
Tantalus-Round Top Drive Corridor Management Plan

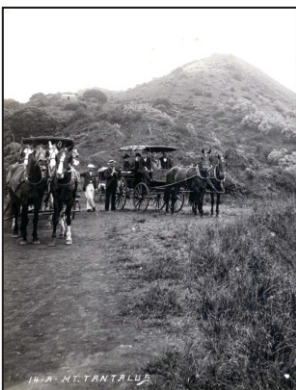
Honolulu Ahupua'a, O'ahu, Hawai'i



Prepared For:
**Division of Forestry and Wildlife
Department of Land and Natural Resources
State of Hawai'i**

Prepared By:
Planning Solutions, Inc.

December 2019



Front Cover:

Portion of an 1889 photograph of the carriage road summit on Pu'u 'Ō'hia (Mount Tantalus) made by members of an excursion party and cameraman Joaquin Augusto Gonsalves; this photograph was originally featured in E.B. Scott's *The Saga of the Sandwich Islands* (1968).

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PROJECT SUMMARY

Project:	Tantalus-Round Top Drive Corridor Management Plan
Agency:	Division of Forestry and Wildlife Department of Land and Natural Resources State of Hawai'i 2135 Makiki Heights Drive Honolulu, Hawai'i 96822 Contact: Marigold S. Zoll (808) 973-9784
Location:	Tantalus-Round Top Drive, Honolulu Ahupua'a, O'ahu, Hawai'i
Proposed Project:	A corridor management plan for the Tantalus-Round Top Drive located in the Honolulu Watershed Forest Reserve
Consultants:	Planning Solutions, Inc. 711 Kapi'olani Boulevard, Suite 950 Honolulu, Hawai'i 96813 Contact: Mākena White, AICP (808) 550-4538

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List of Acronyms

<i>Acronym</i>	<i>Phrase</i>
AC	Asphalt Cement
BWS	Board of Water Supply
CCH	City and County of Honolulu
CMP	Corridor Management Plan
CIP	Capital Improvement Plan
CRM	Concrete Rubble Masonry
DDC	Department of Design and Construction
DFM	Department of Facility Maintenance
DLNR	Department of Land and Natural Resources
DOFAW	Division of Forestry and Wildlife
DPR	Department of Parks and Recreation, Division of Urban Forestry
DTS	Department of Transportation Services
ENV	Department of Environmental Services
FOT	Friends of Tantalus
FRS	Forest Reserve System
FTE	Full-Time Equivalents
GIS	Geographic Information System
HFD	Honolulu Fire Department
HoLIS	Honolulu Land Information System
HPD	Honolulu Police Department
HWFR	Honolulu Watershed Forest Reserve
LMZ	Landscape Maintenance Zone
MOU	Memorandum of Understanding
mph	miles per hour
MUTCD	<i>The Manual on Uniform Traffic Control Devices for Streets and Highways</i>
O&M	Operations and Maintenance
PCC	Portland Cement Concrete
PSI	Planning Solutions, Inc.
RFP	Request for Proposal
ROW	Right-of-Way
TCA	Tantalus Community Association
TMK	Tax Map Key
TRTD	Tantalus-Round Top Drive
TRTD-CMP	Tantalus-Round Top Drive Corridor Management Plan
WPA	Works Progress Administration

FOREWORD

This Tantalus-Round Top Drive Corridor Management Plan (CMP) is an unusual plan, made for a unique place located on O‘ahu. It is a plan for a mountain, forest reserve, historic roadway, and a living community. In it, the Division of Forestry and Wildlife (DOFAW) of the State of Hawai‘i Department of Land and Natural Resources (DLNR) has taken the lead, marshalling the resources and creativity of the State, the City and County of Honolulu, interested organizations, and determined individuals to plan for the maintenance and enhancement of this special place.

DOFAW took up the challenge of developing this plan in response to the needs of the community, which transcend governmental and agency jurisdictional boundaries, and it has taken all possible steps to make this a plan of, for, and by the community. During the planning process, the widest possible net was cast to capture the participation and input of as many sectors of the community as possible. This effort included a dedicated website, a unique online mapping and commenting tool, public presentations, flyers, news releases, agency and organization working groups, and many personal contacts.

The goal of this inclusive approach was to build, from its inception, cooperation between agencies, organizations, and individuals into the very fabric of this plan. It was born out of DOFAW’s conviction that the only way for this CMP to succeed and fully realize its potential was for all stakeholders to work together to better plan for and manage this special place. The result is a plan which:

- Identifies real challenges present in the Plan Area, irrespective of responsibility or jurisdiction;
- Recommends—wherever practicable—a palate of potential remedies and management options;
- Estimates the costs related to those measures; and
- Recruits agencies to work in a coordinated fashion to implement the recommended measures.

In some cases, implementing the recommendations will only require changes in procedures, in others it may require an increase in equipment, staffing, or investment in capital improvements. While these changes will be contingent upon the budgets and other resources available to management agencies, the plan has been designed to be sufficiently flexible to allow for incremental and coordinated progress over a period of many years.

Because this plan is a cooperative product, it would not have been possible without the kōkua of many people working for the State, County, and in the community. DOFAW is very grateful for the support and input from the Office of the Mayor, Office of Councilwoman Carol Fukunaga, Department of Facility Maintenance, Department of Design and Construction, Department of Transportation Services, Honolulu Police Department, Honolulu Fire Department, Office of Senator Brian Taniguchi, Office of Representative Della Au Belatti, Friends of Tantalus, and the Tantalus Community Association.

MAHALO!

CHAPTER 1 – INTRODUCTION

1.1 PLAN PURPOSE

Round Top Drive and Tantalus Drive form an approximately 10-mile scenic roadway above the heart of Honolulu. Tantalus Drive begins near the entrance to Pūowaina (Punchbowl Crater) and climbs Kalāwahine Ridge between Pauoa and Makiki Valleys. Round Top Drive commences at its intersection with Makiki Street and climbs the ridge linking Pu‘u ‘Ualaka‘a, known locally as Round Top, Pu‘u Kākea, and Pu‘u ‘Ōhi‘a also known as Mount Tantalus. Tantalus Drive and Round Top Drive meet at Kala‘i‘ōpua Place, below the summit of Pu‘u ‘Ōhi‘a, and together create a “U” shaped roadway referred herein as Tantalus-Round Top Drive (TRTD).

The TRTD corridor and adjacent lands have intrinsic natural and recreational value. For this and other reasons they are popular, and that use places demands on its infrastructure, its natural resources, state and county agencies charged with its management and upkeep, and on residents that live there and strive to keep it healthy. The purpose of the *Tantalus Round Top Drive Corridor Management Plan* (TRTD-CMP), also referred to as “the Plan” and “the CMP,” is to:

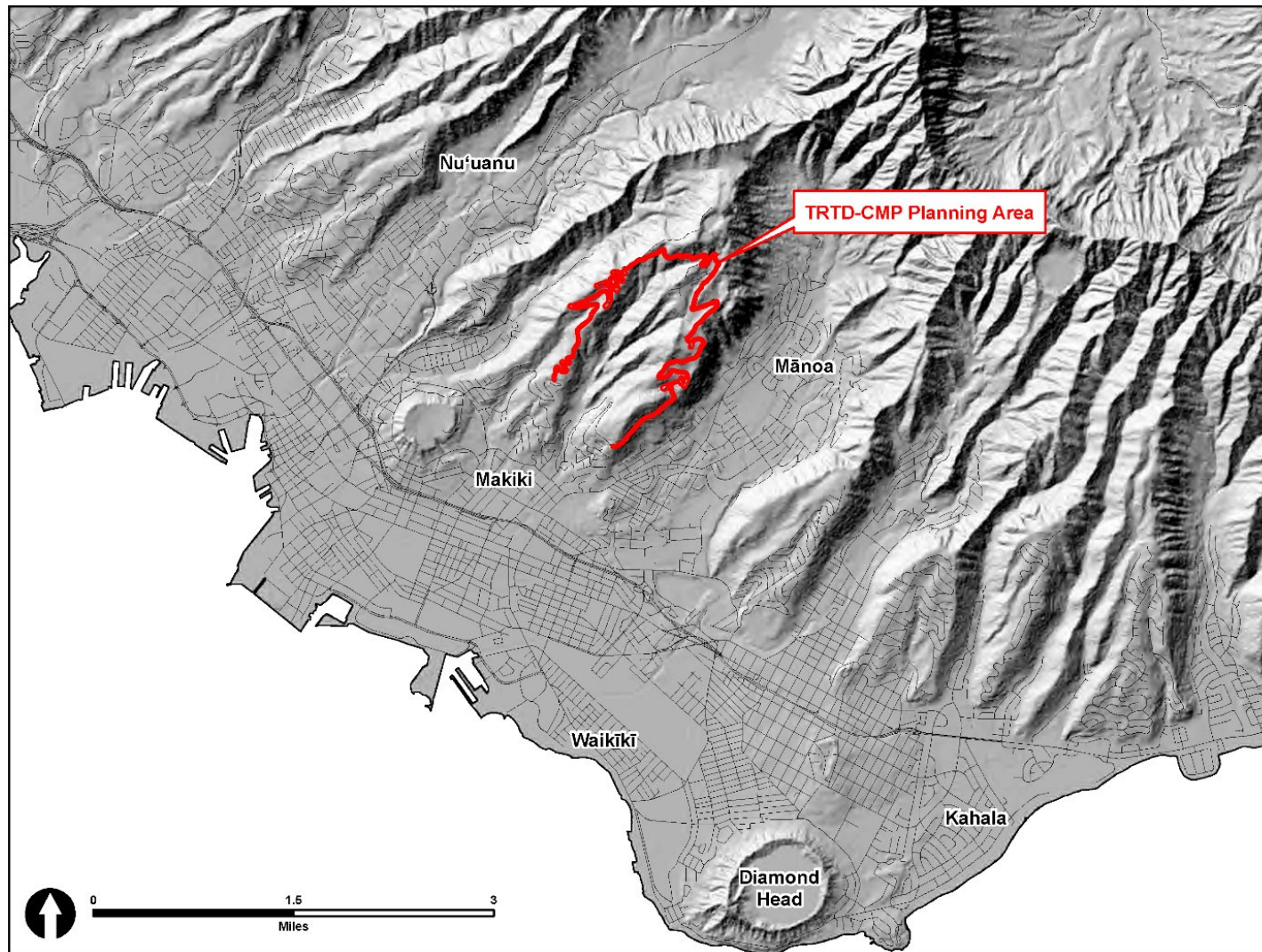
- Articulate the vision Division of Forestry and Wildlife (DOFAW) has adopted for the corridor in consultation and collaboration with the various stakeholders.
- Describe the short- and long-term goals for managing the area’s natural, historic, and recreational resources that have been identified during the planning process.
- Identify the most significant management issues present in the corridor and the entities that are responsible for addressing them.
- Detail new and/or modified maintenance protocols, specific capital improvements, and other actions that will enhance management of the corridor.
- Document the specific implementation responsibilities and outline the necessary steps that each agency and community group has agreed to carry out.

1.2 DESCRIPTION OF THE PLAN AREA

Figure 1.1 and Figure 1.2 show the location of the plan “Plan Area” for the TRTD-CMP. As delineated in Figure 1.2, the corridor begins at the 1.5-mile marker on Tantalus Drive near the Honolulu Watershed Forest Reserve (HWFR) sign and Board of Water Supply (BWS) reservoir and ends at the 8.0-mile marker on Round Top Drive near the Mānoa Valley Lookout and the BWS reservoir on Pu‘u ‘Ualaka‘a. TRTD is a single, continuous roadway that is the sole means of vehicular access to Pu‘u ‘Ualaka‘a (Round Top), Pu‘u Kākea (Sugarloaf); and Pu‘u ‘Ōhi‘a (Tantalus). The TRTD corridor includes the roadway and the State- and privately-owned lands on either side of it. The road corridor knits together many natural and manmade features and serves the many families that reside there. In March 2007 TRTD was added to the State of Hawai‘i’s Register of Historic Places (Site No. 50-80-14-9019), and in August 2009 it was placed on the National Register of Historic Places, the first such designation for a roadway on O‘ahu.¹

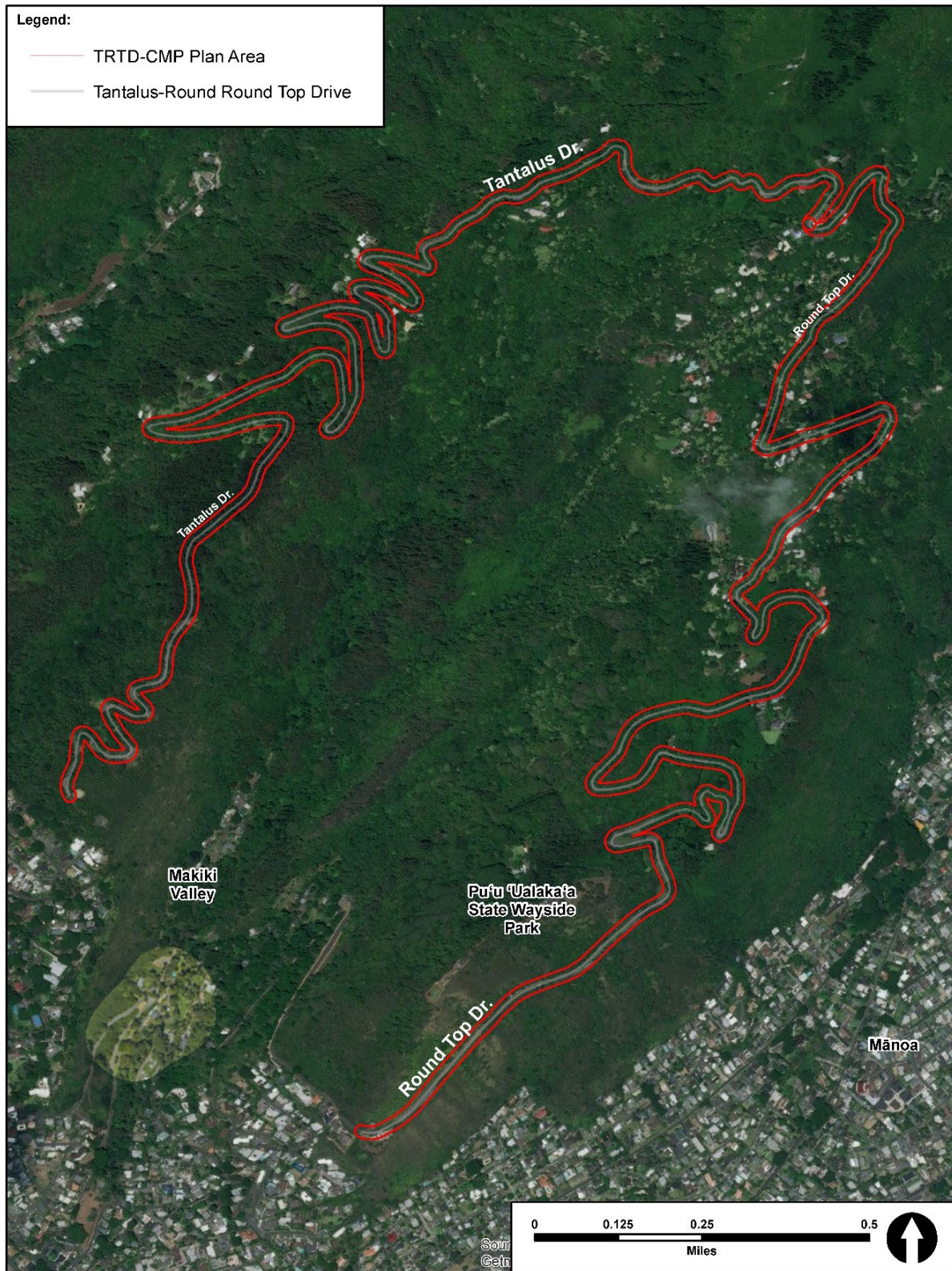
¹ Contributing elements to the historic site include the road, lookouts, culverts, retaining walls and curbs along the shoulder, and encompass the entire public road right-of-way. Specific historic engineering features cited in the site’s nomination include lava rock guard walls.

Figure 1.1 Location Map



Source: Planning Solutions, Inc. (2018)

Figure 1.2 Plan Area Map



1.3 OVERVIEW OF THE PLANNING PROCESS

The major steps involved in the development of the TRTD-CMP are depicted in Figure 1.3. Each of these steps is discussed in more detail below.

1.3.1 STEP 1 – PROCESS INITIATION

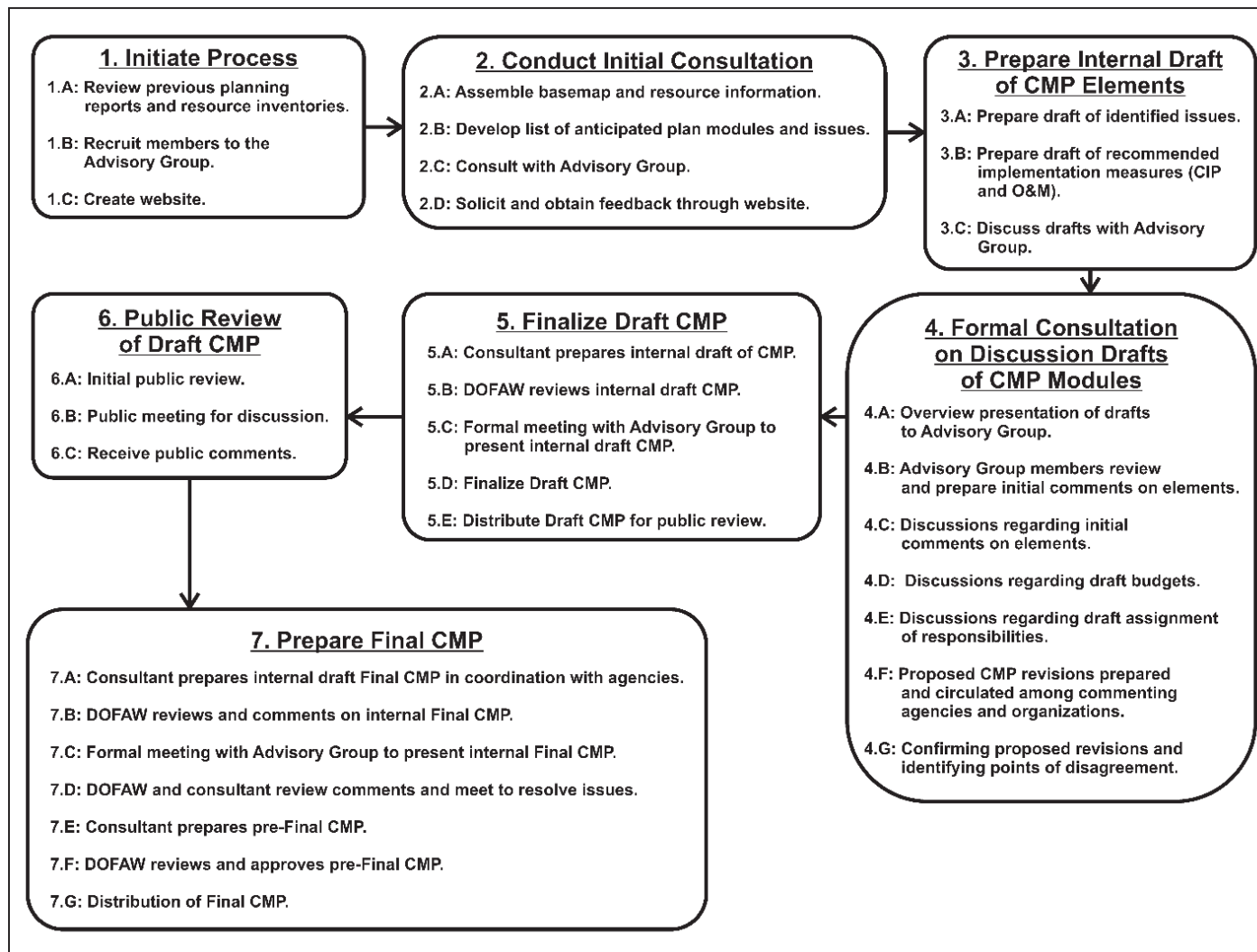
The planning team began work on the TRTD-CMP by:

1. Reviewing previous reports dealing with aspects of, or resources within, the Plan Area, including documents focusing on its natural and human history and reports detailing maintenance of existing, or new, infrastructure. The histories, plans, and reports used as resources in the development of the TRTD-CMP are referenced in the document and complete citations are provided in Chapter 6.
2. Contacting state and county agencies and private organizations and individuals believed to have responsibility for, or interest in, the Plan Area and inviting them to participate in a TRTD-CMP Advisory Group to review drafts of plan components, provide input, and help guide the planning effort. In assembling this Advisory Group, a special effort was made to ensure that it included representatives from all organizations that would share responsibility for funding and implementing the recommendations identified in this Plan.
3. Creating a plan-specific website and geographic commenting tool at www.tantalus-roundtopcorridor.com to publicize the project and its purpose, offer a convenient way for the public to access the draft CMP, and to provide an innovative geographic “social media”-style commenting tool for the public to voice concerns and suggestions, append them to a map of the Plan Area, and converse with others regarding them.

The TRTD-CMP Advisory Group was initiated by DOFAW with a September 8, 2017 letter from the O‘ahu Forestry and Wildlife Manager to the Office of the Mayor, requesting the collaboration of the City and County of Honolulu (CCH). The Office of the Mayor responded in a November 22, 2017 letter supporting the CMP and the participation of CCH in its development. Subsequently, contacts were made with various agencies, and individuals were assembled for the first meeting of the Advisory Group. Table 1.1 lists the name, title, and agency/organization of the Advisory Group members.

To facilitate the exchange of information, the Advisory Group split into the following five “Working Groups” whose members then collaborated on the development of distinct sub-sections of the report which individuals had special expertise on, interest in, or authority over:

- Roadway Maintenance and Capital Improvements;
- Parking Areas and Trailheads;
- Vegetation Management;
- Non-Roadway Capital Improvements; and
- Budgeting and Financing.

Figure 1.3 Planning Process

Source: Planning Solutions, Inc. (2018)

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Table 1.1 TRTD-CMP Advisory Group Membership

<i>Type</i>	<i>Agency</i>	<i>Title</i>	<i>Name</i>
Elected Official	Honolulu City Council	Councilmember	Carol Fukunaga
Elected Official	Office of Senator Brian Taniguchi	Legal Assistant	Tom Heinrich
Elected Official	Office of Representative Della Au Belatti	Legal Assistant	Winnie Groves
State	Division of Forestry and Wildlife	O'ahu Forestry and Wildlife Manager	Marigold S. Zoll
State	Division of Forestry and Wildlife	O'ahu District Planner	Landin R. Johnson
State	Division of Forestry and Wildlife	Forest Management Supervisor	Ryan K.I. Peralta
State	Division of Forestry and Wildlife	O'ahu Trails & Access Specialist	Aaron J. Lowe
City and County	Department of Design and Construction	Engineer	Lois Chong
City and County	Department of Facility Maintenance – Division of Road Maintenance	Chief	Tyler Sugihara
City and County	Department of Transportation Services	Planner	Virginia Sosh
Private	Friends of Tantalus	President	Alan Ewell
Private	Tantalus Community Association	President	Tantalus Community Association

Source: Compiled by Planning Solutions, Inc. (2018)

1.3.2 STEP 2 – CONDUCT INITIAL CONSULTATION

In preparation for the initial meeting of the TRTD-CMP Advisory Group, the planning team prepared a Geographic Information Systems (GIS) database and interactive map and began to populate it with publicly-available and privately developed data. Based on its review of (i) the available background data; (ii) information and dialogue with DOFAW; and (iii) individual interviews with members of the Advisory Group, the planning team identified specific categories of resources in need of management. These categories were used to assemble working groups whose members could address issues and concerns in the TRTD-CMP in an efficient and organized way.

Subsequently, the planning team presented a summary of the assembled information and an outline of the planning approach (see Figure 1.3) to members of the Advisory Group in writing and in person at the first Advisory Group meeting, held on January 19, 2018 at the State's Kalanimoku Building conference room. Members of the Advisory Group provided their initial feedback at the meeting and subsequently provided written communication to DOFAW. During the same period, information from all interested parties was solicited and obtained through the project website. At the first TRTD-CMP Advisory Group meeting, members were provided with a packet of materials that included a charter, a statement of the plan goals, and a list of the objectives of the kickoff meeting. Participants were also asked to commit to continuing their participation throughout the Plan process. The complete Advisory Group orientation packet is included as Appendix A of this report. The first working group meeting (Roadway Maintenance) was held on May 25, 2018, and other working group meetings continued throughout the planning process.

The information gathered through all these channels informed the comprehensive assessment of important issues and problems presented in Chapter 3. That assessment, in turn, formed the basis for the recommendations provided in Chapter 4. The planning team made presentations to the Tantalus Community Association (TCA) at their quarterly meeting on August 22, 2017 and annual meeting on November 18, 2017, to inform the Tantalus community of the planning effort and to listen to the community's vision.

1.3.3 STEP 3 – PREPARE INTERNAL DRAFTS OF PLAN MODULES

Using information gathered during field visits, through literature research, and through collaboration with members of the Advisory Group, the planning team developed draft writeups (also referred to as “plan modules”) of the following categories of issues within the Plan Area:

1. Road Issues. This plan module addresses the challenges affecting the roadway prism, embankments, signage, striping, and reflectors.
2. Roadside Vegetation Management Issues. This plan module focused on the vegetation along the TRTD Corridor and the ways in which roadside vegetation affects its safety, accessibility, and scenic beauty.
3. Drainage Issues. As part of a watershed forest reserve, much of the Plan Area is in a rain forest where storm water, unchecked, can damage public infrastructure and private property. This section describes the current condition of existing drainage structures and the environmental pressures affecting their effectiveness.
4. Safety Issues. The Plan Area is a residential community, a recreational area, and a wilderness; as such it presents safety issues related to residents, legitimate road use, and driver behaviors of concern.
5. Parking Areas and Trailheads. A unique aspect of the TRTD Corridor are the parking areas, lookouts, pullouts, and trailheads that line it. These areas present special opportunities and concerns which are addressed in this plan module.

1.3.4 STEP 4 – INTEGRATE MODULES INTO DRAFT PLAN

Once the issues were identified and potential solutions formulated, the planning team developed draft operating and capital improvement projects (CIP) budgets and implementation plans for them. In those cases where sufficient information was available from past studies and/or agency experience, these cost-estimates were relatively detailed and concrete. In instances where the geotechnical, engineering, or other information was insufficient, only order-of-magnitude cost and implementation activity estimates were possible.

Conceptually, this TRTD-CMP is designed to present a series of “issues” or problems presented in Chapter 3, a set of remedial and management recommendations for each issue is then provided in Chapter 4, and specific implementation strategies are detailed in Chapter 5.

1.3.5 STEP 5 – FORMAL CONSULTATION AND PUBLIC REVIEW

Once each section of the TRTD-CMP had been drafted, reviewed, and revised in collaboration with the Advisory Group, an internal review draft of the Plan was reviewed and further refined internally by DOFAW. As it worked through the issues, the planning team coordinated substantive revisions related to specific tasks with the representative member of the Advisory Group. Once feedback from the Advisory Group and DOFAW had been incorporated into the document, the Draft TRTD-CMP was finalized and was electronically distributed to the public via the dedicated project website and DOFAW's website, accompanied by a press release to publicize it, for a 60-day period of public review and comment.

INTRODUCTION

During the 60-day public review period for the Draft TRTD-CMP, DOFAW held a public meeting (May 8, 2019) to discuss the content of the Plan and to obtain additional feedback from as wide a range of individuals and organizations as possible. Public participation in the meeting was solicited through a DOFAW press release and an hour-long radio broadcast on Hawai‘i Public Radio. The location, date, agenda, and attendance list from the public meeting agenda, as well as copies of handouts, visual displays, and related information are reproduced in Appendix F to the Final TRTD-CMP. In addition to this meeting, the planning team also presented the Draft TRTD-CMP to the Makiki/Lower Punchbowl/Tantalus Neighborhood Board (N.B. No. 10) at its regular meeting on May 16, 2019.

Once the public review period ended, the planning team reviewed all the public comments on the Draft TRTD-CMP and identified revisions that it believed addressed all substantive comments and enhanced the Final Plan. All proposed revisions to the Plan were coordinated with DOFAW and, where appropriate, individual members of the Advisory Group. The planning team then prepared an internal version of the Final TRTD-CMP for review by the Advisory Group and DOFAW. As part of this process, planners consulted individually with any agency representatives and/or elected officials. The Final TRTD-CMP is being distributed electronically to the public via the dedicated project website and DOFAW’s own website, with a press release to publicize it.

1.4 BACKGROUND

The first portion of the roadway was constructed as a six-foot wide unpaved carriage road up the Tantalus side of the mountain in the early 1890s by the Kingdom of Hawai‘i.² The road to the foot of Tantalus was completed by 1902, but wealthy citizens made extensions to reach their residences further east, first to the house of Senator Schmidt, and then to the Waterhouse Estate. The loop was completed in 1917 when the Territory of Hawai‘i completed the portion of Round Top Drive from Makiki up to the ending point of the Tantalus Road.

In 1936, Tantalus-Round Top Drive was paved as part of a series of road improvements undertaken by the Works Progress Administration (WPA). Further road work was curtailed during World War II, but the road was resurfaced in 1947. In 1953, low retaining walls and drainage culverts were added where needed. Only minor alterations have been made to the road since 1954; this included pavement resurfacing and installing metal guardrails, number signs, speed limit signs, reflectors, traffic signs, and short wooden and metal posts to define the edges of lookout parking (Liverman et al. 2009: 15). Despite certain changes in materials and engineering of the surface itself, the curvilinear road continues to demonstrate historical transportation engineering practices (e.g., switchbacks, hairpins, and ridgeline routes) that allowed its builders to deal with the challenging terrain. As such, the road represents not only an effective transportation link, but an aesthetic landscape in harmony with the natural environment.

Complete responsibility for the road right-of-way remained with the Territory of Hawai‘i (and subsequently with the State of Hawai‘i) until the passage of State of Hawai‘i Act 228 and Honolulu

² In 1890, a number of citizens petitioned the Legislature for the construction of a carriage road to the top of Tantalus, to be paid for by the sale of government lots for residential use. The resident lots were surveyed and laid out in 1891, and construction of the road began in 1892. The Biennial Report of the Minister of the Interior to the Legislative Assembly of 1892 describes the road as beginning at an elevation of 185 feet above sea level and forming a junction with the Punchbowl Road and following a 5% grade up the ridge known as the forest ridge to the narrow ridge dividing Makiki from Pauoa Valley, at an elevation of about 1450 feet; then around the South Slope of Tantalus and the head of the ravines leading into Makiki to a point by the pond that was located just above “Sugar Loaf” (Pu‘u Kākea) pond.

City Council Resolution 93-287 in 1993. At that time responsibility for road maintenance was assumed by the CCH.³

The HWFR through which the TRTD corridor passes is managed by DLNR-DOFAW; it encompasses approximately 7,242 acres of non-contiguous *mauka* lands above Honolulu's urban core, and is comprised of several subsections, including all lands owned by the State of Hawai'i in the Makiki-Tantalus area with the exception of the Pu'u 'Ualaka'a State Wayside.⁴ There are many natural and manmade features of beauty and interest within these forest reserve lands, including vistas of Waikiki, Mānoa Valley, and downtown Honolulu, more than a dozen trailheads, and many historic residences.

1.5 PLAN PARTNERS

1.5.1 DIVISION OF FORESTRY AND WILDLIFE (DOFAW)

The mission of DOFAW is to responsibly manage and protect watersheds, native ecosystems, and cultural resources and provide outdoor recreation and sustainable forest products opportunities, while facilitating partnerships, community involvement and education.

The Hawaiian Islands, often characterized as the most geographically isolated archipelago in the world, are high islands with volcanic origins. Most of the inhabited islands encompass a remarkable variety of climates and ecosystems including high, forested mountains. This variety has resulted in a rich diversity of plant, insect, and animal species as they have colonized and adapted to these islands.

Polynesian settlers were the first humans known to have inhabited these islands. With their arrival they brought plants and animals they needed to survive the long voyage from their homes in the South Pacific and to later flourish in their new home. These people quickly learned how to harvest and use the many resources of the Hawaiian forests for food, clothing, shelter, ornamentation, and medicine. As they observed their own impacts on the forests, Hawaiians learned a great deal about the relationship between fresh water, the forest, and the living things found there. They observed that rain followed the forests, that without rain there was no water, and without water there was no life. This acquired wisdom was expressed in an 'ōlelo no'eau (i.e., traditional poetic saying) as follows:

Hahai no ka ua i ka ululā'au.

Rains always follow the forest.

On April 25, 1903, the government of the Territory of Hawai'i established the Forest Reserve System (FRS) via *Act 44, Session Laws of Hawai'i*. The purpose of this Act, which authorized the establishment of the Board of Commissioners of Agriculture and Forestry, was to encourage and protect agriculture, horticulture, and forestry. At that time, overgrazing of mountain slopes and freely ranging introduced wild animals had led to the gradual destruction of native forests and watershed areas. In addition, with the increase of the islands' population, the expansion of ranching, and the extensive growth of commercial sugarcane and pineapple agriculture, early territorial foresters recognized the

³ During the Territorial Period the roadway was operated and maintained by the Territorial Government. From Statehood in 1959 until 1993, the roadway was operated and maintained by the State of Hawai'i Department of Land and Natural Resources. The passage of Resolution 93-287 and Act 228 H.B. No. 1055 in that year transferred responsibility to the City and County of Honolulu in name and tax map. Since no final metes and bounds survey was completed, there has not been an actual exchange of title. See also the list of State owned roadways at <http://hidot.hawaii.gov/highways/home/oahu/oahu-state-roads-and-highways/>.

⁴ Pu'u 'Ualaka'a State Wayside is owned by the State of Hawai'i and operated by DLNR's Division of State Parks. Although it is outside of the Plan Area it is reliant on upon it for access.

INTRODUCTION

need to protect these mauka forests to safeguard and ensure the continued availability of fresh water to meet the demands of agriculture and the community.

Since its inception, the FRS represented a partnership between public and private entities working together to protect and enhance important mauka forestlands, the benefits they provide, and the values they represent. Currently, the FRS is managed by DLNR-DOFAW in partnership with a range of agencies, organizations, and individuals working together to uphold the objectives described in further detail in Table 1.2. DOFAW manages this system pursuant to the authority granted to it by the Constitution of the State of Hawai‘i, Hawai‘i Revised Statutes (HRS), Subtitle 4, Chapter 183, and its implementing regulations contained in Hawai‘i Administrative Rules (HAR), Chapter 104.

Consistent with its legal mandate, DOFAW directs its resources towards: (i) protecting, (ii) managing, (iii) restoring, and (iv) monitoring the natural resources within the FRS. In keeping with the original intention of the FRS, DOFAW’s management of these areas is intended to:

- *Protect and restore* watershed, threatened and endangered (as well as common) native species and habitat, and cultural resources.⁵
- *Provide* educational opportunities, recreational, hunting, and forest product opportunities; and
- *Enhance* aesthetic qualities.

The FRS is open to the public except for areas which are a threat to human health and safety, or which harbor extremely sensitive resources. In total, the system encompasses approximately 678,612 acres of land.

As characterized above, lands within the FRS are intended to provide for a variety of public uses and benefits. Each Forest Reserve within the FRS has a specific set of management needs and goals associated with it, depending on its natural history, patterns of use, and the types of resources found within it. Moreover, administering each individual reserve poses a complex set of unique opportunities and challenges. DOFAW makes every effort to manage each reserve individually while remaining consistent with a set of FRS-wide management goals. These management goals, and specific issues related to each, are summarized in Table 1.2.

This Plan is intended to address these DOFAW’s management goals regarding the Makiki-Tantalus section of the HWFR, with particular emphasis on Goals 1.6, 3.1, 3.2, 3.4. At minimum, it must be consistent with the intent and purpose of these management goals. By enhancing the recreational and forestry value of this portion of the HWFR, this TRTD-CMP is consistent with, and advances the purposes of, the FRS.

1.5.2 CITY AND COUNTY OF HONOLULU (CCH)

The CCH is a consolidated city-county, as well as the state’s capital and largest city. It includes the city of Honolulu, the entire island of O‘ahu and several outlying minor islands, including all the Northwestern Hawaiian Islands beyond Ni‘ihau except for Midway Atoll National Wildlife Refuge. The consolidated city-county was established with the city charter, adopted in 1907, and accepted by the Legislature of the Territory of Hawai‘i at that time. As a municipal corporation and jurisdiction, it manages aspects of government which have traditionally been exercised by both municipalities and counties in the rest of the United States. Approximately 70 percent of the population of the State of Hawai‘i lives in the CCH.

⁵ Watershed protection and restoration refers to a wide range of activities and programs addressing fire protection, invasive insect and disease management, weed control, ungulate control, erosion, and urban encroachment.

Table 1.2 Forest Reserve System (FRS) Management Goals and Issues

<i>Management Goal</i>	<i>Issues</i>
1 – Protect and manage forested watershed for production of fresh water supply for public uses now and into the future.	1.1 Control livestock trespass.
	1.2 Manage pests and diseases.
	1.3 Control invasive species and implement eradication programs.
	1.4 Reforest watersheds and forestlands.
	1.5 Control feral ungulates that pose a threat to watersheds.
	1.6 Participate in collaborative initiatives such as Watershed Partnerships with other public and private forest landowners.
	1.7 Acquire or secure important land areas for their addition to the Forest Reserve System.
	1.8 Maintain and install fence lines.
2 – Maintain biological integrity of native ecosystems	2.1 Protect, create, and manage native and endangered species habitat.
	2.2 Survey and monitor known habitats and populations.
	2.3 Propagate and out-plant key species.
	2.4 Protect rare plants and wildlife individuals and populations.
	2.5 Propagate rare and endangered wildlife species.
	2.6 Monitor the extent and condition of forests and their associated resources.
3 – Provide public recreational opportunities.	3.1 Construct, restore, and maintain roads and trails, arboreta, picnic and camping areas, viewpoints, and signs.
	3.2 Provide public recreation and hunting opportunities.
	3.3 Enable conservation enforcement activities.
	3.4 Increase and maintain public access to forests.
4 – Strengthen the economy by assisting in the production of high quality forest products in support of a sustainable forest industry.	4.1 Utilize woods from hazardous trees adjacent to roads, trails, fences, utility lines and structures.
	4.2 Devise economic means to make the FRS self-supporting in whole or in part.
	4.3 Provide public timber resources for commercial forestry operations.
	4.4 Operate five district nurseries to produce and distribute high quality tree seedlings.
	4.5 Leverage additional funds and associated services through program implementation and partner agency collaboration.
	4.6 Explore other economic opportunities through ecosystem valuations.
Source: http://dlnr.hawaii.gov/forestry/frs/management-goals/	

The municipal government of the CCH is administered by a mayor-council system which oversees all municipal services including civil defense, emergency medical services, fire, parks and recreation, police, sanitation, streets, and water and has an annual operating budget of more than \$3 billion. The municipal government has three independent branches: (i) the Mayor of Honolulu as the executive authority; (ii) the Honolulu City Council, which drafts and passes laws and budgets for various departments; and (iii) the Prosecuting Attorney of Honolulu, who prosecutes criminal offenses committed within the county.

The CCH is divided into nine districts and 36 neighborhoods, each with a neighborhood board. The TRTD-CMP Plan Area is located in District VI, which also includes the neighborhoods of Makiki, downtown Honolulu, Punchbowl, Liliha, Pauoa Valley, Nu‘uanu, ‘Ālewa Heights, Papakōlea, Kalihi Valley, and Lower Kalihi.

The Office of the Mayor, as the executive branch of the City and County Government, oversees a wide variety of departments and agencies; many of these are not directly involved in management activities within the Plan Area. The CCH agencies most directly tasked with management activities in the TRTD-CMP Plan Area are summarized in Table 1.3.

Table 1.3 CCH Agencies Presently Active in the Plan Area

<i>Agency</i>	<i>Specific Responsibility</i>
Dept. of Design and Construction (DDC)	Designing and implementing capital improvements to the roadway.
Dept. of Environmental Services (ENV)	Refuse collection and disposal.
Dept. of Facility Maintenance (DFM)	Repair and maintenance of existing roadway to the pavement's edge.
Dept. of Parks and Recreation (DPR), Division of Urban Forestry	Clearing fallen tree branches from utility lines and rights-of-way and clearing fallen trees from city streets. ⁶
Dept. of Transportation Services (DTS)	Traffic planning and engineering including signage, striping, reflectors, and traffic calming measures.
Honolulu Police Department (HPD)	Law enforcement and public safety.
Honolulu Fire Department (HFD)	Firefighting, fire prevention, search and rescue.
Source: Compiled by Planning Solutions, Inc. (2018)	

1.5.3 TANTALUS COMMUNITY ASSOCIATION (TCA)

The community along the TRTD corridor is unusual, in that it is one of the few residential communities within the State of Hawai'i's Conservation District. The TCA, one of the longest continually active community associations in the State, has long promoted a vision of its community as one in harmony with the natural environment, free of crime, inviting to both residents and visitors, all the while promoting appreciation for this unique place.

The TCA is governed by a Board of Directors and all TCA meetings are open to members of the community and other interested parties. In addition to the Board, there are a series of dedicated committees related to: (i) communications; (ii) community workdays; (iii) neighborhood watch; and (iv) special events. Membership in the TCA, its Board, and all its committees are entirely voluntary. Among many other activities organized by the TCA, it sees itself as the community-based steward of the Tantalus-Round Top watershed area, organizing quarterly workdays among other activities intended to enhance the area. Utilizing the resources available to it, the TCA seeks to work within the community, and in partnership with outside agencies, organizations, and individuals to:

1. Develop and implement an environmental master plan.
2. Improve maintenance of the natural and built environment.
3. Improve the sense of community.
4. Reduce crime and reckless driving.

In pursuit of these objectives, the TCA has worked with the Hawai'i Nature Center, Mānoa Cliffs Native Forest Restoration Project, Nā Ala Hele, O'ahu Invasive Species Committee, The Outdoor Circle, and HPD.

1.5.4 FRIENDS OF TANTALUS (FOT)

Friends of Tantalus (FOT) is a Honolulu-based charity dedicated to the protection and preservation of the Tantalus community and the historic TRTD roadway. The FOT is a tax-exempt organization under Section 501(c)(3) of Title 26 of the U.S. Code; it is a *supporting organization*—often referred to in shorthand as “Friends of” organizations. The FOT was first incorporated to initiate and foster

⁶ Hawaiian Electric Company, Inc. (HECO) also conducts periodic vegetation removal on and around its utility lines.

discussion among all groups who use the TRTD corridor such as residents and hikers using it to reach a destination, or for whom the corridor itself is the destination, as with bicyclists and runners.

The purpose of FOT, as established in their *Articles of Incorporation* are:

1. To promote the wise stewardship, protection, use and understanding of the environment in general, and the Round Top-Tantalus area rain forest environment located in Honolulu, Hawai'i in particular, through education and community projects; and
2. To operate exclusively for charitable, scientific, literary, or educational purposes, within the mean meaning of Section 501(c)(3) of the Internal Revenue Code of 1986 (of the corresponding provision of any future United States internal revenue law).

FOT and TCA worked cooperatively to produce the (2007) *Round Top-Tantalus Management Plan: 2007-2008 Priority Recommendations* which served as one of the starting points for the present TRTD-CMP. It included: (i) the results of resident priorities survey; (ii) identified issues of concern present on Tantalus-Round Top, and (iii) provided a series of recommendations to address them. While this report was a community-based effort, it provided some of the impetus for drawing together state, county, and private resources for additional planning in the area.

1.6 ORGANIZATION OF THIS REPORT

The remainder of this report is divided into the following chapters:

- Chapter 2 lays out the Plan's overall Vision, its broad Goals, and its specific Objectives.
- Chapter 3 devotes individual subsections to characterizing in detail issues to be addressed.
- Chapter 4 provides a series of recommendations intended to manage or remedy the issues identified in Chapter 3.
- Chapter 5 details implementation of the CMP, including jurisdictions and projected costs of ongoing operations and capital improvements.
- Chapter 6 provides references for the works cited in the body of the Plan.
- Chapter 7 describes the consultation that took place during development of this Plan and the agencies, organizations, and individuals who provided input during its formulation.

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CHAPTER 2 – VISION, GOALS, AND OBJECTIVES

Preparation of this CMP began with the framing of its underlying vision and the subsequent identification of specific goals and objectives. These were developed by the planning team based upon direct input from the Advisory Committee members, DOFAW staff, and the public.

- The ***Vision*** described in Section 2.1 is a broad statement of the desired outcome if everything in the plan comes to fruition and accomplishes what is intended.
- The ***Goals*** in Section 2.2 describe the major things that must be accomplished if the vision is to be achieved. The goals group major categories of issues together as a way to focus on them.
- Each goal is further defined by a series of specific ***Objectives*** which may be used to gauge progress towards the attainment of the goal. They describe measurable actions by which the progress of implementing the CMP can be tracked.

These are all part of the overall planning process illustrated in Figure 1.3.

2.1 VISION

As previously noted, the TRTD-CMP is intended as both a practical and a visionary instrument that will help this in-town wilderness area continue to serve the aesthetic, recreational, and practical needs of O‘ahu’s residents and visitors. On January 19, 2018, the Advisory Group adopted the following vision statement for the CMP:

Tantalus-Round Top Drive is Hawai‘i’s only State and National Historic Roadway and is a unique area in urban Honolulu. The Tantalus-Round Top Drive Corridor Management Plan (CMP) is intended to be both a visionary and practical instrument to preserve and enhance this unique, in-town wilderness area so that it will continue to serve the aesthetic, recreational, and practical needs of O‘ahu’s residents and visitors.

