediment, Turbidity, Nutrients, Metals
Critical Source Area(s) for Implementation	Requires further assessment; project proposals should include details that link the area(s) for implementation to the targeted impairment(s) and watershed goals.
PPF Reference	5.2.3.4
Typical O&M Requirements (Source: NRCS CPS Code 600, Terrace)	Typical O&M activities might include: • Periodic inspections, especially immediately following significant runoff events. • Prompt repair or replacement of damaged components.

	• Maintenance of terrace ridge height, channel profile, terrace cross sections and outlet elevations. • Removal of sediment that has accumulated in the terrace channel to maintain capacity and grade. • Regular cleaning of inlets for underground outlets. • Where vegetation is specified, complete seasonal mowing, control of trees and brush, reseed and fertilize as needed. • Notification of hazards about steep slopes on the terrace.

2.3.6 Other Related Practices (F)

Management Measure	**F.1 Monitoring and assessment**^ per Section 2.5 of this plan and Section 7 of the PPF
Impairment(s) Addressed	Sediment, Turbidity, Nutrients, Chlorophyll *a*, Metals, POCs
Critical Source Area(s) for Implementation	Kahoma and Kaua‘ula streams, nearshore marine waters, stormwater outfalls to the Pacific Ocean, urban and agricultural lands where water quality measures and practices are implemented
PPF Reference	7
Typical O&M Requirements	N/A

Management Measure	**F.2 Targeted outreach to support BMP implementation.** Public education and outreach activities related to a specific project or to encourage implementation of specific BMPs for nonpoint source control. For example, a GSI pilot project could incorporate homeowner education on “Building Back Greener” using small-scale GSI. Could include outreach aligned with existing activities of partners including Hui o Wa‘a Kaulua, Hawai‘i Farmer’s Union Foundation, and Ku‘ia Ag Education Center (see PPF, Table 24).
Impairment(s) Addressed	Varies, based on BMP or activity that is the subject of targeted outreach.
Critical Source Area(s) for Implementation	N/A
PPF Reference	Table 24, 5.2.3.2
Typical O&M Requirements	N/A

Management Measure	**F.3 Cesspool conversion pilot project** *Note: Section 319 funds could not be used for conversion of all remaining cesspools to sewer connections; however, the program could potentially fund a pilot project that converts a small number of cesspools, covers costs for connecting residential buildings to collection systems within the boundaries of the residential property, or that focuses on septic system alternatives or enhanced nutrient removal.*
Impairment(s) Addressed	Sediment, Turbidity, Nutrients, Metals, Chlorophyll *a*, POCs
Critical Source Area(s) for Implementation	Remaining cesspools in the Kahoma and Kaua‘ula watersheds
PPF Reference	4.2.1.3
Typical O&M Requirements	N/A

Management Measure	**F.4 Update the Western Maui Community Wildfire Protection Plan (CWPP)** with specific post-fire response actions for water quality protection.
Impairment(s) Addressed	Sediment, Turbidity, Nutrients, Chlorophyll *a*, Metals, POCs
Critical Source Area(s) for Implementation	As identified in the CWPP
PPF Reference	4.2.1.11
Typical O&M Requirements	As identified in the CWPP

2.4 SCHEDULE AND MILESTONES

This section describes the next steps for implementation of pollution reduction efforts under the Alternative Watershed Plan as part of the overall recovery efforts described in Section 1.2. Section 2.3 describes the general categories of BMPs that are most urgently needed to achieve revegetation and soil stabilization in the near term and to support longer term efforts that advance common goals for watershed recovery. DOH anticipates that it will steer Section 319 grant funding to projects and sponsors that advance those goals. While some projects may already be underway, others have yet to be fully developed or implemented. The Alternative Watershed Plan also provides flexibility for DOH to adjust their priorities and decision making over the course of Alternative Watershed Plan implementation based on current conditions and feedback from local stakeholders.

2.4.1 Schedule

During the period covered by the Alternative Watershed Plan, DOH expects to have approximately $500,000 of Section 319 funding available per year for nonpoint source project implementation throughout Hawai‘i. DOH could fund a variety of projects that offer near-term pollutant reductions, including those that achieve revegetation/native plant restoration and erosion control/sediment reduction. Additionally, DOH may fund initial phases of longer-term projects that support wildfire prevention, runoff management/increased infiltration, and wetland restoration as well as supporting projects focused on project effectiveness monitoring, public education, and related efforts. As stated in Section 2.3.3, DOH anticipates OSG will be the primary source of funding for projects implementing recommendations in the GSI Drainage Supplement, with the potential for supplementation funding through Section 319 grants.

As of the publication of the Alternative Watershed Plan, DOH has not made any final decisions on which projects to fund. DOH anticipates awarding Section 319 funding through direct awards to eligible recipients, such as local government entities meeting state procurement requirements, and/or by soliciting proposals from stakeholders through a Request for Proposals (RFP) process.[12]

DOH could award funding to supplement or expand existing, ongoing projects or to initiate new projects. In both cases, DOH expects the scope of the project to have a discrete period of performance consistent with the two-year implementation timeframe for the Alternative Watershed Plan.[13]

2.4.2 Milestones

Table 3 lists milestones to be completed. The dates and timelines provided are estimates and are subject to change based on program capacity, shifting priorities, and external factors.

Table 3. Anticipated Milestones and Timeframe for Awarding Section 319 Funding

Milestone	**Timeframe** (calendar quarter)
Publish RFP	2026 Q1
Select Projects Proposed through RFP or Direct Award	2026 Q2
Execute Contracts	2026 Q3 – Q4
Initiate Projects	2027 Q1 – Q4

[12] The RFP would be published the Hawai‘i Awards & Notices Data System (HANDS) website, available at https://hands.ehawaii.gov/hands/.
[13] This timeline will also facilitate reporting requirements under the Section 319 program.