2.2 GOALS AND OBJECTIVES

Starting from the Vision Statement, the planning team and Advisory Group first identified broad goals for the plan which indicate desired outcomes. The “goals” express a policy direction and assist in structuring individual objectives. They then agreed upon specific objectives for each goal that are expressed in a way that makes it possible to develop measurable actions for each. Those goals and objectives, which are based on an understanding of the existing conditions and perceived needs within the corridor and on community input, have guided all aspects of the planning described in this report. The goals and objectives discussed below are not ranked or presented in order of importance or need.

For the TRTD-CMP to be successful, it must have the full support of the state and CCH agencies that have responsibility for the area. It must also have the support of the many families that have their homes on the mountain, and of the other community groups that take advantage of the planning area’s resources. Consequently, the planning effort began by defining, through an iterative and consultative process, shared goals for the planning area by:

- Establishing and seeking guidance from a Steering Committee composed of representatives of the principal State and City and County Agencies and the Tantalus community.
- Seeking input from residents and organizations having an interest in the planning area by creating an interactive website, sending direct written requests to known organizations (e.g., Hawai‘i

Bicycle League, Trail and Mountain Club, Hunters' organizations, etc.), announcements on the DOFAW/DLNR website, press releases, etc.

- Evaluating input from all parties and identifying those goals and objectives which the participants in the planning process who would most likely be responsible for implementation agree they will pursue.
- Promoting coordinated decision-making by circulating the agreed upon goals and objectives to all those involved in the ongoing planning process.

The goals and objectives listed below are the outcome of that process.

2.2.1 GOAL 1: DEFINE COMMUNITY ISSUES FOR CORRIDOR

The first task undertaken by the planning team was to collect information, and seek consensus among the Advisory Group, regarding: (i) the issues facing the Plan Area, (ii) the kinds of measures that could be implemented to address them, and (iii) their desirable outcomes.

Goal 1

Objective 1. Identify the fundamental structural issues that must be dealt with to ensure that the corridor continues to be able to serve the needs of residents and visitors.

Objective 2. Identify the operations and maintenance activities within the corridor that must be addressed to ensure that it continues to be able to serve the needs of residents and visitors.

Objective 3. Identify the critical safety issues that are present within the corridor and that must be addressed in the plan.

Objective 4. Produce maps depicting the identified structural, operations and maintenance, and safety issues within the corridor.

Chapter 3 of this report contains a detailed description of the major issues that the planning team has identified during this study.

2.2.2 GOAL 2: IDENTIFY SPECIFIC REPAIRS, MAINTENANCE, & CAPITAL IMPROVEMENTS

Identify the specific operation and maintenance activities (including minor repairs) and capital improvements that are needed to preserve and enhance the Plan Area.

Goal 2

Objective 1. Identify the specific ongoing operation and maintenance activities that are required to keep existing facilities serviceable over the long term and the staff and financial commitment needed to accomplish that in view of reasonably foreseeable events.

Objective 2. Obtain preliminary agreement from State and County agencies and from other entities that agree to participate in elements of the plan regarding their willingness and ability (financial and staff) to carry out the identified operations and maintenance activities.

Objective 3. Identify specific capital improvement projects required to correct existing deficiencies and/or support expanded/new activities (and, where applicable, the additional staff and ongoing operating expenses they would necessarily impose).

The specific maintenance activities, repairs, and CIP that are believed to best address and resolve the issues identified in Chapter 3 are presented in Chapter 4.

2.2.3 GOAL 3: AGREE ON SPECIFIC RESPONSIBILITIES

Because ownership of and responsibility for managing the land, roadway, homes, and facilities in and adjacent to the TRTD corridor is divided among many different entities, the planning team placed a

high priority on reaching formal agreement among the parties with respect to the responsibilities that each was willing, and felt it was likely able, to accept in service of these goals.

Goal 3

Objective 1. Agree on the geographic boundaries of each entity's authority.

Objective 2. Agree on the kinds of activities each entity can undertake within the area it controls and the nature of agreements that are needed if those activities extend across jurisdictional boundaries.

Objective 3. Agree on the regulations and administrative rules that govern uses within each entity's area of responsibility.

Objective 4. Produce maps depicting the agreed-upon boundaries.

Chapter 5 of this report identifies specific tasks and the parties responsible for them.

2.2.4 GOAL 4: SECURE FUNDING COMMITMENTS

Secure commitments from stakeholders to seek the operations and maintenance (O&M) and CIP funding needed to implement the maintenance activities and CIP agreed to during development of the CMP.

Goal 4

Objective 1. Obtain preliminary agreement from State and County agencies and from other entities that agree to participate in elements of the plan regarding their willingness to seek funding for CIP projects that are identified as being important to the continued use of the corridor.

Objective 2. Draft agreed upon action plans sufficiently detailed to form the basis for formal budget requests to funding entities.

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CHAPTER 3 – CORRIDOR RESOURCES AND ISSUES

This chapter provides information about the techniques used to gather and analyze information for the TRTD-CMP, characterizes existing natural and manmade resources which are to be addressed in this Plan, and discusses the various management issues related to each. Each section describes the existing condition of the resource and the problems with it that have been identified during the planning process. Management recommendations related to each are provided in Chapter 4.

3.1 METHODOLOGY

The method planners used to identify the specific issues discussed in this chapter involved: (i) multiple field visits; (ii) development of a GIS database; (iii) consulting with a professional engineer and landscape architect; (iv) interviews with residents and agency officials; and (v) working group discussions. The process was generally sequential, with continuous refinement over time.

Field Visits. Planners made repeated field visits, often with other members of the team, to observe specific areas along the corridor and detect issues present there. While in the field, a library of georeferenced photography was built up to form the basis for maps, figures, and further analysis.

GIS Database. To best accumulate, correlate, understand, and communicate the spatial relationships between the diverse features and resources in the project area, the planning team mapped the corridor boundaries and the locations of scenic, historic, natural, and recreational resources within and near the corridor which were relevant for planning, decision-making, and long-term management. In conducting this process, the planning team used industry-standard ESRI ArcGIS software, compatible with existing state and county databases. The result in a TRTD-CMP geodatabase, using information drawn from the field work, publicly available sources (e.g., the CCH's Honolulu Land Information System or "HoLIS"), and other relevant and accurate sources of information. The geodatabase includes, but is not limited to: (i) Tax Map Key (TMK) parcel boundaries; (ii) location and characteristics of roadways and parking areas; (iii) trails and trailheads on or near the corridor; (iv) location and nature of pavement distress; (v) location and characteristics of vegetation-related problems; and (vi) the presence, characteristics, and condition of walls, guardrails, signage, striping, and reflectors. Because the quantity of information is very large, it is not practical to include maps of all this data in this report. However, the GIS files are available upon request and were used to produce many of the maps presented in this report. This information will also be provided to DOFAW as a deliverable product of the planning process.

Consultation. To expand and sharpen the discussion of issues along the TRTD corridor, the planning team worked with a roadway engineer and a landscape architect to understand and incorporate into the Plan additional information and expertise related to these domains. The inputs from the engineer were used to address issues affecting the integrity and quality of the roadway prism, embankments, and parking areas and to develop specific remedies and concept-level capital improvements. The inputs from the landscape architect, similarly, were used to characterize the vegetation management issues along the corridor and develop a series of management protocols and recommendations.

Agency Interviews. The planning team conducted interviews with representatives of the agencies involved in management activities along the corridor (e.g., Department of Design and Construction, Department of Facility Maintenance, etc.). These interviews helped project planners better understand what is being done and by which agency, and to define the potential opportunities and operational constraints which must be considered before the Plan is finalized.

Working Groups. As aspects of the plan were drafted, regular meetings of the Advisory Group and its constituent working groups (see Section 1.3.1) helped to provide continuous feedback into the process as ideas emerged and were subsequently refined.

The result of this method in application is the catalog of planning issues provided in the remainder of this Chapter 3, the recommendations contained in Chapter 4, and the implementation strategies in Chapter 5.

3.2 IDENTIFIED ROADWAY ISSUES

3.2.1 BACKGROUND

As mentioned elsewhere in this report, the road, lookouts, culverts, rock retaining walls, curbs, and other structures within the TRTD corridor were constructed over many years. Much of the basic roadway, including its alignment, roadbed, roadside walls, and embankments were completed as early as 1917. Some drainage and other improvements were made in the early 1950s, but very few fundamental changes have been made since then. The roadway (i.e., the paved road and shoulders) varies from 14 feet to 30 feet wide, and while short stretches of the roadway have been widened and the shoulders improved, it remains a winding and narrow roadway for most of its length. The most significant change to the TRTD roadway in recent decades was the transfer of responsibility for its upkeep and maintenance from the State of Hawai‘i to the City and County of Honolulu (CCH) in 1993, via Hawai‘i Revised Statutes (HRS), Chapter 264, ending TRTD’s status as a “disputed roadway.” Per that statute and City Council Resolution No. 93-287, the Honolulu City Council accepted the ownership and jurisdiction of the roadway (and all County highways as defined in HRS Section 264-1) as public highways under its ownership and jurisdiction.

Since the CCH accepted responsibility for TRTD, three of its departments have taken active roles in, and share responsibility for, its upkeep. The agencies and their specific roles are briefly listed in Table 3.1 below. The Department of Facility Maintenance (DFM) takes the lead in conducting maintenance and repairs to the roadway, including patching potholes and conducting periodic resurfacing efforts known as “block patch” of the roadway. In instances where the condition of the roadway has, or appears as though it will soon be, degraded beyond the ability of discrete repair work to remediate, DFM will transmit a request to the Department of Design and Construction (DDC) to design and build capital improvements to the roadway, as needed, to correct the problem.

Table 3.1 CCH Agencies Presently Managing the Roadway

<i>Agency</i>	<i>Specific Responsibility</i>
Dept. of Facility Maintenance (DFM)	Repair and maintenance of existing roadway to the pavement’s edge and installation and maintenance of signs at request of DTS.
Dept. of Design and Construction (DDC)	Designing and implementing capital improvements to the roadway.
Dept. of Transportation Services (DTS)	Design of signage, striping, reflectors, and traffic calming measures.
Source: Compiled by Planning Solutions, Inc. (2018)	

In addition to multiple agencies conducting activities on the roadway, the road itself has been constructed and maintained according to multiple standards over the years. The standards that were observed during original construction of the roadway and subsequent repairs are not known. From the time it was made responsible for roadway maintenance until 2006, DFM’s Division of Road

Maintenance adhered to the Department of Planning and Permitting’s (DPP) standard, which consisted of a 6-inch granular base topped with 2 ½-inch layer of asphalt. The current standard, which it has employed since that time, calls for a minimum of 4 inches of asphalt treated base course over an aggregate base course of varying thickness, then topped with a 2-inch coat of asphalt. Spot repairs to the roadway, called “patches” are done with “hot mix” asphalt or “synthetic” asphalt if hot mix is not available. Larger repairs, where entire lengths of the roadway are resurfaced, are known as “block patches”; the last block patch resurfacing within the TRTD right-of-way (ROW) by DFM was conducted in 2010. The repair and repaving efforts which DDC and DFM have identified between 2010 and 2017 are listed in Table 3.2 below.

Table 3.2 Roadway Repaving and CIP Projects within the TRTD ROW: 2007 – 2017

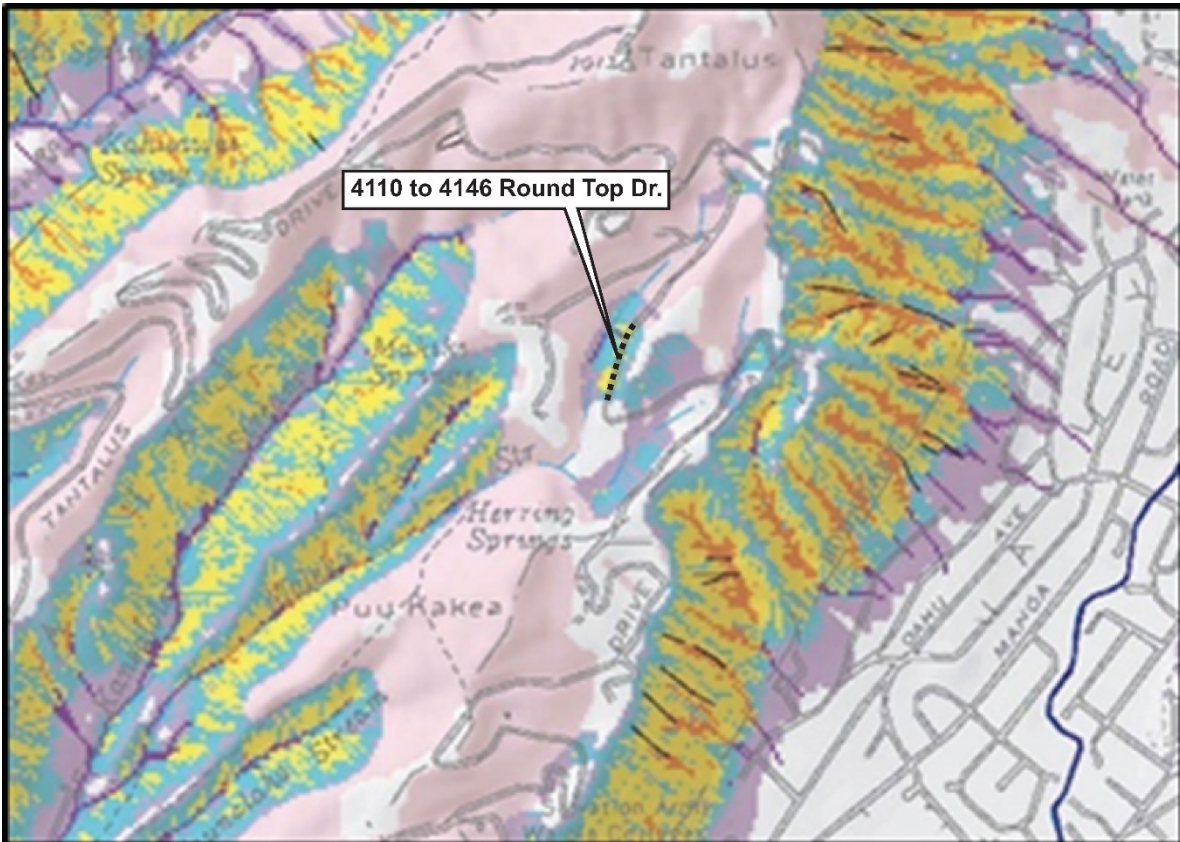
<i>Year</i>	<i>Project</i>	<i>Summary</i>
2007	Highway Structure Improvements	Retaining wall improvements on Tantalus Drive, Job No. 21-06. All construction was completed in 2007.
2007	Round Top Drive Emergency Roadways Repairs	Installation of drilled shafts to support the roadway, Job No. 17-06. All construction was completed in 2007.
2007	Round Top Drive Emergency Roadway Repairs, Site 3, Phases I and II	Installation of concrete pavement and crib wall tie-backs, Job. Nos. 12-07 and 15-07. All construction was completed in 2007.
2007	3798 Tantalus Drive Crib Wall Rehabilitation	Removal of damaged crib wall (aka, the “Hogsback”), roadway, and slope. The project was terminated in 2007 prior to start of construction due to constructability issues.
2008	Round Top Drive Emergency Roadway Stabilization	Stabilization of the roadway near the hairpin turn on the 2600 block of Round Top Drive. All construction was completed in 2008.
2013	Rockslide Potential Inspection and Mitigative Improvements Along Round Top Drive in the Vicinity of Pu‘u ‘Ualaka‘a Park	The final report was submitted in 2013. Rockfall hazards were determined to be on state property.
2013	Crib Wall Repair in the Vicinity of 3798 Tantalus Drive	Project to repair the crib wall (aka, the “Hogsback”) was terminated during the design phase in 2013; funds lapsed while awaiting DLNR approval. A new project to be initiated using alternative design intended to minimize the cost and duration of construction.
2015	Potential Rockslide Inspection and Mitigative Improvements Along Round Top Drive in the Vicinity of Forest Ridge Way	Schematic design was completed in 2015 but was not constructed. Rockfall hazards were determined to be on state property.

Source: Department of Facility Maintenance and Department of Design and Construction (2018)

The planning team reviewed the available reports concerning slope failures to assess the likelihood that a failure like the 2006 event on the western side of Pu‘u ‘Ualaka‘a might occur in a location that would

affect persons using the Round Top lookout. Peterson et al. (1993) documented the spatial and temporal distribution of nearly 1,800 debris flows and other rapid slope movements that occurred in the Honolulu District from about the late 1930s to 1989. The maps provide the principal historical data for a map of debris-flow hazard by Ellen et al. (1993) and complement a report by Torikai and Wilson (1992) that documents debris flows reported in newspaper articles and Civil Defense records. Interestingly, as indicated in the drawing to the right, the only area that the mapping identified as being potentially hazardous due to debris-flow is a short strip of roadway adjacent to 4110-4146 Round Top Drive, and even there the risk was identified as low to moderate.

Figure 3.1 Relative Exposure to Debris Flow Hazards



Source: Stephen D. Ellen, Robert K. Mark, Susan H. Cannon, And Donna L. Knifong (1993). *Map of Debris-Flow Hazard in the Honolulu District of Oahu, Hawai'i*. Downloaded File name = o93-213_map

No structural engineering work or geotechnical investigations have been conducted as part of this study. As a result, the road integrity issues identified, and discussed below, are based on visual observations by planners, discussions with staff of the DFM, and a cursory visual inspection by a qualified civil engineer. While the judgements are believed to be generally accurate, they are not intended to be used for design.

Multiple factors contribute to the current state of the roadway. The roadway's age, unstable substrate, the rugged topography, and the demanding climatic environment through which the corridor passes all affect the roadway. As a result, several issues have developed that need to be addressed in order to continue to meet the transportation needs of corridor residents and visitors alike. For the purposes of the TRTD-CMP, these challenges to the integrity of the roadway are broadly categorized as follows:

- Issues related to the soundness of the underlying road prism (see Section 3.2.2);

- The condition of roadside embankments and safety barriers (see Section 3.2.3); and
- Signage, striping, and reflectors (see Section 3.2.4).

3.2.2 ROADWAY PRISM

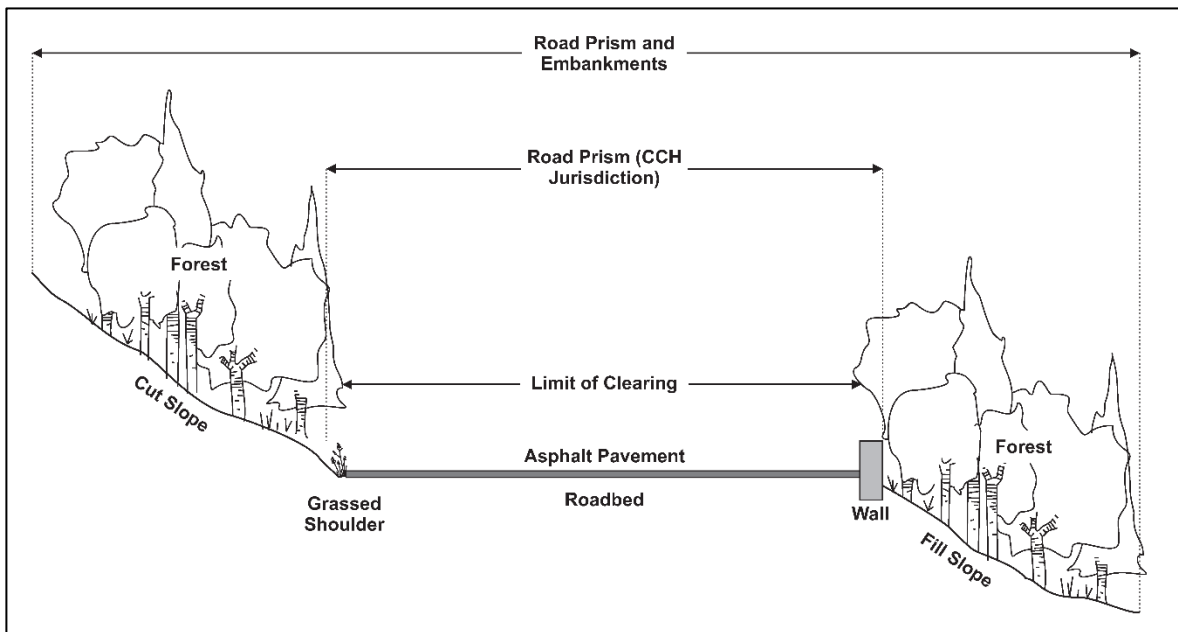
In this TRTD-CMP, the term “road prism” is defined as that portion of the informal TRTD right-of-way (ROW) which consists of the paved road surface and shoulder, the natural and engineered rock soil, and other material which directly supports the paved roadway, and the retaining walls which support the roadway. This section will discuss issues along the ROW related to:

- Systematic breakdown of the asphaltic road surface resulting in extensive potholing, rutting, and generalized breakdown of the surface (see Section 3.2.2.1).
- Subsidence of the supporting material beneath the road surface, resulting in “slumping” of the roadway (see Section 3.2.2.2).
- Deterioration of the retaining walls which support the roadway (see Section 3.2.2.3).

Of note, non-supportive embankments (i.e., those which do not directly contribute the integrity of the roadway, but which are adjacent to it) and safety barriers are discussed in Section 3.2.3.

A generic example of a road prism is shown in Figure 3.2 below; the locations of specific issues related to the road prism are shown in Figure 3.3. In many other environments, the roadway prism extends to the limits of vegetation-clearing; however, because the TRTD was constructed many years ago, the ROW over which the CCH has maintenance responsibility does not include as much of the roadside area as would normally be acquired for a road being built today to modern design standards. In addition, per Revised Ordinances of Honolulu (ROH), Article 20, Section 14-20.1 requires that “every property owner whose land abuts or joins a public street shall continually maintain, and keep clean, passable, and free from weeds and noxious growths, the sidewalk and gutter area which abuts or adjoins the property owner’s property.” As a result, a substantial portion of the cut and fill slopes on which the roadway ultimately depends for its integrity lie on property owned by private individuals or the State of Hawai‘i and are, therefore, not necessarily the responsibility of the CCH.

Figure 3.2 Cross-Section Schematic of Road Prism



Source: Planning Solutions, Inc. (2018)

3.2.2.1 Systemic Breakdown of the Road Surface.

While the road surface within the entire TRTD ROW exhibits significant weathering and wear, there are three locations which have been identified by planners as being particularly severe.⁷ They are:

- The 3200 block of Round Top Drive, consisting of a series of hairpins above the entrance to Pu‘u ‘Ualaka‘a State Wayside and locally known as “Chicken Corner”;
- The 3700 block of Round Top Drive, consisting of the roadway adjacent to the area referred to informally as “Duck Ponds”;
- The 3300 block of Tantalus Drive, consisting of a long straightaway near the entrance to the Tantalus Arboretum Trail.

The location of these areas is shown in Figure 3.3; existing conditions in these locations are depicted in Figure 3.4, Figure 3.5, and Figure 3.6, respectively.

⁷ For a road segment to be identified in this report as exhibiting severe systemic breakdown it must exhibit a minimum of 50 meters of continuous generalized degradation, potholing, and rutting.

Figure 3.3 Locations of Systemic Breakdown of Roadway



Source: Planning Solutions, Inc. (2018)

Figure 3.4 Existing Conditions in the Vicinity of 3200 Block of Round Top Drive



Source: All photos by Planning Solutions, Inc. dated May 4, 2018.

Figure 3.5 Existing Conditions in the Vicinity of 3700 Block of Round Top Drive



Source: All photos by Planning Solutions, Inc. dated May 4, 2018.

Figure 3.6 Existing Conditions in the Vicinity of 3300 Block of Tantalus Drive



Source: All photos by Planning Solutions, Inc. dated May 4, 2018.

3.2.2.2 *Erosion and Subsidence Beneath the Roadway*

There are several areas along the TRTD ROW which show signs of slumping, where the roadway is beginning to sink, resulting in depressions and fissures in the road surface. In some instances, this may be a result of the breakdown of retaining structures (see Section 3.2.2.3), but in others it is also due to subsidence. Inspections of the TRTD ROW have presented three areas which meet these criteria; two on Tantalus Drive and one on Round Top Drive (see Figure 3.7) which are described below.

- The single-lane portion of the Tantalus Road immediately below the “Telephone Road”.⁸ Commonly referred to as either the “Hogsback” or the “Crib Wall”, this approximately 400-foot long stretch has been identified as in need of reconstruction (DDC, 2011). The roadway is delineated by a concrete curb, concrete rubble masonry (CRM) wall, or guardrail on either side. The northern edge of the roadway is supported by the crib wall structure, measuring approximately 16 to 20 feet high and 120 feet long. The southern edge of the roadway is supported by a low CRM gravity retaining wall. In 2005, DDC evaluated the condition of the crib wall when pavement cracks were observed nearby, and visual observation revealed marked deterioration, raising concerns about its structural integrity. Further study in 2011 concluded that the exposed face of the crib wall structure is intact. However, surfaces of the concrete members are weathered and worn. Minor spalls and signs of deterioration due to corrosion are also visible. The existing asphalt concrete curbs and low CRM walls located on both sides of the road contain the storm water runoff within the roadway section. There is no opening in the existing asphalt concrete curb or CRM wall along the south (Makiki Valley) side of the roadway. Storm water runoff crosses over to the north side, near the low point in the roadway and also discharges through the opening (spillway) in the CRM wall. The runoff then drops approximately 20 feet to the toe of the crib wall, where erosion has been observed.⁹
- Several areas along a roughly 1,400-foot-long stretch of Round Top Drive between 4110 Round Top Drive and just above its intersection with Forest Ridge Way. Figure 3.8 provides photographs of existing conditions in this area.
- Portions of the roadway along the steep southern side of Pu‘u ‘Ōhi‘a starting a short distance above 3811 Tantalus Drive and extending to the vehicle parking area opposite the base of the Pu‘u ‘Ōhi‘a Trail. Figure 3.9 provides photographs of existing conditions in this area.

⁸ The segment includes much of the stretch of roadway between the upper end of the Nahuina Trail and the southwestern end of the Kalawāhine Trail.

⁹ Although upper Tantalus Drive was repaved in April 2009, longitudinal cracks had reappeared by 2011. According to the resulting report, one vertical cell of the crib wall structure is completely hollow, and erosion has left adjacent cells only partially filled (DDC, 2011). Based on these findings the City and County of Honolulu determined that a long-term solution was needed, however this project remains in the initial design stage as of late-2018.

Figure 3.7 Locations of Roadway Subsidence

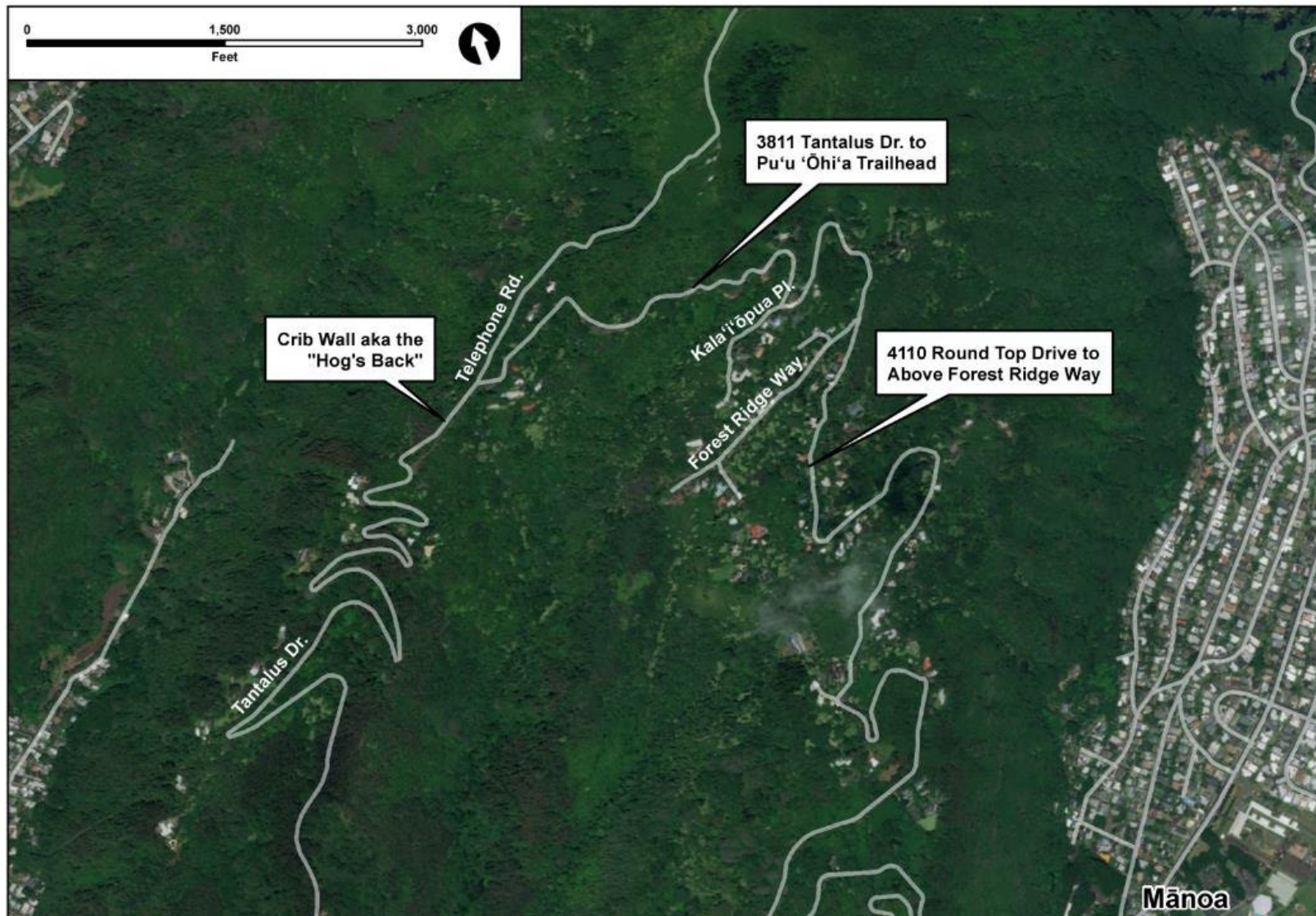


Figure 3.8 Subsidence Between 4110 Round Top Drive and Forest Ridge Way



Source: All photos by Planning Solutions, Inc. dated May 4, 2018.

Figure 3.9 Subsidence between 3811 Tantalus Drive and Pu‘u ‘Ōhi‘a Trailhead



Source: All photos by Planning Solutions, Inc. dated May 4, 2018.

Figure 3.10 Subsidence on the Hogsback

Source: All photos by Planning Solutions, Inc. dated May 4, 2018.

3.2.2.3 Deterioration of Retaining Walls

Portions of the TRTD ROW rely on retaining walls to provide structural support to the roadway. Visual inspections of the TRTD ROW have revealed multiple instances where these retaining walls are exhibiting signs of vehicular damage, cracking, and crumbling as a result of weathering. Over time, these conditions can result in the loss of the retaining structures and ultimately of the roadway itself. Many of the most severe instances of these breakdowns are located in the area between the Hogsback and the Pu'u 'Ōhi'a Trailhead. Examples of these conditions are provided in Figure 3.11 below.

Figure 3.11 Deterioration of Retaining Walls between the Hogsback and the Pu‘u ‘Ōhi‘a Trailhead



Source: All photos by Planning Solutions, Inc. dated May 4, 2018.

3.2.3 ROADSIDE EMBANKMENTS

This section identifies issues related to the sloped cuts and filled embankments which help define the roadway, but which are not integral to its structure. Signage and traffic controls are treated in Section 3.2.4.

Tantalus Drive and Round Top Drive were collectively built using cut and fill along the steep slopes of Pu‘u ‘Ualaka‘a, Pu‘u Kākea, and Pu‘u ‘Ōhi‘a. In the context of this report:

- Cut refers to the embankment upslope from, and beyond, the road prism which was excavated to create the space upon which the roadway was built.
- Fill refers to the downslope embankment below the roadway, and beyond the road prism, where bedrock was exposed, and compacted earth was placed to create a relatively level surface for the roadway.

Both the cut slope and the fill slope are depicted in Figure 3.2. Along this corridor, there are a number of very steep slopes on the uphill and/or downhill side of the road prism. Over time, natural erosion and mass wasting have contributed to slumping adjacent to the roadway.¹⁰ Slumping of the cut slope can result in small- or large-scale landslides which have the potential to partially or completely obstruct the roadway. There have been several instances of this, including a large landslide on Round Top Drive just below the Plan Area which led to the closure of a portion of that roadway for approximately two years. Slumping of the fill embankment, if left unchecked, can result in the complete loss of the roadway as the material supporting the roadway migrates downslope.

Finally, the stability of roadside embankments is affected by the growth of large trees and other vegetation with shallow root structures in both positive and negative ways. On the cut slope, vegetative root structures can contribute to stability by improving soil retention and reducing erosion. However, trees can also overhang, fall into, or otherwise obstruct the roadway. In addition, large root structures also have the potential to undermine the embankments on either side of the road prism, create uplift which breaks through the pavement, and increases the potential for slope failure during periods of high rainfall and/or strong winds.

Most of the areas identified in Section 3.2.2 also exhibit issues related to the stability of the slopes immediately adjacent to the roadway. Generally, these areas are outside of the ROW and thus beyond the jurisdiction of the CCH. These lands are owned either privately or by the State of Hawai‘i and addressing stability issues is technically the responsibility of these entities. However, designing and implementing solutions to these issues will require cooperation and coordination across all three jurisdictions (i.e., State, County, and private).

Visual inspections of embankments adjacent to the TRTD ROW have detected several areas where embankment stability appears to be an issue. The location of these sites along the TRTD corridor which appear to present challenges related to the cut and fill embankments immediately adjacent to the roadway are identified in Figure 3.12.

¹⁰ Mass wasting, also known as slope movement or mass movement, is the geomorphic process by which soil, sand, regolith, and rock move downslope typically as a mass, largely under the force of gravity, but frequently affected by water and water content as in mudflows.

RESOURCES & ISSUES

Figure 3.12 Locations of Roadside Embankment Issues

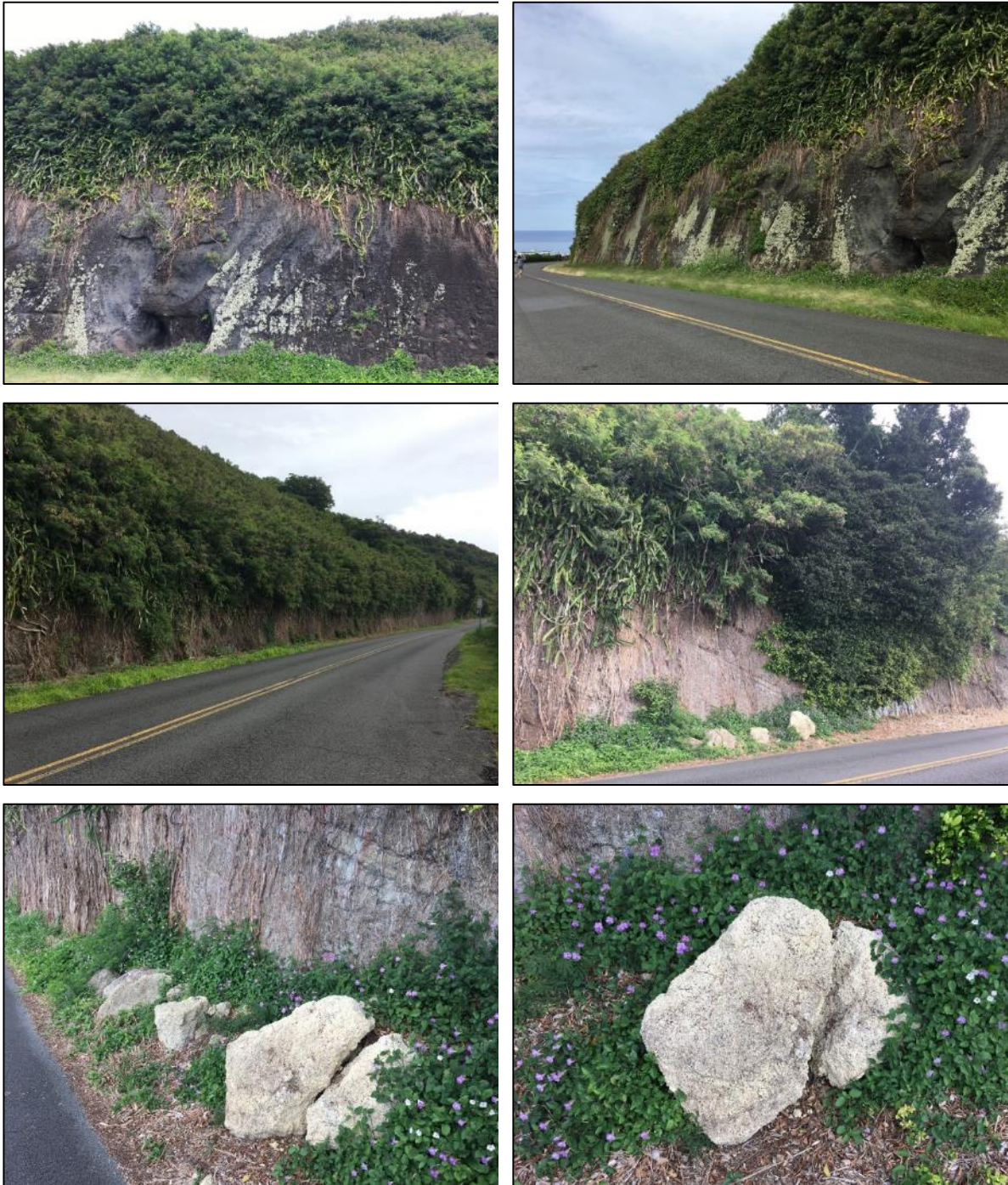


Source: Planning Solutions, Inc. (2018)

These roadside embankment sites include:

- The cut (i.e., upslope) embankment directly adjacent to the Round Top Lookout. Boulders have become dislodged from the embankment in this area and fallen down into the ROW. The existing condition of the embankment in this area is shown in Figure 3.13.
- A roughly 1,200-foot-long stretch of Round Top Drive starting approximately 300 feet below its intersection with Forest Ridge Way. This area has experienced more than one substantial landslide and has had some remedial work conducted there. The existing condition of embankments in this area is shown in Figure 3.14; the first two photos in the figure show some of the previous reinforcement up the cut slope.
- The fill (i.e., downslope) embankment directly above the intersection of Round Top Drive and Forest Ridge Way where a recent landslide has occurred. Figure 3.15 depicts the original condition of the landslide in November 2017 and the temporary remediation with geotextile fabric as of May 2018.
- Portions of the roadway along the steep southern side of Pu‘u ‘Ōhi‘a starting a short distance above 3811 Tantalus Drive and extending to the vehicle parking area opposite the base of the Pu‘u ‘Ōhi‘a Trail. The existing condition of embankments in this area is shown in Figure 3.16.

Figure 3.13 Embankment Issues near Round Top Lookout



Source: All photos by Planning Solutions, Inc. dated May 4, 2018.

Figure 3.14 Embankment Issues between 4110 Round Top Dr. and Forest Ridge Way



Source: All photos by Planning Solutions, Inc. dated May 4, 2018

Figure 3.15 Embankment Issues above Forest Ridge Way



Source: All photos by Planning Solutions, Inc. dated September 26, 2017 and May 4, 2018.

Figure 3.16 Embankment Issues between 3811 Tantalus Drive and Pu‘u ‘Ōhi‘a Trailhead



Site of a previous landslide with reestablished ruderal vegetation in the foreground.

Source: Photo by Planning Solutions, Inc. dated August 22, 2017

3.2.4 SIGNAGE, STRIPING, AND REFLECTORS

All the factors which contribute to degradation of the roadway also contribute to the current condition of the signage, striping, and reflectors in the TRTD ROW. Briefly summarized, these include the age of the roadway, unstable terrain, aggressive vegetation, and demanding climatic environment. These conditions have led to signage, striping, and reflectors being worn or failing completely. In addition to this natural weathering, signs can be unintentionally damaged by vehicles or intentionally vandalized. Finally, because the pavement within the TRTD is very narrow in many locations, drivers tend to migrate to the center of the roadway, which in turn means that striping and reflectors are subject to greater wear. These factors contribute to a situation where in order to remain effective, the signage, striping, and reflectors require maintenance and/or replacement far more frequently than would typically be the case elsewhere on the island. Figure 3.17 depicts selected instances of these conditions.

Figure 3.17 Examples of Weathered or Damaged Signage, Striping, and Reflectors



Sign obscured by vegetation and graffiti.



Reflector missing from roadway centerline.



Sign defaced by graffiti.



Sign obscured by vegetation

Source: Photo by Planning Solutions, Inc. dated August 22, 2017

3.3 ROADSIDE VEGETATION MANAGEMENT ISSUES

The size and aggressive nature of the dense vegetation that characterizes the TRTD corridor means that keeping the roadway functional, safe, and attractive requires substantial ongoing maintenance. Unclear lines of responsibility, extremely limited funding, availability of maintenance staff, and encroachment of alien species into new areas has resulted in acknowledged deficiencies that this CMP seeks to address.

Long-time residents of the mountain recall that roadside vegetation was generally kept in control during the 1950s, 1960s, and 1970s. During that period, there was a dedicated City maintenance staff that operated out of the baseyard that was located just below the entrance to Pu‘u ‘Ualaka‘a State Wayside. Many of the trees were also younger, smaller, and rooted in more stable material. Since that time, the baseyard closed and staff were consolidated with the urban Honolulu District baseyard that used to be located at Kewalo Basin and is now located in Hālawa Valley. Due to increased development in urban Honolulu and development of rural O‘ahu agricultural lands to residential developments, City maintenance resources were diverted to other areas and could no longer provide the same level of maintenance to the Plan Area. The incursion of non-native plants species, particularly Guinea Grass

(*Megathyrus maximus*), and the grow-out of tree species that were introduced many years ago, have led to a situation where more aggressive efforts to manage and control the growth of roadside vegetation are called for.

In this report, the challenges are divided into two categories. Issues related to managing roadside vegetation (both groundcover and shrubs/trees with low-hanging branches) are discussed in Section 3.3.1. Issues related primarily to falling trees are discussed in Section 3.3.2.

3.3.1 ROADSIDE VEGETATION

Its lush vegetation gives the TRTD corridor its special character and makes it physically attractive. Preventing it from compromising the safety and functionality of the roadway also represents a major management challenge. Those challenges, as identified by the agencies charged with maintaining the roadside, by TRTD residents who regularly use the roadway and have homes adjacent to it, and by other parties who participated in the planning process, are discussed below.

3.3.1.1 *Ecological Zones*

Recognizing the significant effect that the character of roadside vegetation can have on its ability to safely operate and efficiently maintain roadways, the Highways Division of the State of Hawai‘i Department of Transportation has established an *Ecological Zones and Native Planting List* (SWCA Environmental Consultants, December 2014). The list, which identifies the native plants species that are best adapted to growing in particular ecological zones throughout Hawai‘i is based on the belief that having roadside plantings that are appropriate for the ecological zone through which the roadway passes, will minimize both maintenance costs and disruption to native ecosystems.¹¹ Its stated purpose is to help landscape architects, engineers, and contractors in selecting appropriate native Hawaiian plant species for Highway right-of-way projects, but it also provides insights into the kinds of vegetation that are most desirable along the sides of existing roadways.

Noting that one of the main challenges to successful roadside revegetation with native plants is that Hawai‘i’s extremely diverse climate means that a one-size-fits-all approach is inappropriate. Accordingly, the *Ecological Zones and Native Planting List* identifies broad areas whose specific environmental conditions (e.g., climate, elevation, landform, and soil characteristics) make them naturally suitable for certain types of plants. It notes that determining the appropriate ecological zone and choosing the right plants for the roadside can save time and money. It recommends following the general steps listed below.

1. *Define the objective(s) of the native planting project. This will guide the selection of native species.*
2. *Identify the county and HDOT Ecozone where the landscaping project falls.*
3. *Determine which plant form(s) (grasses, shrubs, trees, etc.) will best suit the project objectives.*
4. *Consider any specific requirements listed in the tables.*
5. *Select the most appropriate plant(s) based on the steps above.*

Figure 3.1 in the publication depicts the boundaries of the ecological zones on O‘ahu, showing that the corridor is within Ecozone 9 (the “Mesic Zone”). While other native plants, shrubs, and trees do grow in this Mesic Zone, the State Department of Transportation-recommended roadside plants for Ecozone 9 are shown in Table 3.3. As discussed in Sections 3.3.1.2 and 3.3.1.3, most of the roadside

¹¹ In addition to the scientific, common, and Hawaiian plant names, the list includes information on the biogeographical status (indigenous versus endemic) and growth form (grass, shrub, etc.) for each species.

groundcover and adjacent shrubs and trees that are presently within the corridor are not those that the State Department of Transportation would typically install as part of a new roadway project.