2.5 WATER QUALITY RESULTS MONITORING

Water quality monitoring and assessments are critical to adaptive management for watershed restoration – particularly because the watersheds quickly change after disasters and during recovery. Water quality monitoring, analysis, and assessment are helpful to evaluate the effectiveness of management measures and BMPs for reducing target pollutants. Similarly, monitoring results help to indicate if management measures and BMPs are ineffective and need to be modified or if additional measures are needed to address nonpoint sources of pollution.

Several types of monitoring can be used to evaluate the effectiveness of nonpoint source practice implementation, including:

- **BMP implementation monitoring**: Monitoring to ensure the proper location and installation of water quality protection measures and BMPs relative to an implementation schedule and milestones as well as ongoing monitoring to ensure measures and BMPs are being properly operated and maintained.
- **BMP effectiveness monitoring**: Monitoring to evaluate if the selected management measures and BMPs are achieving nonpoint source pollutant reductions as intended and to inform decision making regarding the need for modifying or adding pollutant reduction measures. Although BMP effectiveness monitoring is generally not eligible for funding under Section 319, the results of this type of monitoring can be very useful to inform selection of future projects to ensure water quality outcomes.
- **Pollutant source monitoring**: Monitoring throughout the watershed to evaluate pollutant contribution from various land uses to inform watershed modeling and planning.
- **Status and trend monitoring**: Monitoring to collect data for assessing the attainment of water quality standards during a specific time period. This type of monitoring involves sampling for a standard set of pollutants (corresponding to established water quality criteria) collected from the same location to evaluate changes in water quality over time.

Of these monitoring types, BMP effectiveness monitoring is eligible for Section 319 funding as a standalone project.

Since this Alternative Watershed Plan focuses primarily on near-term actions, this section largely covers the processes and measures related to BMP implementation monitoring and considerations for BMP effectiveness monitoring. Section 7 of the PPF includes additional details regarding BMP effectiveness monitoring, pollutant source monitoring, and status

and trend monitoring, all of which will support watershed recovery and restoration during the mid- to long-term time frame.

2.5.1 Immediate Monitoring: Processes and Measures

The near-term focus of BMP implementation monitoring will be to evaluate the installation and ongoing operation[14] of the measures and BMPs identified in Section 2.3. BMP implementation monitoring includes administrative desktop reviews and field inspections. Desktop reviews involve communication with those responsible for BMP installation to determine the status of the project. Once the BMPs have been installed, it is important to conduct field inspections to confirm that BMPs have been installed in the appropriate location and are functioning as designed. DOH expects that the project leads implementing the BMPs will be responsible for conducting and documenting BMP implementation monitoring on a quarterly basis. Scheduling of ongoing field inspections should include consideration for monitoring after large storm events that have the potential to impact BMPs.

DOH also anticipates that the project leads will be responsible for documenting the results of implementation monitoring activities. Documentation for administrative desktop reviews would focus on the project status (i.e., “not started,” “in progress,” or “completed”). Documentation of field inspections should include a description of any concerns with the BMPs, particularly those indicating incorrect installation or needs for repair and records of completing the needed repair.

BMP effectiveness monitoring, if conducted, will occur after BMP implementation monitoring, and may also include baseline monitoring prior to BMP installation. Effectiveness monitoring will support data collection to evaluate if measures and BMPs are achieving the desired pollutant reduction and modifications that may be needed to increase effectiveness. The process for designing, collecting, and analyzing effectiveness monitoring should consider the following: [15]

- Identification of sampling locations
- Identification of parameters for monitoring
- Identify pollutant reduction targets/metrics
- Identification of frequency of monitoring
- Data analysis to inform decision making

[14] As indicated in Section 2.3, Section 319 funding cannot be used for ongoing operation of BMPs, including BMP implementation monitoring beyond the funded project period, but DOH expects that BMPs implemented using Section 319 funding will be properly operated and maintained over the life of the practice.
[15] Additional details on this type of monitoring are available in Section 7.2 of the PPF.

2.5.2 Longer-term Monitoring

DOH and nonprofit partners in West Maui have conducted coastal water quality monitoring over the past several years, including before and immediately after the wildfires, with monitoring projected to continue. DOH and other partners also conducted quarterly monitoring of nearshore water and sediment for a standard set of fire-related contaminants of potential concern during 2024 and 2025, which can be used to support trend monitoring. Summaries and links to these data are available on DOH's Maui Wildfires Coastal Waters webpage.[16] As part of the long-term recovery and restoration efforts for the areas impacted by the Lahaina wildfire, DOH plans to work with partners and existing water quality monitoring efforts to collect water quality monitoring data that can be used to support watershed decision making (including monitoring to support CWA Section 305(b) requirements for assessing water quality).

Long-term monitoring should consist of fixed-site sampling stations throughout the Kahoma and Kaua‘ula watersheds, including sites above the fire disturbance, and continue to lower watershed sites that are established for BMP effectiveness monitoring. Sampling parameters should include, at a minimum: sediment, turbidity, nutrients, and metals. Data gathered from monitoring these sites can help DOH and its partners evaluate BMP effectiveness, assess changes or impairments in the watersheds, and identify areas where additional restoration or recovery efforts are needed.

Lastly, the approach to water quality results monitoring throughout the watersheds will need to be flexible and adaptable to continuously provide data to inform science-based decision making for environmental management. DOH recognizes the dynamic nature of post-disaster watershed conditions and recovery efforts and may need to increase monitoring or adapt monitoring approaches to best inform watershed management decisions.

[16] https://health.hawaii.gov/environmental-data/coastal-waters/