Table 3.3 Ecozone 9 Vegetation (Mesic)

<i>Scientific Name</i>	<i>Hawaiian / Common Name</i>	<i>Status</i>	<i>Form</i>
<i>Acacia koa</i>	Koa	Endemic	Tree
<i>Carex wahuensis</i>	O‘ahu sedge	Endemic	Sedge
<i>Dodonaea viscosa</i>	‘A‘ali‘i	Indigenous	Shrub
<i>Eragrostis variabilis</i>	Kāwelu	Endemic	Grass
<i>Euphorbia celastroides var. amplexans</i>	‘Akoko	Endemic	Shrub
<i>Heteropogon contortus</i>	Pili	Indigenous	Grass
<i>Myoporum sandwicense</i>	Naio	Indigenous	Shrub
<i>Nototrichium sandwicense</i>	Kulu‘ī	Endemic	Shrub
<i>Osteomeles anthyllidifolia</i>	‘ūlei	Indigenous	Shrub
<i>Pandanus tectorius hala,</i>	Hala / Screwpine	Indigenous	Tree
<i>Psydrax odorata</i>	Alahe‘e	Indigenous	Tree
<i>Sapindus oahuensis lonomea,</i>	Kaulu	Endemic	Tree
<i>Scaevola gaudichaudiana</i>	Naupaka kuahiwi	Endemic	Shrub
<i>Charpentiera obovata</i>	Pāpala	Endemic	Shrub / tree
<i>Plumbago zeylanica</i>	‘Ilie‘e	Indigenous	Ground cover
<i>Wikstroemia uva-ursi</i>	‘Ākia	Endemic	Ground cover

Source: Highways Division of the State of Hawai‘i Department of Transportation. Table 3.9, *Ecological Zones and Native Planting List*

3.3.1.2 Groundcover

The nature of the roadside groundcover within the TRTD corridor varies greatly over its length (see Figure 3.18). Its composition is a function of local environmental conditions (e.g., rainfall, amount of sunlight, exposure to runoff, etc.) and the frequency and type of human intervention it receives. The great majority of the groundcover is non-native. Some of these species have been established for many years and appear to constitute a stable groundcover. Other species, such as Pothos (*Epipremnum pinnatum*), are much more aggressive, and it is possible to find them spreading from the roadway corridor where they were first introduced into the surrounding forest.

Groundcover in Well-Tended Areas. A few stretches or corners within the corridor are the result of either the State or one or more residents trimming the vegetation on a regular basis. Examples include: (i) the nose opposite the entrance to Pu‘u ‘Ualaka‘a State Wayside, (ii) the meadow near Chicken Corner, and (iii) the plantings near the intersection of Round Top Drive and Forest Ridge Way. In most of these cases, the groundcover consists of introduced short grasses (e.g., Saint Augustine grass or *Stenotaphrum secundatum*); however, larger shrubs and other plantings have been maintained in a few areas. These are likely to remain in their present state so long as the responsible parties continue to direct some level of effort toward their maintenance and no significant new pest species are introduced.

Figure 3.18 Examples of Differing Roadside Groundcover

Manicured short grasses

California grass (*Urochloa mutica*)

Mixed species in heavily shaded areas.

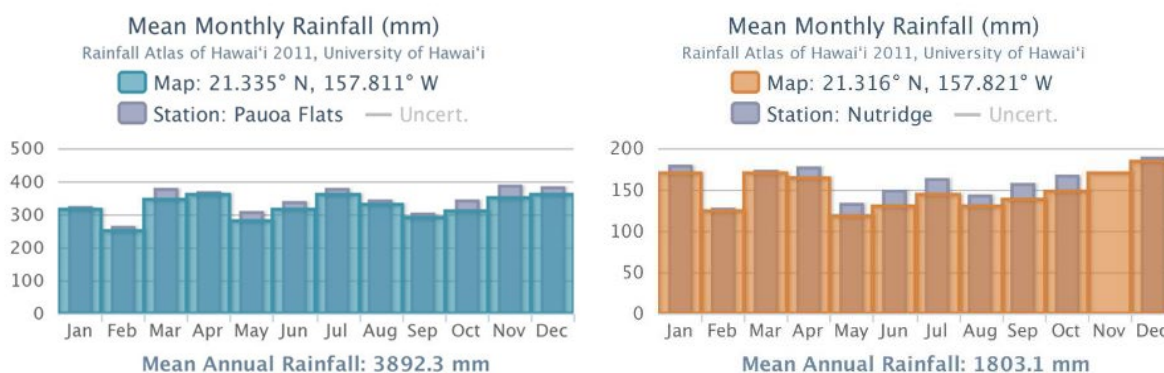
Guinea grass (*Megathyrsus maximus*)

Source: Planning Solutions, Inc. (2018)

Groundcover in Wet Shaded Areas. As indicated in Figure 3.19, average annual rainfall within the upper part of the corridor is nearly 3,900 millimeters (i.e., more than 150 inches) and is relatively evenly distributed throughout the year. The vegetation that predominates on the road shoulder in most of the wetter areas consists of a mixture of ferns and other moisture-tolerant plants. For now, these appear to out-compete other alien/invasive species that out-compete them lower on the mountain. Anecdotal evidence from discussions with residents suggests that their ability to do so is related at least in part to the frequency/infrequency of mowing/weed-whacking.

However, larger plants and or different plantings have been installed/are maintained in a few areas. These are likely to remain in their present state so long as the responsible parties continue to direct the same level of effort towards their maintenance and no significant new pest species are introduced.

Figure 3.19. Mean Monthly (in millimeters) at Pauoa Flats and Pu‘u ‘Ualaka‘a.



Source: Giambelluca, T.W., et al., *Online Rainfall Atlas of Hawai'i*. (2013)

Groundcover in Areas Exposed to Sun. Portions of the roadside that are exposed to a substantial amount of direct sunlight are susceptible to encroachment by aggressive invasives including Guinea Grass and California grass.

3.3.1.3 Shrubs and Trees

Most of the vegetation within the road right-of-way is composed of the groundcovers discussed above; however, there are a number of shrubs and trees present and these predominate in certain areas. While the variety is vast, some species are representative of distinct zones along the corridor. In areas lower down on both the Tantalus Drive and Round Top Drive portions of the corridor, where the climate is drier and sunnier, common shrubs and trees include: (i) Koa Haole (*Leucaena leucocephala*); (ii) Hau (*Hibiscus tiliaceus*); and (iii) Night-Blooming Cereus (*Hylocereus undatus*). Higher up along the corridor, where the climate is wetter, and the canopy more pronounced, common shrubs and trees include: (i) Bamboo (*Poaceae* spp.); (ii) Banyan (*Ficus* spp.); and (iii) Yellow Ginger (*Hedychium flavescens*). Figure 3.20 provides photographic examples of some of these roadside shrubs and trees.

With only a few exceptions, the shrubs and trees that are present in and immediately adjacent to the road corridor are introduced. Nearly all the native species that once predominated were displaced by poor management practices (e.g., timber-harvesting and over-grazing) during the nineteenth century.¹² Prior to that time, the land within the corridor was covered with dense and almost impenetrable forests. Removal of the trees, whether to exploit valuable native species such as sandalwood, to provide firewood for dense urban settlement, or to allow livestock grazing, resulted in the rapid transformation of the vegetation on the lower portions of the mountain. The native forest, whose undergrowth is composed largely of a dense mass of moisture-absorbing/soil protecting ferns, was replaced by a thick matting of grass. The grazing animals that were introduced ate and trampled down the ferns and other undergrowth, thus allowing the soil to become dry and often hardened so that the roots began to dry up and the trees naturally died. The barren hillsides became heavily eroded, and both the quantity and quality of fresh water in the streams below declined.

¹² Cf. *General Description of the Hawaiian Forests*, 1902, A Report of U.S. Forester E. M. Griffith on Hawaiian Forests Presented at Yokohama, Japan, on March 5, 1902.

Figure 3.20 Examples of Roadside Shrubs and TreesKoa Haole (*Leucaena leucocephala*)Bamboo (*Poaceae* spp.)Yellow Ginger (*Hedychium flavescens*)Hau (*Hibiscus tiliaceus*)

Source: Planning Solutions, Inc. (2018)

In response to this degradation, the Territorial Board of Agriculture and Forestry acquired upper Makiki Valley in 1904 and, in 1910, began a much-needed reforestation effort. Ralph Hosmer, the first territorial forester, began to select and grow thousands of trees, mostly species introduced from Australia, Asia, and other parts of the world at the DOFAW Makiki nursery located near the present Hawai'i Nature Center buildings in Makiki. The majority were used in reforestation projects elsewhere on the island but the Territorial Government, recognizing the problems that poor forest management had created, undertook extensive plantings in a number of areas along the TRTD corridor during the early 20th century. While maps depicting the locations and extent of these reforestation efforts are not available, observation along the roadway and a review of the available satellite and aerial imagery provides a good sense of where some of this work occurred.

Since these early reforestation efforts, the non-native, invasive shrubs and trees (including, while technically a grass, bamboo) have become dominant in many of the areas through which the TRTD corridor passes. These areas include:

- Eucalyptus (*Eucalyptus* spp.) planted in several areas along Tantalus Drive between the Punchbowl Lookout and the Makiki Valley Trail trailhead. Eucalyptus, like Strawberry Guava (see below) is

believed to be allelopathic, exuding compounds which affect soil pH and inhibit the growth of other adjacent plants.

- Invasive Bamboo (*Phylostachys nigra*) is present, principally along the upper reaches of the roadway where it crosses the slopes of Pu‘u ‘Ōhi‘a. While the exact date of its introduction is not known, the Mānoa Cliffs Forest Restoration Project estimates that the bamboo on Tantalus spread from 12 acres in 1959 to 46 acres in 2005.
- Strawberry Guava (*Psidium cattleianum*) is particularly prevalent at higher elevations, where it is closely associated with feral pig populations. The two species are often found near each other, most likely because feral pigs aid in the spread of *P. cattleianum*. The pigs disturb habitats by digging in the soil, making it easier for *P. cattleianum* seeds to reach the soil. Additionally, feral pigs may ingest the fruits, whose seeds reach the soil in the scat of the feral pigs (Huenneke, 1990). *P. cattleianum* is considered the most invasive plant in the Hawaiian Islands (Lowe et al., 2000).

3.3.2 FALLING TREES

In addition to the areas with possible slope-stability issues that are described in Section 3.2.3, trees that are growing in a number of areas within the TRTD corridor are problematic or have the potential to be so. While no records of falling trees is compiled by the City or State, trees have been observed to affect smooth operation of the roadway in several ways:

- Low limbs overhang the roadway, obstructing taller vehicles including ENV garbage trucks;
- They become so large and/or their root systems become so compromised by the gradual erosion of overlying soil that they fall;
- The trees support invasive vining plants, or in the case of banyans, produce vine-like aerial roots which hang down into the roadway; and
- They are downed by high winds and/or rains during storm events.

Interviews with personnel at DFM’s Division of Road Maintenance and DOFAW’s O‘ahu Forestry program indicate that the procedures for dealing with fallen trees in the TRTD corridor are representative of the jurisdictional challenges that frequently burden effective management of the Plan Area. While management of existing vegetation overhanging the roadway is usually executed by crews from the City’s Division of Road Maintenance and Department of Parks and Recreation Division of Urban Forestry, they are prevented from hiring arborists or having their crews operate the heavy chainsaws and other equipment required for tree-removal operations within State areas. Thus, when a large tree falls from state-owned land onto the roadway, DFM must rely on the Department of Parks and Recreation’s Urban Forestry Division to send a crew to buck and chip the tree, although DFM often assists with large branch and tree trunk removal using heavy equipment and dump trucks. Tree-fall events often result in prolonged road-closures while the necessary coordination between various departments and divisions take place in order to mobilize response efforts from distant baseyards.

3.4 IDENTIFIED DRAINAGE ISSUES

Storm water drainage structures, in varying states of disrepair, are visible at intervals all along the TRTD corridor. Originally constructed in 1953-1954 of concrete and quarried basalt, these installations represented one of the first improvements to the roadway after the Second World War. These drainage facilities were constructed to allow for storm water to be gathered on the mauka side of the road, travel through culverts under the roadway to makai outlets, and continue downslope without inundating or

damaging the roadway. These structures do not appear to have been meaningfully altered since their construction.¹³

While the CCH has assumed, as discussed in Section 3.2, responsibility for Round Top Drive and Tantalus Drive, none of the old culverts and other drainage facilities that are present within the corridor were considered to be transferred to the CCH, nor are they being actively maintained. This is reflected by the fact that none of these drainages have been added to the CCH storm water system database, as depicted by the HoLIS GIS system. Moleka Stream is the only named waterway which intersects the TRTD corridor, approximately 300 feet east of the Mānoa Cliffs Trail parking area.¹⁴

There are no extant copies of the original construction plans for the roadway and drainage improvements. Because of this, the planning team has developed this discussion of identified drainage issues based on limited research and field observations. Because of the paucity of information available regarding these facilities, a preliminary engineering study should be developed prior to any major work being done on them. Such a study should incorporate the results of a more detailed and comprehensive (i) research, (ii) field investigation, (iii) inventory, and (iv) drainage analysis.

In response to comments that were received during development and internal review of this TRTD-CMP, the planning team conducted an informal inventory of roadway-related drainage structures that could be observed along the corridor. The following broadly typical conditions were observed during these site visits:

- Weathered, worn, damaged, and clogged drain inlets, culverts, and outlet structures;
- Drain inlets higher than adjacent grades, due to repeated resurfacing of the roadway without reference to the pattern of drainage;
- Drain swales bypassing and/or redirecting storm water runoff away from and/or around drain inlets;
- Roadway grades at, or near, the top of the adjacent walls which once served to contain storm water runoff within the roadway;
- Damaged and/or deteriorated rockwork retaining walls; and
- Erosion along the shoulders and at discharge locations where runoff leaves the roadway.

Based on these observations, there appear to be isolated drainage issues at various locations along the corridor related to excess storm water runoff entering the roadway. In some instances, this water may pond on the roadway and cause damage to the asphalt cement (AC) pavement there (see Section 3.2.2). In general, excess storm water runoff which is not captured by functional drainage structures and which, instead accumulates on the roadway is attributable to a combination of causes; these include: (i) age-related deterioration of the drainage structures; (ii) lack of maintenance; (iii) repaving work conducted without reference to storm water drainage; (iv) inadequate drainage collection and conveyance systems including drain inlets, roadside swales, and culverts; and (v) additional development within the watershed, including renovation, addition, and related improvements to private property along the TRTD corridor. See Figure 3.21 for photographs of drainage structures at points along the TRTD corridor.

¹³ In recent years, the DLNR has modified a drainage facility mauka of the Mānoa Lookout to create a dispersion field that is intended to reduce point discharge that may have contributed to a landslide in Mānoa Valley and then transferred maintenance responsibility to the CCH.

¹⁴ This is the right-hand branch of Moleka Stream; its left-hand branch crosses Forest Ridge Way but stops just short of the corridor. The small gully in which it is located is most evident below the corridor, but faint traces of it are present uphill of the roadway as well.

Figure 3.21 Typical Drainage Structures Along the TRTD Corridor



Source: Planning Solutions, Inc. All photos dated August 22, 2017.

3.6 IDENTIFIED SAFETY ISSUES

3.6.1 ROAD USER SAFETY ISSUES

The TRTD roadway poses innate safety issues. It is an old roadway built to the standards of the time; its narrow and winding, with lane-widths that reflect the era in which it was constructed. Drivers and bicyclists must exercise particular care when driving on these two roadways, and the challenge increases at night, during periods of fog and/or rain, for persons unfamiliar with the route, and for drivers operating large vehicles. The serpentine nature of the roadway limits site-distance around corners and the situation is exacerbated by the long intervals between vegetation trimming which allow rapidly-growing vegetation to encroach on the travelway and further restrict the visibility of vehicles, pedestrians, signs, and safety barriers.¹⁵

A final layer of complexity added to road user safety is related to the mixed-use which is typical of both Tantalus Drive and Round Top Drive, by residents, tourists, and recreational users in vehicles, on bicycles, and on foot who share the narrow travelway. However, as noted in Table 1.2, one of DOFAW's principal objectives for the FRS is to provide public recreational opportunities and to increase and maintain public access to forests. Thus, no provision in this CMP is intended to curtail or reduce the wide range of uses along the TRTD corridor.

To develop and incorporate a data-based treatment of road safety issues and recommendations into the TRTD-CMP, the planning team made several contacts with the HPD and the State Department of Transportation (HDOT), Highways Division to review the formal public safety and accident records for the Plan Area maintained by these agencies. This was done with the goal of identifying any issues which are potentially correctible through modifications to the design, maintenance, and operation of the travelway. To date, planners have been unable to obtain sufficiently detailed and accurate information regarding accident records from these agencies to provide a quantitative basis for recommendations. As a result, planners have relied on information gathered through field visits, conversations with area residents, the TCA, agency officials, and other members of the various user groups active on the roadway and who have some awareness of the safety issues related to it.

In doing so, care was taken to distinguish between issues that are present at all times and those which are conditional and/or make themselves evident only during nighttime, or periods of moderate to heavy rain or fog. This process is oriented to targeting specific locations along the TRTD corridor where short-term remedial work may provide substantial and immediate benefit, as well as addressing more global and generalized safety concerns.

For the purposes of the TRTD-CMP, "road safety issues" refers to matters related to physical conditions of, on, or around the roadway, which have the potential to affect the safety of road users (i.e., pedestrians, bicyclists, or drivers). Generally, these issues are interrelated, but are categorized here for clarity. Specific topics discussed in this section include those related to safety issues:

- Resulting from the current state of vegetation in, on, and around the travelway (see Section 3.6.1.1).
- Related to the condition of the roadway, striping, and signage (see Section 3.6.1.2).

¹⁵ In past opinion surveys, residents have ranked road safety as the highest near-term priority. The highest-ranking specific safety concern was timely road paving and line-of-sight vegetation trimming. This was followed by trimming dangerous trees, and structural road improvements.

Readers should note that, because drifting and racing are related to driver behavior rather than to the design or condition of the travelway, they are discussed separately in Section 3.6.3.¹⁶ Recommendations related to each set of issues are provided in Chapter 4.

3.6.1.1 Road Safety Issues Related to Vegetation Management

As noted throughout this report, the TRTD corridor is characterized by lush vegetation. While this is generally considered a desirable aspect of the Forest Reserve, it poses management challenges, and at times can affect the safety of roadway users in several ways. Ways in which vegetation affects the roadway include: (i) growth along the road shoulder; (ii) growth in the roadway itself; (iii) overhang on the roadway; and (iv) root structures which undermine or uplift the road surface. In addition to affecting the structural integrity of the road (see Section 3.2), vegetation acting on the roadway presents the following road safety issues related to vegetation management depicted in Figure 3.22.

Figure 3.22 Examples of Road Safety Issues Related to Vegetation Management



Rapidly growing invasive plants species, including guinea grass (*Megathyrsus maximus*), several species of bamboo (*Poaceae spp.*), haole koa (*Leucaena leucocephala*), yellow ginger (*Hedychium flavescens*), and white ginger (*Hedychium coronarium*) grow along the road shoulder and, as the plants develop their foliage, narrowing the travelway as it spreads. To avoid having their vehicles struck and damaged by the foliage, drivers deviate towards the centerline, deteriorating the striping and reflectors, and posing a hazard of collision with oncoming traffic.



Thick vegetation growing on the nose of tight hairpins or other curves in the road can reduce or completely obstruct site distances.

¹⁶ The danger posed by drivers who use portions of the roadway for “drifting”—where drivers intentionally allow the rear slip angle to be greater than the front slip angle, to such an extent that the front wheels may point in the opposite direction to the turn—came into sharp focus on January 25, 2018, when the driver of a car drifting on the lower portion of Tantalus Drive lost control, striking and critically injuring a bicyclist.



Overhanging vegetation, such as banyan (*Ficus benghalensis*) and hau (*Hibiscus tiliaceus*) can strike taller vehicles (e.g., Department of Environmental Services (ENV) refuse collection trucks) and deposit vegetable matter onto the roadway, reducing traction.



Vegetation on the shoulder, when not properly maintained, can make it difficult or impossible for pedestrians to get out of the way of oncoming vehicles. This situation is particularly noticeable in areas such as the stretch of Tantalus Drive between Telephone Road and the Mānoa Cliffs Trailhead.



Unchecked vegetation on the shoulder can make existing walls and safety barriers difficult or impossible to see, posing a collision hazard to vehicles.



Uplift of the roadway caused by root structures from adjacent trees can disrupt the integrity of the road's surface.

Source: All photos by Planning Solutions, Inc. (2018)

3.6.1.2 Road Safety Issues Related to Condition of the Roadway, Striping, and Signage

Issues related to the generally poor condition of the roadway, signage, striping, and reflectors have been discussed in detail in Section 3.2. All the factors which have contributed to this deterioration, including the age of the roadway, the unstable terrain, and the demanding climate have led to the road surface,

signage, striping, and reflectors being worn or failing completely (see Section 3.2.4), which in turn can have serious implications for driver safety. Briefly summarized, they include:

- Breakdown of the road prism and embankments have increased the possibility of landslides, particularly during prolonged rain events.
- Degradation of the road surface reduces vehicle traction and can damage tire tread, increasing the potential for skidding, loss of control, and flats.
- Weathered, damaged, or vandalized signage fails to appropriately guide, warn, and regulate the flow of traffic, including motor vehicles, bicycles, and pedestrians.
- Insufficiently maintained drainage structures can allow excess of water to drain along and across the roadway, decreasing vehicle traction, hydroplaning, and loss of control.
- Inadequately maintained vegetation along the road shoulder can lead motorists to gravitate towards the centerline, wearing away the striping and reflectors which demarcate lanes on this narrow roadway, increasing the potential for collisions.

3.6.2 PUBLIC SAFETY ISSUES

The planning process identified several safety issues of particular concern in the planning area which included burglary, fire, illegal dumping, and vandalism. The ultimate objective is to determine whether there are measures which could be implemented to better protect residents and visitors in this relatively isolated area and incorporate them into this CMP.

3.6.2.1 Fire Protection

3.6.2.1.1 Honolulu Fire Department (HFD)

As noted in Section 1.2, the Plan Area is outside of the BWS' municipal water service area, demarcated by the water storage tanks that bookend the TRTD corridor. Consequently, there are no fire hydrants or other public sources of fire-fighting water present in the Plan Area. While some individual homeowners may have incorporated special fire-fighting provisions into their privately-owned properties that they can use in the event of a structural fire, this is the exception rather than the rule.

The HFD responds to calls using a tanker-truck based at the Makiki Fire Station No. 3, but the response time is generally at least 15 to 20 minutes depending on the location of the fire. Consequently, structural fires that have occurred within the Plan Area over the past five decades have typically resulted in the total loss of the structure. However, fire-fighting operations have been successful in keeping fires from spreading to adjoining properties or igniting surrounding vegetation.

3.6.2.1.2 DLNR Fire Buffer Zone Standards

For fires which occur within the FRS, DOFAW is the primary responder. The State of Hawai'i Board of Land and Natural Resources has established "Fire Buffer Zone Standards" applicable to certain kinds of development within the State Conservation District (i.e., HAR §13-5, Exhibit 5, dated August 12, 2011). The stated purpose of fire buffer zones is to:

"...reduce the risk of fire spreading to an area, and to reduce the speed at which fire spreads, should one occur. This is accomplished by (1) reducing the amount of available fuels, (2) reducing the continuity of available fuels, both horizontally through the proper spacing of trees and shrubs, and vertically by removing the ladder of fuels that can carry fire from the surface to the tree crowns, (3) developing a high-canopy forest, (4) replacing highly-flammable flora with drought and fire resistant indigenous, endemic, or Polynesian-

*introduced species, and (5) encouraging community stewardship of lands in the Conservation District.*¹⁷

This Fire Buffer Zone is intended to create standards for a transitional zone along the interface between wilderness conservation areas and development, wherein conditions are to be managed to effectively reduce the potential for fires to start, and to reduce the ability for fires to spread once they have started. While thick vegetation on the slopes of the Pu‘u ‘Ualaka‘a, Pu‘u Kākea, and Pu‘u ‘Ōhi‘a, is one of the distinguishing characteristics of the Plan Area and constitutes a potentially large source of fuel, no fire buffer zones have been established there.¹⁸

While no comprehensive survey of the fire potential within the Plan Area was conducted during preparation of this CMP, observations indicate that in many instances the existing structures development would not conform to these standards if they were to be applied.¹⁹ Hence, it appears that additional pruning of branches, removal of dead trees, annual maintenance trimming of trees, and the thinning of understory would be required in order to comply with the standards set forth in HAR §13-5, Exhibit 5, if the area were subject to these rules.

While it is fortunate that the most heavily vegetated areas along the corridor correspond to the areas which see the highest quantity and most even distribution of rainfall, the volume of potential fuel continues to increase over time and the wildfire threat cannot be completely discounted. If a wildfire were to occur, it could be difficult to contain or extinguish the blaze quickly. Instead, the focus of efforts might have to be on protecting structures and allowing the fire to burn itself out. In view of this, by far the most prudent approach appears to be maximizing public awareness of the hazard and promoting responsible use of potential ignition sources within the Plan Area.

3.6.2.2 Crime Prevention

The planning team attempted to obtain crime data from the HPD that would allow it to characterize the kinds of crimes of greatest concern within the Plan Area. This review was intended to aid in the development and incorporation of a data-based treatment of public safety issues and to formulate recommendations to address them which could be incorporated into this TRTD-CMP. The goal of this information gathering was to identify classes of criminal activity which are present in the Plan Area and which could be potentially corrected or better managed through modifications to infrastructure or police operations. To date, planners have been unable to obtain sufficiently detailed and accurate records from this agency to provide a quantitative basis for recommendations. As a result, the planning team has relied on information gathered through field visits, conversations with area residents, informal discussions with police officers patrolling the area, the TCA, agency officials, and other members of the user groups which are active in the corridor and have some awareness of the public safety issues related to it.

The TCA and the community it represents takes public safety and security very seriously, focusing on property crimes that directly affect the families who live in this low-density area. It has an active

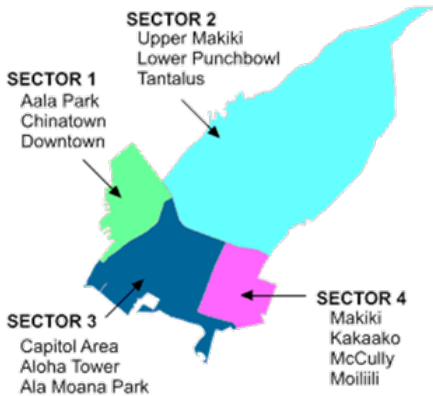
¹⁷ According to the Office of Conservation and Coastal Lands (OCCL), the intent of this section was to decrease permitting for community associations or property owners to better manage vegetation surrounding subdivisions in dry areas and was not intended to be a “standard”. The OCCL has indicated that it will be proposing to repeal this section in its next round of rule amendments. Notwithstanding this potential change, DOFAW recommends that homeowners create a vegetation-free buffer on their property to protect these structures from the threat of wildfires.

¹⁸ The State Conservation District Rules (HAR §13-5-41.1) provide only that where requested by DLNR [emphasis added], fire buffer zones shall be established and shall include the requirements listed in the “Fire Buffer Zone Standards”.

¹⁹ DOFAW’s standard recommendation is that all structures be located at least 30 feet from the nearest Forest Reserve boundary. This is consistent with the recommendations of the National Fire Prevention Association (NFPA) Firewise USA® program. An additional benefit of observing this 30-foot buffer recommendation is that it has the potential to decrease the likelihood of tall trees falling on private property during high winds or storms.

Neighborhood Watch program, with block captains representing residents in all zones of the TRTD corridor, and all residents can sign up to receive the email security alerts that the TCA Neighborhood Watch Program issues. The TCA also partners with the HPD’s District 1 Community Policing Team.²⁰ Its partnership with HPD has made it possible for the TCA to hold safety workshops and to invite police officers to provide free security assessments for residents’ homes.

Figure 3.23 Patrol Sectors in HPD District 1



Source: Honolulu Police Department (2018)

Because the residences along the TRTD corridor are relatively widely dispersed, and the neighborhood itself is well-removed from other neighborhoods patrolled by HPD, the total police presence is low. Figure 3.23 depicts the 4 patrol sectors which make up HPD’s District 1 and provide a sense of the challenge which policing of Sector 2 (i.e., Makiki-Tantalus) poses. This sector is larger than the other three combined, but with far fewer people and residences than any single other sector in the District. Discussions with representatives of HPD have indicated that it is their intent to have a patrol car make a circuit of the TRTD corridor approximately 4 times per day. However, the limited number of patrol officers available, and the need to handle complaints in the much more densely populated sectors frequently make that impossible.

There are at least seven categories of criminal activity believed to be present, at varying times, within the Plan Area; they are: (i) illegal dumping; (ii) vandalism; (iii) racing and/or drifting; (iv) operation of motor vehicles while under the influence of drugs and/or alcohol; (v) vehicular property crimes (i.e., theft of vehicles or their contents); (vi) residential property crimes; and (vii) violent crimes. Arguably, residential property crimes are conducted on private property, rather than on State-owned lands; however, the point of ingress and egress for this category of criminal activity would be across state-owned lands and therefore potentially subject to this CMP. Chapter 4 includes a discussion of measures which may be employed individually or collectively to address and manage these undesirable activities.

3.6.3 DRIVER BEHAVIOR SAFETY ISSUES

For this TRTD-CMP, the term “driver behavior safety issues” refers to those matters related to the behavior of drivers of motor vehicles, as opposed to the physical conditions on, or around, the roadway, which have the potential to affect the safety of road users (i.e., pedestrians, bicyclists, or drivers). Generally, these issues are related to automobiles and motorcycles traveling on the roadway at unsafe speeds in various forms, including: (i) speeding; (ii) racing; and (iii) drifting. Readers should note that, because they are related to the design or condition of the travelway rather than to driver behavior, issues related to the road prism, embankments, signage, striping, and reflectors are discussed separately in Section 3.2.

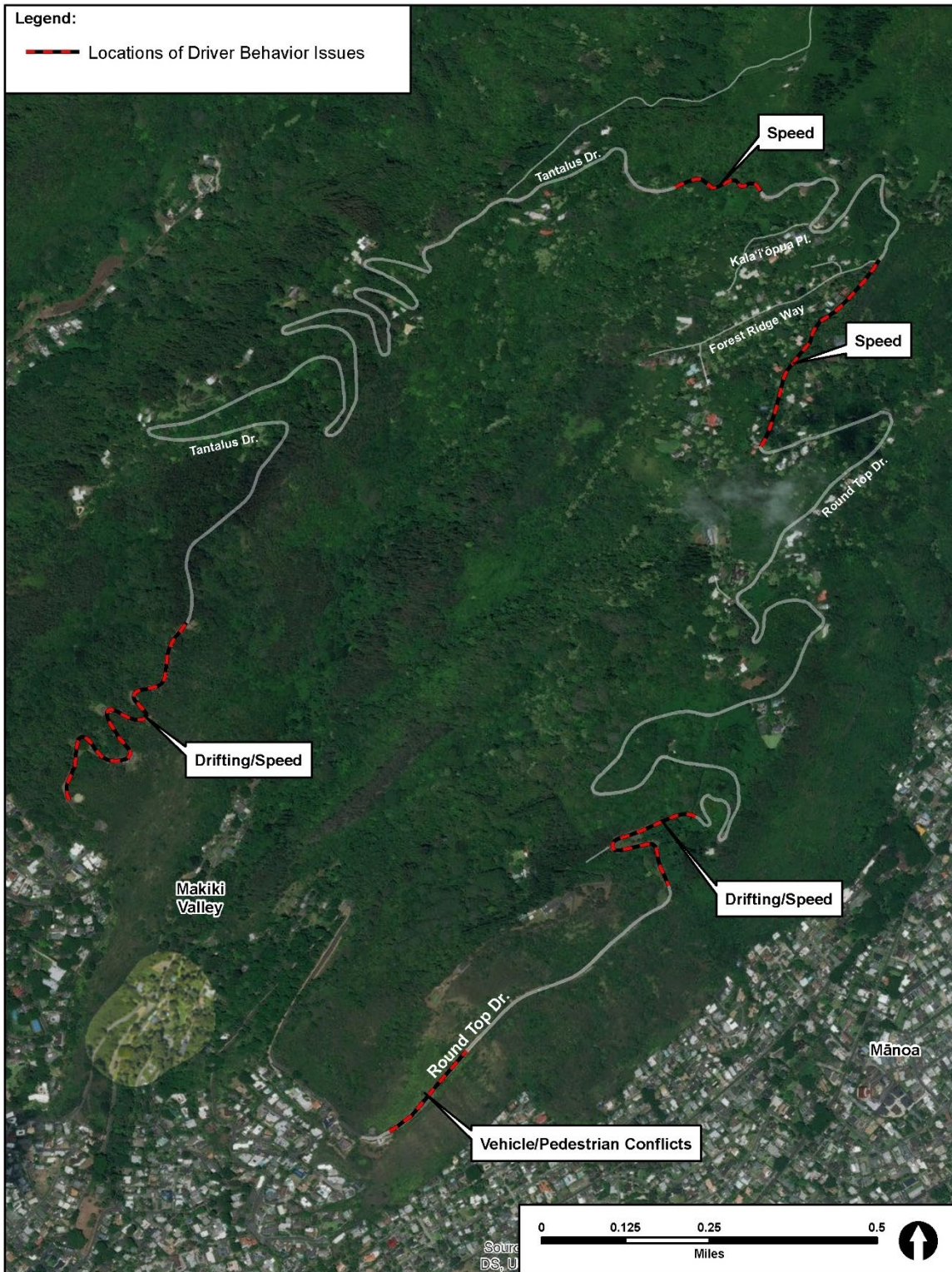
While the posted speed limit along the TRTD corridor is only 25 miles per hour (mph)—with lower limits at selected locations due to sharp turns, restricted sight-distance, and other conditions—many factors contribute to the prevalence of driver behavior-related safety issues. These factors include:

²⁰ The TRTD-CMP Plan Area is in HPD’s District 1, Sector 2, which includes Tantalus-Round Top, Upper Makiki and Lower Punchbowl.

- The roadway is narrow, with substandard lane-widths, little or no shoulder, inadequate surface, and overgrown vegetation.
- The winding and scenic nature of the roadway make it attractive for people seeking a place to joyride in proximity to urban Honolulu.
- Tantalus and Round Top Drives, with their many scenic viewpoints and lush vegetation are an attraction for visitors and residents from other parts of the island who are not familiar with the route or its condition, and in turn, may be driving with divided attention.
- The upcountry conditions, including its cooler, wetter climate can lead to slick roads and poor visibility; this can be particularly true at night or during periods of heavy rain or fog.
- The wide range of users, including residents, visitors, recreational drivers, bicyclists, and pedestrians results in a broad mix of activities in unpredictable patterns and in close proximity to each other.

While a complete traffic study was outside the scope of this TRTD-CMP, there are specific problem areas and problem times along the corridor which could be made subject to targeted interventions that could result in incremental improvements. Selected locations, where specific behaviors have been observed over the years, are identified in Figure 3.17. Chapter 4 provides recommendations which may be employed individually or collectively to address and manage these behaviors.

Figure 3.24 Locations of Known Driver-Behavior Issues



Source: Planning Solutions, Inc. (2018)

3.7 IDENTIFIED PARKING AREA AND TRAILHEAD ISSUES

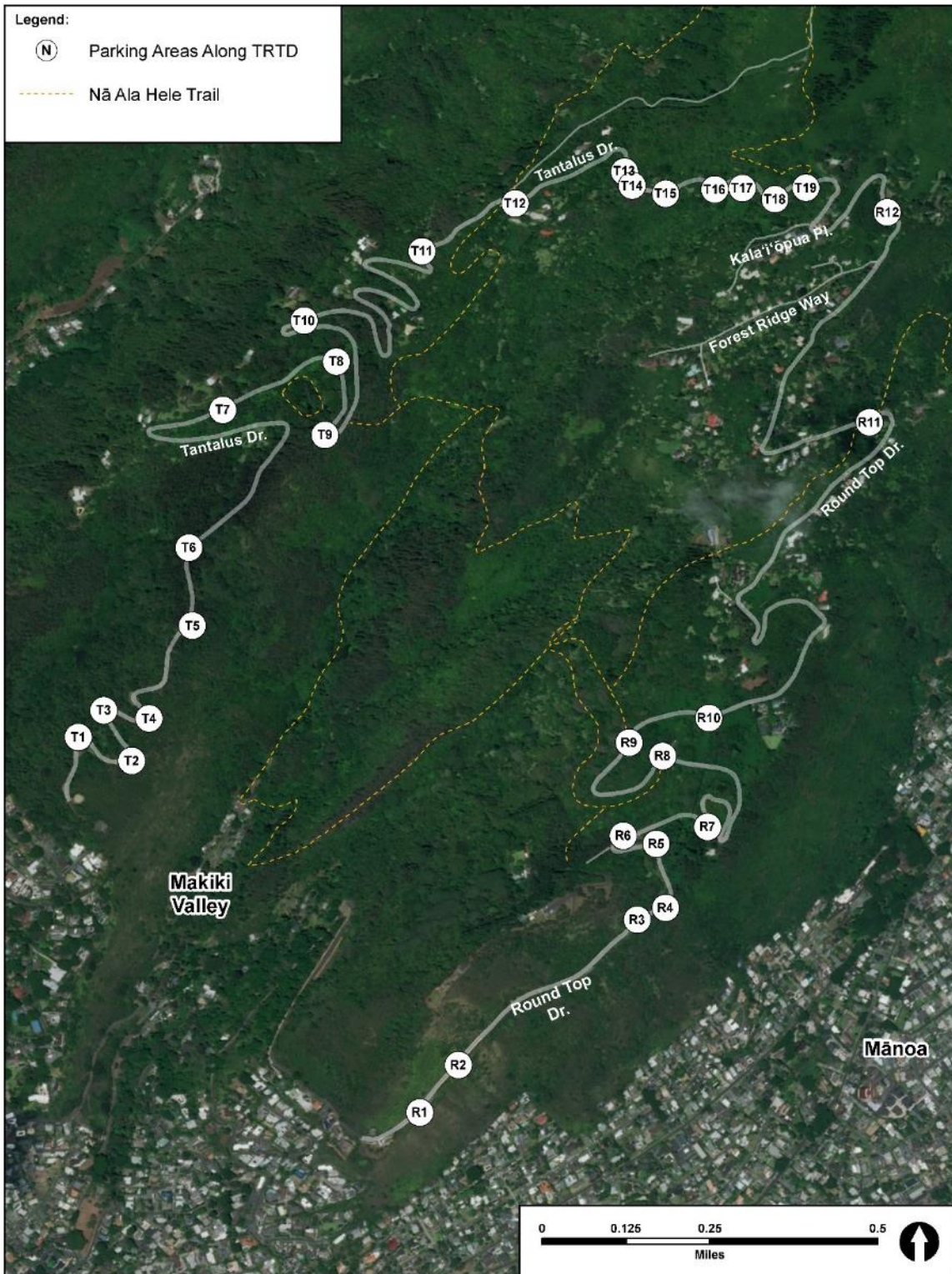
3.7.1 PARKING AREA ISSUES

There are two types of parking areas along the TRTD corridor: (i) paved parking areas, some formally signed as such, and (ii) informal parking areas which have been created by residents and visitors accessing their respective destinations. This section identifies issues related to the first category of formal parking areas. Recommendations addressing these issues are provided in Chapter 4, which if applied, could enhance their use and help reduce the reliance on informal parking areas. The unique identifier, approximate size, and other characteristics of these designated parking areas are provided in Table 3.4. The location of each of these designated parking areas along the TRTD corridor is shown in Figure 3.25.

While this TRTD-CMP uses the term “parking area” to describe these paved areas adjacent to the travelway, in fact they serve a mixture of four generalized purposes: (i) vehicular parking; (ii) lookouts; (iii) turnouts to allow safe passing; and (iv) trailheads. The single largest of these areas is the Mānoa Lookout. Situated on the lower end of the portion of Round Top Drive that is within the Plan Area, it provides a panoramic view of Mānoa Valley, Diamond Head, and Waikīkī. Other major parking areas are intended to serve the trailheads of the Nā Ala Hele Trail and Access System (see Figure 3.25). Because these paved areas occupy State-owned land outside the main travelway, the CCH does not view them as being under its jurisdiction or as being its maintenance responsibility. Consequently, these parking areas are not typically repaved as part of the road maintenance projects conducted by the CCH. As a result, the asphalt and general condition of these parking areas, as summarized in Table 3.4, are poor and nearly all of them need resurfacing, new signage, and additional and/or refurbished trash receptacles.









As noted above, in addition to the formal parking areas, there are also a few areas where cars are frequently parked opportunistically. This occurs where there is a combination of adequate space off the road shoulder to accommodate vehicles in areas proximal to attractions such as lookouts, trailheads, and residences. Vehicles in these areas can: (i) reduce the width of the roadway; (ii) cause erosion as they enter and leave paved areas; (iii) entrain mud onto the roadway; (iv) contribute to property crime; and (v) create safety hazards as occupants leave and enter their vehicles from the travelway.

Figure 3.25 Locations of Designated Parking Areas along TRTD Corridor


















Source: Planning Solutions, Inc. (2018)

Table 3.4 Pavement Characteristics of Identified Roadside Parking Areas

<i>ID/ Area (ft.²)</i>	<i>Existing Condition</i>	<i>ID/ Area (ft.²)</i>	<i>Existing Condition</i>
R1/ 4,600		R2/ 1,700	
R3/ 1,800		R4/ 2,200	
R5/ 800		R6/ 1,500	
R7/ 900		R8/ 3,800	

<i>ID/ Area (ft.²)</i>	<i>Existing Condition</i>	<i>ID/ Area (ft.²)</i>	<i>Existing Condition</i>
R9/ 1,100		R10/ 900	
R11/ 2,700		R12/ 1,300	
T1/ 1,800		T2/ 3,000	
T3/ 2,300		T4/ 900	

<i>ID/ Area (ft.²)</i>	<i>Existing Condition</i>	<i>ID/ Area (ft.²)</i>	<i>Existing Condition</i>
T5/ 3,800		T6/ 1,500	
T7/ 400		T8/ 200	
T9/ 3,000		T10/ 200	
T11/ 2,700		T12/ 600	

<i>ID/ Area (ft.²)</i>	<i>Existing Condition</i>	<i>ID/ Area (ft.²)</i>	<i>Existing Condition</i>
T13/ 400		T14/ 1,200	
T15/ 500		T16/ 200	
T17/ 300		T18/1,800	
T19/4,500			

Source: Planning Solutions, Inc. (2018)

Parking areas and trailheads with specific issues related to them are discussed in greater detail below in Sections 3.7.2 through 3.7.9. Specific recommendations related to each location identified in Table 3.4 above are provided in Chapter 4.

3.7.2 R1 AND R2: MĀNOA LOOKOUT PARKING AREA

The Mānoa Lookout on Round Top Drive is a combination of two parking areas, identified as R1 and R2 in Table 3.4 and Figure 3.25, which offer panoramic vistas of Mānoa Valley, Diamond Head, and Waikīkī. These two parking areas are located at the lower end of the relatively long straight section of Round Top Drive that runs along the eastern slope of Pu‘u ‘Ualaka‘a.

Because the roadside pavement area is relatively large, parking opportunities are generally adequate even though a large proportion of visitors driving up the mountain stop here for the view. However, for about two hours each evening typically centered on sunset, limousines, tour vans, and private vehicles can crowd these parking areas. At these times, the area becomes congested with vehicular and pedestrian traffic as people congregate to take advantage of the spectacular views out over the lighted city. This congestion can, at times, conflict with the normal through-traffic along Round Top Drive. Photographs of R1 and R2 during normal daytime hours and during typical peak evening hours are shown in Figure 3.26.

While no traffic study was conducted during preparation of this TRTD-CMP, it appears that most vehicles can find a space to park. However, several processes combine to aggravate circumstances, including:

- A significant proportion of the vehicles are high-occupancy vans and buses which disgorge visitors who are focused on the view, each other, and photography. Many of these people behave as though they are unaware that they are moving in an active roadway.
- Many of the drivers are professionals who cooperate with their colleagues by pulling into the parking area perpendicular to the roadway instead of parking parallel to the roadway centerline as intended. This allows more cars to park in R1 and R2 than would otherwise be possible, but it leaves the rear-ends of many of the vehicles protruding into the travelway.
- Having completed their visits, many of these drivers tend to turn around in the travelway directly fronting R1 and R2 and descend directly back down Round Top Drive.
- In other cases, tour vehicles continue up Round Top Drive to the entrance of Pu‘u ‘Ualaka‘a State Wayside and make a U-turn on that hairpin corner, using the park entrance for additional turning space.
- Whether vehicles turn in front of R1 and R2 or make their turn at the entrance to Pu‘u ‘Ualaka‘a State Wayside, oversize tour vehicles such as buses, vans, and limousines require multi-point turns, backing up and turning repeatedly within the limited space available.

This combination of large vehicles, preoccupied visitors, limited turnaround opportunities, and ongoing through traffic in an unlit area creates a chaotic environment, obstructing the flow of traffic and leading to potentially unsafe conditions. To address this congestion, authorities have periodically made special efforts to encourage drivers of larger vehicles to continue up Round Top Drive and turn around at the entrance to Pu‘u ‘Ualaka‘a State Wayside. However, because of the additional time and effort required to do so, drivers have generally resisted the suggestion and resumed the practice of turning around in the roadway adjacent to R1 and R2 as soon as any special police presence ceases.

Figure 3.26 Parking Area R1 at the Mānoa Lookout



View of Parking During Mid-Day, August 16, 2018



View of Parking During Busy Evening, September 20, 2018.

Source: Planning Solutions, Inc. (2018)

3.7.3 R8: BOY SCOUT CAMP EHRHORN PARKING AREA

The area identified as R8 in Table 3.4 and shown in Figure 3.27 provides parking for persons using the connecting portion of the ‘Ualaka‘a-Makiki Valley Trail. It also provides overflow parking for the Aloha Council of the Boy Scouts of America’s Camp Ehrhorn and is used to off- and on-load supplies and gear going into the camp. None of these uses generates large number of vehicles. Relatively few people use the trail between Pu‘u ‘Ualaka‘a State Wayside and Round Top Drive near Camp Ehrhorn, and most of those who do start and finish elsewhere, minimizing the need for parking at this trailhead. The same is true for parking adjacent to the point where the trail re-crosses Round Top Drive above the camp (see R9 on Figure 3.25).

Only a small portion of R8 has ever been paved; crushed coral was placed in some areas in the past, but it does not appear to have been replenished for many years. As a result, the area has a poor rutted and often muddy surface. The entry and exit areas off the road edge are uneven and, when wet and muddy, can create hazards for cars entering and exiting the travelway. This condition is worsened by the dense vegetation that surrounds the immediate parking area, which results in high-shade and poor air circulation. The parking area itself has a small cluster of plants that form a sort of island making the pull-out area more of a circular driveway. The Camp Ehrhorn entry gate is not clearly visible so people trying to find its entrance can easily miss the access point.

Contacts were made with the Aloha Council’s Director of Support Services for Camping, Eric McFee on August 12 and 13, 2018. Mr. McFee indicated that use of the camp’s facilities was intermittent, with campers present, on average, approximately two weekends per month. Because of carpooling and the fact that the Boy Scouts allow their users to park vehicles inside the camp gates, camp activities do not result in substantial roadside parking. As a result, Boy Scout-related use of R8 is limited to occasional overflow parking and for the drop-off and pick-up of campers. The driveway providing access from Round Top Drive into Camp Ehrhorn is a combination of course gravel, dirt, and grass.

Parking area R8’s proximity to the travelway, location approximately midway up Round Top Drive, and it’s “horseshoe”-shaped configuration, with separate entrance and exit points, makes it a popular site for dumping. Individuals can pull in on one end, dump their refuse, and exit in a short span of time all the while partially obscured from view by the plantings along the travelway. Finally, because of the very infrequent paving which this parking area receives, rutting and the collection of standing water after rain events are common.

Figure 3.27 Parking Area R8 and the ‘Ualaka‘a-Makiki Valley Trail Trailhead*View of parking area R8 on mauka side of Round Top Drive.**Driveway into Camp Ehrhorn**View of ‘Ualaka‘a-Makiki Valley Trail trailhead (mauka side).**View of ‘Ualaka‘a-Makiki Valley Trail trailhead (makai side).*

Source: Planning Solutions, Inc. (2018) Photos dated August 22, 2017 and August 16, 2018.

3.7.4 R11: MOLEKA AND MĀNOA CLIFFS TRAILHEAD PARKING AREA

The R11 parking area (see Table 3.4 and Figure 3.25) serves both the Moleka Trail and the Mānoa Cliffs Trail. The terminus of the Moleka Trail is immediately makai of this parking area, and the Mānoa Cliffs Trail begins directly opposite it on the mauka side of the roadway. Because of this, and the popularity of these two trails, it is one of the most heavily used parking areas along the upper portion of the TRTD corridor. Photographs of its current condition are provided in Figure 3.28 below.

Figure 3.28 Parking Area R11 and the Moleka and Mānoa Cliffs Trail Trailhead



View of Parking and Moleka Trail Trailhead



View of Manoa Cliffs Trail Trailhead

Source: Planning Solutions, Inc. (2018). Photos dated August 22, 2017 and August 16, 2018.

The R11 parking area stretches approximately 100 feet along the side of the roadway and extends approximately 20 feet makai from the travelway to allow for perpendicular parking. As a result, parking area R11 has sufficient space to accommodate between 10 and 11 cars or light trucks. As can be seen in Figure 3.28, the R11 parking area has had an asphalt pavement in the past, but the pavement is badly deteriorated and in need of replacement. In addition, because the travelway has been repeatedly repaved, while the R11 parking area has not, the crowned roadway now drains directly into this parking area where water now collects and stands during and after rain events.

This combination of storm water runoff and standing water has led to some erosion on the edge of the R11 parking area along the bank that leads down to the Moleka Trail. There are no berms or drainage structures at this parking area to prevent the downhill movement of water. Signage at, and across from, this parking area directs trail users from the parking area to the Moleka and Mānoa Cliffs Trails.

3.7.5 T6: PUNCHBOWL LOOKOUT PARKING AREA

The Punchbowl Lookout on Tantalus Drive, identified as T6 on Table 3.4 and Figure 3.25, offers a panoramic view of west O‘ahu, including the Punchbowl National Memorial Cemetery of the Pacific and downtown Honolulu in the foreground, stretching west out to the ‘Ewa plain and the Wai‘anae Mountains. As with the other parking areas along lower Tantalus Drive, this parking area is used by both residents and visitors as a convenient location for small groups to pause, relax, and enjoy the views.

The photographs presented in Figure 3.29 depict the current condition of parking area T6. As can be seen in the first picture, the pavement condition at this parking area is poor as it has not been included in any recent paving or patching efforts by the CCH. The trash receptacle at this location was destroyed by vandals some number of years ago and had not been replaced at the time this photo was taken. As a result, this popular area tends to have more loose refuse than some of the other parking areas along the lower portion of Tantalus Drive where trash receptacles have been maintained and serviced regularly. Moreover, because it is relatively low down on the TRTD corridor and does allow for vehicles to park directly adjacent to the downslope, it is a popular site for mass dumping of old appliances, tires, demolition waste, and other refuse. Finally, although this area is intended to serve as a scenic viewpoint, there has been no vegetation management at this location for many decades. As the forest has grown up, the view has gradually become more restricted.

Figure 3.29 Parking Area T6 and Punchbowl Lookout



Uphill view of area T6.



Downhill view of area T6.

Source: Planning Solutions, Inc. (2018). Photos dated August 22, 2017 and August 16, 2018.

3.7.6 T9: MAKIKI VALLEY TRAIL PARKING AREA

Hikers accessing the Makiki Valley Trail, or wishing to connect to the Nahuina Trail, from Tantalus Drive frequently use the parking area identified as T9 in Table 3.4 and Figure 3.25. Photographs of its current condition are provided in Figure 3.30. For many years this parking area was the site of large-scale dumping, with drivers backing their vehicles up to the low rock wall along the makai side of this parking area and emptying their refuse down onto the slope below. To discourage this, segments of wooden utility poles were embedded into the pavement many years ago, preventing vehicles from getting close enough to the edge of the parking area to easily dump refuse. While these wooden poles have deteriorated to the point where they no longer constitute an effective barrier, the large-scale dumping of tires, trash, old appliances, and demolition waste which once occurred here no longer seems to be a major problem.

Figure 3.30 Parking Area T9 near Makiki Valley Trail Trailhead



View of parking area T9.



Makiki Valley Trail trailhead Near T9.

Source: Planning Solutions, Inc. (2018) Photos dated August 22, 2017 and August 16, 2018.

3.7.7 T11 AND T12: NAHUINA AND KALĀWAHINE TRAILHEAD PARKING AREAS

The T11 and T12 parking areas, shown in Table 3.4 and Figure 3.25, are used by hikers accessing the nearby western trailhead for the Kalawāhine Trail and for Nahuina Trail. While they are very different in character, one formal and the other less so, they are discussed here together because they serve the same uses. Parking area T11 is shown below in Figure 3.31, parking area T12 is shown in Figure 3.32; the trailhead they serve are shown in Figure 3.33.

Figure 3.31 Parking Area T11



Source: Planning Solutions, Inc. (2018). Photo dated August 16, 2018.

Figure 3.32 Parking Area T12 near Kalāwahine Trailhead*Paved parking area T12 on makai side of road.**Unpaved overflow parking on mauka side of road.*

Source: Planning Solutions, Inc. (2018). Photo dated August 16, 2018.

Hikers accessing Kalāwahine Trail (which links with Pu‘u ‘Ōhi‘a Trail and Mānoa Cliffs Trail) will typically select the closest available parking. This is often parking in area T12 (see first photo, Figure 3.32), but may also be the opportunistic unpaved parking area directly mauka of T12 (see second photo, Figure 3.32), or on the other side of the single-lane Hogsback at parking area T11 (Figure 3.31).

Figure 3.33 Kalawāhine and Nahuina Trailheads*View of Kalawāhine Trail trailhead mauka of Tantalus Drive.**View of Nahuina Trail trailhead makai of Tantalus Drive.*

Source: Planning Solutions, Inc. (2018). Photos dated August 16, 2018.

On busy days, most vehicles park close to the start of the Kalāwahine Trail on the grassy shoulder mauka of the roadway because of the limited paved area available at T12. This area is on a bend in the road immediately above Tantalus Drive’s intersection with Telephone Road and offers only limited sight-distance. Exiting and entering the travelway can be challenging at this location, and when it is rainy, this shoulder can become extremely muddy; in addition to covering hikers’ clothing and shoes, this mud can be entrained by vehicles into the travelway.

While parking area T12 is one of the most intensively used parking areas along the TRTD corridor, it was not formally intended to serve as a parking area. Moreover, it is not well maintained, and its use

as a parking area conflicts with the adjacent driveway serving the residences at 3803, 3809, and 3811 Tantalus Drive, and at times, even obstructing it. The shape of T12 is irregular and because it has not been repaved for several decades, the pavement is deteriorated. The estimated number of vehicles that can possibly park in area T12 and on the adjacent grassy shoulder, depending on their size and the way they are positioned, is between 10 to 12 cars or light trucks.

The parking area identified as T11 in Table 3.4 and Figure 3.31 is more distant from the Kalāwahine Trail than parking area T12, but is a true parking area designed for the purpose and is frequently preferred by groups going on hikes. In addition, because it is paved and removed from the travelway, it provides a cleaner and safer staging area for hikers. As with other parking areas along the TRTD corridor, the pavement is not striped for stalls, and the total number of vehicles which parking area T11 can accommodate depends on their type and the way drivers park them. Based on observations over the course of this study, the capacity ranges from 5 to 6 vehicles. If free access to all vehicles is maintained, then perhaps twice that number of vehicles can park if drivers belong to an organized group and are willing to double-park (also known as “theater parking” wherein one vehicle parks behind a second vehicle and blocks the second vehicle in).

Based upon long-term observation and discussions with area residents, the number of stalls at this parking area appears to be adequate most of the time. Occasionally, groups of people on organized hikes occupy all the spaces, and this can lead to double-parking and/or participants parking in the alternate area discussed below. The pavement in the area is in relatively good condition, with the pronounced slope of this parking area preventing ponding of water and associated deterioration of the asphalt, but there are several sizeable potholes.

3.7.8 T19: PU‘U ‘ŌHI‘A TRAILHEAD PARKING AREA

This parking area, identified at T19 in Table 3.4 and Figure 3.25, is on the makai side of Tantalus Drive directly opposite the trailhead for the Pu‘u ‘Ōhi‘a Trail. Photographs of the T19 parking area are provided in Figure 3.34 below. As can be seen in these photos, there is no parking on the mauka side of Tantalus Drive where the trail begins.

Figure 3.34 Parking Area T19 and the Pu‘u ‘Ōhi‘a Trailhead



Roadside Parking Opposite Pu‘u ‘Ōhi‘a Trailhead



View of Pu‘u ‘Ōhi‘a Trailhead

Source: Planning Solutions, Inc. (2018). Photos dated August 22, 2017.

The total paved area of the T19 parking area is approximately 4,500 square feet, but its irregular shape and the presence of metal posts set back approximately 12 feet from the edge of the travelway makes some of the area unusable for parking by cars and light trucks. These posts were installed shortly before the year 2000 as a means of allowing the parking area to be closed at night, thereby discouraging its use as a raucous party area. The nightly closure was accomplished with a chain and lock that nearby

residents closed each evening and opened every morning. Because the chain was removed some time ago, the posts no longer serve a useful purpose, but they continue to reduce the parking capacity of this parking area.

As a result, T19's practical capacity is limited to approximately 8 or 9 cars or light trucks, with overflow space for two or three additional vehicles parallel to, and between, the metal posts and the travelway. In some instances, this number may be exceeded when groups of hikers park together and are willing and able to double park. On busy days, some hikers may also park at the nearby T18 area. T19 is currently used for short periods as a staging and departure point for commercial bicycle tours operated along the TRTD corridor. Based on observations made during field research for this report and conversations with area residents, the number of parking stalls available at this location appears to be adequate most of the time.

The pavement in parking area T19 is in generally good condition, but because there is no striping there, parking can often be chaotic and inefficient. As can be seen in Figure 3.34, some ponding of water does occur there during rain events. In addition, the metal posts which form a partial barrier there have created a break in the paving where weeds have become established.

3.7.9 ISSUES AT OTHER PARKING AREAS ALONG TANTALUS DRIVE

The discussion in the previous subsections describe conditions at the more notable areas where parking occurs along the TRTD corridor. The remaining parking areas along the corridor all share many of the same characteristics and present a common set of management issues. These include: (i) the poor condition of pavement; (ii) inadequate waste management; (iii) insufficient vegetation management; and (iv) vandalism of signage. A set of management prescriptions for each parking area is provided in Section 4.4.

Finally, a concern that has recently emerged within the Plan Area is the increasing prevalence of individuals and groups using roadside parking areas and pullouts as overnight campsites. Residents familiar with the situation report that automobiles begin showing up between 4:00 p.m. and 10:00 p.m. and begin to depart in the early morning hours; typically, they are all gone by 10:00 a.m. Most of these vehicles are sufficiently large that their occupants sleep in them, but smaller vehicles are sometimes used, and occupants of these vehicles have been seen pitching tents on adjacent areas. Overnight parking is already prohibited in the areas where car-camping is occurring, but HPD has informally indicated that it cannot do anything unless clear signage is posted prohibiting the activity. Signage to this effect which had been put up in the past has been largely destroyed or made useless by vandals.

The community has indicated that the people engaged in car-camping have been well behaved and do not seem to be leaving piles of trash behind. However, there are several concerns related to this activity: (i) the camping is illegal; (ii) in the absence of restrooms, it is likely that they are leaving their waste in the adjacent woods; (iii) some individuals have been observed performing oil changes and other forms of car maintenance, and it is likely that this waste is also disposed of in the adjacent Honolulu Watershed Forest Reserve; and finally (iv) while this activity has probably always occurred on an occasional basis within the Plan Area, without proper enforcement it is probable that the intensity of this illegal use will increase. Were that to occur, the increased camping and the problems that accompany it would compromise the quality of the environment within the corridor.

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CHAPTER 4 – MANAGEMENT RECOMMENDATIONS

This chapter identifies the O&M and CIP recommendations that the planning team has identified after careful consideration of the available options. It is based on the information on existing resources and issues presented in Chapter 3, discussion with resource management agencies, residents, and the general community. Rather than merely a discussion of possible options, it provides specific recommendations which the planning team has concluded will best address management challenges. In some instances, a discussion of options, rather than a single set of recommended actions is included in recognition of the fact that, while some actions can be undertaken by the responsible parties under their own authority and budgets, others will require additional staffing, CIP budget authorizations, and/or additional layers of review and approval. Readers should also note that, while these recommendations are as comprehensive and concise as possible based on the current level of study, project planners and engineers should continue to search for superior solutions as they implement the recommendations.

4.1 ROADWAY RECOMMENDATIONS

4.1.1 GENERAL ROADWAY PAVEMENT RECOMMENDATIONS

DDC reports that the roadway within the corridor was last repaved in 2009. While some segments in the lower portions of the route have held up reasonably well, as noted in Section 3.2.2, most of the route needs an asphalt overlay at a minimum. Because of this the planning team has developed budget estimates for the two alternatives outlined below. It was not possible to develop specific budget estimates for a third concept that would involve milling and filling the existing surface with spot reconstruction to address segments with failed base course/subgrade. The detailed engineering studies needed to determine the scale and methods for this approach have not been conducted and thus it is not possible to develop cost estimates for it. However, it is safe to say that the cost of implementing this approach would be intermediate between the other two and that, given the qualitative observations made during this study, is likely to be no lower than the midpoint of the two (i.e., at least \$15 million).

- The first budget estimate assumes that the existing roadway pavement is completely removed, and where necessary the subgrade reconstructed to current standards, and a new AC pavement is installed in all areas that do not suffer from the specific road prism and/or embankment issues discussed in Section 4.1.2 and Section 4.1.3 below. This is different from the simple overlay that has been used in past resurfacing projects and would include: (i) removing the existing AC pavement; (ii) excavating to the required depth of 4"; adding a (iii) 6" aggregate base course; (iv) 4" asphalt treated base; (v) 2" AC; and (vi) implementing traffic control measures during construction.
- The second budget estimate is based on an AC pavement overlay alone. The upfront capital cost of this would be lower than that of reconstruction. However, a simple overlay could exacerbate some drainage issues, would deteriorate much more rapidly (and therefore require subsequent work) and have a higher life-cycle cost. The AC pavement overlay work would include: (i) temporary BMPs; (ii) 1½" AC pavement overlay; and (iii) traffic control measures during resurfacing.

Assuming that the general repaving work extends over all of the roadway length not covered by the specific projects discussed in Section 4.1.2 and Section 4.1.3 (i.e., a distance of approximately 7 miles), the cost of the work is likely to be on the order of \$29 million for reconstruction and \$4 million for the fallback AC pavement overlay option. These costs are in addition to those that would be incurred for the work described in Section 4.1.2 and Section 4.1.3.

Developing full engineering plans and budgets for reconstruction is likely to require at least two to three years and cost at least \$1.7 million. The reconstruction work would likely extend over a period of three to four years and would reduce the level of service on the roadway for much of that time. Engineers anticipate that full closure could be confined to just a portion of the time but doing this is likely to result in higher costs than if the contractor is allowed more extensive closures.

Preparing plans and budgets for the much simpler overlay project would require no more than half that time and is expected to cost on the order of \$500,000. The overlay work would likely extend over a period of 18 to 24 months and would reduce the level of service on the roadway for much of that time. Engineers anticipate that short periods of full closure will be needed.

4.1.2 ROADWAY PRISM IMPROVEMENT RECOMMENDATIONS

As discussed in Section 3.2.2, several areas within the corridor exhibit signs of particularly severe breakdown of the roadway prism. Repaving without addressing the underlying problems might slightly delay the time when complete failure occurs. However, more fundamental reconstruction of these areas is needed to prevent a major failure that will be much costlier to address than it would be if corrective measures are taken while access/work from the existing roadway is still possible. The locations of the areas where it appears that substantial reconstruction of the roadway prism, and possibly associated retaining walls, is needed are shown in Figure 3.3 and the specific conditions are illustrated in Figure 3.4, Figure 3.5, and Figure 3.6. All three of these roadway segments also have roadside embankment issues, and the tasks needed to address them are included in the discussion below.

The CCH has completed the engineering design work needed for one of the three areas where extensive reconstruction is required. That work is described in Section 4.1.2.1 below. Comparable engineering studies have not yet been undertaken for the two other areas that are identified, but the general nature of the remedial work that appears to be needed is described in Sections 4.1.2.2 and 4.1.2.3. Detailed engineering analyses and design that is beyond the scope of this work will be required before corrective actions can be implemented in these areas.

4.1.2.1 Hogsback or the Crib Wall

Several years ago, the City and County of Honolulu, Department of Design and Construction (DDC) developed a plan to repair the narrow section of Tantalus Drive immediately below its intersection with the Telephone Road that residents commonly refer to as the Hogsback. As described in the Final Environmental Assessment for the project (Kimura International, Inc., August 2012), the existing asphalt concrete roadway surface and adjacent CRM walls were to be demolished and replaced by a roadway built atop a 200-foot-long reinforced concrete slab with integrated 27-inch reinforced concrete railings (barrier walls). The improvements that were contemplated were an attempt to balance the historic character of the road with current design guidelines.

Before seeking a contractor for the work, DDC undertook a comprehensive review of the proposed design and has tentatively decided on an alternate approach which entails shotcreting the existing crib wall, adding soil anchors, and other ancillary improvements. It does not yet have a final plan, schedule, or budget for implementation, but it is anticipated to be less than the previous budget (which was approximately \$4.5 million).

4.1.2.2 4110 Round Top Drive to 4160 Round Top Drive

The approximately 1,400-foot-long stretch of Round Top Drive from 4110 to just below its intersection with Forest Ridge Way was constructed along the side of steeply sloping terrain. The property on both sides of the roadway is privately owned and has been developed as house lots. The homes that are situated on the downhill side of the road are served by steep driveways and/or walkways from garages located along the downhill (i.e., western) side of the road, and the continued viability of these homesites depends upon maintaining this access. While the height of the cut on the uphill (i.e., eastern) side of the roadway is not as great as it is on the opposite side, it is also very steep, and that means both that

the thick overhanging vegetation and slumping of material onto the roadway are already issues that will worsen if corrective action is not taken.

Some of those issues, such as maintaining the physical integrity of garages and carports that are perched along the side of the roadway, are the responsibility of the private landowner. Ensuring the integrity of the roadway itself is a public responsibility and is critical to the continued functioning of the roadway corridor.

Determining the exact nature of the physical improvements that would best protect this segment of the roadway was beyond the scope of this report. However, the signs of stress that are evident in the pavement and the substantial adverse effect that a failure could have on the functionality of the roadway leads the planning team to believe that a field investigation of the situation should be initiated immediately. Furthermore, an in-depth engineering analysis should be undertaken unless the results of the field investigation demonstrate that it is unnecessary. Making structural improvements will be both challenging and disruptive even if the work is undertaken in advance of a failure. It will be much more challenging, take longer, and be substantially costlier if a repair is attempted after a failure occurs.

The planning team believes that a preliminary field investigation of this segment can be done over a period of a few months and at a cost of no more than \$25,000. The information it would provide will allow engineers to better define the underlying source of the problem and to develop scopes of work and budgets for the geotechnical, design, and environmental analyses needed to formulate, evaluate, and gain approval of the best solution. The cost of conducting the necessary studies, developing and evaluating alternative solutions, obtaining required environmental and other approvals, and preparing construction plans and documents will depend upon the results of the various studies and design decisions, but the planning team believes they are likely to cost from \$1.0 to \$1.2 million. Because of the steep terrain and presence of nearby residences, the planning teams estimates that implementing the recommended improvements is likely to cost between \$2.0 million and \$7.0 million. All of these are rough estimates based on limited information and will need to be updated as studies progress.

4.1.2.3 3811 Tantalus Drive to Pu'u 'Ōhi'a Trailhead

While this nearly half-mile long segment of roadway is discussed together here, conditions vary quite significantly along its length. On the uphill (i.e., northern) side of the roadway, the terrain climbs relatively steeply, and medium-height and tall trees overhang the roadway in many areas. Slumping has occurred at several locations, most frequently when the ground is saturated by heavy rain and winds blowing on the vegetation act to overturn them, lifting their roots out of the ground and disturbing and destabilizing the surrounding/underlying cindery soil.

The number of small landslides could probably be reduced by controlling vegetation for 25 to 75 feet uphill of the pavement, but excessive vegetation clearance exposes the soil to increased erosion due to rainfall/runoff and creates an opportunity for the accelerated spread of weeds and other invasive plants. Because of this, relatively frequent vegetation trimming is likely a more effective management technique than is less frequent/more extreme cutting. The preferred vegetation management approach is discussed more fully in Section 4.4.2.10 of this report.

Portions of the downhill (i.e., southern) side of this stretch of roadway rely on retaining walls to provide structural support to the roadway. When originally constructed a century or more ago, some of these extended one to three feet above the road surface. However, as a result of repaving, and in a few instances slumping, there are a few locations where the tops of the walls are at the same level as the

adjacent road surface, no longer providing the same level of protection against vehicles completely leaving the roadway as these barriers did previously, when the roadway was new.²¹

Determining the exact nature of the physical improvements that would best protect this segment of the roadway was beyond the scope of this report. However, because certain portions of this roadway segment traverse extremely steep terrain and exhibit signs of deterioration, it is important that an in-depth engineering analysis be initiated now and that the recommendations from that study be implemented as soon as funding permits. As was true of the Hogsback, it will be challenging enough to implement repairs while the work areas are still readily accessible from the existing roadway. If work begins after a catastrophic failure, it will be much more difficult, costly, and time-consuming.

The planning team believes that the monitoring needed to determine if movement of the retaining walls and/or subgrade is actually occurring can be done using monthly or quarterly visual observations and/or instruments (such as the tiltmeters). The monitoring will provide a much more voluminous and accurate data set that will show if the roadway's retaining walls are starting to shift.²² It appears likely that a year's worth of monitoring at up to ten locations along this road segment would provide sufficient data to determine if further investigation is warranted, and that collecting and analyzing these data will cost about \$50,000.

If the monitoring data do indicate that remedial action appears necessary and further geotechnical and engineering studies are appropriate, the follow-up studies, environmental analyses, and design work is likely to be relatively costly. The exact cost of this work will depend upon the nature of the preliminary findings, but the planning team believes that it is likely to be between \$1.0 to \$1.5 million. Because of the steep terrain and difficult access, the present estimate is that the work itself could cost between \$4 million and \$10 million. All of these are rough estimates based on limited information and will need to be updated as studies progress.

4.1.3 ROADWAY EMBANKMENT MANAGEMENT RECOMMENDATIONS

This section addresses the two areas that have been identified as having roadside embankment issues that are not integrally linked to the stability of the roadway itself. The first is Round Top Drive immediately above Forest Ridge Way, and measures that could help address the issues in that area are discussed in Section 4.1.3.1. The second is adjacent to the long stretch of roadway along the Mānoa side of Pu'u 'Ualaka'a and measures that could help address the issues in that area are discussed in Section 4.1.3.3. The locations of both are shown on Figure 3.12.

4.1.3.1 Round Top Drive/Tantalus Drive Between Forest Ridge Way and Pu'u 'Ōhi'a Trailhead

Much of the roadway between Forest Ridge Way and the Pu'u 'Ōhi'a Trailhead is carved into steep hillside. The cut slope in several areas is quite steep and is covered with thick vegetation. As noted in the previous chapter, nearly all of the problematic roadside embankment areas in this vicinity are located on State land and/or private property that is outside the road ROW. However, these embankment areas are not in locations where storm water runoff or erosion appears to pose a serious threat to the landowners, and the water that enters the roadway is not a result of their facilities or activities. Hence, managing these areas in a way that best supports the ongoing use of the corridor is legitimately within the purview of this TRTD-CMP.

²¹ Anecdotally, there are at least two locations where the absence of a protective wall has led to vehicles plunging down the hillside. One is immediately to the west of the entrance to Kala'i'ōpua Place, where a vehicle with four occupants that failed to make the turn ran at least a hundred feet down the slope. Another is at the point where the Telephone Road intersects Tantalus Drive, where a vehicle that was stopped without its parking brake or gearbox engaged rolled over the edge and many tens of feet down the slope into Pauoa Valley and had to be lifted out by two heavy duty tow trucks.

²² Such instruments can transmit data remotely and detect movements of ± 2 arc sec. ($\pm 0.0006^\circ$) (0.01 mm/m) or smaller.

The fact that bamboo predominates in many of the areas on the uphill side of this segment of roadway differentiates it from some of the other areas discussed in this report because it lowers the potential for treefalls blocking the roadway. At the same time, the steepness of the terrain and the fact that keeping the vegetation at bay depends upon the diligence of the adjoining landowner (which is currently quite high) means that it is deserving of at least a contingency plan that lays out a course of action in case the private maintenance decreases. Two segments within this segment deserve particular attention:

- The structural integrity of the retaining wall on the downhill side of the turn just above the beginning of Kanealole Stream should be explored because of the steep drop off at that location. Minor repairs were made at this location but did not address fundamental issues.
- Similarly, the steep drop-off adjacent to the downhill side of the roadway segment between Kala'i'ōpua Place and the Pu'u 'Ōhi'a Trailhead should be inspected. Repeated repaving has brought the pavement nearly even with the top of the retaining wall.

Determining the exact nature of the physical improvements that would best protect this segment of the roadway was beyond the scope of this report. However, while the issues that are apparent in this area are such that they not likely to lead to a failure that would block the roadway for a long period of time, leaving the issues unaddressed is likely to lead to more and more frequent slumping that temporarily closes the roadway. Identifying and then implementing specific drainage (see Section 4.2) and roadway improvements that will prevent this should be undertaken as soon as possible.

The planning team believes that the engineering and/or geotechnical studies needed to fully evaluate these issues are likely to cost on the order of \$100,000 to \$125,000 and require up to a year to complete. The cost of making improvements, if any are determined to be needed, cannot be ascertained until the work that is required has been defined. However, the team believes that the cost could range from \$200,000 to \$1.0 million.

4.1.3.2 3811 Tantalus Drive to Pu'u 'Ōhi'a Trailhead

The embankment issues between Pu'u 'Ōhi'a trailhead and 3811 Tantalus Drive are largely on the uphill side of the roadway because the steepest areas have retaining walls on the downhill side of the roadway. Management of the vegetation growth as described in Section 4.3 appears to be the best means of addressing the issues that have been identified in this area. In addition, the retaining walls on the makai side should be: (i) inspected; (ii) cleared of all vegetation; and (iii) where necessary, repaired.

Having said that, there are certain areas along this roadway segment where the upslope embankment may require additional work. The planning team recommends that engineering and/or geotechnical studies needed to fully evaluate these issues be commissioned as soon as possible and believes that it would be best if this were done in conjunction with the roadway engineering analyses recommended in Section 4.1.3.1 and Section 4.1.3.3. This study is likely to cost on the order of \$150,000 to \$200,000 and require at least a year to complete. The cost of making improvements, if any are determined to be needed, cannot be ascertained until the work that is required has been defined. However, the planning team believes that the costs may be substantial, ranging from \$500,000 to \$3.0 million or more.

4.1.3.3 Round Top Lookout Along Mānoa Side of Pu'u 'Ualaka'a

As discussed in Chapter 3, the ground on the uphill side of the roadway adjacent to the Mānoa Valley overlook slopes steeply upward. While most of the ground is vegetated, the lava, cinders, and other material of which the pu'u is composed is highly weathered, and small clumps of material have become dislodged and dropped to the ground along the shoulder. While there is no evidence that the type of major failure that occurred on the Makiki Valley side of the pu'u is likely to occur in this area, the fact that the lookout is heavily used means that the potential for harm (which is a function of both the likelihood of occurrence and the number of people likely to be present if a failure occurs) is too great to ignore.

Completely eliminating the risk in this area would require concrete retaining walls, terracing, or other extensive regrading. The costs of this would be very high and it would almost certainly require another prolonged closure of the roadway, affecting all who rely on the roadway. Other techniques, such as soil nailing, can be more economical, but have not been tested in the kind of material that is present on this hillside. In view of this, it appears that the best approach to managing risk in this area is not to carry out extensive stabilization work on large areas of the natural hillside, but to mitigate the risk by preventing debris from the natural hillside above from reaching the roadway and lookout using flexible debris barriers and/or a concrete barrier at the toe of the natural hillside if monitoring of the hillside indicates that this is appropriate.²³ The advantages of flexible barriers is that they are relatively easy to install on steep natural terrain, less visually obtrusive, and have less environmental impact compared with reinforced concrete barriers. However, they are not effective on vertical faces unless they can be set back adequately from the area that is to be protected, a condition that cannot be satisfied everywhere adjacent to the lookout.

Because that kind of monitoring is not currently being conducted, it is recommended that State and City agencies work together to develop and implement a monitoring plan. Plan development is expected to cost on the order of \$200,000 and require approximately 24 months to complete. The annual cost of implementation cannot be determined until the work that is required has been defined.

4.1.4 ROADWAY SIGNAGE AND STRIPING/REFLECTORS²⁴

Issues pertaining to the design and condition of existing roadway signage and striping/ reflectors are discussed in several portions of Chapter 3 of this report (see Sections 3.2.4 and 3.6.1.2). The measures that the planning team have identified as being most likely to address those issues are outlined below. In most cases implementation of these measures will require either the preparation of detailed specifications and the issuance of work orders (for items that can be done by existing staff within the current budget) or contracts for items that will require supplemental budgeting and/or the issuance of contracts to outside suppliers. The “clear zone” recommendations contained in the *Roadside Design Guide, 4th edition* (American Association of Highway and Transportation Officials, 2011) cannot readily be applied within an existing corridor such as this.

4.1.4.1 Roadway Signage Recommendations

The existing roadway signage consists principally of regulatory and warning signs, including but not limited to speed limit signs, turn warning signs, and cautionary signs.²⁵ Sign maintenance within the corridor is the responsibility of the DFM, which generally conducts maintenance and replacement in the corridor consistent with its practices elsewhere on the island. The relatively poor condition of area signage suggests that the environment is such that either an increased maintenance effort is needed, or the signs must be replaced more frequently than is now done.

²³ Several types of flexible debris barriers are in use. One common type is mainly formed of steel ring nets mounted between horizontal steel ropes spanning between steel posts and anchored into the ground. The design methodology for flexible rock fall barriers is based on an energy approach whereby a falling rock or boulder is stopped in one go by the barrier designed to absorb the kinetic energy carried by the rock or boulder. The design usually entails the use of proprietary flexible barrier systems with specific energy absorbing capacities that are verified by full scale field testing in accordance with the relevant national or international standards.

²⁴ As used here, the term “roadway signage” refers to signs that are intended to guide and caution individuals driving cars, trucks, bicycles, and other vehicles on the roadway. The term “striping/reflectors” refers to markings on the pavement that delineate the center line and/or edge of pavement.

²⁵ Small distance marker signs were installed at relatively close intervals approximately 10 years ago when the roadway was surveyed. They do not appear to have served a useful purpose as geo-locators, however, and their presence has interfered with the use of landscape maintenance equipment such as tractor-mounted mowers. Because of this, they should be removed.

No official inventory of the signs is available, but informal observations made during this study suggest dozens are present. A substantial proportion of those appear to be in substandard condition. In many cases the degradation stems from the fact that the signs are located in areas where the combination of high humidity (e.g., rainfall, fog, and/or clouds) facilitates the growth of mold, moss, and other organic matter; in other cases, graffiti has reduced the legibility of the signs. In a few cases the signposts, rather than the signs themselves, have been damaged or are no longer firmly anchored in the ground, and these will require special attention. In general, it is best if signs are inspected on at least an annual basis and the cleaning/refurbishment of individual signs scheduled based on observations made during the annual inspection. Because DFM has indicated that it presently lacks the resources to do this, it is important that the CCH increase or redirect funds to DFM so that this and other important maintenance responsibilities can be better implemented.

In the absence of corridor-specific data on the unit cost of signs and sign maintenance, planners searched for comparable information online. Based on estimates contained in a Federal Highway Administration (FHWA) report *Maintaining Traffic Sign Retroreflectivity: Impacts on State and Local Agencies*, Publication No. FHWA-HRT-07-042 (FHWA, April 2007) and assuming use of the highest-grade materials (which the report concludes have much lower total life-cycle costs than materials with the lowest initial cost), it is likely that replacing the traffic signs within the corridor will cost approximately \$100-\$200 per sign, \$300-400 for the post and other materials, and \$150-\$200 per sign for labor, for a total cost of \$600-\$800 per unit. Applying that to the estimated few tens of traffic warning signs that are present, the total cost of complete replacement would probably amount to between \$15,000 and \$25,000. This includes labor, hardware, administrative expenses, and other costs and would not have to be repeated for at least 15 years (though periodic cleaning would eventually be required).

Feedback received from the public has suggested that placement of signage encouraging motorists and bicyclists to share the road, and for slower traffic to give way to faster traffic, may be useful at strategic locations along the corridor. DTS should consider installing such signage at the earliest possible time. In addition, DTS should remove the metal roadside mileage markers that were installed as part of the road survey work as they are damaging DFM's arm mower, thereby substantially increasing the difficulty and cost of roadside vegetation management.

Trimming/Removal of Obscuring Vegetation. One of the common signage deficiencies is partial or full obscuring of signs by roadside vegetation.²⁶ Vegetative obstruction of roadway signage is most prevalent within the upper reaches of the corridor. A good deal of the issue will be ameliorated or eliminated if the vegetation management recommendations described elsewhere in this report are implemented. However, some targeted clearing of vegetation on and around signs may continue to be needed. So long as the identification of such signs is made a responsibility of the individuals who conduct the annual maintenance inspection, appropriate vegetation clearance around road signage can be made a part of the regular roadside maintenance trimming that is conducted by DFM and should not add substantially to the required effort or cost.

Traffic signs can require repair or replacement for a number of reasons. The most common include vandalism, being hit by a vehicle or falling tree, and suffering damage from storms.²⁷ Replacement is also needed when they reach the end of their normal useful life.²⁸ It is generally more cost-effective to

²⁶ The topic of vegetation control is more thoroughly discussed in the FHWA field guide entitled, *Vegetation Control for Safety, A Guide for Local Highway and Street Maintenance Personnel*. Eck, Ronald W. and Hugh W. McGee (May 2007).

²⁷ Examples of sign vandalism include sign stealing, over painting, and bullet holes.

²⁸ All signs eventually become ineffective and require replacement. The timing of the replacement can be based on their having reached their rated service life, determination that their colors have faded and/or the retro-reflectivity level is below

replace signs that have been painted-over with graffiti than to try to clean or repair them. None of the signs within the corridor are so critically important that replacement has to occur immediately, but as a minimum all degraded signs should be identified and replaced on an annual basis in accordance with a set schedule.

While it does not appear to be a major problem within the corridor, sign design measures that make it difficult to remove signs are already being used and should be continued. These include the use of special fasteners (e.g., expanding anchor bolts and blind aluminum rivets, bolts or nuts that require special tools).

4.1.4.2 Pavement Marking Recommendations

Chapter 3 of *The Manual on Uniform Traffic Control Devices for Streets and Highways* (MUTCD) issued by the Federal Highway Administration of the U.S. Department of Transportation provides extensive guidance on roadway pavement and curb markings, object markers, and delineators. These markings, which provide important guidance and information to road users, include pavement and curb markings, object markers, and lane delineators. They can be used either alone or to supplement other traffic control devices such as signs. The CCH adheres to the MUTCD, and all pavement markings within the Plan Area will comply with that guidance or be done per the requirements of DTS.

Under most highway conditions, pavement markings provide important information while allowing minimal diversion of attention from the roadway. They can enhance roadway delineation with the addition of audible and tactile features such as bars, differential surface profiles, raised pavement markers, or other devices intended to alert the road user that a delineation on the roadway is being traversed. At the same time, they have limitations. For example, debris and water on or adjacent to the markings can limit their visibility. As noted elsewhere in this document, their durability is affected by material characteristics, traffic volumes, weather, and location.

Pavement and curb markings are commonly placed by using paints or thermoplastics; however, other suitable marking materials, including raised pavement markers and colored pavements, are also used. Delineators, object markers, barricades, and channelizing devices are visibly placed in a vertical position similar to signs above the roadway.

The MUTCD establishes several standards for roadway markings that are relevant to the TRTD corridor:

- Section 3B.01 calls for the use of yellow centerline pavement markings, where appropriate, to delineate the separation of traffic lanes that have opposite directions of travel on roadways. They allow the marking of short sections of roadways that do not have continuous centerline pavement markings in order to control the position of traffic at specific locations, such as around curves, over hills, and at bridges. Despite the combination of the low traffic volumes present within the corridor and the relatively narrow roadway widths, the standards for centerline markings, which are a function of average daily traffic and the width of the roadway, are generally applicable.²⁹

the minimum required for that type of sign as determined by field inspection, the sign having reached its expected sign life, or at some pre-specified interval deemed appropriate for the roadway on which they are located.

²⁹ The MUTCD calls for centerline markings on paved urban arterials and collectors that: (i) have a traveled way of 20 feet or more in width and an ADT of 6,000 vehicles per day or greater; (ii) two-way streets or highways that have three or more lanes for moving motor vehicle traffic; (iii) urban arterials and collectors that have a traveled way of 6.1 m (20 ft) or more in width and an ADT of 4,000 vehicles per day or greater; (iv) rural arterials and collectors that have a traveled way of 18 feet or more and an ADT of 3,000 vehicles per day or greater; and (v) other traveled ways where an engineering study indicates such a need. It stipulates that engineering judgment be used in determining whether to place centerline markings on traveled ways that are less than 16 feet wide because of the potential for traffic encroaching on the pavement edges, traffic being affected by parked vehicles, and traffic encroaching into the opposing traffic lane.

- Section 3B.02 addresses no-passing zone pavement markings and warrants. It provides that no-passing zones be marked by either one direction no-passing zone pavement markings or two-direction no-passing zone pavement markings. Such markings, which consist of two normal solid yellow lines (as described in Section 3B.01.C. of the MUTCD) where crossing the centerline markings for passing is prohibited for traffic traveling in either direction, are present along nearly all of the roadway within the Planning Area. The major exceptions include the Hogsback and the approximately one-quarter-mile-long road segment downhill of 4000 Round Top Drive.
- Table 3B-1 contains minimum passing sight distances that affect where the double yellow lines delineating no passing zones ought to be present. Observations made during the course of this study indicate that there is only one roadway segment (the relatively straight road segment from the Mānoa Valley Lookout to the turn before the entrance to the Pu‘u ‘Ualaka‘a State Wayside) where this could be relaxed and passing allowed. It is possible that the no passing restriction could be eliminated from a portion of the straightaway in the 3300 block of Tantalus Drive, as well, but this should be done only after further study.
- Section 3B.11 establishes standards for raised pavement markers. Such markers are defined as devices with a height of at least 0.4 inches that are mounted on or in a road surface which serve as a positioning guide or to supplement or substitute for pavement markings, or to mark the position of a fire hydrant. The color of raised pavement markers conforms to the color of the marking for which they serve as a positioning guide, or for which they supplement or substitute. Both retroreflective and internally illuminated raised pavement markers are allowed and they may be either monodirectional or bidirectional. The spacing of raised pavement markers should correspond with the pattern of lines for which the markers supplement or substitute. The spacing of raised pavement markers for solid lines should equal the spacing for the broken or dotted lines that might be adjacent to or might extend the solid lines (see Sections 3B.13 and 3B.14 of the MUTCD).
- Sections 3B.12, 3B.13, and 3B.14 of the MUTCD provide other guidance concerning raised pavement markings. Guidance in Section 3B.13 provides that when supplementing double line markings, pairs of raised pavement markers placed laterally in line with or immediately outside of the two lines should be used.

The existing roadway markings within the corridor appear to conform to standards outlined in the MUTCD. However, the harsh environmental conditions combined with the deteriorating condition of the pavement itself have compromised their performance to the point where they no longer provide the clear guidance that is desirable.

Given that the principal issue with the pavement markings is related to poor bonding between the paint and raised marker adhesives, the most long-lasting improvements to them would occur if they were installed immediately following resurfacing with a durable pavement as discussed in Section 4.1.1. However, if this cannot be done in a timely fashion, then re-marking the roadway (with paint and raised markers) should be planned and implemented within two years.

Currently, virtually the entire length of the roadway is double-striped, prohibiting passing. As a result, drivers caught behind slow-moving vehicles can face substantial and frustrating delays. Road striping should be reviewed and, where possible, allow for passing zones in areas where it can be done safely. One example where this appears possible is along the straightaway adjacent to the R1 and R2 parking areas (see Figure 3.26).

As the responsible agency, DTS should budget for and carry out a review of the existing practices, identify the changes, if any, that it believes are appropriate, and include funds for the work that it determines is required in its annual operating budget. The review will require a minimum of six months to complete but can be done by existing staff without additional cost.

4.2 DRAINAGE RECOMMENDATIONS

Except for improvements made in 2006 on the Mānoa Valley side of Round Top Drive about 1,100 feet below the entrance to Pu‘u ‘Ualaka‘a State Wayside, the newest storm water drainage structures within the corridor are more than 60 years old. The oldest structures have been in place for more than a century. None were built to modern design standards. More importantly, they have not been consistently maintained and, in some instances, maintenance and repaving of the adjacent roadway has altered the grade and the inlet configuration and capacities. Hence, while there has been little new development within the area that contributes to runoff, the system no longer functions as it was intended. Thus, to achieve the optimal restoration of the storm water drainage system in the TRTD corridor, the measures that are recommended in this section should be implemented in conjunction with the measures for the roadway recommended in Section 4.1 and the vegetation management recommendations in Section 4.3. While none of the drainage issues observed during field work appear to be critical, an inability to accommodate most or all the storm water runoff that accumulates in the roadway during periods of heavy rain does contribute to accelerated deterioration of the pavement, and where it is left unchecked, will ultimately degrade the subgrade as well.

4.2.1 PHASE 1: RESTORATION OF THE EXISTING DRAINAGE SYSTEM

Because no critical drainage deficiencies were identified during field work, this CMP recommends that Phase 1 focus on restoring the original: (i) patterns of flow, (ii) drainage capacity, and (iii) performance of the existing collection, drainage, and conveyance systems. These maintenance-related tasks should be accomplished by:

- Removing the accumulated sediment and debris from the drainage systems and maintaining them in a detritus-free state over the long-term;
- Repairing and restoring the damaged inlet, culvert, and outlet structures;
- Cleaning and repairing the drainage swales to direct storm water runoff into drain inlets and/or other drainage collection points;
- Cold planing, repaving, and reconstructing the adjacent roadway to near the original pavement grades, as conditions allow;
- Repairing and restoring retaining walls adjacent to the roadway;
- Repairing and restoring the paved shoulder; and
- Installing erosion control measures along unpaved shoulder.

A budget of \$1 million (i.e., \$500,000 for Tantalus Drive and \$500,000 for Round Top Drive) should be programmed for Phase 1 of the work related to storm water drainage restoration.

4.2.2 PHASE 2: DRAINAGE IMPROVEMENTS

Because the existing storm water drainage system is many decades old and in a state of disrepair, Phase 1 work would be remedial in nature. However, because not all structures may be reconditioned, and because the environmental conditions present within the TRTD corridor have continued to evolve, there may be certain areas within the Plan Area where new drainage improvements are desirable or necessary.

The design of new drainage improvements should be in accordance with the current CCH *Rules Relating to Storm Drainage Standards* and *Rules Relating to Water Quality*, as applicable. Special design considerations should be given to the quantity, location, and method of discharge to minimize impacts to downstream areas. All designs should consider a drainage system that disposes of storm water runoff onsite, if feasible, or disperses the discharge of storm water runoff over a relatively large area.

The TRTD-CMP planning team anticipates that an advanced planning study of the existing roadway drainage systems and an investigation of possible drainage improvements could be performed with a 12-month timeframe. A budget of \$300,000-\$400,000 should be programmed for this work. If a decision was made to perform both the Phase 1 and 2 work from the outset, the costs related to each could be estimated with greater precision in the resulting advanced planning study.

4.3 VEGETATION MANAGEMENT RECOMMENDATIONS

As discussed in Section 3.3 of this CMP, the TRTD corridor passes through the heavily vegetated HWFR and improving and maintaining the Plan Area will require sustained effort on the part of the agencies tasked with managing it. While DOFAW's vision encompasses restoration of the native ecosystem within the TRTD corridor, in light of the present technical and resource limitations, it has focused the vegetation management recommendations in this plan on the more modest and achievable goal of halting the spread of invasive species through intensified roadside maintenance work rather than restoring it to its original state. This section outlines the portfolio of recommendations the planning team has identified for the management of the existing vegetation within the corridor. These recommendations are intended to: (i) articulate an efficient and cost-effective approach to vegetation management; (ii) promote public safety; (iii) maintain and/or enhance the beauty of the area; (iv) preserve or selectively restore scenic view planes; and (v) slow the introduction or spread of invasive species.

These vegetation management recommendations are organized as follows:

- The concept of landscape maintenance zones and standards is introduced in Sections 4.3.1. The zones themselves are described in Section 4.3.1.1 and the specific clearance standards are covered in Section 4.3.1.2.
- General vegetation management recommendations that are applicable to the entire corridor are discussed in Section 4.3.2.
- General parking area and trailhead design recommendations are presented in Section 4.4.1.
- Specific vegetation management recommendations for individual parking areas, lookouts, and trailheads are discussed in subsections throughout Section 4.4.2.

4.3.1 LANDSCAPE MAINTENANCE ZONE CONCEPT AND STANDARDS

4.3.1.1 *Landscape Maintenance Zone Concept*

The HDOT has defined Landscape Maintenance Zones (LMZs) as the area extending from the outer edge of the travelway to the first obstacle on the road shoulder, or to a recommended lateral clearance-distance which varies by context (SWCA Environmental Consultants, 2011) and within which vegetation should be managed in keeping with defined standards. The primary function of LMZs is to provide for the safety of motorists, bicyclists, and pedestrians moving along the travelway. An LMZ can serve this function by providing a "recovery area" for motorists. A recovery area is a zone along the shoulder of the road that has been cleared of obstructions that allows a driver to stop safely or regain control of a vehicle that has left the roadway. The width of this recovery area is based on "exposure"; the key factors in determining exposure are: (i) vehicle speed, (ii) traffic volume; and (iii) slope. Recovery zones must consider both fixed objects which can act as obstacles, and terrain which may cause a vehicle to overturn. By providing recovery zones, agencies increase the likelihood that a roadway departure results in a safe recovery rather than a crash and mitigate the severity of crashes that do occur.

The steeply sloping nature of the terrain along most of the TRTD corridor allows only a very few areas where LMZ targets are, or can be, met. Because of the severely limited shoulder area usable by

vehicles, the LMZ throughout much of the corridor is a cut-slope face on the mauka side and a downhill slope or barrier (e.g., curb, guardrail, or wall) on the makai side, and it is impractical to bring these areas into conformance with the targets applicable to the design of new roads.

HDOT vegetation management guidelines for areas within the LMZ call for the following:

- Removing and keeping all roadway, shoulder, and pullout surfaces free from vegetation.
- Maintaining all vegetation in a manner which allows clear line-of sight to all signs, oncoming traffic, roadside barriers, intersections, and any vertical structure that exists within the ROW or LMZ.
- Maintaining a minimum of 18 inches horizontal or operational clearance between the edge of the travelway and the nearest obstruction, such as trees, rocks, or shrubs.
- Ensuring that vegetation, including overhanging vegetation or trees leaning into the travelway, does not create a significant impact hazard or otherwise diminish road safety, visibility, or hinder drainage systems.

The planning team recommends that these guidelines be followed insofar as possible but that the focus be on items close to the travelway, with relaxed standards for the outer portions of the LMZ.

4.3.1.2 Vegetation Clearance Standards in the LMZ

In Chapter 6 of HDOT's *Highway Manual for Sustainable Landscape Maintenance* (HDOT, 2011), numerous objectives for landscape maintenance within the LMZ are identified. The most applicable to the TRTD-CMP's Plan Area include the following: (i) protecting persons, vehicles, and property from injury or damage; (ii) providing adequate clearance for vehicles and utilities; (iii) improving views and aesthetics; (iv) removing high risk trees and controlling invasive species; and (v) maintaining and improving tree structure and health. It further recommends that a certified arborist be involved to guide work on larger trees and that pruning be aimed at encouraging each species' natural form of growth.³⁰

The vertical clearance standard within the LMZ established by HDOT calls for any overhanging vegetation such as tree branches to be 17 feet or more above ground level within 2 feet of the travelway, as shown below in Figure 4.1. These standards also call for trees to be trimmed in sufficient frequency and extent to ensure that foliage is at least 10 feet from all overhead utility lines.³¹ Of particular importance in the Plan Area is the recommendation that all other vegetation, including vining plant material, be removed from overhead utility lines and support cables. Currently, little or no vine-removal is being conducted within the corridor, and as a result such vegetation is visibly compromising both the utility lines and the trees adjacent to the travelway.

³⁰ The Department's guidance also calls for preserving trees that contribute to the aesthetic and pleasing landscape experience along the corridor and for paying special attention to trees that are frequently involved in accidents, or that are in dangerous locations.

³¹ During pruning activities near utility lines, effort should be taken to prune branches in such a way that the remaining branches are an additional 5 to 10 feet further away from the 10 feet utility line setback to allow for future growth and reduce the need for more frequent pruning. The guidelines also suggest that trees whose growth is likely to conflict with an overhead utility line for perpetuity be considered for removal, but that recommendation is not well suited to the Planning Area.

Figure 4.1 Ideal Vertical Clearance within the LMZ

Note: The following are recommended for vegetation within the LMZ: (i) maximum ground vegetation height of 3 feet; (ii) minimum overhanging vegetation (e.g., tree branch) clearance of 17 feet; and (iii) 7-foot canopy clearance above areas where people walk.

Source: HDOT Highway Manual for Sustainable Landscape Maintenance, Chapter 6 (2011)

As discussed in Section 3.3, there are many stretches of the TRTD corridor where vegetation is encroaching into the roadway, obscuring guardrails, retaining walls, barriers, road markers and other features within the LMZ. To provide a frame of reference, Figure 4.2 below depicts examples of desirable and undesirable guardrail conditions. If adequate functionality of the TRTD corridor is to be maintained, the vegetation between the road and guardrails, and up to 2 feet beyond the guardrail, must be kept maintained in conformity with the following standards:

- (1) Vegetation should not exceed 1 foot in height to maintain clear visibility of the guardrail or wall from the travelway.
- (2) In areas where the existing vegetation between the edge of the pavement and the guardrail is a species that would require constant management to maintain within this safety parameter, it should be removed and replaced with either a stable porous material or by an appropriate grass or low-growing groundcover shrub.
- (3) Vegetation growing on and around signage must be completely removed so that all signs remain visible; see Figure 4.2 below for undesirable and desirable examples.

The HDOT guidelines call for trees greater than 4 inches in diameter at 4.5 feet above ground level that have already been established within or adjacent to the LMZ be left in place unless it has been determined that the tree should be removed to address safety concerns. Examples of considerations cited in this manual include: (i) whether the tree is particularly valued by the community or an interest group; (ii) the extent to which removing the tree might damage infrastructure, cause erosion, or pose a safety risk; and (iii) whether reasonable measures are available that could allow a particularly valued tree to be saved instead of removed. Unfortunately, because most of the specific guidelines contained in the *Highway Manual for Sustainable Landscape Maintenance* were developed for urbanized areas, they are not directly applicable to the Plan Area.

Figure 4.2 Undesirable and Desirable Guardrail Conditions



Tall grass has completely obscured the guardrail.

Properly maintained and clearly visible guardrail.

Source: Planning Solutions, Inc. (2018). All photos dated August 22, 2017.

Figure 4.3 Desirable and Undesirable Sign Conditions



Undesirable sign conditions.

Undesirable sign conditions.



Undesirable sign conditions.

Desirable sign conditions, free from vegetation.

Source: Planning Solutions, Inc. (2018). All photos dated August 22, 2018.

4.3.2 GENERAL VEGETATION MANAGEMENT RECOMMENDATIONS

Based on: (i) repeated observation of existing conditions within the Plan Area; (ii) long experience with vegetation management protocols throughout the State of Hawai‘i; and (iii) an extensive review of all relevant guidance literature, the planning team has developed the vegetation management recommendations described in detail in the following subsections of this CMP. These recommendations are intended to serve as an information resource for the management agencies tasked with vegetation management within the TRTD corridor, assisting with the planning, budgeting, and execution of these tasks. In addition to these general recommendations, site-specific recommendations related to vegetation are presented in the vegetation management subheadings of Section 4.4.2.

4.3.2.1 Hazard Trees and Tree Removal

The term “hazard trees” refers to trees that are: (i) dead, (ii) dying, (iii) diseased, (iv) structurally deformed, or (v) unstable and have a high probability of falling and, in doing so, damaging public or private property, causing obstructions on roads, sidewalks, trails or other pedestrian use areas or posing other public safety concerns. Hazard trees are typically large trees growing close to roads or private property and whose age, insect infestation, or disease, prevailing winds, slope, shallow tree roots, soil depth, and other factors make it susceptible to downing. The primary means of managing hazard trees is removal or topping.³²

Identifying specific hazard trees within the Plan Area is beyond the scope of this TRTD-CMP. However, the analysis of conditions that was conducted during preparation of this report indicates several broad areas that deserve to be regularly monitored to determine if proactive hazard tree management measures are needed to safeguard the public and private property. The three areas within the corridor that are of greatest concern are:

- Approximately 2 miles along Tantalus Drive, which were subject to reforestation efforts with large introduced species of trees in the early 20th century, extending from the Punchbowl Lookout (i.e., parking area T6 in Figure 3.25) to a few hundred yards below the Hogsback near 3710 Tantalus Drive.
- Approximately 1 mile of roadway that traverses the steep terrain from the Hogsback to parking area T18 near the Pu‘u ‘Ōhi‘a trailhead (see Figure 3.25).
- The segment between 3705 Round Top Drive and 4059 Round Top Drive, which extends from the Duck Pond area to parking area R11 (see Figure 3.25) serving the Moleka Trail and Mānoa Cliffs Trail trailheads.

These locations consist of areas where large, old trees which are heavily burdened with vines, ferns, bromeliads and other parasitic growth are near the roadway and/or private residences.

To the extent possible, hazard trees should be cut in a manner that minimizes damage to the trunk and root systems of adjacent trees. This is especially important on slopes, where further erosion may arise if nearby trees are damaged or weakened. Where steep or unstable slopes make it impractical to remove such trees safely, they should be topped in such a way as to remove as much of their height or overhanging canopy as possible to reduce the potential for damage or hazard of injury should the tree eventually fall. If a tree is removed and it is on relatively flat terrain in an area where it could easily be struck by a vehicle leaving the roadway, the stump should be cut flush with or below the adjacent ground level within the LMZ. If a tree whose trunk originates outside the LMZ needs to be removed, an effort should be made to cut stumps to within 6 inches of the ground.

³² Tree topping is the practice of removing whole tops of trees or large branches and/or trunks from the tops of trees, leaving stubs or lateral branches that are too small to assume the role of a terminal leader, and thus limiting potential future regrowth.

4.3.2.2 Green Waste Handling

A significant proportion of the total time and cost of vegetation management is related to the removal and disposal of green waste and debris which accumulates during these operations. In addition, green waste is, in general, valuable to the health of the forest, providing the decomposing topsoil layer that will provide nutrients for future growth. Thus, whether the green waste is generated from periodic pruning activities or tree removal operations, laying the green waste material on the ground at the base of vegetation will provide both ecological and economic benefit, reducing the time and cost required for vegetation management activities while restoring valuable nutrients to the soil. Table 4.1 summarizes the TRTD-CMP green waste management recommendations. No green waste material should be left in the road shoulder when it poses a hazard to safe operation of motor vehicles.

Table 4.1 Summary of General Green Waste Management Recommendations

<i>Type</i>	<i>Recommendation(s)</i>
Leafy Vegetation	May be left in that condition, layered on the ground where there is space. No composted or raw green waste material should be left directly on the trunk of an existing plant, whether tree, palm, or shrub. Instead, this material should be placed at least 1 foot from the outside edge of any tree trunk, and a 3"-4" layer of compost or small-scale green waste should be placed above root zones.
Small Branches (<1" in dia.)	May be left in that condition, layered on the ground where there is space. No composted or raw green waste material should be left directly on the trunk of an existing plant, whether tree, palm, or shrub. Instead, this material should be placed at least 1 foot from the outside edge of any tree trunk, and a 3"-4" layer of compost or small-scale green waste should be placed above root zones.
Larger Branches (>1" in dia.)	Larger branches should first be chipped and then treated as for small-scale branches and leafy vegetation recommendations provided above.
Trunk and Stump Matter	Tree trunks, stumps, and very large branches too large for chipping may be left on the ground so long as there is sufficient space to keep it from negatively impacting existing vegetation or blocking surface runoff. Any green waste that is left must be sufficiently stable that it is unlikely to be moved during storm events or during heavy surface water runoff and will not contribute to blockage of drainageways.
Green Waste in Excess of Available Space	Quantities of green waste material which are in excess of available space or too large and unstable to leave on the ground at the site of the pruning or tree removal operation should be removed from the area and placed at a holding yard for use in other corridor management operations or at an approved green waste disposal center.
Green Waste from Diseased or Infested Trees	Green waste accumulated from diseased trees or trees that are infested with invasive pests should be removed from the TRTD-CMP Plan Area and disposed of at an approved location. If a disease or pest condition is lightly present or the condition is uncertain, it is better to treat the green waste as diseased material and remove from TRTD-CMP for proper disposal.
Source: Umemoto Cassandro Design Corp. (2018)	

4.3.2.3 Removal of Vining Plants

A defining feature of the forests in the Plan Area is the preponderance of vining plants which scale trees, signs, and utility lines. These vining plants inhibit airflow, trap moisture, and block sunlight, contributing to a dank and claustrophobic forest environment. They also have the potential to damage public infrastructure, private property, and trees with their opportunistic and parasitic colonization of existing vegetation and structures. In addition to reducing or preventing such damage, better management of these vining plants would enhance the scenic and recreational value of the Plan Area.

The vines present along the TRTD corridor are non-native, invasive species. They tend to be opportunistic, using trees, structures, street signs, and utility lines and guy lines to scale upward, seeking

space and sunlight. These vines are frequently parasitic, using the trunks and branches to spread out and, in the worst cases blanket the tree's canopy, overwhelming its own leaves and ability to convert sunlight to energy. The diminished sunlight and air movement increase the likelihood of mold, mildew and mossy growth on the roadway, paved shoulder areas, signs, and other structures. This creates slippery surfaces and consistently damp road surfaces, all of which accelerate the deterioration of the pavement and increase the frequency with which remedial action (repaving) is needed. Examples of the types of vining encroachment present within the corridor are provided in Figure 4.4.

To address this, wherever feasible, the large leafy vines should be removed from vertical tree trunks within the LMZ by cutting away the vines at the base which connect the upper story to their roots and then stripping as much of the vines away from the tree's trunk as possible. This will create better visibility through these densely vegetated areas, helping drivers see approaching bicyclists and pedestrians. Table 4.2 summarizes specific TRTD-CMP vining plant management recommendations.

Figure 4.4 Examples of Vine Encroachment



Source: Planning Solutions, Inc. (2018). All photos dated August 22, 2017.

Table 4.2 Vining Plant Management Recommendations

<i>Type</i>	<i>Recommendation(s)</i>
Vines on Utility Lines	Vines on electrical or communications utility lines can cause failures resulting in service outages and expensive repairs. Observations made during this planning effort indicate that the Hawaiian Electric Co., Inc. (HECO) periodically clears vegetation from its ROW, particularly where it departs from the road ROW. Hawaiian Telcom and Spectrum (formerly Oceanic Time Warner Cable) appear from observations to be much less proactive with respect to vegetation removal from their lines. As publicly-regulated utility providers, HECO and the other utility operators are responsible for maintaining the lines and the conduct of all work to keep them clear of vegetation. This work should be conducted in two phases; (i) a primary remedial phase wherein a concentrated effort would be made to remove all vines that have become established on overhead utility lines over the years; and (ii) a secondary maintenance phase which would address all lines in the Plan Area via a scheduled, periodic vegetation maintenance cycle. Priority should be given to the areas with the heaviest vines, and as they place the most stress on infrastructure and therefore are the most likely to result in failure. By utilizing a phased approach, the utilities involved would be able to address the system’s needs in a timely and economical way.
Vines on Street Signage	Vines on street signs can prevent drivers, bicyclists, and pedestrians from clearly seeing posted speed limits, road conditions, street names, and potential hazards. As a result, signs should be inspected regularly and reported to the City to have incipient vine growth removed. Once completed, very little time will need to be assigned to the action in the future if the vines are not allowed to recover and grow onto the posts and signage again.
Vines on Trees Over Roadway	Of critical importance are the vining plants which scale trees and overhang the roadway. Particularly in areas where the mauka, upslope embankment allows trees to cantilever over the roadway, heavy vines like Pothos (<i>Epipremnum aureum</i>) and Monstera (<i>Monstera deliciosa</i>) overburden them, causing the trees to droop and lean further into the LMZ and the travelway. The initial result is a decrease in the vertical clearance of the roadway as the vines hang down. Eventually, the weight of these vines can compromise the tree branches and cause limbs to break off and land in the roadway. In extreme cases, the weight can overcome the soil’s ability to support the tree, causing trees to collapse into to the roadway under the weight of vines. This, in turn, can increase the potential for erosion of the embankment and landslides into the travelway. Consequently, the TRTD-CMP makes the following recommendations: (i) proactive vine removal from vegetation immediately adjacent to the roadway; (ii) where vine removal would be too invasive, the host tree itself should be pruned back to where the canopy cannot conflict with roadway clearances.
Source: Umemoto Cassandro Design Corp.	

4.3.2.4 Management of Overhanging Trees

Table 4.3 below summarizes the TRTD-CMP overhanging tree management recommendations. Several factors should be considered when implementing these recommendations.

- First, as noted in Section 3.3, trees overhanging the roadway can negatively affect slope stability and the function of the corridor. Management of the upslope tree canopy is challenging in most instances along the TRTD corridor because these areas are intrinsically difficult to access. As a result, most management work on vegetation other than grasses must be accomplished by closing a lane and working directly from the roadway using heavy equipment.
- Second, the overhanging canopy must always meet the vertical clearance requirements of the TRTD roadway. However, managing that vertical clearance can be made easier by strategic pruning that goes beyond the minimum requirements at the moment the work is performed.

Table 4.3 Summary of TRTD-CMP Overhanging Tree Management Recommendations

<i>Type</i>	<i>Recommendations(s)</i>
General	<p>The overhanging canopy should be strategically pruned to maintain the required 17-foot vertical clearance within the LMZ at all times.</p> <p>Where the overhanging canopy is too extensive for effective pruning, the tree(s) should be cut back hard to create a tall shrub at the top of the embankment.</p> <p>With all vegetation management operations, the goal is to retain the erosion control and slope-stabilizing effects of the plants' roots while pruning back the canopy sufficiently to allow many months or years to elapse before the vegetation once again violates the LMZ clearances.</p> <p>The extent of strategic pruning should allow for all LMZ clearances to be met for a period of 8 to 12 months following the work, such that a tree will not become a hazard before the next regularly scheduled vegetation maintenance cycle.</p>
Downward-Angled Branches	All downward-angled branches which overhang the LMZ are to be removed.
Horizontal and Upward Angled Branches	Any horizontal or upward-angled branches growing in the LMZ which are less than 18 feet above the roadway are to be removed.

Source: Umemoto Cassandro Design Corp.

4.3.2.5 Management of Vegetation Near Viewpoints

As described in Section 3.7, there are more than 30 roadside parking areas along the corridor, serving a mixture of four purposes: (i) general parking; (ii) trailhead parking; (iii) turnouts to allow safe passing; and (iv) parking at scenic lookouts. One of the most aesthetically attractive aspects of travel along the TRTD corridor is the expansive views that many of these areas offer. Unfortunately, views from many of these parking areas have been impaired by the growth of vegetation that now obstructs the views that the corridor once provided, and which many of the parking areas were intended to capitalize on. With better vegetation management, these parking areas can once again provide superb views over Waikīkī, central Honolulu, the ‘Ewa Plain, and Mānoa and Pauoa Valleys. An example of a parking area that could benefit from this treatment is shown in Figure 4.5.

Figure 4.5 Parking Area T16 and Vegetation Obstructing View Plane



Source: Planning Solutions, Inc. (2018). Photo dated August 16, 2018.

As part of the fieldwork and analyses performed during preparation of this report, the planning team has identified those areas where a modest amount of vegetation management work could restore these “lost” views or improve the character of those that remain, thereby enhancing the scenic value of the corridor. These areas, along with the specific recommendations for each, are identified in Section 3.7. Table 4.4 below summarizes the TRTD-CMP vegetation management recommendations for this remedial work at parking areas.

Table 4.4 General Scenic Viewpoint Vegetation Management Recommendations

<i>Type</i>	<i>Recommendation(s)</i>
General	Trees should be pruned up so that a viewer can look out onto the viewshed under the tree canopy. Grasses should be trimmed so that a viewer can look out onto the viewshed over the grass bed. The extent of vegetation management at parking areas should allow for an open view plane to be maintained for a period of 12 months following the work, such that the view will not be compromised before the next regularly scheduled vegetation maintenance cycle.
Tree Canopies Restricting Views	Restore the view plane while maintaining the canopy by opening or “lifting” it up with selective pruning of lower and branches. Where this is inadequate to restore the view plane, tree(s) should be cut back hard to reduce them to a shrub-like stance while maintaining their root health.
Tree Trunks and Large Branches	It is acceptable to have tree trunks and very large branches within the viewshed; the width of these features can be greatly reduced by removing all other plant material (e.g., leaves, small branches, parasitic plants, etc.) to a height of between 7 and 8 feet above the ground elevation at the parking area.
Invasive Grasses	Where tall, invasive grasses such as Guinea grass are impacting visibility of the viewshed, the grass should be trimmed to $\leq 24"$ or as tall as any adjacent wall in instances where there is a containment or retaining wall defining the outer edge of the parking area.
Vines on Over-hanging Trees	Vines should be removed from tree trunks and branches in areas adjacent to parking area.

Source: Umemoto Cassandro Design Corp. (2018)

4.3.2.6 *Vegetation Management for Roadway Visibility Maintenance*

The TRTD corridor is known as a scenic roadway and a wide range of visitors come to the Plan Area to enjoy the natural beauty and views of O‘ahu found there. There are many sections of the TRTD corridor where visibility is restricted by vegetation.

The restrictions are of two basic types. First, many stretches of both Round Top Drive and Tantalus Drive have had their aesthetic value diminished by the encroachment of aggressive roadside vegetation blocking scenic views that would otherwise be available from the roadway. Second, vegetation growing within the LMZ often unduly limits drivers’ ability to see the road ahead, particularly on the many sharp turns. While the situation in some areas cannot be improved due to the presence of adjacent embankments, better management of roadside vegetation within the LMZ can substantially improve road safety and aesthetic value in the Plan Area. Figure 4.6 provides examples of vegetation obstructing views across the LMZ of oncoming traffic.

Figure 4.6 Examples of Vegetation Impacting Road Visibility



Source: Planning Solutions, Inc. (2018). All photos dated August 22, 2017.

Better management of vegetation provides several clear aesthetic and roadway benefits, including:

- Improving the safety of vehicles, bicycles, and pedestrians along the roadway, particularly near hairpin turns by allowing drivers to look across the switchback for potential oncoming hazards.
- Increasing the ability of vehicles that have left the roadway to safely recover control by keeping the LMZ free of vegetation and other obstacles.

- Providing a more spacious aesthetic experience by opening the canopy within the corridor and allowing travelers to see the forest, rather than simply seeing the first row of plants, through which they are driving.

Table 4.5 below describes the vegetation management measures which the planning team recommends be implemented to enhance and maintain roadway visibility and aesthetics.

Table 4.5 General Vegetation Management for Visibility Recommendations

<i>Type</i>	<i>Recommendation(s)</i>
Hairpin Turns	Grass, shrubs, and other vegetation should be regularly trimmed to a height of 6" to 12", and <u>never</u> be allowed to exceed 30" in height. The above standard should be maintained for 50 feet from the apex of the hairpin turn. Specific guidelines for grassy areas are provided in Section 4.3.2.7.
Scenic Road Segments	Keep shrubs immediately adjacent to the roadway sufficiently well-trimmed that they do not obscure views of the larger forest beyond. Maintain the health of the trees that comprise the forests through which the corridor extends. Maintain and enhance expansive views from and aesthetic character of lookouts. Minimize structural improvements that are not in keeping with the historic character of the roadway.
Source: Umemoto Cassandro Design Corp. and Planning Solutions, Inc.	

4.3.2.7 Mowing and Edging Standards

Mowing, the mechanical trimming of grass, weed, and small shrubs, is the most common form of roadside vegetation management required within the TRTD corridor. Conducting mowing operations to a consistent standard contributes to the safety of road users, including the occupants of motor vehicles, cyclists, and pedestrians. Developing schedules and standards for mowing operations can also help to: (i) limit erosion; (ii) control the spread of invasive weeds; and (iii) enhance the natural beauty and recreational value of the TRTD corridor.

The height of grass determines the depth of roots; the more blades of grass that are visible, the deeper the roots of the grass grow and the more drought and pest-resistant it becomes. If grass is consistently cut shorter than is appropriate for the species: (i) the grass will rapidly dry out; (ii) begin to die-back during periods of low rainfall; and (iii) succumb to less desirable and more aggressive invasive species. Mowing grass too severely or frequently can also expose soil surface and give opportunistic weeds area to establish and spread themselves. In the TRTD Plan Area, maintaining short-cut grass is difficult to effectively maintain and poses management challenges related to scheduling and available manpower. Some of the most common grass species in the TRTD corridor include: (i) Saint Augustine Grass (*Stenotaphrum secundatum*); (ii) Bermuda Grass (*Cynodon dactylon*); and (iii) Carpet Grass (*Axonopus* spp.). Accordingly, the planning team recommends the mowing and edging standards summarized in Table 4.6.

Table 4.6 Summary of Mowing Recommendations for Common Grasses

<i>Type</i>	<i>Common Name</i>	<i>Latin Name</i>	<i>Mowing Height</i>	<i>Frequency of Mowing</i>
Lawn Grass	Saint Augustine Grass	<i>Stenotaphrum secundatum</i>	2 – 3"	≤4 weeks
Turf-grass Cultivars	Bermuda Grass	<i>Cynodon dactylon</i>	1.5" – 2"	≤4 weeks
Turf-grass Cultivars	Carpet Grass	<i>Axonopus</i> spp.	1.5" – 2"	≤4 weeks
Turf-grass Cultivars	Centipede Grass	<i>Eremochloa ophiuroides</i>	1.5" – 2"	≤4 weeks
Rural Grass	Guinea Grass	<i>Megathyrsus maximus</i>	4" – 6"	≤4 weeks
Rural Grass	California Grass	<i>Brachiaria mutica</i>	4" – 6"	≤4 weeks
Source: Umemoto Cassandro Design Corp. (2018)				

4.3.3 VEGETATION MANAGEMENT IMPLEMENTATION RECOMMENDATIONS

As discussed elsewhere in this report, the TRTD corridor passes through several different microclimate and vegetation ecozones. These range from open and sunny grassy areas to heavily forested environments dominated by large trees where there is little significant groundcover, and each has its own particular maintenance and management care requirements. Moreover, the steep terrain and limited roadway width impose additional management constraints that must be addressed for the vegetation management program to be practical and effective. Finally, because most of the vegetation within the corridor is overgrown, vegetation management must be thought of in two distinct phases:

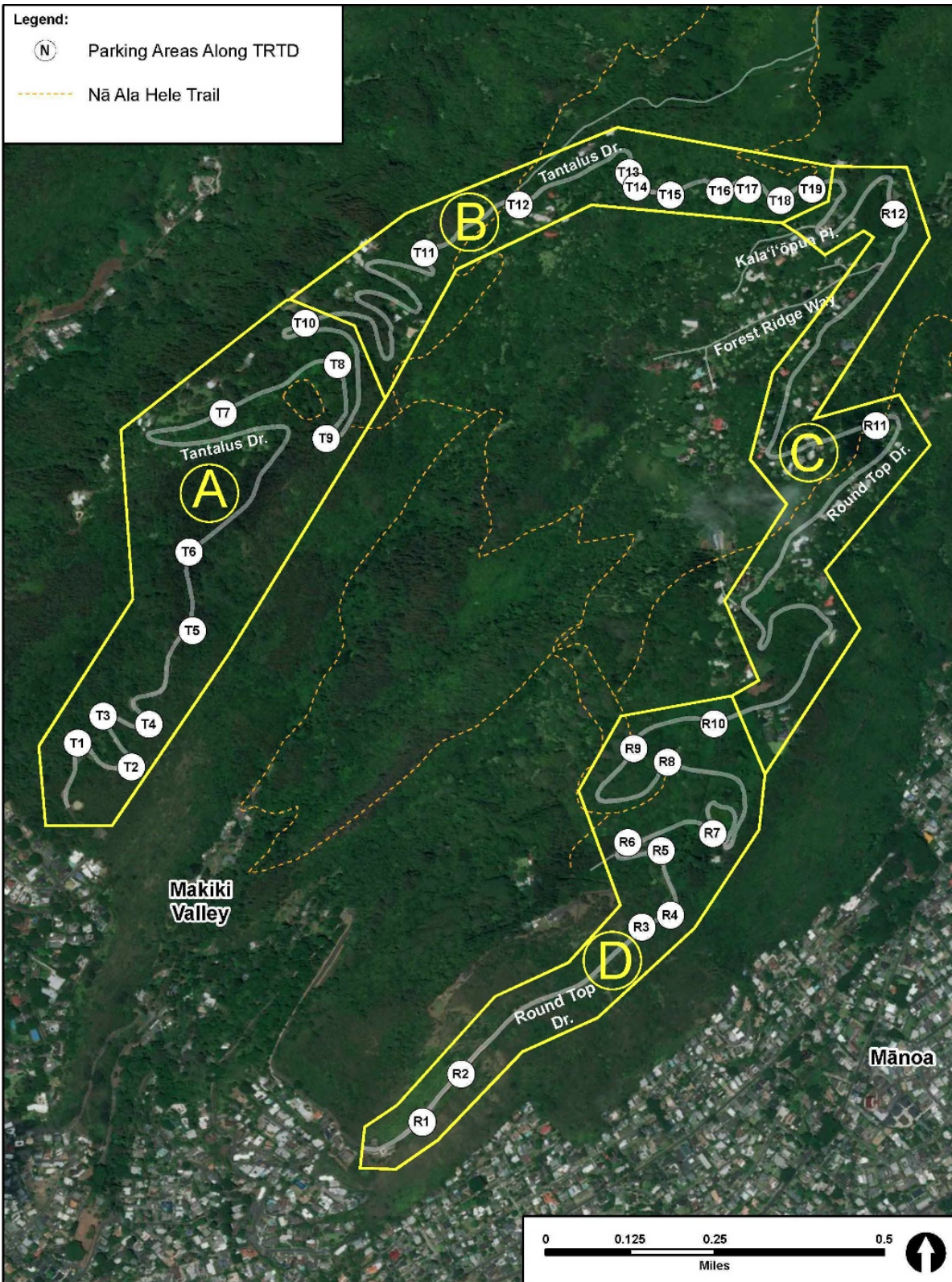
- Phase 1 will involve the extensive remedial work that will be required to bring roadside vegetation back to a state where it can be managed with a more modest ongoing maintenance program.
- Phase 2 will be the ongoing maintenance program itself, but even that will entail a more consistent and rigorous effort than has been funded for the past several decades.

The specific activities, budgets, and implementation schedules for each of these phases are outlined below in Sections 4.3.3.1 and 4.3.3.2, respectively.

The boundaries of the four Vegetation Management Zones that are referred to in the recommendations are shown in Figure 4.7, which is referenced for both the remedial work and the ongoing maintenance. These zones are provided to help manage and organize vegetation management schedules and work. The zones roughly define areas that whose environmental conditions require similar types of actions. For example:

- Zone A has similar parking area and viewpoint area conditions, is generally sunnier and has more hairpin turn conditions than the other zones.
- Zone B is very shady, with consistent overhead canopies and mostly overgrown parking areas with views obstructed by vegetation.
- Zone C passes through some of the narrowest roadway conditions and is typified with the most residential lot adjacencies and driveway interactions.
- Zone D has the most traffic to the lower parking areas and Pu‘u ‘Ualaka‘a State Wayside.

Figure 4.7 Vegetation Management Zones



Source: Umemoto Cassandro Design Corp.

4.3.3.1 Remedial Roadside Vegetation Maintenance Work

The goal of the remedial work is to achieve a stable vegetation condition within the corridor. Once that is achieved, it will be possible for a regular vegetation maintenance and management crew to conduct the ongoing work that will be required. The two types of work will necessarily overlap in time because ongoing maintenance must be initiated as soon as the vegetation in a particular area is brought up to standard; if it is not, the progress that has been made will quickly degrade. This remedial work is needed because it has been many years since the City has allocated sufficient resources (i.e., funds, personnel, and equipment) to roadside maintenance within the corridor. DFM has done the best that it can with the allocation it has received, but resource limitations have kept it from meeting the desired standards and have often forced it to carry out the work using personnel and equipment that are not the most efficient for the tasks. Many of the issues noted elsewhere in this report, such as: (i) lookouts where vegetation has limited or eliminated views, (ii) guardrails and signage that are obscured in whole or part, (iii) sight-lines that are impaired creating unsafe conditions, and (iv) downed trees blocking the roadway, all stem from this sub-optimal regime of vegetation maintenance.³³

Prior to starting this initial remedial work, a state-certified arborist should review the corridor-adjacent trees to identify the hazard trees or tree branch conditions. The arborist should clearly mark those trees that require action, prepare a tree report and meet on site with the remedial vegetation management team foreman or supervisor to discuss the actions required. This coordination is necessary to create an efficient and well-planned approach that will include traffic control, safety planning and green waste management.

The activities that need to be carried out during this initial phase to bring roadside vegetation into compliance with the standards set forth in Section 4.3.1.2 include the following:

- Hazard tree pruning and removal.
- Intensive machine-mowing and edging of all roadway shoulders to reduce the grass height and increase visibility across hairpin turns.
- Clearance of excess vegetation in and around viewpoints and parking areas in accordance with the recommendations contained in Section 4.4.
- Removal and/or trimming of vines, shrubs, and trees as needed to restore public/vehicular safety, including visibility sightlines, overhead obstructions, and utility pole and line conflicts.
- Removal and disposal of the large amounts of green waste that will be produced by this initial remedial work. This could include establishment of on-mountain green waste placement areas that would reduce the effort required for both this initial and ongoing vegetation management effort.

The remedial work is estimated to take a minimum of 16 weeks. In general, the planning team anticipates that this time would be divided roughly equally between the four Vegetation Management Zone shown in Figure 4.7. Assuming the use of a 6-person crew with associated equipment (including but not limited to a boom truck, a bucket lift truck, a tractor-mounted extension arm flail, pick-up and dump-trucks, and personnel transport trucks or vehicles, each with driver/operator). The estimated cost of this work is shown in Table 4.7. If equipment and vehicles from existing government use vehicle pools are used, the total would be substantially lower.

³³ Abutting private property owners have some roadside vegetation maintenance responsibilities, but the nature of the corridor's terrain makes those more limited than in most locales. Parking areas and lookouts are under DLNR-DOFAW jurisdiction, and vegetation maintenance at them is its responsibility.

Table 4.7 Estimated Cost of Remedial Roadside Vegetation Work

<i>Quantity</i>	<i>Units</i>	<i>Description</i>	<i>Unit Price</i>	<i>Cost</i>
1	Lump Sum	Arborist Study	\$30,000	\$30,000
480	Landscape Maintenance Laborer Person-days	Remedial Trimming along Road Corridor	\$240	\$115,200
40	Boom-Truck Days (including Driver)	Remedial Trimming along Road Corridor	\$800	\$32,000
40	Lift-Truck Days (including Driver)	Remedial Trimming along Road Corridor	\$750	\$30,000
20	Dump-Truck Days (including Driver)	Remedial Trimming along Road Corridor	\$750	\$15,000
20	Tractor-Mounted Extension-Arm Flail (including Operator)	Remedial Trimming along Road Corridor	\$600	\$12,000
1	Lump Sum	Green Waste Management/Disposal	\$40,000	\$40,000
80	Work Days	Traffic Control	\$480	\$38,400
Subtotal				\$312,600
1	Lump Sum	Miscellaneous/Contingency	15% of Subtotal	\$46,890
Grand Total				\$359,490
Note: Landscape-laborer estimate is based on State of Hawai'i Department of Labor and Industrial Relations Wage Rate Schedule Bulletin No. 483, dated February 17, 2014, indicating a prevailing wage for landscape maintenance laborer was \$29.81/hour (which was rounded to \$30.00/hour)				
Source: Estimates by Planning Solutions, Inc. and Umemoto Cassandro Design Corp. (2019)				

4.3.3.2 Ongoing Roadside Vegetation Management

4.3.3.2.1 Year-Round Management

Once the initial remedial work has been completed, the ongoing effort will be required to maintain the roadside vegetation in a stable condition. A four-person crew with appropriate support equipment will be needed to carry out the work to the standards set forth in Section 4.3 of the CMP. The estimated cost of the work is shown in Table 4.8.

The activities that need to be carried out during the ongoing maintenance phase include the following:

- Continued machine-mowing and periodic edging of all roadway shoulders to maintain acceptable grass height and visibility across hairpin turns as described in Sections 4.3.2.6 and 4.3.2.7.
- Vegetation management of parking area and viewpoints as described in 4.3.2.5 and in the vegetation management recommendations described throughout Section 4.4.2.
- Management of green waste produced by vegetation management efforts as described in Section 4.3.2.2.

The maintenance work would be ongoing and continuous. In general, it is anticipated that the work would be divided evenly between the four Vegetation Management Zones shown in Figure 4.7. This would essentially provide a schedule for monthly mowing and general maintenance with biannual heavier pruning and maintenance efforts.

The personnel budget assumed for this effort would be a 4-person crew with associated equipment required to carry out tasks, including but not limited to bucket lift truck, tractor mounted extension arm flail, pick-up or dump trucks and personnel transport trucks or vehicles and a driver/operator. It is assumed that the equipment is available from existing government-use vehicle pools.

Table 4.8 Estimated Cost of Regular Ongoing Vegetation Management

<i>Quantity</i>	<i>Units</i>	<i>Description</i>	<i>Unit Price</i>	<i>Cost</i>
1,040	Landscape Maintenance Laborer Person-days	Trimming along Road Corridor	\$240	\$249,600
13	Boom-Truck Days (including Driver)	Trimming along Road Corridor	\$800	\$10,400
13	Lift-Truck Days (including Driver)	Trimming along Road Corridor	\$750	\$9,750
13	Dump-Truck Days (including Driver)	Trimming along Road Corridor	\$750	\$9,750
26	Tractor-Mounted Extension-Arm Flail (including Operator)	Trimming along Road Corridor	\$600	\$15,600
1	Lump Sum	Green Waste Management/Disposal	\$25,000	\$25,000
26	Work Days	Traffic Control	\$480	\$12,480
Subtotal				\$332,580
1	Lump Sum	Miscellaneous/Contingency	5% of Subtotal	\$16,630
Grand Total				\$349,210
Note:	Landscape-laborer estimate is based on State of Hawai'i Department of Labor and Industrial Relations Wage Rate Schedule Bulletin No. 483, dated February 17, 2014, indicating a prevailing wage for landscape maintenance laborer was \$29.81/hour (which was rounded to \$30.00/hour)			
Source:	Estimates by Planning Solutions, Inc. and Umemoto Cassandro Design Corp.			

4.3.3.2.2 Semi-Annual Heavy Vegetation Management

Twice a year, a larger crew with the vehicles and equipment needed to manage areas that are too inaccessible or demanding for regular maintenance crews will conduct intensive vegetation management. For this semi-annual heavier crew, two additional crew members (for a total of six) with associated equipment required to carry out tasks will be needed, including but not limited to boom truck, bucket lift truck, tractor mounted extension arm flail, pick-up or dump trucks and personnel transport trucks or vehicles and a driver/operator.

This semi-annual heavy vegetation management would include such things as:

- Non-emergency hazard tree pruning and removal.
- Vegetation management along corridor related to public/vehicular safety, including visibility sightlines, overhead obstructions, utility pole and line conflicts. This would focus on hard to reach areas or areas that benefit from the tractor mounted extension arm flail doing a deeper reach to push back a vegetation line.
- Management of green waste produced by vegetation management efforts.

Table 4.9 Estimated Cost of Semi-Annual Heavy Ongoing Vegetation Management

<i>Quantity</i>	<i>Units</i>	<i>Description</i>	<i>Unit Price</i>	<i>Cost</i>
240	Landscape Maintenance Laborer Person-days	Trimming along Road Corridor	\$240	\$57,600
20	Boom-Truck Days (including Driver)	Trimming along Road Corridor	\$800	\$16,000
8	Lift-Truck Days (including Driver)	Trimming along Road Corridor	\$750	\$6,000
10	Dump-Truck Days (including Driver)	Trimming along Road Corridor	\$750	\$1,400
4	Tractor-Mounted Extension-Arm Flail (including Operator)	Trimming along Road Corridor	\$600	\$15,600
1	Lump Sum	Green Waste Management/Disposal	\$15,000	\$15,000
8	Work Days	Traffic Control	\$480	\$3,840
Subtotal				\$108,340
1	Lump Sum	Miscellaneous/Contingency	5% of Subtotal	\$5,417
Grand Total				\$113,757
Note:	Landscape-laborer estimate is based on State of Hawai'i Department of Labor and Industrial Relations Wage Rate Schedule Bulletin No. 483, dated February 17, 2014, indicating a prevailing wage for landscape maintenance laborer was \$29.81/hour (which was rounded to \$30.00/hour).			
Source:	Estimates by Planning Solutions, Inc. and Umemoto Cassandro Design Corp.			

4.4 PARKING AREA AND TRAILHEAD RECOMMENDATIONS

This section of the report describes measures that address the parking area and trailhead issues identified in Section 3.7 of this report. General guidelines, applicable to all parking areas and trailheads, are provided in the general recommendations contained in Section 4.4.1. Specific actions relating to individual parking areas are covered in Section 4.4.2. The locations of each parking area are shown in Figure 3.25. The general and specific recommendations for parking areas are intended to make the parking areas more functional and therefore more attractive. It is hoped that this will discourage vehicles from using the informal parking areas that have developed and which are generally less appropriate.

4.4.1 GENERAL RECOMMENDATIONS FOR ALL PARKING AREAS

As discussed in Section 3.7.1, the individual parking areas shown in Figure 3.25 and in Table 3.4 serve a variety of purposes, including: (i) vehicular parking; (ii) lookouts; (iii) turnouts to allow safe passing; and (iv) trailheads. However, the following general measures should be implemented at all such areas so that they continue to function effectively and provide a good user experience:

- Parking areas should be reconstructed to the standards shown in Appendix B using light-colored Portland Cement Concrete (PCC). While repaving these areas with AC pavement would suffice over the short term, reconstruction with PCC offers at least two significant advantages. First, the use of light-colored concrete would clearly delineate the parking area from the dark asphalt of the adjacent travelway, thereby providing improved pedestrian safety. Second, the engineering review conducted in support of this plan indicates that the much greater durability and structural integrity of PCC would provide a significantly lower long-term (i.e., lifecycle) cost. The projected costs associated with reconstruction of the parking areas in the TRTD corridor using PCC are summarized in Table 4.10.

- Where budgetary constraints make reconstruction with PCC impossible, the parking area in question should be reconstructed (not just overlaid) using AC pavement to the standards shown in Appendix B. Going forward in time, parking areas where AC is used should be resurfaced whenever the adjacent travelway is repaved unless individual inspections conclude that this is unnecessary. The projected costs associated with reconstruction of the parking areas in the TRTD corridor using AC pavement are also summarized in Table 4.10.
- All signage at the parking areas should be maintained in good order. If signs are lost or damaged beyond repair, they should be replaced with new signs within six months.
- All parking areas should be equipped with one or more signs indicating that parking is prohibited between the hours of 10:00 p.m. and 5:00 a.m.
- Standardized trash receptacle(s) consisting of a heavy concrete cylinder with replaceable plastic liner should be placed in a visible and accessible location close to the parking area and serviced regularly. Any trash that has found its way onto the pavement within the parking area and/or immediately surrounding area should be picked up and hauled away each time the trash receptacles are emptied. Where needed, the cylinders can be attached to permanent foundations so that it is impossible to remove them.
- The boundary between each parking area and the travelway and the boundary between each parking area and adjacent property should be clearly delineated using striping, low curbs, variations in surface material, or a combination of these methods.
- Any walls or other barriers which help to delineate and serve parking areas should be maintained and repaired as needed to offset the effects of age, weathering, vandalism, and damage by vehicles.
- Vegetation in adjacent, unpaved areas should be maintained in good order, and where present, any view planes should be kept open through period vegetation maintenance operations conducted to the standards described in Section 4.3. Due to the current, overgrown condition of the TRTD corridor, the focus of this plan is on vegetation management. However, thought may also be given to the strategic planting of trees at parking areas or their surroundings both for their ornamental and shade-giving value.

In addition to these general recommendations which apply to all parking areas, some parking areas possess certain unique characteristics and/or patterns of use which require some individualized treatment; recommendations for these are provided in Section 4.4.2 below.

Table 4.10 Summary of Parking Area Pavement Reconstruction Costs

<i>Unique Parking Area ID</i>	<i>Area (ft.²)</i>	<i>AC Pavement Cost</i>	<i>PCC Cost</i>
R1	4,600	\$332,300	\$419,300
R2	1,700	\$128,700	\$195,900
R3	1,800	\$138,600	\$190,100
R4	2,200	\$163,600	\$223,700
R5	800	\$46,000	\$73,100
R6	1,500	\$111,300	\$170,000
R7	900	\$51,400	\$78,400
R8	3,800	\$271,200	\$356,000
R9	1,100	\$79,300	\$134,400
R10	900	\$51,400	\$78,400
R11	2,700	\$192,900	\$262,600
R12	1,300	\$96,800	\$148,700
R-Subtotal	23,300	\$1,663,500	\$2,330,600
T1	1,800	\$133,600	\$190,100
T2	3,000	\$220,200	\$292,600
T3	2,300	\$169,400	\$230,400
T4	900	\$51,400	\$78,400
T5	3,800	\$271,200	\$351,000
T6	1,500	\$111,300	\$170,000
T7	400	\$27,600	\$50,100
T8	200	\$17,900	\$37,500
T9	3,000	\$220,200	\$292,600
T10	200	\$17,900	\$37,500
T11	2,700	\$195,500	\$262,600
T12	600	\$36,300	\$60,500
T13	400	\$27,600	\$50,100
T14	1,200	\$94,100	\$145,000
T15	500	\$30,900	\$54,200
T16	200	\$17,900	\$37,500
T17	300	\$23,400	\$44,900
T18	1,800	\$133,600	\$195,100
T19	4,500	\$326,500	\$412,600
T-Subtotal	29,300	\$2,126,500	\$2,992,700
TOTAL	52,600	\$3,790,000	\$5,323,300
Source: Park Engineering			

4.4.2 SPECIFIC PARKING AREA/TRAILHEAD RECOMMENDATIONS

4.4.2.1 R1 and R2: Mānoa Valley Lookout Parking Area Recommendations

4.4.2.1.1 Preliminary Discussion of Options Considered

Round Top Drive near the Mānoa Lookout consists of two approximately 11-foot wide travel lanes with asphalt-concrete pavement (“AC pavement”) with between 10- and 13-foot wide shoulders on

each side of the road. The posted speed limit at this location is 25 miles per hour. There is no clear delineation between the travelway and the paved parking area that vehicles occupy at the lookout.³⁴

Parking area R1 at Mānoa Lookout consists of a parking and viewing area adjacent to Round Top Drive near Mile Marker 8.0 (see Figure 3.26). It varies in width between 10 and 22.5 feet and is approximately 180 feet long; a low stone wall/metal guardrail runs along its eastern side and would accommodate approximately 8 parking spaces if configured using standard 22-foot long parking stalls. Parking area R2 begins approximately 200 feet uphill of R1. It is slightly shorter and much narrower (8 to 10 feet), and there is no wall or guardrail along its outer side. It is sufficiently long to accommodate 7-8 cars parked parallel to the roadway, but its width is so limited that passengers exiting vehicles on the roadway side must be careful of passing vehicles.

Unlike the Round Top Drive travelway, the R1 and R2 parking areas have not been resurfaced with AC pavement recently. Consequently, the pavement shows signs of deterioration and distress, including visible cracking, possibly due to a combination of vehicle loading, ground settlement, and movement of the deteriorating CRM retaining wall that supports a portion of the parking area.

During development of this plan, the planning team explored a series of possible options that could enhance the R1 and R2 parking areas and the adjacent portion of Round Top Drive. Those included:

- Upgrading the pavement structure for R1 and R2 to accommodate larger design vehicle loads and traffic volumes than were present when the existing roadway was constructed.
- Delineating the border between the parking areas and the travelway with pavement striping and/or a change in paving material, e.g., AC pavement for the travelway and PCC for the parking area, to make the boundary clearer for both drivers and pedestrians.
- Repairing and/or reconstructing the CRM retaining wall to provide additional stability to the lookout and minimize distress to the AC pavement.
- Realigning a portion of Round Top Drive near R1 and R2, shifting the travelway to the northwest so as to be able to widen/provide additional space within the R1 and/or R2 parking areas.
- Expanding the R1 and/or R2 parking areas to the southeast to provide additional parking capacity and pedestrian space, thereby reducing the potential for hazardous interactions between through-traffic, tour vehicles, and pedestrians.
- A combination of a realigning Round Top Drive and expanding the R1 and/or R2 parking areas to maximize the space available at the Mānoa Lookout.
- Creating a vehicular turnaround area at the former DLNR-DOFAW baseyard between Mile Marker 7.5 and the entrance to Pu‘u ‘Ualaka‘a State Wayside or widening the portion of the park entrance road closest to Round Top Drive so that fewer vehicles would attempt to turn around at the parking areas themselves.

Results of the engineering review conducted for this plan indicated that, while it is not presently recommended, before widening of the R1 and/or R2 parking areas could be considered a viable and desirable option, a detailed feasibility study would need to be conducted. Such a study would be tasked with determining the opportunities and constraints which might shape any potential modifications.

The total length of the R1 parking area is approximately 178 feet, but it is 10 feet or more in width for only 145 feet of that length. Thus, based on the existing dimensions of the parking area and the space

³⁴ While the roadway appears to be in satisfactory condition, a geotechnical investigation and pavement analysis should be performed to determine the adequacy of the existing pavement structure to support the design vehicle loads and traffic volume if any modification or reconfiguration is contemplated.

requirements for angled parking, only parallel parking can currently be accommodated, with a maximum capacity of 6 or 7 vehicles. In addition, a substantial portion of the lower part of the paved area of the R1 parking area is quite narrow, between 5 and 10 feet in width. This is not an issue during the daytime when there is adequate space in the wider, upper portion of the parking area to accommodate typical visitation. However, this limited width can become problematic during the evening peak when the number and size of vehicles stopping here is at its maximum. During these peak-use periods, even regular passenger cars parked in narrower portions of the parking area, as well as larger vehicles anywhere within it, often project out into the mauka-bound lane of the travelway. This, in turn, poses the risk that persons will be struck while entering or exiting their vehicles, or while walking between to and from the Mānoa Lookout to their vehicles.

Theoretically, these conditions could be improved by widening the lower, narrowest portion of the R1 parking area, but this would require that the adjacent portion of the travelway be shifted closer to the hillside. Preliminary analysis conducted during development of this CMP indicate that sufficient space may be available but doing so would reduce the available sight-distance for vehicles traveling in the makai-bound (i.e., downhill) lane of Round Top Drive. Realignment of the roadway would also place the travelway closer to the hillside and any potential rockfall hazards that might be present there.

If it is determined that this additional space would be highly beneficial, a detailed design study should be commissioned to evaluate the potential costs and benefits of a moderate realignment of the travelway. If the results of this analysis show that the paved travelway could be shifted 5 to 10 feet towards the cut slope while maintaining adequate sight-distances and protection from rockfalls, this should be considered for CIP funding.

After careful review of the reconfiguration options discussed above, the planning team concluded that the potential hazards and increased costs associated with enlarging the R1 and/or R2 parking areas would outweigh the comparatively modest benefits. Consequently, it is not recommending it at this time and no detailed engineering analyses of these options were conducted as part of this CMP.

Should further consideration of widening be deemed appropriate in the future, additional technical studies and design analyses will be required to determine the feasibility of: (i) realigning a portion of Round Top Drive to the northwest; (ii) expanding the parking area(s) R1 and/or R2 to the southwest; or (iii) combining a realignment of Round Top Drive and expansion of these parking area(s). At minimum, these analyses should include:

- Slope stability and rockfall hazard analyses of the steep ($\frac{1}{4}$ H:1 V to $\frac{1}{2}$ H:1 V) cut slope along the inbound lane (headed in the makai direction) of Round Top Drive should be performed in conjunction with the study to realign Round Top Drive. Generally, roadways should be set back a sufficient distance away from steep cut slopes to provide an area for potential rockfall hazards. The cinder boulders along the shoulder of Round Top Drive near the Mānoa Lookout are evidence of this potential hazard.
- Similarly, a slope stability analysis should be performed in conjunction with the study to evaluate the feasibility of expanding the parking area. A higher retaining wall will be needed to expand the parking area further downslope and into Mānoa valley. Special geotechnical and structural engineering analyses and design will likely be required.

The combined analysis (e.g., topographical, preliminary geotechnical, structural, and civil engineering) is likely to require at least a year to conduct and require an expenditure of between \$250,000 and \$350,000. The cost of the CIP improvements that might result from such studies is impossible to predict accurately in advance. However, the planning team believes that they would at the very least amount to \$1.5 million and could be several times that amount.

Whether or not a realignment of Round Top Drive and/or modification of the R1 and R2 parking areas are deemed to be a desirable course of action, planners have identified other means to improve their safety and functionality. Those are presented in Section 4.4.2.1.2 and 4.4.2.1.3.

Finally, it may be appropriate to give some consideration to alternative means of addressing the demand for nighttime views from this location. This demand could be met by opening the Pu‘u ‘Ualaka‘a State Wayside for nighttime visitation, or by placing the R1 and R2 parking areas into the jurisdiction of the Division of State Parks, who would then manage and regulate use of the area. While these interventions are outside the scope and plan area of this CMP, they are consistent with its goals, and if there is enough interest in these solutions, a discrete planning effort should be undertaken to assess demand, evaluate specific proposals, and consider the potential impacts.

4.4.2.1.2 Physical Improvement Recommendations

Based on the discussion above of potential modifications to the R1 and/or R2 parking areas and adjacent roadway, the planning team has identified the following measures to enhance this high-use portion of the corridor:

- As noted in Section 3.7.2, the surfaces of parking areas R1 and R2 are degraded and require remedial work. Because it offers the most durable solution and provides the clearest distinction between the parking area and the travelway, the planning team recommends that both parking areas be reconstructed using PCC. At bare minimum, spot repairs should be made to localized areas of the base course and new AC pavement installed. In either case, the separation between the parking area and the adjacent travelway should be further accentuated by the installation of reflective pavement markings demarcating the boundary between the two.
- Damaged portions of the CRM retaining wall along the southwestern edge of the R1 parking area at the Mānoa Lookout should be repaired.
- The low asphalt berm along the outside (i.e., Mānoa Valley) edge of the R2 parking area should be replaced with an edge delineation that does not constitute a tripping hazard for persons exiting their vehicles and which facilitates maintenance of a vegetative barrier that keeps visitors back from the steep slope immediately beyond.
- Oversized vehicles should be discouraged from turning around at the Mānoa Lookout to minimize the conflicts between through vehicle traffic on Round Top Drive, vehicle parking, and pedestrians. This could be done by posting signage directing drivers to an uphill turnaround point at either the former DLNR-DOFAW baseyard between the 7.5 Mile Marker and the entrance to Pu‘u ‘Ualaka‘a State Wayside, or at the entrance to the park itself. Some physical improvements would be needed at these locations, the exact nature and cost of which have not been established.
- If vehicles continue to turn around at the lookout despite the signage, the use of flexible high-density plastic lane delineator posts, like those being considered for two turns on Tantalus Drive could be installed at the centerline. However, use of these delineators should be considered only if traffic engineers conclude that there is no better alternative.
- Signage, appropriate to the context and purpose, identifying parking areas P1 and P2 as the Mānoa Lookout would help orient visitors who have come to enjoy this superb viewpoint.

The replacement of the existing AC pavement surface with concrete would be done to the specifications shown in Appendix B. The costs associated with each of the recommendations above are summarized in Table 4.11 below, including both resurfacing options. The use of either the former baseyard site or the entrance to Pu‘u ‘Ualaka‘a State Wayside would require coordination and approval from DLNR Division of State Parks and they have been notified of this possibility.

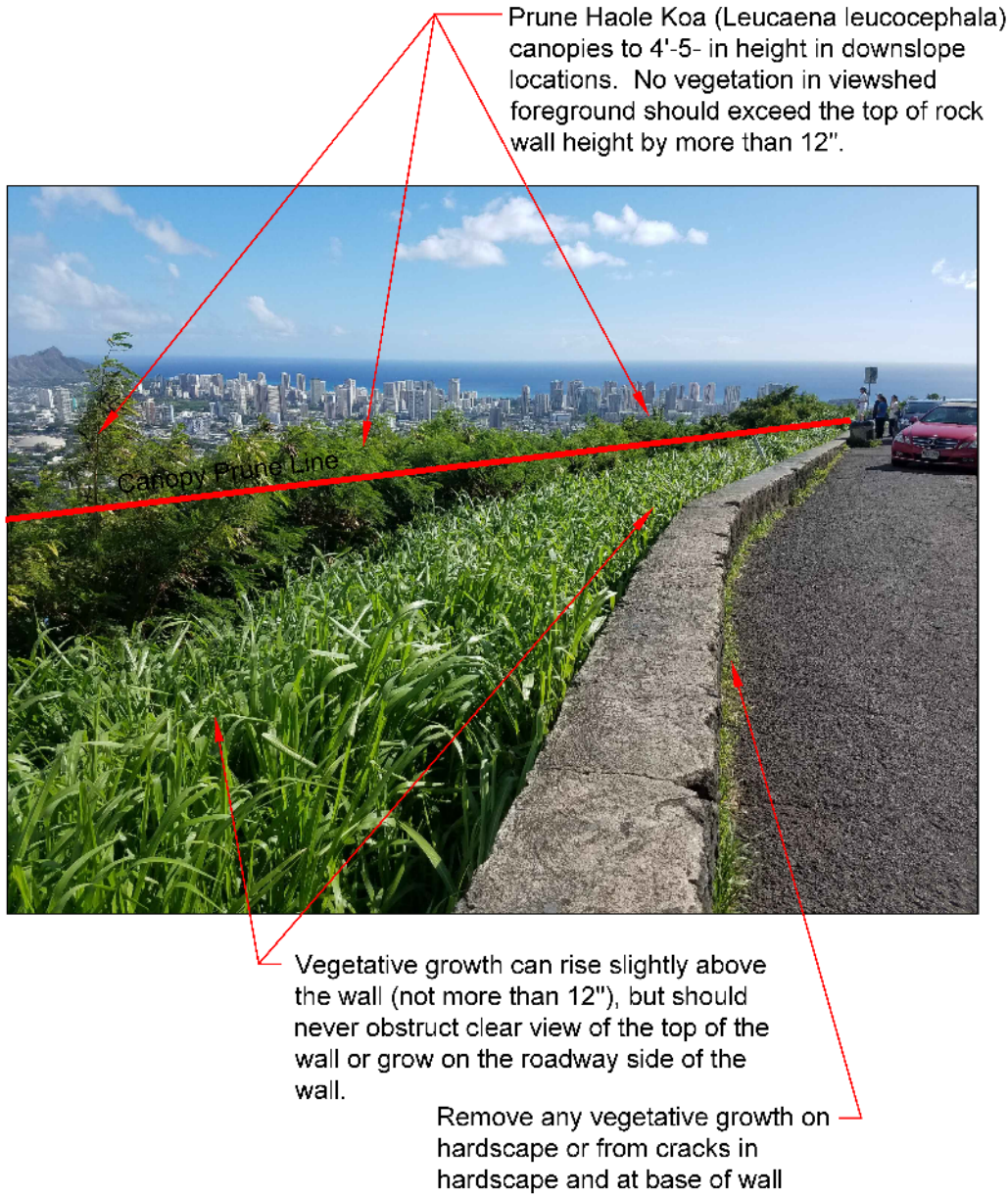
Table 4.11 Estimated Cost of Recommended Improvements to R1 and R2 Parking Areas

<i>Recommendation</i>	<i>Estimated Cost</i>
Reconstruct R1 and R2 with PCC ^(see Note 1)	\$615,200
Reconstruct R1 and R2 with AC Pavement ^(see Note 1)	\$461,000
Reconstruct CRM Retaining Wall at R1 Parking Area	\$150,000
Vehicle Turnaround at Former Baseyard ^(see Note 2)	\$250,000
Vehicle Turnaround at Park Entrance ^(see Note 2)	\$100,000
Centerline Lane Delineators	\$25,000
R1 and R2 Vegetation Management Recommendations	\$15,900
Note 1: Reconstruction of R1 and R2 would be done using <u>either</u> PCC of AC; hence only one of these expenses would be incurred.	
Note 2: A vehicle turnaround would be provided at either the former baseyard or at the park entrance; hence, only one of these expenses would be incurred.	
Source: Park Engineering, Inc., Umemoto Cassandro Design Corp., and Planning Solutions, Inc.	

4.4.2.1.3 Vegetation Management Recommendations

As the most heavily visited location within the corridor, the appearance and aesthetics of this location are particularly important to the overall impression left with visitors. Because of this the planning team recommends that it be upgraded to at least the level that is maintained at the lookouts and rest areas within the adjacent Pu‘u ‘Ualaka‘a State Wayside. Accordingly, all trash receptacles, signage, and walls should be maintained at/brought into accord with the general design recommendations presented in Section 4.4.1 of this report. In addition to following these general guidelines, consideration should be given to installing one or two simple displays that explain the major features that can be seen from the viewpoint. Specific vegetation management recommendations for the Mānoa Valley Lookout are shown on Figure 4.8 and Figure 4.9. The approximate cost of these measures is shown in Table 4.11.

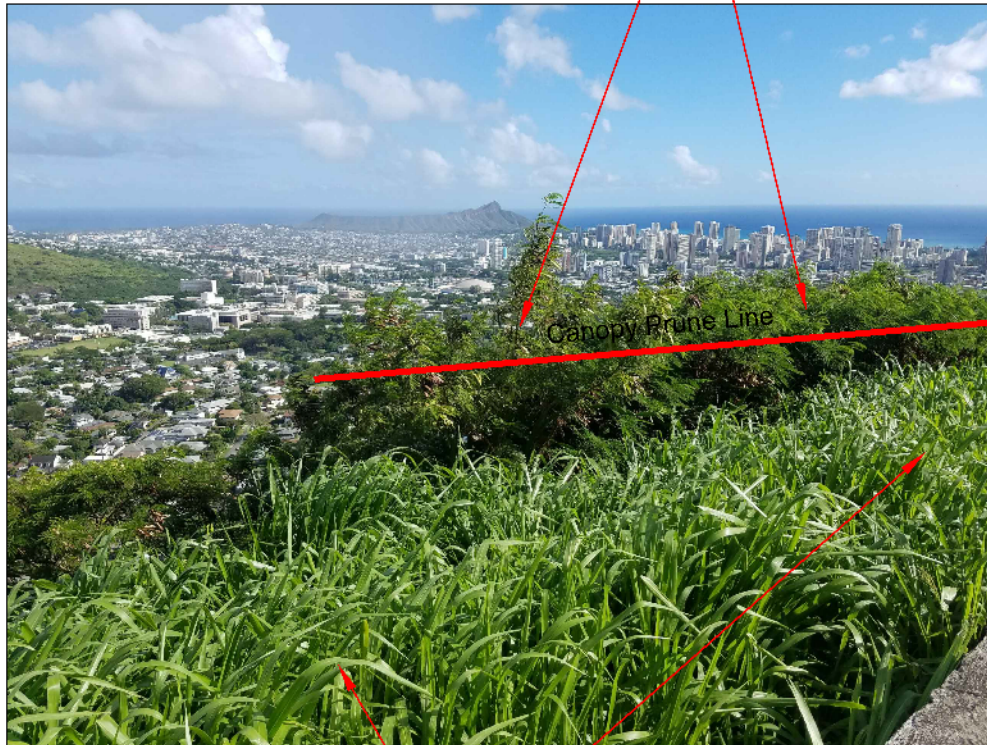
Figure 4.8 R1 and R2: Vegetation Management Recommendations A



Source: Umemoto Cassandro Design Corp. (2018)

Figure 4.9 R1 and R2: Vegetation Management Recommendations B

Prune Haole Koa (*Leucaena leucocephala*) canopies to 4'-5'- in height in downslope locations. No vegetation in viewshed foreground should exceed the top of rock wall height by more than 12".



Vegetative growth can rise slightly above the wall (not more than 12"), but should never obstruct clear view of the top of the wall or grow on the roadway side of the wall.

Source: Umemoto Cassandro Design Corp. (2018)

4.4.2.2 R8: Camp Ehrhorn/'Ualaka'a Trail Parking Area Recommendations

4.4.2.2.1 Physical Improvement Recommendations

Based on preliminary discussions that have taken place during the drafting of this plan, continued Boy Scout use of Camp Ehrhorn appears to be completely compatible with the goals and objectives that have been set for the corridor, and the planning team recommends that they be allowed to continue. The short unpaved driveway that connects it with the adjacent roadway deserves repair at a minimum; reconstruction with pavement would be even better.

The planning team believes that excess space is available at Camp Ehrhorn and recommends that the responsible agencies determine if establishing a small baseyard at this location where equipment and

materials used during regularly scheduled and/or intermittent repair and maintenance projects can be stored. If the results of that investigation indicate that this would be beneficial, the CCH, in coordination with DLNR, could enter into an agreement that would allow the shared use of the property.

Modest improvements to the small R8 parking area adjacent to Camp Ehrhorn have the potential, in tandem with the vegetation management recommendations provided in the following subsection to eliminate the deficiencies identified in Chapter 3. Specific recommendations include:

- The R8 parking area should be resurfaced using 1" to 3" coarse aggregate, as is used for stabilized construction entrances, which would withstand the ponding water that tends to accumulate here.
- The short unimproved driveway entrance to Camp Ehrhorn should be upgraded to PCC to reinforce the sloped accessway and allow for heavier equipment that might be staged there.

The reconstruction of the existing parking area and driveway should be done to the specifications shown in Appendix B. The costs associated with each of the recommendations are summarized in Table 4.12 below.

Table 4.12 Estimated Cost of Recommended Improvements to R8 Parking Area

<i>Recommendation</i>	<i>Estimated Cost</i>
Resurface R8 with Gravel	\$100,000
Removal/Replacement of Planter Area	\$10,000
Upgrade Camp Ehrhorn Driveway to PCC	\$25,000
R8 Vegetation Management Recommendations	\$8,700
Source: Park Engineering, Inc. and Umemoto Cassandro Design Corp. (2018)	

4.4.2.2 Recommended Vegetation Management

The tree canopy within parking area R8 should be pruned back, such that a minimum vertical clearance of between 10 and 12 feet is maintained at all times. The larger shrubs and trees adjacent to this parking area should have their understory pruned, so that any branches extending below a height of 10 to 12 feet are removed. This is intended to maintain a clear space for parked vehicles and open up the parking area for more sunlight and better air circulation, which may help to keep this parking area drier. Preliminary budget estimates for this are shown in Table 4.12.

4.4.2.3 R11: Moleka and Mānoa Cliffs Trail Parking Area Recommendations

4.4.2.3.1 Physical Improvement Recommendations

This parking area sees heavy usage as trailhead parking for the popular Moleka and Mānoa Cliffs trails and needs substantial refurbishment. Based on the patterns of use and wear observed at this parking area, the planning team recommends the following:

- The pavement should be completely reconstructed, as opposed to repaving it. While simply repaving the existing AC pavement would suffice for a while, reconstructing it with PCC would: (i) clearly delineate the parking area from the adjacent travelway, thereby improving safety and (ii) be much more durable and offer a lower long-term cost in this very wet, poorly drained, high traffic environment.
- Restore drainage to its original level of function as part of the pavement reconstruction.
- Reconstruct the berm around the makai edge of the parking area as a low, flat-topped retaining wall. This would improve the stability of the parking area and provide a place for hikers to stage gear or clean mud from their shoes when they are starting and finishing their hikes.
- The steps which connect the parking area to Moleka Trail should be reconstructed to interface with the parking area and retaining wall.

The reconstruction of the existing parking area would be done to the specifications shown in Appendix B. The costs associated with each of the recommendations above are summarized in Table 4.13 below.

Table 4.13 Estimated Cost of Recommended Improvements to R11 Parking Area

<i>Recommendation</i>	<i>Estimated Cost</i>
Reconstruct R11 Parking Area with PCC	\$262,600
Restore Drainages	\$50,000
Enhanced Retaining Wall Structure	\$300,000-\$500,000
Enhanced Access Stairway to Moleka Trail	\$10,000-\$20,000
R11 Vegetation Management Recommendations	\$10,100
Source: Park Engineering, Inc., Umemoto Cassandro Design Corp., and Planning Solutions, Inc.	

4.4.2.3.2 Vegetation Management Recommendations

The vegetation (trees and shrubs) around parking area R11 should be trimmed such that a minimum vertical clearance of between 10 and 12 feet is maintained at all times. This is intended to maintain a clear space for parked vehicles and open up the parking area for more sunlight and better air circulation, which may help to keep this parking area drier. Preliminary budget estimates for this are shown in Table 4.13.

4.4.2.4 T1, T2, T3, and T4: Parking Area Recommendations

4.4.2.4.1 Physical Improvement Recommendations

These four parking areas, which are at lower elevations within the Plan Area, receive relatively high levels of use, but they are not exposed to the same environmental rigors as those in the upper parts of the corridor. At minimum, these parking areas are in need of resurfacing; however, the planning team recommends that they be completely reconstructed with PCC. While repaving these areas with AC pavement would suffice for up to a decade, reconstruction with PCC would offer several advantages, including: (i) clearly delineating the parking area from the adjacent travelway; (ii) providing for improved safety; and (iii) offering a lower long-term cost. The engineering review conducted as part of the development of this CMP suggests that PCC’s initial capital cost would be approximately \$216,900 more than that of AC pavement for all four parking areas, but because PCC would last for many decades longer, it would have the lowest life-cycle costs.

The reconstruction of the existing parking areas would be done to the specifications shown Appendix B. The costs associated with each of the recommendations above are summarized in Table 4.14.

Table 4.14 Estimated Cost of Recommended Improvements to T1, T2, T3, & T4 Parking Areas

<i>Recommendation</i>	<i>Estimated Cost</i>
Reconstruct T1 Parking Area with PCC	\$190,100
Reconstruct T2 Parking Area with PCC	\$292,600
Reconstruct T3 Parking Area with PCC	\$230,400
Reconstruct T4 Parking Area with PCC	\$78,400
T1, T2, T3, and T4 Vegetation Management Recommendations	\$21,100
Source: Park Engineering, Inc.; Umemoto Cassandro Design Corp.	

4.4.2.4.2 *Vegetation Management Recommendations*

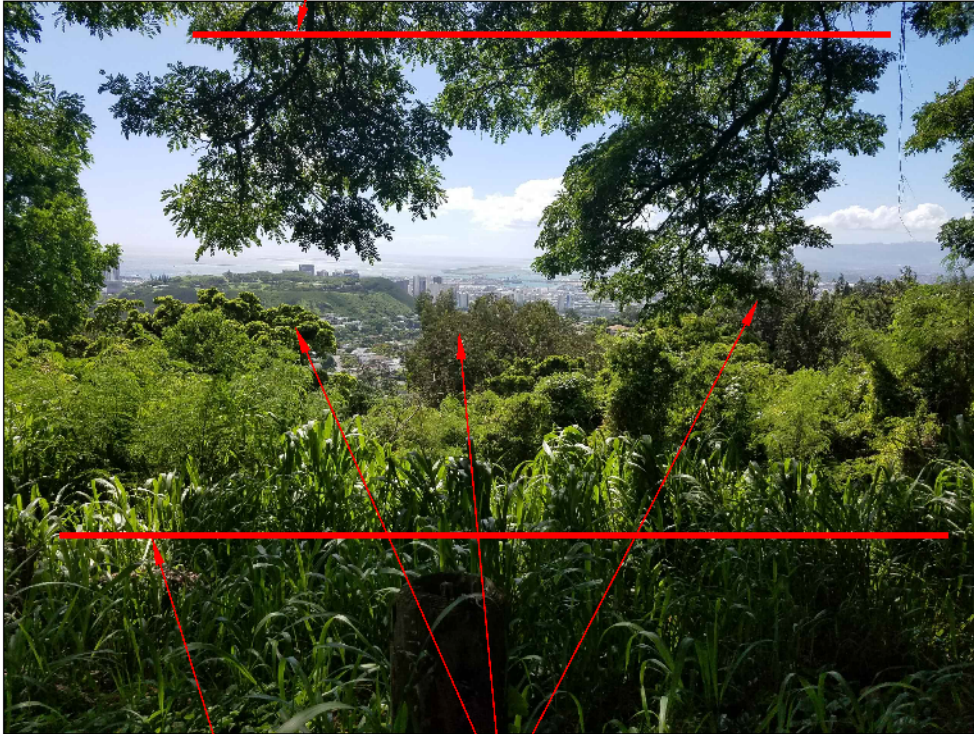
The T1, T2, T3, and T4 parking areas are among the most popular within the corridor and offer spectacular views of Honolulu and the Pacific Ocean. Because of this, the planning team recommends that all trash receptacles and signage be maintained at or brought into accord with the general design recommendations presented in Section 4.4.1 of this report. In addition, the planning team recommends implementation of the following specific vegetation management measures:

- The recommendations for the T1 parking area shown in Figure 4.10, Figure 4.11, and Figure 4.12.
- The recommendations for the T2 parking area shown in Figure 4.13, Figure 4.14, Figure 4.15, Figure 4.16, and Figure 4.17.
- The recommendations for the T3 parking area shown in Figure 4.18 and Figure 4.19
- The recommendations for the T4 parking area shown in Figure 4.20, Figure 4.21, and Figure 4.22.

The approximate cost of implementing these vegetation management measures is shown in Table 4.14.

Figure 4.10 T1 Vegetation Management Recommendations A

Remove tree branches that are downward hanging or heading in an orientation that is primarily below the horizontal plane to clear view. Remove branch to the next main branch that is not conflicting with viewshed.

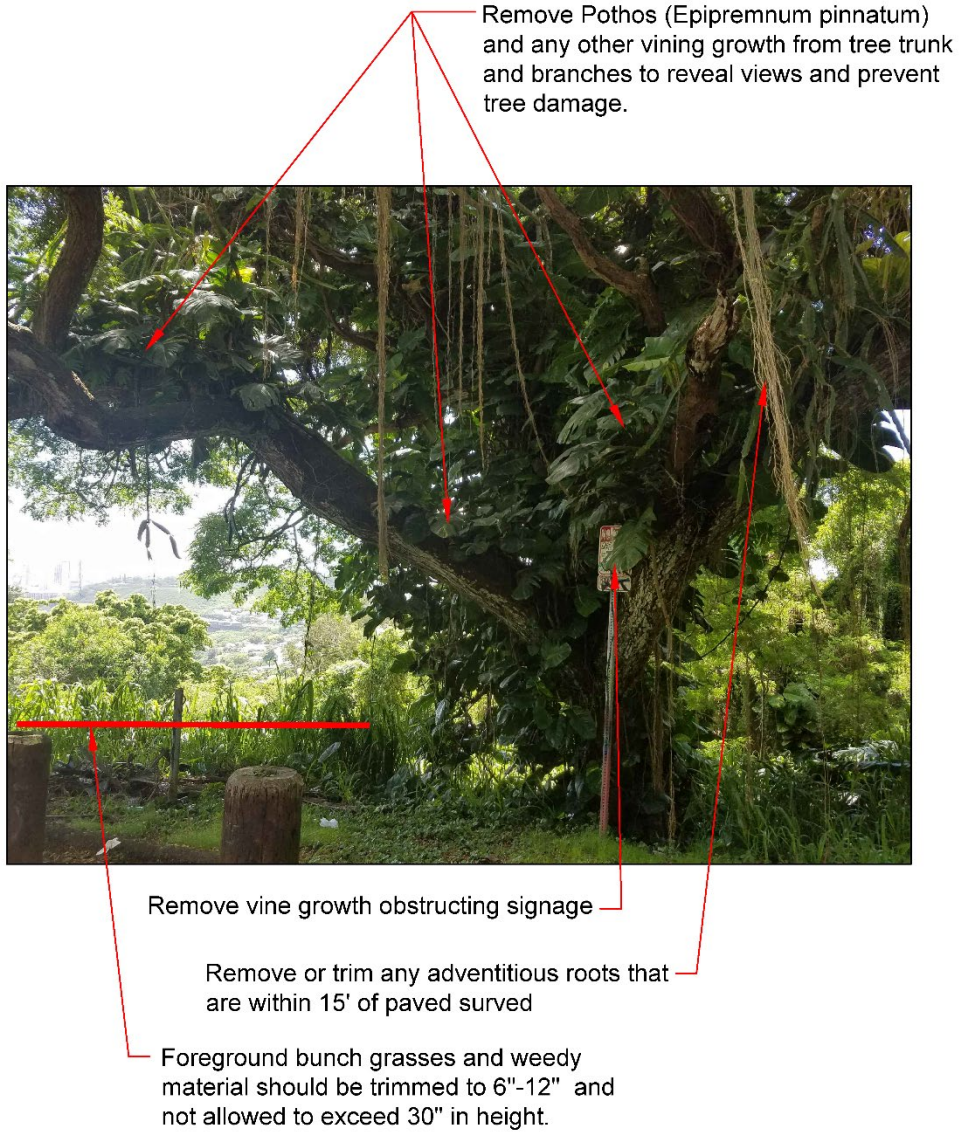


In time, these trees will begin to obstruct the viewshed. The canopy should be pruned and lowered well below the view lines so action on these trees is infrequent.

Foreground bunch grasses and weedy material should be trimmed to 6"-12" and not allowed to exceed 30" in height.

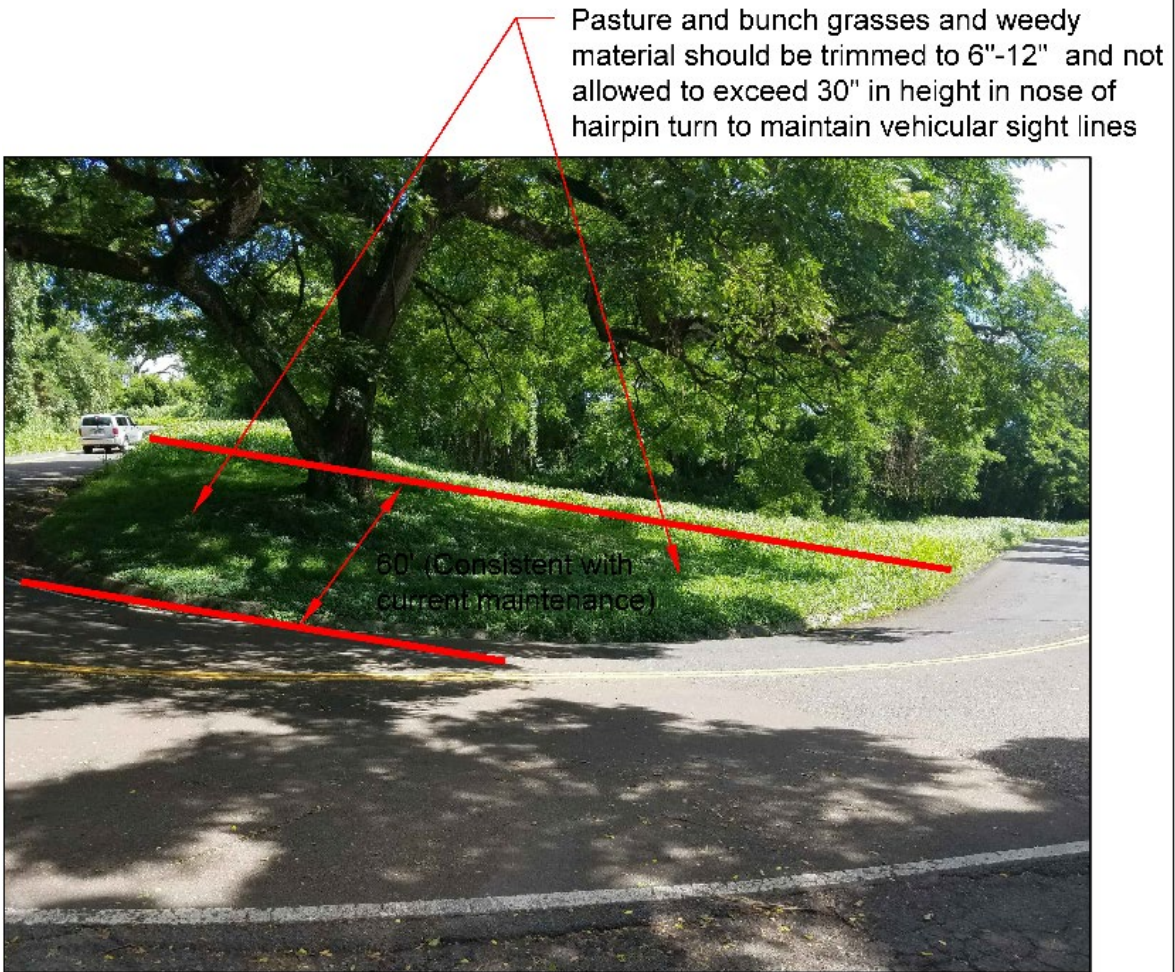
Source: Umemoto Cassandro Design Corp. (2018)

Figure 4.11 T1 Vegetation Management Recommendations B



Source: Umemoto Cassandro Design Corp. (2018)

Figure 4.12 T1 Vegetation Management Recommendations C



Source: Umemoto Cassandro Design Corp. (2018)

Figure 4.13 T2 Vegetation Management Recommendations A

Remove tree branches that are downward hanging or heading in an orientation that is primarily below the horizontal plane to clear view and vertical road clearance concerns in the future (Any branch at or oriented to grow into a 20' vertical road surface clearance should be removed).



Pasture and bunch grasses and weedy material should be trimmed to 6"-12" and not allowed to exceed 30" in height in nose of hairpin turn to maintain vehicular sight lines

Source: Umemoto Cassandro Design Corp. (2018)

Figure 4.14 T2 Vegetation Management Recommendations B

Remove or prune under canopy branches to expose views to Honolulu.

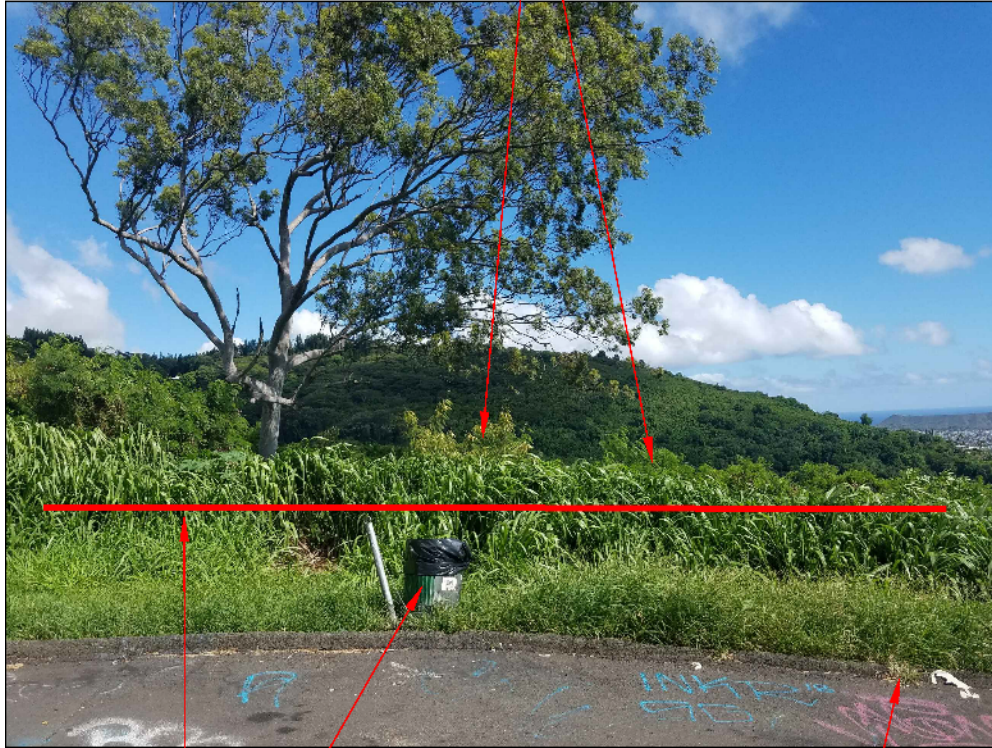


Foreground and mid-ground bunch grasses and weedy material should be trimmed to 6"-12" and not allowed to exceed 30" in height.

Source: Umemoto Cassandro Design Corp. (2018)

Figure 4.15 T2 Vegetation Management Recommendations C

Remove juvenile Haole Koa (*Leucaena leucocephala*) where it is within viewshed. If already established, prune to same level as adjacent grasses.



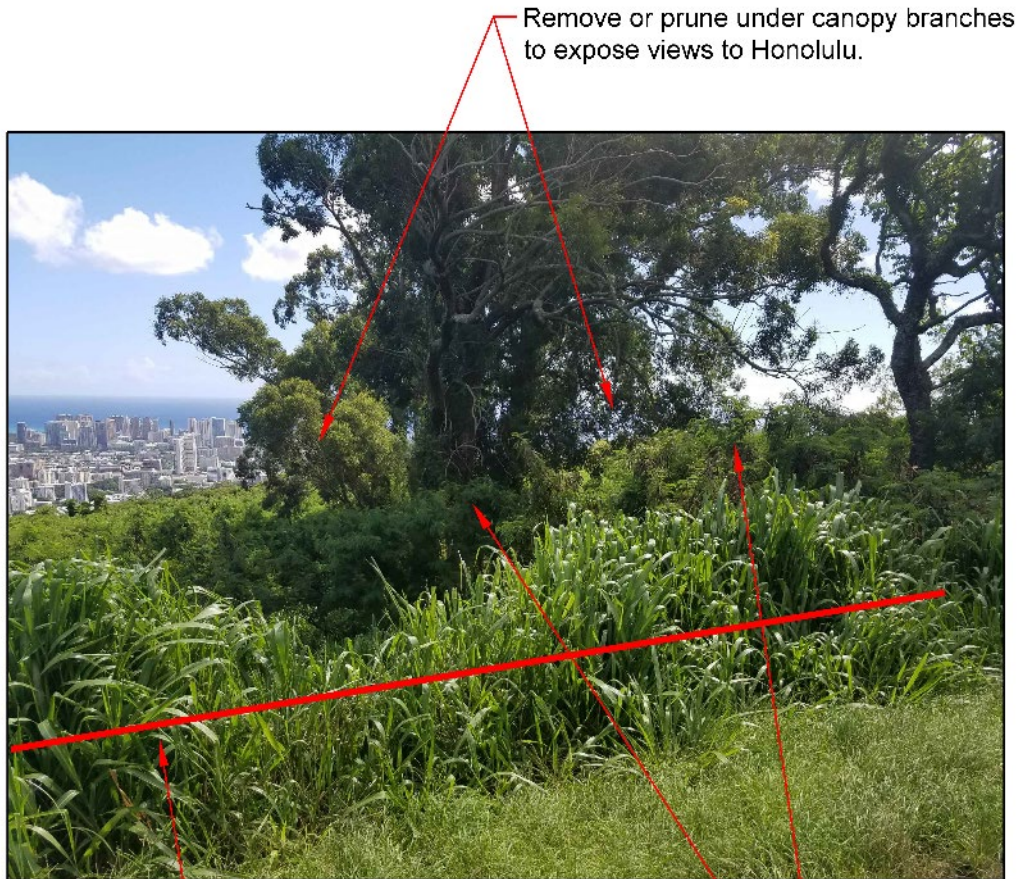
Replace metal trash receptacles with standardized concrete trash receptacles. Remove metal post.

Foreground bunch grasses and weedy material should be trimmed to 6"-12" and not allowed to exceed 30" in height.

Remove any vegetative growth that has spread on top of on in front of the asphalt curb. The top of curb and the face of curb should be clearly visible from the roadway.

Source: Umemoto Cassandro Design Corp. (2018)

Figure 4.16 T2 Vegetation Management Recommendations D



Remove or prune under canopy branches to expose views to Honolulu.

Foreground bunch grasses and weedy material should be trimmed to 6"-12" and not allowed to exceed 30" in height.

Remove juvenile Haole Koa (*Leucaena leucocephala*) where it is within viewshed. If already established, prune to same level as adjacent grasses.

Source: Umemoto Cassandro Design Corp. (2018)

Figure 4.17 T2 Vegetation Management Recommendations E

Remove or prune under canopy branches to expose views to Honolulu under the tree canopy



Foreground bunch grasses and weedy material should be trimmed to 6"-12" and not allowed to exceed 30" in height.

Source: Umemoto Cassandro Design Corp. (2018)

Figure 4.18 T3 Vegetation Management Recommendations A

Remove or prune under canopy branches to expose views to Harbor and Airport area under the tree canopy

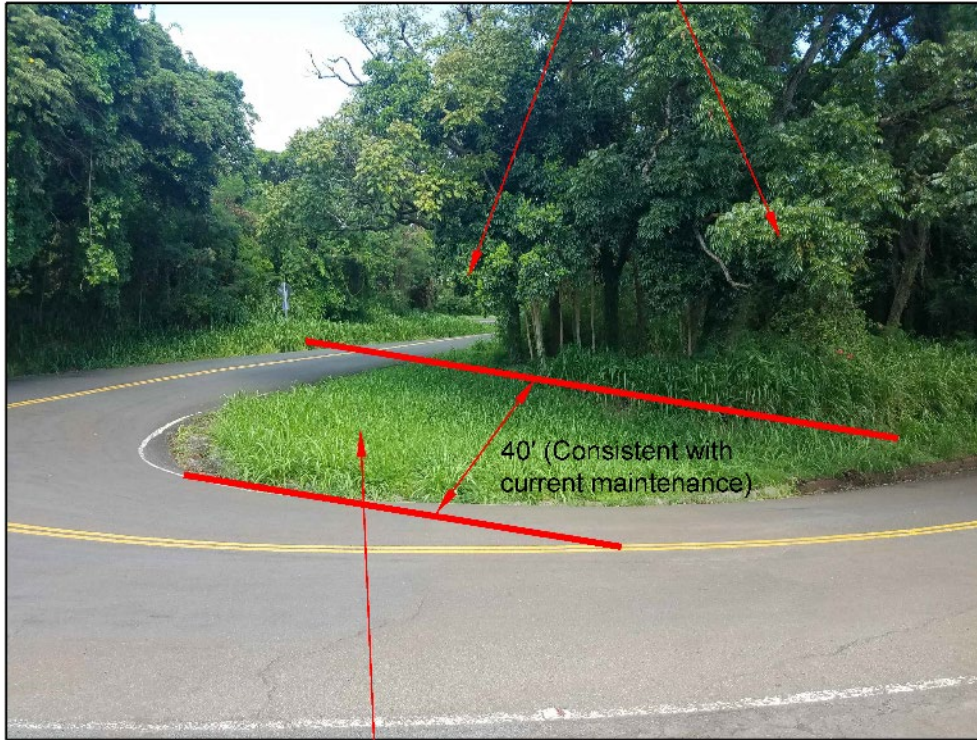


Foreground bunch grasses and weedy material should be trimmed to 6"-12" and not allowed to exceed 30" in height.

Source: Umemoto Cassandro Design Corp. (2018)

Figure 4.19 T3 Vegetation Management Recommendations B

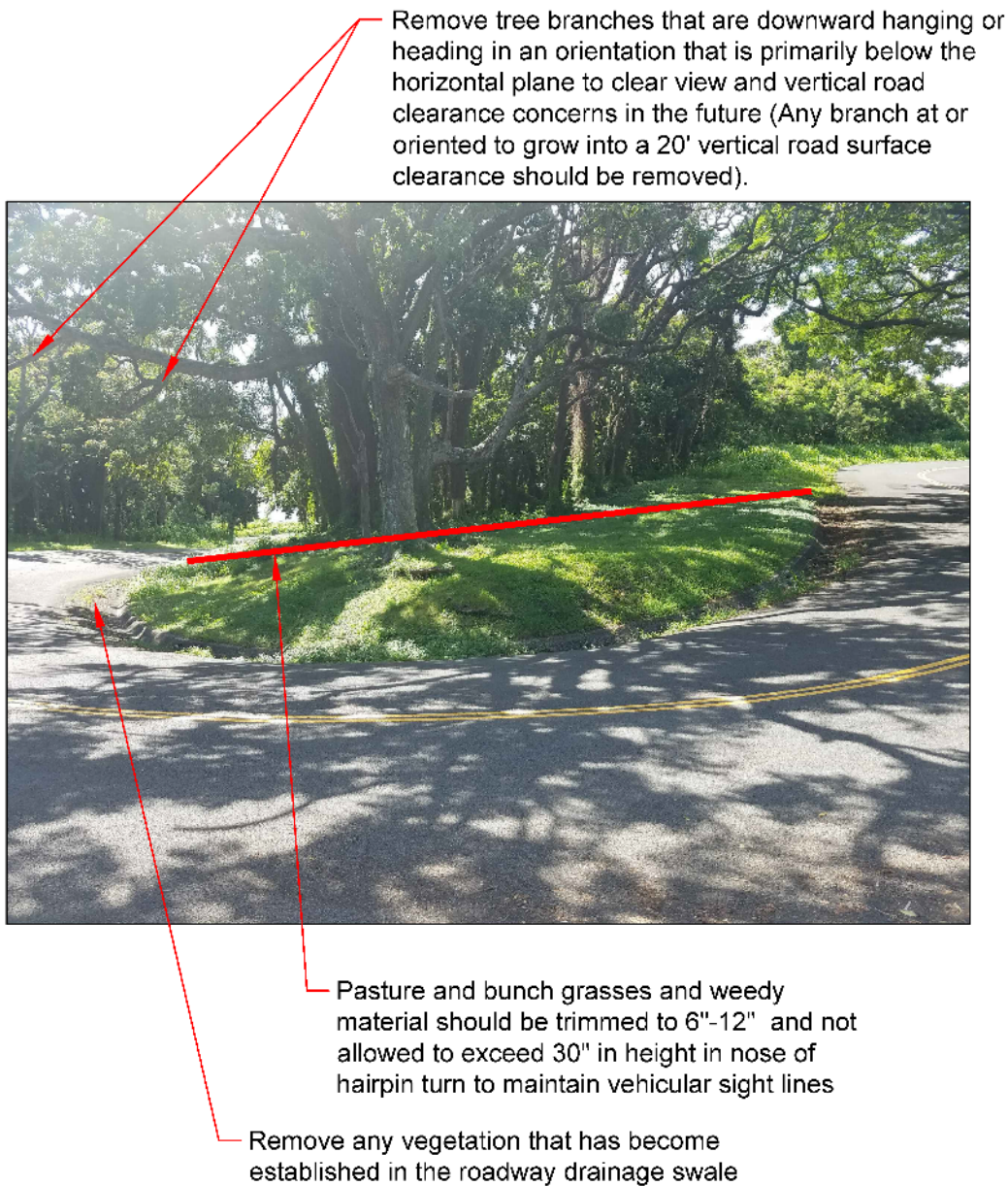
Remove or prune back branches from adjacent trees that enter the 40' zone of vehicular sight lines that are below 10' or primary growth direction is downward.



Pasture and bunch grasses and weedy material should be trimmed to 6"-12" and not allowed to exceed 30" in height in nose of hairpin turn to maintain vehicular sight lines

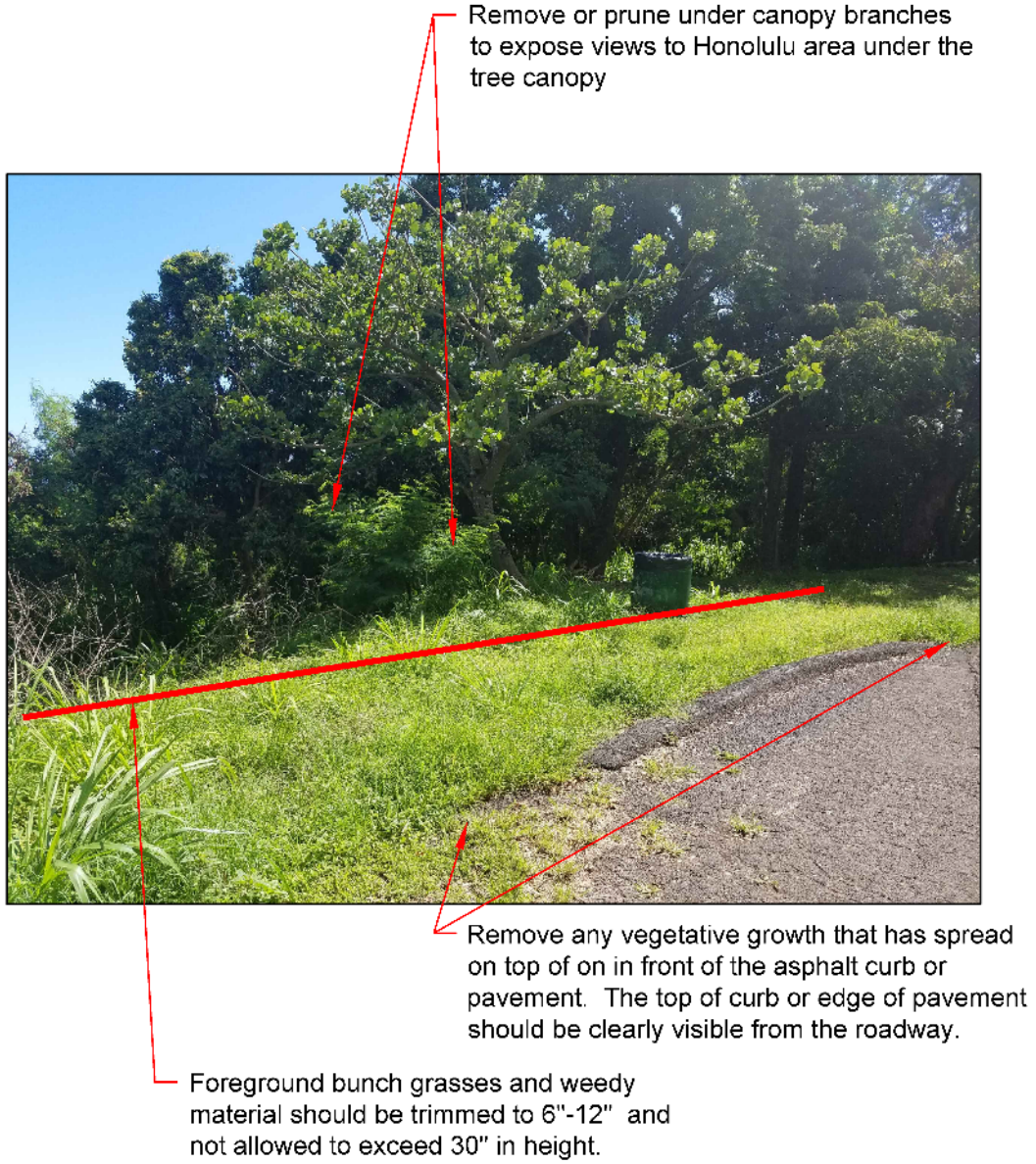
Source: Umemoto Cassandro Design Corp. (2018)

Figure 4.20 T4 Vegetation Management Recommendations A



Source: Umemoto Cassandro Design Corp. (2018)

Figure 4.21 T4 Vegetation Management Recommendations B



Source: Umemoto Cassandro Design Corp. (2018)

Figure 4.22 T4 Vegetation Management Recommendations C

Prune downslope tree canopies to allow views over pruned canopies to Honolulu. Top of canopy should be trimmed to approximately 3' above relative elevation of parking area pavement

Remove or prune under canopy branches to expose views to Honolulu area under the tree canopy



Foreground bunch grasses and weedy material should be trimmed to 6"-12" and not allowed to exceed 30" in height.

Source: Umemoto Cassandro Design Corp. (2018)

4.4.2.5 T6: Punchbowl Lookout Parking Area Recommendations

4.4.2.5.1 Physical Improvement Recommendations

This is a relatively spacious parking area which provides a cool, shaded lookout with views of Punchbowl, downtown Honolulu, and the Pacific Ocean; consequently, it sees substantial use. However, this parking area has been allowed to physically deteriorate and is presently adversely affected by the growth of surrounding vegetation, which now restricts the formerly expansive view.

Based on the patterns of use and wear observed at this parking area, the planning team recommends that the T6 parking area be reconstructed with PCC. While repaving these areas with AC pavement would suffice for several years, reconstruction with PCC would offer several advantages, including: (i) clearly delineating the parking area from the adjacent travelway; (ii) providing for improved safety; and (iii) offering a lower long-term cost. The engineering review conducted as part of the development of this CMP suggests that PCC would cost approximately \$60,000 more than AC pavement per parking area, but once in place would last for many decades longer.

The reconstruction of the existing T6 parking area would be done to the specifications shown in Appendix B. The costs associated with this recommendation is summarized in Table 4.15 below.

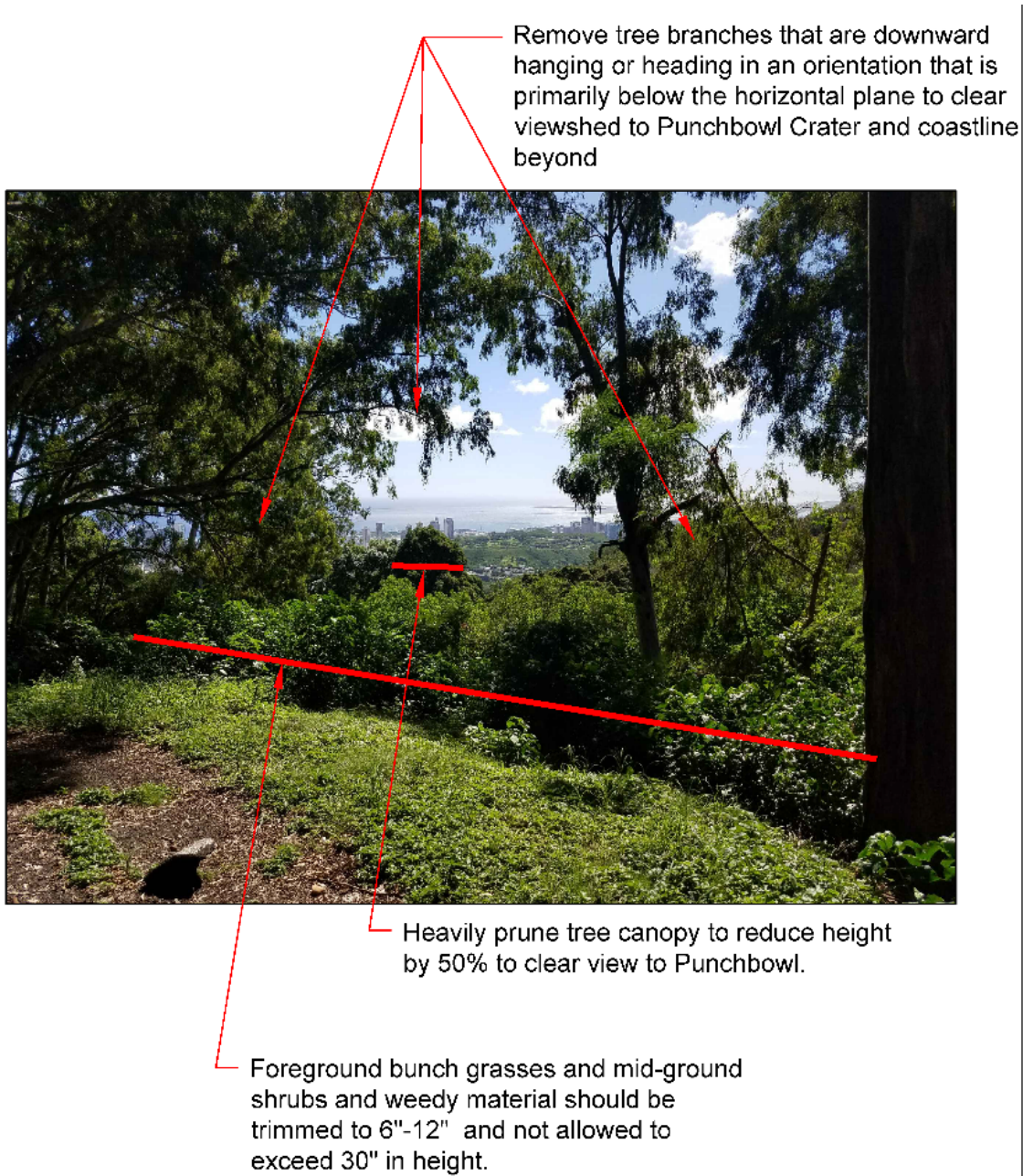
Table 4.15 Estimated Cost of Recommended Improvements to T6 Parking Area

<i>Recommendation</i>	<i>Estimated Cost</i>
Reconstruct T6 Parking Area with PCC	\$170,000
T6 Vegetation Management Recommendations	\$4,800
Source: Park Engineering, Inc. and Umemoto and Cassandro Design Corp.	

4.4.2.5.2 Vegetation Management Recommendations: Punchbowl Lookout Parking Area (T6)

All trash receptacles, signage, and walls should be maintained at/brought into accord with the general design recommendations presented in Section 4.4.1 of this report. Specific vegetation management recommendations for the Punchbowl Lookout are shown in Figure 4.23, Figure 4.24, and Figure 4.25. The approximate cost of these measures is shown in the last line of Table 4.15.

Figure 4.23 T6 Vegetation Management Recommendations A



Source: Umemoto Cassandro Design Corp. (2018)

Figure 4.24 T6 Vegetation Management Recommendations B

Remove or prune under canopy branches to remove branches that are or will enter the 17' min. vertical clear space in the LMZ and create a better vehicular sight lines at this curve in the roadway.



Foreground bunch grasses and weedy material should be trimmed to 6"-12" and not allowed to exceed 30" in height.

Source: Umemoto Cassandro Design Corp. (2018)

Figure 4.25 T6 Vegetation Management Recommendations C

Replace metal trash receptacles with standardized concrete trash receptacles. Remove metal post.



Remove any vegetative growth that has spread on top of the asphalt or concrete pavement. The edge of pavement should be clearly visible from the roadway.

Source: Umemoto Cassandro Design Corp. (2018)

4.4.2.6 T9: Makiki Valley Trail Parking Area Recommendations**4.4.2.6.1 Physical Improvement Recommendations**

Based on the discussion of issues related to this parking area and the patterns of use and wear observed during development of this CMP, the planning team recommends the following measures be taken to enhance this parking area in addition to the general recommendations described in Section 4.4.1:

- The T9 parking area should be reconstructed with PCC. The engineering review conducted as part of the development of this CMP suggests that PCC would cost approximately \$70,000 more than AC pavement per parking area, but once in place would last for many decades longer.
- The deteriorated wooden posts that were embedded in the pavement to discourage dumping (see Figure 3.30) should be replaced with durable metal bollards, concrete posts, or other appropriate material. At least some of these posts should be removable so that they can be moved to allow maintenance and repair vehicles and equipment access to the retaining wall and areas downslope on occasions when that is necessary.

The reconstruction of the existing parking areas would be done to the specifications shown in Appendix B. The costs associated with each of the recommendations above are summarized in Table 4.16 below.

Table 4.16 Estimated Cost of Recommended Improvements to T9 Parking Area

<i>Recommendation</i>	<i>Estimated Cost</i>
Reconstruct T9 Parking Area with PCC	\$292,600
Install Moveable Vehicular Barrier	\$12,000
T9 Vegetation Management Recommendations	\$8,200
Source: Park Engineering, Inc. and Umemoto and Cassandro Design Corp.	

4.4.2.6.2 Vegetation Management Recommendations

In addition to the general recommendations in Section 4.4.1 and the specific recommendations for the T9 parking area in Section 4.4.2.6.1, the planning team has identified vegetation management measures that should be taken to enhance this area. They include: (i) removing the vining growth hanging from tree branches on the downslope, makai side of this parking area to open up the vista, prolong the lives of adjacent trees, and allow better air circulation; and (ii) regularly trim the vining plants that grow up and over the CRM retaining wall so that they do not encroach on the trash receptacles, signs, and utility poles in the area.

The recommended vegetation management measures for the T9 Makiki Valley Trail Parking Area are shown in Figure 4.26, Figure 4.27, and Figure 4.28. The approximate cost of these measures is shown in Table 4.16.

Figure 4.26 T9 Vegetation Management Recommendations A



Remove vining growth hanging from tree branches over the roadway. Do not only trim bottom of growth as this will continue life cycle maintenance of this condition. Remove the vine material to prevent weight damage to the tree and roadway clearance issues.

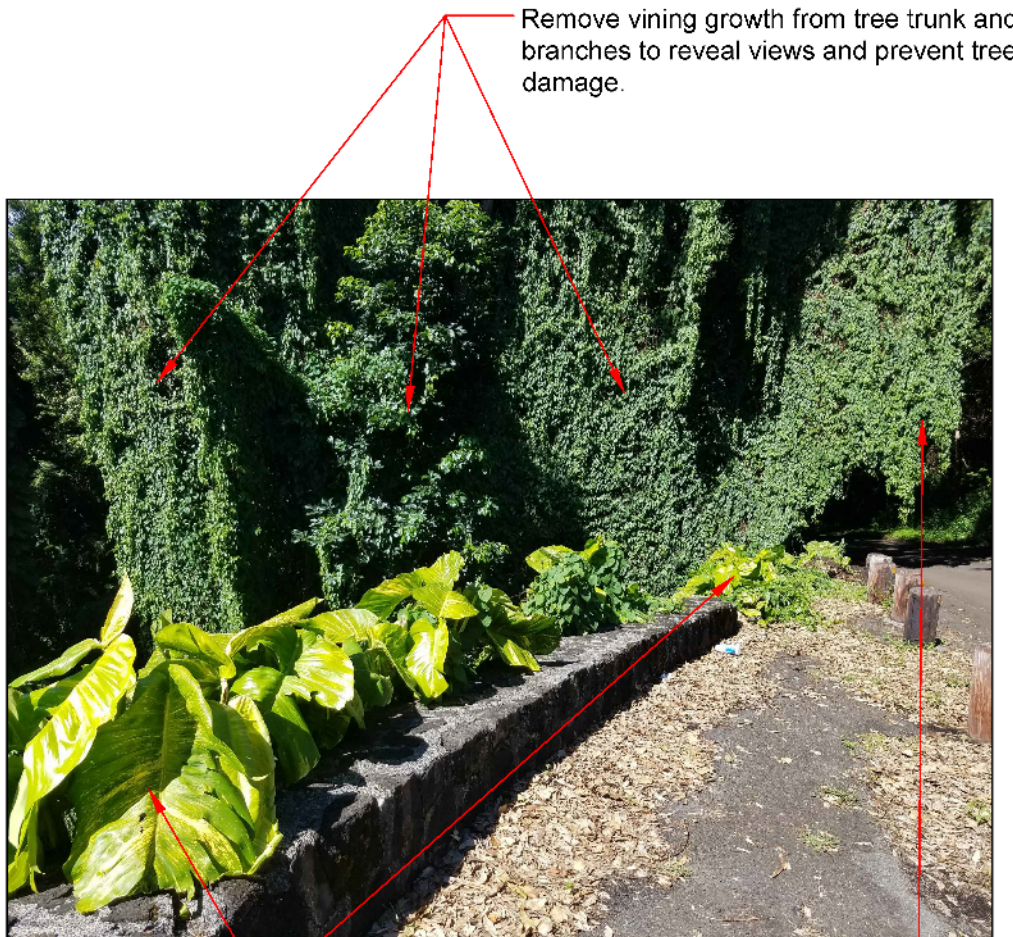
Source: Umemoto Cassandro Design Corp. (2018)

Figure 4.27 T9 Vegetation Management Recommendations B

Trash Receptacles at all Parking Areas and other location along the TRTD Corridor should be uniform. Concrete rounds allow use of a standard trash bag should be used. There should be a cover and the color should be uniform, such as a coffee brown or green.

Source: Umemoto Cassandro Design Corp. (2018)

Figure 4.28 T9 Vegetation Management Recommendations C



Remove vining growth from tree trunk and branches to reveal views and prevent tree damage.

Vegetative growth can rise slightly above the wall, but should never obstruct clear view of the top of the wall or grow on the roadway side of the wall.

Remove vining growth hanging from tree branches over the roadway. Do not only trim bottom of growth as this will continue life cycle maintenance of this condition. Remove the vine material to prevent weight damage to the tree and roadway clearance issues.

Source: Umemoto Cassandro Design Corp. (2018)

4.4.2.8 *T11 and T12: Nahuina and Kalawāhine Trail Parking Area Recommendations***4.4.2.8.1 *Physical Improvement Recommendations***

Based on the patterns of use and wear observed at these parking areas, the planning team recommends a series of measures which are intended to enhance this high-use portion of the corridor. These measures include:

- Consistent with the general recommendations in Section 4.4.1, the planning team recommends that the T11 parking area and T12 (i.e., the makai, paved portion) parking area be reconstructed with PCC. The engineering review conducted as part of the development of this CMP suggests that PCC would cost approximately \$67,100 more for T11 and \$24,200 for T12 than AC pavement, but once in place would last for many decades longer. During reconstruction, the total surface area at T11 can be modestly increased if designers so choose; the area would allow for that and thus a few more parking spots.
- Regarding the unpaved, informal overflow parking on the mauka side of T12, the planning team recommends that the most heavily used portions of this shoulder be resurfaced with 1" to 3" coarse aggregate which will drain well and have a reduced tendency to become muddy during periods of wet weather.

The reconstruction of the existing T11 and T12 parking areas would be done to the specifications shown Appendix B. The costs associated with this recommendation are summarized in Table 4.17 below.

Table 4.17 Estimated Cost of Recommended Improvements to T11 and T12 Parking Areas

<i>Recommendation</i>	<i>Estimated Cost</i>
Reconstruct T11 Parking Area with PCC	\$262,200
Reconstruct T12 Parking Area with PCC	\$60,500
Resurface mauka overflow of T12 with Gravel	\$25,000
T11 Vegetation Management Recommendations	\$7,500
T12 Vegetation Management Recommendations	\$2,600

Source: Park Engineering, Inc. and Umemoto and Cassandro Design Corp.

4.4.2.8.2 *Vegetation Management Recommendations*

The recommended vegetation management measures for the T11 parking area are shown in Figure 4.29 and Figure 4.30. The approximate cost of the vegetation management recommendations for the T11 and T12 parking areas are shown in Table 4.17.

Figure 4.29 T11 Vegetation Management Recommendations A

Prune downslope tree canopies to approximately 3' above relative elevation of parking area pavement to allow views over pruned canopies to Honolulu.

Remove tree branches that are downward hanging or heading in an orientation that is primarily below the horizontal plane to clear viewshed.

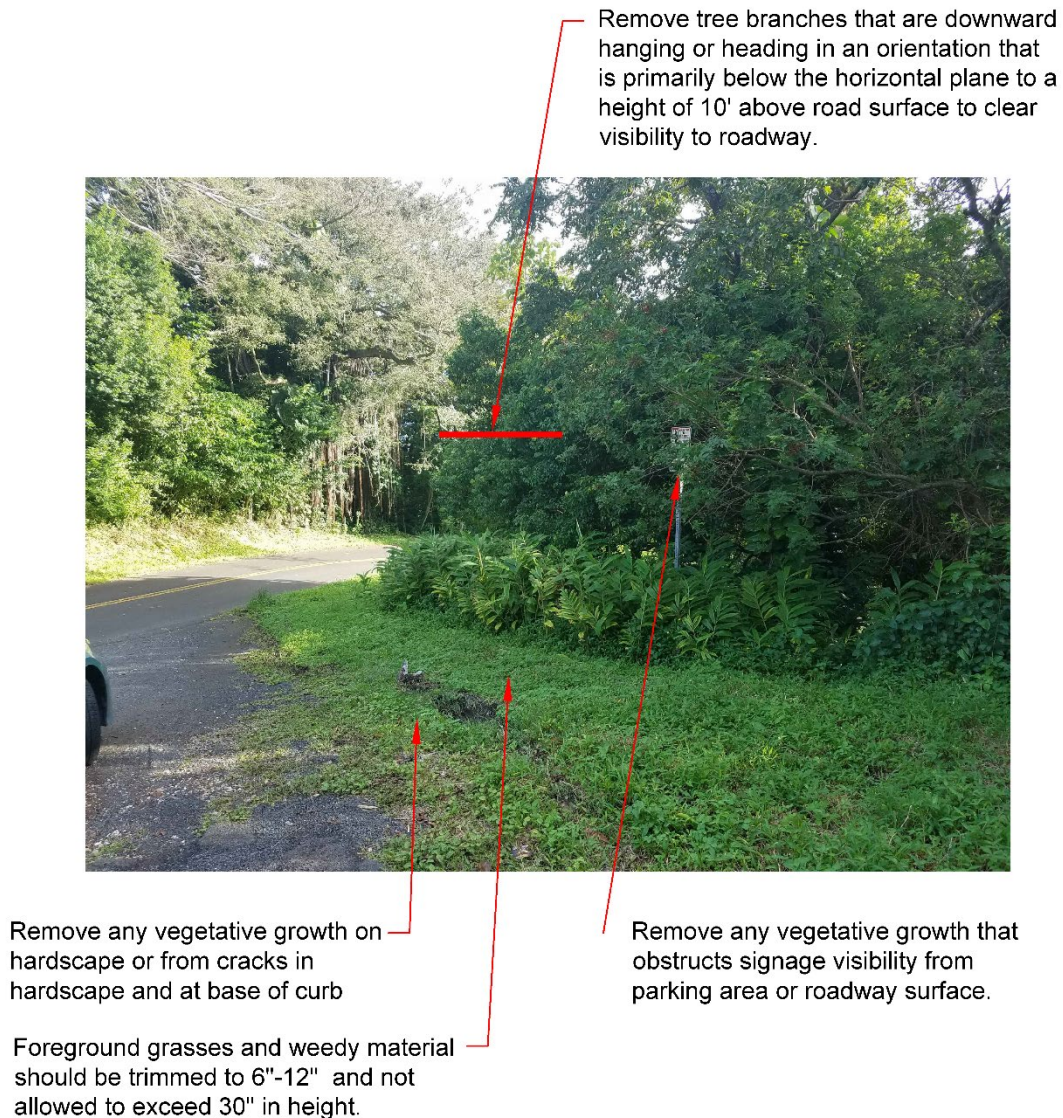


Remove any vegetative growth on hardscape or from cracks in hardscape and at base of curb

Trash Receptables at all Parking Areas and other location along the TRTD Corridor should be uniform. Concrete rounds allow use of a standard trash bag should be used. There should be a cover and the color should be uniform, such as a coffee brown or green.

Foreground bunch grasses and weedy material should be trimmed to 6"-12" and not allowed to exceed 30" in height.

Source: Umemoto Cassandro Design Corp.

Figure 4.30 T11 Vegetation Management Recommendations B

Source: Umemoto Cassandro Design Corp. (2018)

4.4.2.9 T16: Parking Area Recommendations

4.4.2.9.1 Physical Improvement Recommendations

Based on the patterns of use and wear observed at this parking area, the planning team recommends that the T16 parking area be reconstructed with PCC. The engineering review conducted as part of the development of this CMP suggests that PCC would cost approximately \$20,000 more than AC pavement per parking area, but once in place would last for many decades longer.

The reconstruction of the existing T16 parking area would be done to the specifications shown Appendix B. The costs associated with this recommendation is summarized in Table 4.18.

Table 4.18 Estimated Cost of Recommended Improvements to T16 Parking Area

<i>Recommendation</i>	<i>Estimated Cost</i>
Reconstruct T16 Parking Area with PCC	\$37,500
T16 Vegetation Management Recommendations	\$5,600
Source: Park Engineering, Inc. and Umemoto and Cassandro Design Corp.	


4.4.2.9.2 Vegetation Management Recommendations

The planning team’s vegetation management recommendations for the T16 parking area are shown in Figure 4.31, Figure 4.32, Figure 4.33, and Figure 4.35. The approximate cost of these measures is shown in Table 4.18.

Figure 4.31 T16 Vegetation Management Recommendations A

Remove or prune under canopy branches to remove branches that are or will enter the 17' min. vertical clear space in the LMZ and create a better vehicular sight lines along the roadway.

Remove vining growth from tree trunk and branches to reveal views and prevent tree damage.

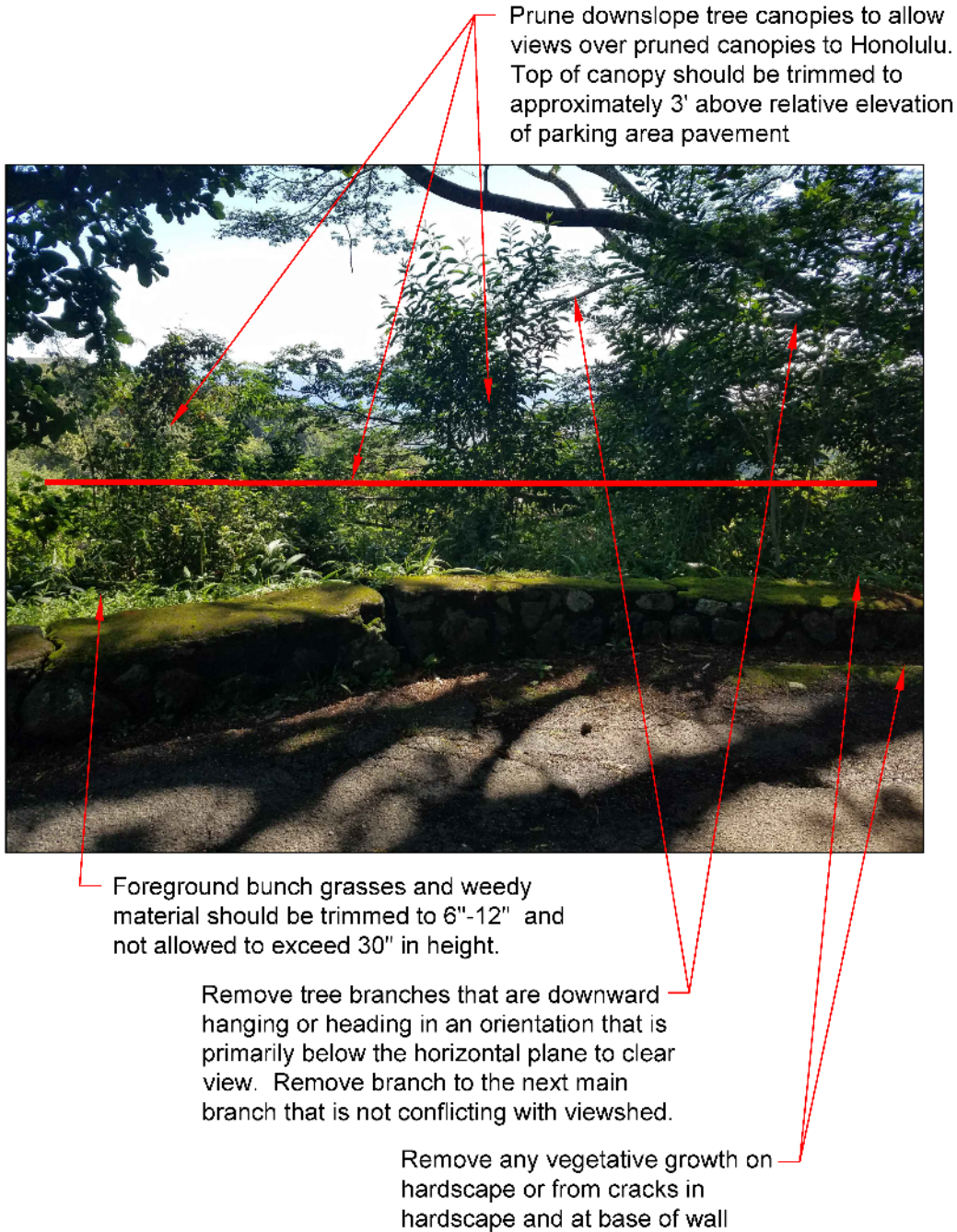


Remove any vegetative growth on hardscape or from cracks in hardscape and at base of wall

Remove any vegetative growth that has spread on top of the asphalt or concrete pavement. The edge of pavement should be clearly visible from the roadway.

Source: Umemoto Cassandro Design Corp. (2018)

Figure 4.32 T16 Vegetation Management Recommendations B



Source: Umemoto Cassandro Design Corp. (2018)

Figure 4.33 T16 Vegetation Management Recommendations C

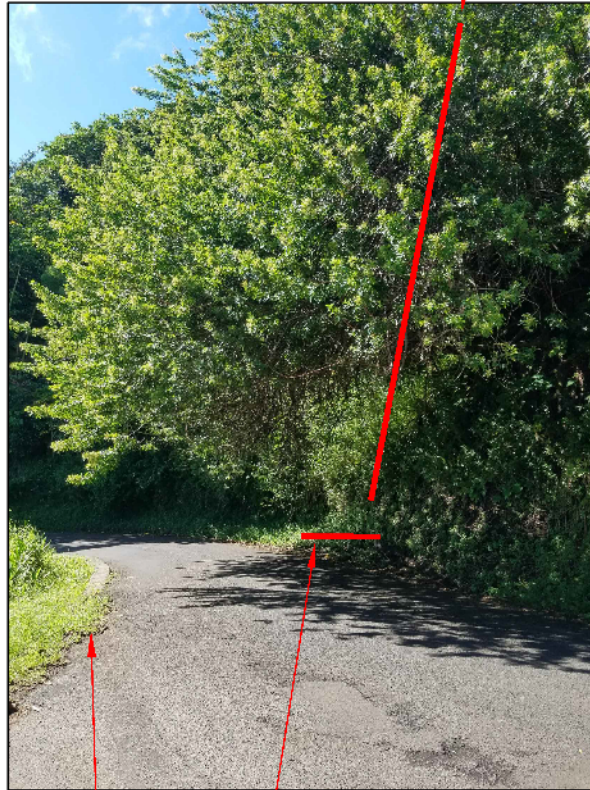


Remove tree branches that are downward hanging or heading in an orientation that is primarily below the horizontal plane to clear view. Remove branch to the next main branch that is not conflicting with viewshed.

Source: Umemoto Cassandro Design Corp. (2018)

Figure 4.34 T16 Vegetation Management Recommendations D

Remove or prune under canopy branches that are or will enter the 17' min. vertical clear space in the LMZ and create a better vehicular sight lines at this curve in the roadway. If tree cannot be removed without causing potential erosion on slope, heavily prune so the direction of branching is upward and as tight to the face of slope as possible.



Foreground bunch grasses and weedy material should be trimmed to 6"-12" and not allowed to exceed 30" in height.

Remove any vegetative growth that has spread on top of the asphalt or concrete pavement. The edge of pavement should be clearly visible from the roadway.

Source: Umemoto Cassandro Design Corp. (2018)

4.4.2.10 T17: Longan Tree Parking Area**4.4.2.10.1 Recommended Physical Improvements**

This is a relatively small parking area shaded by a large longan tree (*Dimocarpus longan*). Based on the patterns of use and wear observed at this parking area, the planning team recommends that the T17 parking area be reconstructed with PCC. The engineering review conducted as part of the development of this CMP suggests that PCC would cost approximately \$21,500 more than AC pavement per parking area, but once in place would last for many decades longer.

The reconstruction of the existing T17 parking area would be done to the specifications shown in Appendix B. The costs associated with this recommendation are summarized in Table 4.19.

Table 4.19 Estimated Cost of Recommended Improvements to T17 Parking Area

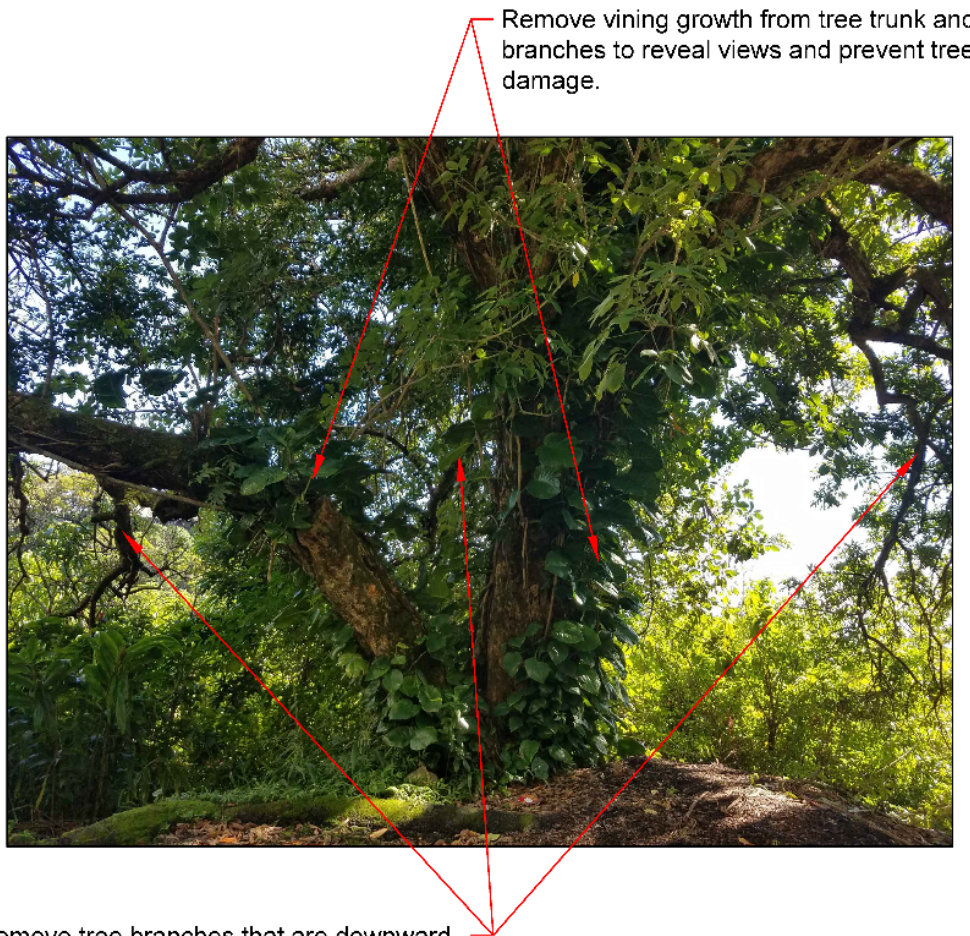
<i>Recommendation</i>	<i>Estimated Cost</i>
Reconstruct T17 Parking Area with PCC	\$44,900
T17 Vegetation Management Recommendations	\$3,600

Source: Park Engineering, Inc. and Umemoto and Cassandro Design Corp.

4.4.2.10.2 Recommended Vegetation Management

The planning team’s vegetation management recommendations for the T17 parking area are shown in Figure 4.35. The approximate cost of these measures is shown in Table 4.19.

Figure 4.35 T17 Vegetation Management Recommendations



Remove vining growth from tree trunk and branches to reveal views and prevent tree damage.

Remove tree branches that are downward hanging or heading in an orientation that is primarily below the horizontal plane to clear view. Remove branch to the next main branch that is not conflicting with viewshed.

Source: Umemoto Cassandro Design Corp. (2018)

4.4.2.11 T18 and T19: Pu‘u ‘Ōhi‘a Trailhead Parking Area Recommendations***4.4.2.11.1 Recommended Physical Improvements***

These two parking areas are principally used as trailhead parking for the Pu‘u ‘Ōhi‘a Trail. The T18 parking area is long, relatively narrow, and has no barriers; the T19 parking area is deeper and has a series of metal bollards. In the past, the vehicular entrance between the bollards was closed off with a heavy chain between 10:00 p.m. and 5:00 a.m. by a resident volunteer. However, for approximately the past decade, this has no longer been occurring and the chain that was once there is no longer present. Because there is no indication that this type of volunteer effort can be guaranteed in the future, the planning team considered recommending removal of these bollards as part of the reconstruction process. However, comments received through the draft review process indicate that the bollards may serve a continuing function of preventing reckless driving (e.g., high speed circular “donuts”) at this location. Thus, consideration should be given to maintaining or recreating this barrier when the parking area is reconstructed. The T18 and T19 parking areas appear to be well-drained and no improvements to drainage appear to be needed at this time.

In addition to the general recommendations related to signage and trash receptacles outlined in Section 4.4.1, and based on the patterns of use and wear observed at these parking areas, the planning team recommends that the T18 and T19 parking areas be reconstructed with PCC. While repaving these areas with AC pavement would suffice for several years, reconstruction with PCC would offer several advantages, including: (i) clearly delineating the parking area from the adjacent travelway; (ii) providing for improved safety; and (iii) offering a lower long-term cost. The engineering review conducted as part of the development of this CMP suggests that PCC in T18 and T19 would cost approximately \$61,000 and \$86,000 more than AC pavement in those locations, respectively, but once in place would last for many decades longer. If AC pavement continues to be used due to budgetary constraints, the T18 and T19 parking areas should be included in any repaving projects implemented for the adjacent travelway, as that is the surest and most economical means of contracting for that work.

The reconstruction of the existing T18 and T19 parking areas would be done to the specifications shown in Appendix B. The costs associated with this recommendation is summarized in Table 4.20 below.

Table 4.20 Estimated Cost of Recommended Improvements to T18 and T19 Parking Areas

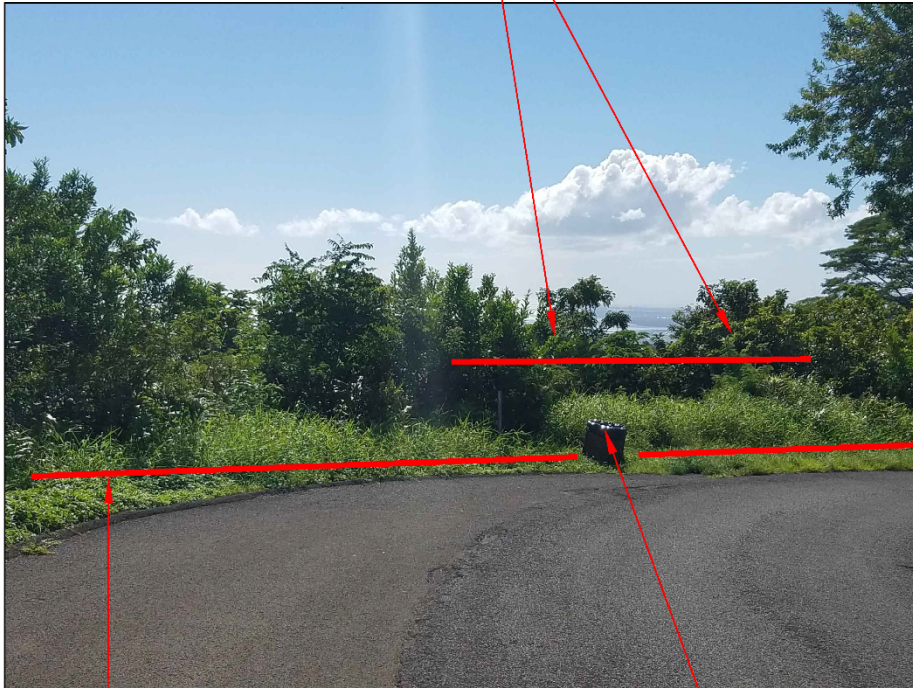
<i>Recommendation</i>	<i>Estimated Cost</i>
Reconstruct T18 Parking Area with PCC	\$195,100
Reconstruct T19 Parking Area with PCC	\$412,600
T18 Vegetation Management Recommendations	\$5,900
T19 Vegetation Management Recommendations	\$12,500
Source: Park Engineering, Inc. and Umemoto and Cassandro Design Corp.	

4.4.2.11.2 Vegetation Management Recommendations

The planning team’s vegetation management recommendations for the T18 parking area are shown in Figure 4.36. The planning team’s vegetation management recommendations for the T19 parking area are shown in Figure 4.37, Figure 4.38, Figure 4.39, and Figure 4.40. The approximate cost of these vegetation management measures is shown in Table 4.20.

Figure 4.36 T18 Vegetation Management Recommendations

Prune downslope tree canopies to allow views over pruned canopies to Honolulu. Top of canopy should be trimmed to approximately 3' above relative elevation of parking area pavement



Trash Receptables at all Parking Areas and other location along the TRTD Corridor should be uniform. Concrete rounds allow use of a standard trash bag should be used. There should be a cover and the color should be uniform, such as a coffee brown or green.

Foreground bunch grasses and weedy material should be trimmed to 6"-12" and not allowed to exceed 30" in height.

Source: Umemoto Cassandro Design Corp. (2018)

Figure 4.37 T19 Vegetation Management Recommendations A

Trash Receptables at all Parking Areas and other location along the TRTD Corridor should be uniform. Concrete rounds to allow use of a standard trash bag should be used. There should be a cover and the color should be uniform, such as a coffee brown or green.



Remove any vegetative growth on hardscape or from cracks in hardscape that extend into the roadway or parking area.

Remove bollards during repaving.

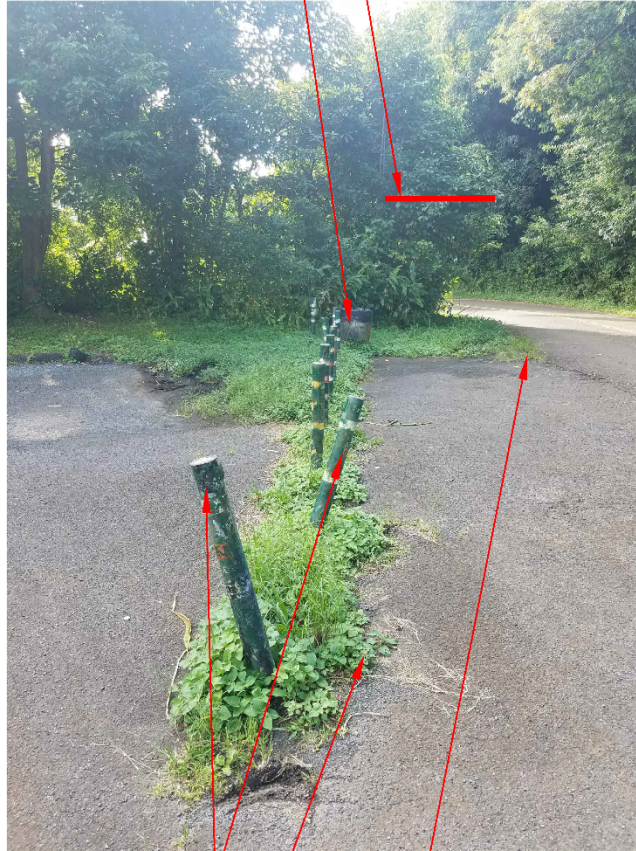
Foreground bunch grasses and weedy material should be trimmed to 6"-12" and not allowed to exceed 30" in height.

Source: Umemoto Cassandro Design Corp. (2018)

Figure 4.38 T19 Vegetation Management Recommendations B

Trash Receptables at all Parking Areas and other location along the TRTD Corridor should be uniform. Concrete rounds allow use of a standard trash bag should be used. There should be a cover and the color should be uniform, such as a coffee brown or green.

Remove tree branches that are downward hanging or heading in an orientation that is primarily below the horizontal plane to a height of 10' above road surface to clear visibility to roadway.



Remove all bollards during repaving.

Remove any vegetative growth on hardscape or from cracks in hardscape and at base of curb

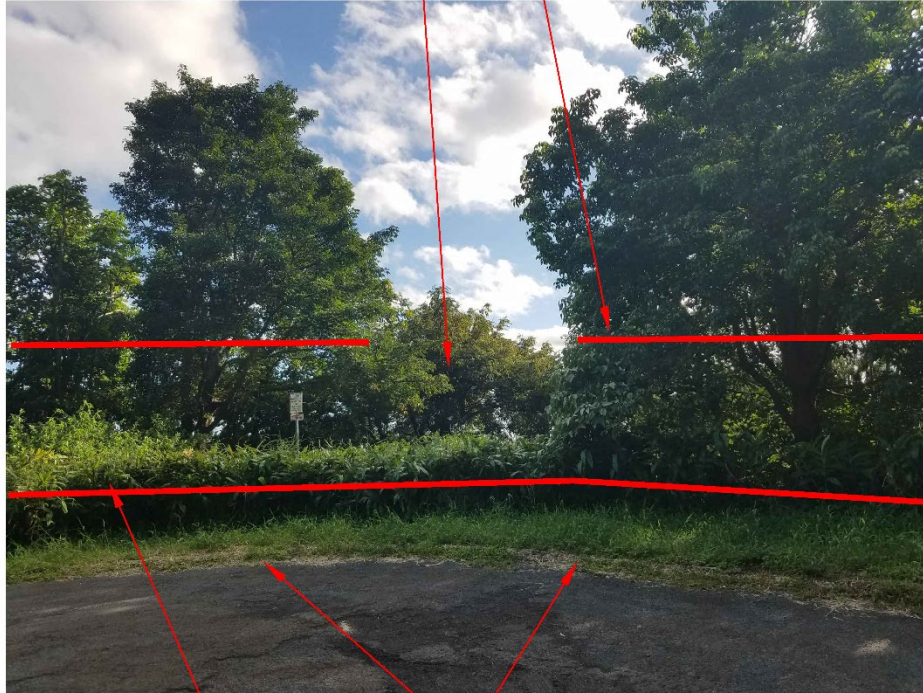
Foreground bunch grasses and weedy material should be trimmed to 6"-12" and not allowed to exceed 30" in height.

Source: Umemoto Cassandro Design Corp. (2018)

Figure 4.39 T19 Vegetation Management Recommendations C

Prune downslope tree canopies to allow views over pruned canopies to Honolulu. Top of canopy should be trimmed to approximately 3' above relative elevation of parking area pavement

Remove tree branches that are downward hanging or heading in an orientation that is primarily below the horizontal plane to clear viewshed to Punchbowl Crater and coastline beyond



Remove any vegetative growth on hardscape or from cracks in hardscape and at base of curb

Foreground bunch grasses and weedy material should be trimmed to 6"-12" and not allowed to exceed 30" in height.

Source: Umemoto Cassandro Design Corp. (2018)

Figure 4.40 T19 Vegetation Management Recommendations D

Prune vegetation away from trailhead signage so it is clearly visible from parking area and roadway.

Prune/trim vegetation to a height of 12" a min. of 20' from trailhead intersection with roadway to improve visibility of pedestrians and vehicles.



Remove all bollards during repaving.

Source: Umemoto Cassandro Design Corp. (2018)

4.4.2.12 Tantalus-Arboretum Trail Parking

The Tantalus Arboretum Trail is a short (0.3 mile) loop trail whose start and finish is located opposite 3300 Tantalus Drive. Because the gently sloped trail, which is part of the statewide trail network operated by Nā Ala Hele Trail and Access System, is very lightly trafficked, the small area on the road shoulder opposite the trailhead provides adequate parking for the few people who presently use this trail.

Nā Ala Hele Trail and Access System is presently seeking a grant to support the design and installation of environmentally themed public art along the Tantalus Arboretum Trail. The grant is intended to support two artists who will design and implement artworks that creatively engages the community and promotes environmental awareness and sustainable stewardship of natural resources. Design criteria will require that artworks placed along the trail are constructed from organic or biodegradable material. Each artist will receive a monetary stipend to cover costs including design, materials, transportation, and installation. A filmmaker and photographer will document the artists' creative process as they

install the art along the trail, and the resulting video and photographs will be exhibited at various locations downtown with the aim of bringing the forest to the city.

Because the term of this initial installation would be short, no permanent improvements are needed. Small groups of visitors would come to the exhibition in vans or minibuses that would carry them to and from the existing parking area opposite the trailhead. If this type of use of the trail were to become permanent and/or result in substantial numbers of visitors accessing the site in their own vehicles, parking over and above what is provided for in this plan would be required.

4.5 SAFETY RECOMMENDATIONS

4.5.1 ROAD USER SAFETY RECOMMENDATIONS

4.5.1.1 *Road Safety Recommendations Related to Vegetation Management*

As discussed in Section 3.6.1.1 many of the identified issues related to road safety involve improper management of roadside vegetation, or lack thereof. Examples of specific threats to the safety of road-users posed by inadequate vegetation management include, but are not limited to:

- Damage to vehicles that strike roadside vegetation extending into the travelway;
- The tendency of vehicles to cross the centerline in an effort to avoid roadside vegetation extending into the travelway.³⁵
- Limited line-of-sight around corners caused by thick vegetation.
- Reduced space on the road shoulder, making it difficult for pedestrians to move clear of passing vehicles in the travelway.
- Increased potential for falling trees or tree branches to obstruct the travelway and injure roadway users, particularly bicyclists and pedestrians.

Adherence to the vegetation management recommendations and standards provided in Section 4.3 of this TRTD-CMP, including the Landscape Maintenance Zones identified in Section 4.3.1.1 and the vegetation clearance standards provided in Section 4.3.1.2 will reduce, but not completely eliminate, the potential for hazardous interactions between road-users and vegetation in, on, or around the travelway. By way of illustration, maintaining grass, shrubs, and other vegetation on hairpin turns to a height of between 6 and 12 inches, and never allowing it to exceed 30 inches in height would eliminate concerns related to limited line-of-sight around sharp corners.

4.5.1.2 *Road Safety Recommendations Related to Condition of Roadway*

Section 3.6.1.2 notes that, in addition to those hazards related to inadequate vegetation management, the condition of the roadway, its embankments, signage, striping, and other accoutrements can have perilous implications for drivers and bicyclists. Specific threats to the safety of road-users resulting from poor roadway conditions include, but are not limited to:

- Reduced vehicle traction and damage to tire treads due to breakdown and potholing of the road surface.
- Lack of adequate guidance, warnings, and regulation of the flow of traffic due to weathered, damaged, overgrown, and vandalized signage (e.g., the “One Lane Bridge Ahead” sign which formerly warned drivers approaching the Hogsback from the mauka direction).

³⁵ This occurs most consistently with taller vehicles (e.g., refuse and delivery trucks) that would otherwise strike the overhanging vegetation.

- Poorly maintained embankments which result in landslides during prolonged or intense rain events.

While the TRTD corridor will remain narrow, wet, and winding, the long-term application of the remedial and ongoing roadway and drainage maintenance recommendations provided in Section 4.1 and Section 4.2 have the potential to eliminate nearly all of these hazards.

4.5.2 PUBLIC SAFETY RECOMMENDATIONS

4.5.2.1 *Public Safety Recommendations Related to Crime*

While there are isolated incidences of more serious offenses, the majority of crimes occurring in areas along the TRTD corridor are related to: (i) car break-ins, (ii) dumping, and (iii) vandalism. Because of this, focused recommendations are described below.

These crimes are concentrated at the parking areas shown in Figure 3.25 and discussed in detail in Section 3.7, particularly those which serve as trailheads and lookouts. While attempts to develop more quantitative and locational data related to crime reports within the Plan Area were unsuccessful (see discussion in Section 3.6.2.2), information gathered from, individual police officers, members of the community, and the TCA have allowed the planning team to develop what it believes are meaningful and useful recommendations on this issue.

The consensus which has emerged from the planning process is that, while desirable, a substantially increased police presence within the Plan Area is not likely to be possible due to HPD's budgetary and manpower limits. The low population density of the area, the long transit times required for police patrols, and the relatively low level of crimes occurring militate against any substantial increase in police presence within the TRTD corridor. In the absence of an increased police presence, the planning team has been challenged to identify measures which could meaningfully address crime in the Plan Area.

Based on the scope of the TRTD corridor and the limited resources available, the planning team has concluded that the most viable approach would be a community-based policing effort using surveillance cameras and signage at selected locations. Information from this system would provide the HPD with information it could use to focus enforcement efforts at times/places where they are most likely to produce positive results and furnish them with the evidence to support prosecution of criminals.

The precise details of such an effort are beyond the scope of the TRTD-CMP and will need to be developed by the responsible agencies and organizations. In addition to the HPD, DOFAW, and TCA, it would be helpful to involve a security contractor(s) with up-to-date knowledge of rapidly evolving surveillance equipment and techniques.³⁶ The planning team recommends that the monitoring and enforcement program include, at minimum, the following components:

- Signs should be placed at all parking areas warning of the potential for criminal activity. The signs should: (i) warn that it is a high-crime area; (ii) ask the public to avoid leaving valuables in cars and (iii) inform the public that the areas may be subject to surveillance, including the use of electronic devices, which may act as a deterrent to criminal activity, to some extent.
- Digital surveillance cameras should be placed at identified high-crime locations where the necessary electrical power and telecommunications infrastructure is present or can easily be made available. These devices would be capable of recording and storing digital images which could be made available to HPD when a crime is reported at that location. These cameras should be situated

³⁶ This could be best accomplished by developing a reasonably detailed Request for Proposals (RFP) that would be issued by the contracting entity and funded through either specific appropriation, community contributions, or a combination of these. The RFP should stipulate the use of robust equipment which will function effectively for extended periods with relatively low levels of maintenance in the rigorous environmental conditions which prevail in the Plan Area.

such that they are difficult to spot and access and should have sufficient resolution, range, and field of view that qualified staff reviewing the recorded images can accurately determine the nature of the illegal activity, the appearance of individuals engaging in criminal activity, the make, model, and license number of any vehicles that appear to have been used by the individuals involved in the criminal activity and the exact time at which the event occurred.

- If it appears to be useful, efforts should be made to find cooperative residents in adjacent areas who would be willing to place camera(s) on their property to record vehicles; in the event of illegal dumping, break-ins, or other crimes this information could be used in concert with parking area footage as evidence for prosecution.
- The technology related to cameras, digital recordings, and power supply are rapidly advancing and, frequently, becoming less costly. Any plan for surveillance of parking areas along the TRTD corridor should be adaptive in nature, using the best available combination of technology to provide HPD with the tools necessary to reduce, if not eliminate, vehicle break-ins, illegal dumping, and vandalism.

Finally, in a few select locations, the use of barriers to prevent vehicles from getting close enough to downslope embankments to dump refuse may be justified. These instances are discussed in Section 4.4 which deal with recommendations related to parking areas and trailheads.

Preparing a detailed budget for implementation of public safety recommendations related to crime was beyond the scope of the TRTD-CMP and will need to be developed by the responsible agencies and organizations. However, based on limited discussions with community members who have researched the topic, it seems likely that annual funding on the order of \$5,000 in the form of grants-in-aid to community organizations (see Section 5.3.4) and/or allocations to agencies for equipment and staff time should be sufficient to provide significantly improved monitoring and protection for vehicles using the parking areas within the corridor.

4.5.2.2 Public Safety Recommendations Related to Fire

Because of the relatively high rainfall that prevails there throughout the year, there have been no significant wildfires in the planning area. Because of this, the lack of a municipal water supply for firefighting has not been considered a major problem. The extent to which rainfall patterns may change over time in the future as a result of global climate change is uncertain. What is known is that the amount of vegetative fuel in the planning area is greater than it was in the past as the result of the spread of alien plant species. In particular, three of the most aggressive and pervasive plant communities in the Plan Area—eucalyptus, haole koa, and guinea grass—are three of the most flammable species in the Hawaiian Islands, and all three are growing in ever increasing abundance directly adjacent to the most likely sources of ignition (e.g., cigarettes tossed from passing cars, sparks and/or hot exhaust systems from vehicles travelling through the corridor, fireworks set off by persons at roadside parking areas, etc.) and residences constructed of flammable materials. The potential for catastrophic fire which this combination creates was illustrated recently by the Malibu, California fire in November 2018 wherein the fire spread via eucalyptus tree canopy, with the oil-rich crowns becoming explosive and resulting in the loss of lives, property, and habitat.

While no plan can completely eliminate the possibility for wildfire, the planning team has concluded that the best means to reduce the risk of wildfires is through implementation of the vegetation management recommendations and standards provided in Section 4.3. In acknowledgement that the most likely sources of ignition will be from the roadway, these protocols would reduce the amount of grasses, shrubbery, and overhanging trees which have the potential to be ignited by persons and vehicles travelling through the corridor.

4.5.2.3 Public Safety Recommendations Related to Falling Trees

While maintaining a clear roadway is the responsibility of the CCH, there are locations within the TRTD corridor where trees on state-owned land adjacent to the roadway and/or private property have grown to the point where they could fall on the road, homes, or other private property as a result of age, disease, or weather. Many of these may be in the areas listed in Section 4.3.2.1 where past reforestation efforts were focused.

The planning team recommends that DOFAW seek funding to enable Forestry staff to work with a qualified arborist to survey the corridor annually, assess the health and condition of the trees in these areas, and initiate remedial action if the results of that survey indicate that it is warranted. It is important to note that, with the exception of an imminent risk to homes, DOFAW's ability to perform these surveys and tree trimming/removal activities along the TRTD corridor is contingent upon funding, staffing, and engaging an arborist, and thus DOFAW cannot be deemed liable if unable to complete.

4.5.3 DRIVER BEHAVIOR SAFETY RECOMMENDATIONS

Driver behavior safety issues, as defined in this report, are those threats to human safety which result from unsafe driving practices, whether intentional or otherwise. These behaviors, as discussed in Section 3.6.3, may include: (i) speeding, (ii) racing, (iii) drifting, and (iv) driving while under the influence of drugs and/or alcohol; however, other less clearly defined behaviors such as texting or other manner of inattentive driving have the potential to be equally dangerous to drivers, bicyclists, and pedestrians.

There are relatively few tools available to change unsafe driving behavior on the TRTD corridor. Establishing lower speed limits and effectively enforcing them would require a level of police presence that: (i) would result in only temporary compliance, (ii) incur prohibitive costs; and (iii) would unfairly burden area residents. It would also increase travel times to the point where drivers would find them unreasonably restrictive and would, in turn, be likely to exceed the posted limit, further exacerbating the problem rather than remedying it. In addition, it is generally desirable that the level of intervention be commensurate with the problem behaviors, and the planning team was not able to obtain qualitative data from HPD that would support the introduction of draconian methods of control. Lastly, use of cameras to enforce speed limits and other traffic laws is an island wide issue that cannot be effectively addressed in this Plan.

At a passive level, to the extent that the roadway maintenance, signage improvements, and vegetation management protocols recommended in this report are implemented and maintained over the long-term, they will make a positive contribution to the safety of the TRTD corridor. While these, in of themselves, will not drastically alter driver behavior, they may marginally reduce the incidence of poor driver behavior as the general appearance of the area reflects better management and oversight. These enhancements will also improve driver visibility, vehicle traction, and traffic flow guidance from signs, striping, and reflectors which are frequently maintained and kept free from vegetation.

While a comprehensive analysis of traffic safety in the Plan Area is beyond the scope of this CMP, there remain certain areas (see Figure 3.22) and times which are known to be problematic. Accordingly, the planning team recommends that DTS and other agencies tasked with management of Round Top Drive and Tantalus Drive limit their consideration of traffic calming measures in the Plan Area to those which are: (i) relatively inexpensive, (ii) able to accommodate larger delivery and refuse trucks, and (iii) compatible with the setting and driver expectations. Measures for consideration include:

- Electronic speed feedback signs indicating the speed of vehicles as they approach;
- Convergence chevrons on the road surface where side streets converge with the TRTD corridor;
- Legends on the roadway, indicating the speed limit or warnings (e.g., "15 MPH" or "SLOW");
- Flexible lane delineators which could be installed to discourage drifting near sharp turns;

- Road surface treatments which could discourage or inhibit drifting;

While some individuals have suggested that speed bumps, speed tables, or other kinds of roadway design features should be implemented to reduce unsafe driving, careful consideration of all factors have led the planning team to conclude that none of these could be implemented without unduly reducing the functionality of the roadway and/or introducing new safety concerns of their own, as drivers would pass over them without slowing, as some would almost certainly do.

Preparing a detailed budget for implementation of measures that would encourage safer driving behavior was beyond the scope of the TRTD-CMP and will need to be developed by the responsible agencies and organizations. However, based on limited discussions with community members who have researched the topic, it seems likely that annual funding to DTS averaging \$10,000 would provide sufficient funds for it to respond to site-specific issues of this sort as they are identified.

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CHAPTER 5 – IMPLEMENTATION

5.1 INTRODUCTION

As indicated at the beginning of this report, while the CCH has assumed responsibility for the Tantalus Drive and Round Top Drive roadways, the effective long-term management of the roadway requires work on State-owned land adjacent to the roadway and directly affects private landowners whose property abuts, or whose sole access is via the roadway. Determining exactly which entity is responsible for what portion is further complicated by the fact that a metes-and-bounds delineation of the roadway has never been finalized. Hence, successful implementation of plans for the corridor is highly dependent upon the voluntary cooperation of all the responsible parties.

The remainder of this chapter is divided into the following main parts:

- Section 5.3 contains a broad discussion of the way that responsibilities within the planning area are divided functionally and geographically among different agencies and private landowners.
- Section 5.4 describes a framework for historic preservation and review when conducting operations within the Historic Roadway.
- Section 5.5 discusses the way that the measures that the Plan recommends would be funded. It distinguishes between costs that the various entities are already bearing and those which are additions.
- Section 5.6 provides a master implementation table which relates each of the TRTD-CMP's recommendations with the responsible parties, proposed budgets, and other relevant information.

5.2 MODEL FOR IMPLEMENTATION

To reiterate the structure of this TRTD-CMP:

- Chapter 3 identifies, classifies, and documents the issues and challenges which are present in the Plan Area, irrespective of jurisdiction or responsibility;
- Chapter 4 provides practicable, actionable range of potential remedial and management options to address the challenges present in the corridor; and this
- Chapter 5 compiles cost estimates related to each measure recommended and invites agencies to work in a coordinated fashion to implement these recommendations.

As noted previously in this report, implementation of some of the recommendations may only require minor procedural changes in various CCH and State departments. However, because of the size of the Plan Area and the pressing nature of some of the issues present within it, some will require significant investments in equipment, staffing, and capital improvements. While these changes will be contingent upon the funds and other resources available to management agencies, the TRTD-CMP has been designed to be sufficiently flexible to allow for incremental and coordinated progress—whether concurrently or sequentially—over a period of many years, even as resources and priorities fluctuate.

The treatment of the parking areas and trailheads (see Section 3.7 and Section 4.4) is useful to illustrate the intent of this structure because: *(i)* being on State-owned land accessed via the CCH roadway, they typify the jurisdictional complexities of the Plan Area; *(ii)* they offer an opportunity for cooperative cost-sharing between the CCH and the State; and *(iii)* they benefit area residents, the O'ahu community, and tourists alike. They may also, as discussed in greater detail in Section 5.3.4, afford opportunities for advancing public-private partnerships.

The total cost of reconstructing the parking areas and trailheads within the corridor, as recommended in Section 4.4, is approximately \$5.3 million. While this is a significant expenditure, it is a model for recommendations made throughout this TRTD-CMP, insofar as:

- The work can be accomplished over a period of years, and as funds are available.
- The parking areas and trailheads may be constructed using materials which: (i) will reduce the future maintenance costs for a period of decades or (ii) have lower immediate capital costs but are more costly over the long run.
- It can be built and maintained using State personnel and resources.
- The approach provides opportunities for public-private partnerships wherein private organizations (e.g., the TCA, FOT, trail user groups, etc.) assist with periodic vegetation maintenance and cleaning at trailheads, adopted corners, and other key areas in order to enhance the corridor.

Ultimately, most or all the recommendations which are made in this report follow a similar model, where they are intended to be planned and implemented in a programmatic and phased way over a period of many years.

5.3 GEOGRAPHIC & FUNCTIONAL AREAS OF RESPONSIBILITY

While much of the TRTD roadway occupies land that is controlled by the CCH, the much larger area through which the corridor passes is under the jurisdiction of the State of Hawai‘i and, to a much lesser extent, private landowners. Because of that and the fact that the preparation of the TRTD-CMP was funded by the State of Hawai‘i, the State responsibilities are discussed first (in Section 5.3.1). The nature of the CCH’s authority, as well as the way it has chosen to divide responsibilities among various Departments in accordance with CCH ordinances, is discussed in Section 5.3.2.

5.3.1 STATE OF HAWAI‘I RESPONSIBILITIES

5.3.1.1 DLNR-DOFAW

As noted in Section 1.5.1, the great majority of the lands adjacent to the TRTD corridor are owned and passively managed by the State of Hawai‘i. The lands are in the HWFR and administered by DLNR-DOFAW. DOFAW manages the HWFR as part of the FRS for a variety of public uses and benefits, pursuant to the authority granted to it by HRS Chapter 183 and HAR §104.³⁷ Those public uses include such things as: (i) constructing, restoring, and maintaining roads and trails, arboreta, picnic and camping areas, viewpoints, and signs; (ii) providing public recreation and hunting opportunities; and (iii) increasing and maintaining public access to forests. Because of its location close to Honolulu’s urban core, the trails within the planning area are of particular importance, and DOFAW manages these trails as part of its Nā Ala Hele Hawai‘i Trail and Access System.³⁸ The most important interface between the trails and the road corridor occurs at the various trailheads and parking areas.

Typical minor operations and uses within the FRS, such as: (i) the removal of invasive species, (ii) placement of signs, (iii) repairs to existing structures or land uses, (iv) tree removal; and (v) other minor land and resource management actions, which are part of DLNR-DOFAW’s ongoing management actions can be conducted under its sole authority or be reviewed and approved administratively by the Office of Conservation and Coastal Lands (OCCL), as appropriate. Major projects and proposed land

³⁷ A much smaller portion of the roadway within the corridor abuts private property (see ControlPoint Surveying, Inc.’s May 15, 2015 *Tantalus-Round-Top Drive Boundary Study Report* for detailed parcel maps).

³⁸ HRS Chapter 195D, Hawai‘i Statewide Trail and Access System, provides the basic authorization for the trail system. Hawai‘i Administrative Rules, Title 13, Chapter 130, contains the specific regulatory guidance for its operation.

uses outside of the FRS must be reviewed, to determine the level of Conservation District Use authorization that may be required, and approved by OCCL or the BLNR, pursuant to HAR §13-5. Regarding proposed improvements which are either within the road ROW or which have the potential to significantly impact it, DOFAW will coordinate with the appropriate department(s) of the CCH, pursuant to HRS §264-1. Finally, actions which have the potential to affect historic roadway features in a significant way will be coordinated with the State Historic Preservation Division (SHPD), pursuant to HRS §6E.

5.3.1.2 DLNR Division of State Parks

DLNR's Division of State Parks operates the Pu'u 'Ualaka'a State Wayside. The park is situated adjacent to, and accessed from, Round Top Drive and it provides a beautiful, panoramic view of southern O'ahu from Diamond Head to Pearl Harbor. While the park is technically outside of the Plan Area, the fact that Round Top Drive is the only means of accessing it, and the need to maintain the stability of the steeply sloping land immediately mauka of the adjacent roadway means that the Division of State Parks has an important stake in the planning process.

5.3.2 CITY AND COUNTY OF HONOLULU RESPONSIBILITIES

The CCH has divided responsibility for the TRTD corridor land that it controls along functional, rather than geographic lines. The general responsibilities that each of these agencies would have are summarized in Subsections 5.3.2.1, 5.3.2.2, and 5.3.2.3. The funding and staffing that would be required to accomplish that are detailed in Section 5.5.

5.3.2.1 Department of Facilities Maintenance

The DFM is responsible for maintaining the roadway itself, traffic signs, and the markings that serve it. The Department of Parks and Recreation Division of Urban Forestry assists DFM by clearing fallen trees or large branches from the roadway.

5.3.2.2 Department of Design and Construction

The DDC is the primary agency responsible for the City's CIP. Its Civil Division plans, designs, and constructs CIP-funded projects related to infrastructure of facilities within CCH public rights-of-way including streets and highways, drainage and flood control systems, bridges, and other public works structures.

5.3.2.3 Department of Transportation Services

The DTS consists of four divisions: (i) Public Transit, (ii) Traffic Engineering, (iii) Traffic Safety and (iv) Technology, and Transportation Planning. The Traffic Engineering Division (Traffic Safety and Alternate Modes Branch) is the only one that has historically had responsibilities in the Plan Area, and that has been limited principally to exploring traffic calming measures. However, the *O'ahu Bike Plan* includes one project within the Plan Area.

5.3.3 ABUTTING PRIVATE LANDOWNER RESPONSIBILITIES

While the great majority of the land abutting the roadway is State-owned, some of it is privately owned, and in many cases private residences have been constructed on these private parcels. While some of the residences are immediately adjacent to the roadway, in many cases the homes are set back a goodly distance from the roadway, and the area between the roadway and homes is heavily vegetated. In *Whitesell v. Houlton*, 632 P.2d 1077 (App. Ct. 1981), a Hawaiian appellate court first adopted what is generally known as the "Hawai'i Rule," which holds that when there is imminent danger of overhanging branches causing "sensible" harm to property other than plant life, the tree owner is liable for the cost of trimming the branches as well as for the damage caused. In adopting what it called "a modified Virginia rule", the Hawaiian court held that:

“overhanging branches which merely cast shade or drop leaves, flowers, or fruit are not nuisances; that roots which interfere only with other plant life are not nuisances; that overhanging branches or protruding roots constitute a nuisance only when they actually cause, or there is imminent danger of them causing, sensible harm to property other than plant life, in ways other than by casting shade or dropping leaves, flowers, or fruit; that when overhanging branches or protruding roots actually cause, or there is imminent danger of them causing, sensible harm to property other than plant life, in ways other than by casting shade or dropping leaves, flowers, or fruit, the damaged or imminently endangered neighbor may require the owner of the tree to pay for the damages and to cut back the endangering branches or roots and, if such is not done within a reasonable time, the damaged or imminently endangered neighbor may cause the cutback to be done at the tree owner’s expense.”

If this rule were applied to the TRTD corridor, private landowners would bear the cost of keeping a sizeable stretch of the roadway free of overhanging vegetation and trees that might fall into the roadway. Even a cursory analysis shows that there are two major problems with the strict application of such a rule to the corridor. First, the financial burden on landowners could easily exceed their ability to pay. Second, the rules that govern actions on land that is within the State Conservation District (i.e., all of the land within the Plan Area) mean that the permitting burden on private landowners would be difficult or impossible for them to bear. For this reason, government has long-assumed primary responsibility for maintaining vegetation within the corridor.

Having said that, it is also true that many of the owners of private land that abuts the roadway have gone out of their way to help manage the corridor. Over the years they have participated in community work days to help remove junk, trim vegetation, and clean up trash. The TCA’s “adopt-a-corner” program has kept the grass trimmed and shrubbery tidy at many of the key curves along the roadway, helping to maintain adequate sight-distance for drivers and beautifying the corridor. Consequently, this TRTD-CMP recommends that this public-private partnership be fostered on an ongoing basis, and that the relevant government agencies continue to take the lead in managing vegetation adjacent to the roadway.

5.3.4 COMMUNITY-BASED ORGANIZATIONS

One of the most exceptional aspects of the TRTD Plan Area is the extent to which the community, and community-based organizations, have stepped forward to provide sustained leadership, energy, and resources (both human and capital) for its improvement. Importantly, some of these organizations such as the TCA and FOT, have held out the possibility of partnering with government agencies to oversee implementation of some of the measures described in this report. This partnership would take the form of a Memorandum of Understanding (MOU), curatorship agreement, or similar mechanism between the community organization and the State and CCH and would be contingent upon receipt of outside funding being made available through governmental appropriations, grants, or other means.

In this scenario, the State and CCH would enter into an MOU with one or more community organization which would authorize the selected organization(s) to procure and administer one or more contracts for services along the corridor. These services could include, but would not necessarily be limited to, implementation of vegetation management protocols described in Section 4.3 and implementation of the public safety measures described in Section 4.5.2.1. In exchange for taking on these responsibilities, and per the terms of the MOU, the State and CCH would create a special fund and commit to making annual contributions to it for a specified term and provide for those funds to be used to compensate the entities that the community organization contracts with for the performance of the work. Based on the input it has received from members of the Advisory Group, the planning team has concluded that this approach has the potential to: (i) be less cumbersome, (ii) more cost-effective than other available

options, and (iii) offer the additional advantage of placing oversight of the contract into the hands of the community it serves.

The planning team recommends that meetings be held between the three potential parties to the MOU that have been identified to-date (i.e., TCA-FOT, CCH, and DLNR-DOFAW) to discuss the appropriate path towards creation of such an agreement. These meetings would include both elected officials and City and State agency personnel and would be dedicated to exploring the scope, term, and mechanisms by which an MOU could provide for the funding and implementation of the necessary maintenance activities. If the details can be worked out to the satisfaction of all parties, the resulting MOU or similar document could be finalized and executed.

5.4 HISTORIC PRESERVATION AND REVIEW

As noted in Section 1.2, in March 2007 TRTD was added to the State of Hawai‘i’s Register of Historic Places (Site No. 50-80-14-9019), and in August 2009 it was placed on the National Register of Historic Places, the first such designation for a roadway on O‘ahu. According to the document nominating it to the National Register (see Appendix D for the complete form), the historic property’s character-defining features include:

“the roads, lookouts, culverts, retaining walls and curbs along the shoulders and encompasses the entire public road right of way. The period of significance is from 1890, when residents of Honolulu petitioned the Kingdom of Hawaii for a carriage road to the top of Tantalus, until approximately 1954 when the present roadside drainage improvements were completed.”

The purpose of designating the TRTD right-of-way as a Historic Roadway was to help it retain its rural nature by preserving its unique characteristics. As a listed historic roadway, the TRTD corridor is considered a “significant historic property” under state law. As such, the Secretary of the Interior’s Standards for the Treatment of Historic Properties provides the standards and guidelines for appropriate design and construction parameters to protect the defining features and historic integrity of the resource. Defining characteristics of the Historic Roadway include, but are not necessarily limited to:

- The historic footprint of the road as determined by the 1936 federal WPA project (see Section 1.4); the footprint is represented by the width and alignment of the current roadway.
- The hand-laid, split rock retaining walls and culverts that were first constructed in the late-19th and early 20th centuries and are found along the entire length of the roadway, including notable areas such as the Hogsback.
- The unique, panoramic views of Honolulu and its environs, including vistas of Diamond Head, Mānoa, the Airport Runway, Punchbowl, and Waikīkī.
- Limited use of official signage and road markings.

Thus, where new walls, culverts, or other structures may be needed, primary consideration should be given to replicating the original forms and materials in their replacements, where feasible.

In 2012, as a result of discussions related to repair or reconstruction of the Hogsback, the SHPD directed the CCH to prepare a Programmatic Agreement (PA) for improvements, stating that, “this PA will need to be in effect prior to SHPD review of any new projects within the Tantalus/Round Top Drive Historic Roadway”.³⁹ In response to this directive, efforts were conducted to draft a PA, which culminated in a *Programmatic Agreement Between the State Historic Preservation Division and the City and County*

³⁹ SHPD Letter to CCH-DDC, dated June 19, 2012 (File No: 1206AW09).

of Honolulu Regarding Tantalus/Round Top Drive Historic Roadway Improvements – 5th Draft (see Appendix E for the complete draft). The Draft PA included stipulations for design guidelines, specialized signage, the discovery of previously unidentified historic properties, dispute resolution processes, and amendments to the agreement. It was intended to be valid for a period of 5 years from its execution, at which point it was to be reviewed and renewed. However, no final agreement was made between the participating parties, and the PA was never executed or placed into effect.

Notwithstanding the fact that the PA has not yet been finalized and signed, the guidelines developed through the PA process (see Table 5.1 below) remain a valid, albeit non-binding, point of reference. They should be given due consideration in the planning of each of the recommended improvements identified in Chapter 4 which have the potential to affect the Historic Roadway while also considering the critical importance of allowing it to continue to fulfill its original and essential transportation function, until such time as a superseding PA is executed.

Table 5.1 Design Guidelines from the 2012 Programmatic Agreement (5th Draft)

1–The current/historic footprint of the road shall be preserved.	<ul style="list-style-type: none"> a) The roadway shall not be straightened or relocated as a part of any maintenance or construction. b) When road shoulders or roadside planting is disturbed by maintenance or construction, area shall be replanted with low maintenance, low growing plants to improve sight lines.
2 – The current width of the road shall be preserved.	<ul style="list-style-type: none"> a) The roadway shall not be widened as a part of any maintenance or construction.
3 – The macadamized road surface shall be preserved.	<ul style="list-style-type: none"> a) Any concrete roadbed required for structural purposes shall be surfaced with asphalt to match the existing roadway or finished in a manner mimicking asphalt. b) Any maintenance or new construction shall include repavement of roadway shoulders to improve road drainage and control runoff.
4 – All original hand-laid and faced bluestone basalt rockwork walls and curbs shall be preserved.	<ul style="list-style-type: none"> a) All new safety barriers and those modified for safety or drainage shall be replaced with hand-laid and hand-faced basaltic stone to match the existing. b) All rebuilt stone walls shall be rebuilt to their historic height. c) New stone walls shall have a maximum height of 24 to 36 inches depending on location, posted speed limits, and safety issues. d) Repaired or rebuilt stone walls shall be repaired in kind to match and reuse original historic materials. When original materials are insufficient in quantity, new stone shall match existing. e) Historic walls shall be repaired or rebuilt by trained masons with experience working with historic stonework.
5 – Official road signage shall be minimized and centralized.	<ul style="list-style-type: none"> a) All informational roadway signage shall be consolidated into a single location at each end of the historic 8-mile drive—this includes parking, speed and other restrictions, distance indicators, maps, and historical markers. Hiking trailhead yield signs, and side street identifiers may be located at their reference point. b) Signage required along the historic roadway should be designed to harmonize with the natural surroundings.
<p>Source: <i>Programmatic Agreement Between the State Historic Preservation Division and the City and County of Honolulu Regarding Tantalus/Round Top Drive Historic Roadway Improvements – 5th Draft (2012)</i></p>	

It is important to note that these guidelines were intended to promote, not inhibit, timely repair and maintenance of the Historic Roadway while curating its defining characteristics for the enjoyment of future generations. Further, not all the recommended design guidelines, such as those related to

signage, are consistent with the historic realities of the corridor. In some instances, adhering too closely to these guidelines may conflict with sound principles of design, engineering, or safety and general preference should be given to pragmatism over style. The potential for such conflicts was acknowledged in the original draft PA (see Appendix E, Sections IV, V, and VI) which allowed for variance from these guidelines in consultation with the participating parties, including DOFAW, CCH, and SHPD; this flexibility in approach should be observed moving forward.

As a means of guidance for determining whether or not an individual project recommended as part of this TRTD-CMP should consult with SHPD regarding the potential for adverse impacts to the Historic Roadway, potential projects may be evaluated against HRS, Chapter 6E and its implementing regulations, contained in HAR, Chapter 13-275 *Rules Governing Procedures for Historic Preservation Review for Governmental Projects*, which states (HAR, §13-275-7):

- a. *The effects or impacts of a project on significant properties shall be determined by the agency. Effects include direct as well as indirect impacts.*
- b. *Effects include, but are not limited to, partial or total destruction or alteration of the historic property, detrimental alteration of the properties' surrounding environment, detrimental visual, spatial, noise or atmospheric impingement, increasing access with the chances of resulting damage, and neglect resulting in deterioration or destruction.*

Finally, the importance of preserving the Historic Roadway must be balanced with the need to maintain access to the Round Top-Tantalus community and the FRS, and the demands of public safety. All parties participating in discussions related to potential projects or a new PA should work collaboratively to ensure that needed maintenance, repairs, and improvements are conducted in a timely and efficient way and before catastrophic failures create a demand for emergency work which cannot fully accommodate the purposes of historic preservation.

5.5 FUNDING AND STAFFING

The estimated costs of implementing the measures that the planning team has recommended are enumerated in Chapter 4. Some of these costs are associated with the continued implementation of existing operating and maintenance activities. Others stem from the recommended improvements to the operating and maintenance procedures and activities. Finally, many costs – including all of the largest ones – are associated with capital improvements that the planning team believes are needed to ensure the long-term health and functionality of the corridor and to achieve the goals and objectives of the TRTD-CMP identified in Section 2.2.

Most of what follows is presented in a tabular format. The numbers themselves come from the cost estimates presented in Chapter 4. The planning team is responsible for those estimates and for the way this report suggests they be allocated between specific parties. In most cases, the collaborative nature of the planning process has allowed us to make the allocations based on consensus among the various parties. This was not difficult for ongoing activities and measures, but it was more challenging where the recommended measures call for increased staffing, additional equipment, the hiring of consultants/contractors, or other items that are not included in the agencies' already authorized budgets. Funding for those will require authorization by either the Legislature (for State entities) or the Honolulu City Council (for CCH agencies), and that funding is not assured. Importantly, it will also require that the Governor and the Mayor release whatever funds are appropriated to the operational departments. While this has generally occurred in the State hierarchy, funds approved by the City Council have not always been released to the implementing Departments, e.g., DFM, DDC, etc.

Similarly, the plan calls for costly design and engineering analyses as well as the even more expensive CIP expenditures that these studies are likely to recommend. Implementation of those will require appropriations over a period of years, and the willingness of elected officials to appropriate and expend

those funds will depend upon their judgements regarding the importance of the measures relative to other priorities and the overall fiscal health of the State and the CCH.

5.5.1 FUNDING FOR DLNR

5.5.1.1 Continued DLNR Funding of Operating Expenses

Because DLNR does not presently fund any of the costs of maintaining and operating the roadway or facilities within it, the Department's existing O&M costs are zero.

5.5.1.2 Additional DLNR Funding of Operating Expenses

5.5.1.2.1 Parking Areas, Pullouts, and Lookouts

As discussed in Chapters 3 and 4, the many parking areas, trailheads, and lookouts along the travelway are suffering from neglect. Because they are outside the travelway, the CCH does not consider them to be roadways transferred to the CCH. Conversely, because portions of them are within the roadway right-of-way, DLNR has not taken responsibility for this work. Based on the work it has conducted during preparation of this report, the planning team believes that the pullouts and viewpoints serve largely to support functions and activities (e.g., trail access, scenic vistas of statewide value, and recreational use of the HWFR) that are principally DLNR's responsibility and that DLNR must provide the funds needed to keep them in good condition, consistent with its mandate to provide and maintain recreational resources within the FRS. In addition to rehabilitating the pavement and hardscape at the parking areas, trailheads, and lookouts, this funding would cover such things as sign maintenance, trash collection, and the like. The work could be contracted directly by DLNR or, perhaps more efficiently, handled by DLNR contracting with the CCH to carry out this work in conjunction with its efforts within the travelway.

The additional O&M funding that will be needed depends upon the approach that is used in the lookout/parking area refurbishment. If the areas are reconstructed with PCC as recommended, the ongoing annual maintenance cost for the pavement will be essentially zero for at least 50 years. All the costs associated with this approach are capital expenditures that are described in Section 5.5.1.3 below.

5.5.1.2.2 Ongoing Vegetation Management

As discussed in Section 4.3.3.2, vegetation within the corridor will need to be effectively managed on an ongoing basis in order to achieve the goals and objectives of this TRTD-CMP. The estimated annual cost of ongoing vegetation management is \$465,000. Of that total, \$350,000 is for regular, ongoing roadside vegetation management that is focused on vegetation that originates principally within the CCH's ROW. The remaining \$115,000 covers the heavier twice-yearly work that is needed to keep the route safe from hazardous trees and the encroachment of surrounding forest vegetation that would diminish views available from the lookouts or otherwise detract from the scenic and recreational value of the corridor. The planning team recommends that DLNR include the amount needed for the twice-yearly work in its annual operating budget, adjusting the amount over time to reflect inflation and/or changes in the maintenance program suggested by its ongoing experience. The larger part (i.e., \$350,000 per year) of the ongoing vegetation management expense is focused on the area immediately adjacent to the roadway and would continue to be borne by the CCH (see Section 5.5.2.1 below).

5.5.1.3 DLNR CIP Expenses

5.5.1.3.1 Parking Areas, Pullouts, and Lookouts

As discussed in Section 4.4.1, the planning team has recommended that the parking areas and trailheads within the corridor be reconstructed using PCC. Based on the rationale explained in Section 5.5.1.2, the planning team believes that the approximately \$5.3 million cost of the reconstruction using that long-lasting material should be funded by DLNR-DOFAW through an appropriation by the State. This

choice would eliminate the need for subsequent CIP authorizations for this purpose for a period of approximately 50 years.⁴⁰

5.5.1.3.2 Remedial Vegetation Work

The remedial roadside vegetation work that is recommended in Section 4.3.3.1 is estimated to cost approximately \$360,000. The great majority of this work involves vegetation that grows on State property outside the road ROW and, for that reason, the planning team believes it is appropriate for the State of Hawai'i to fund this one-time work through a line item in DLNR's CIP budget.

5.5.1.4 DLNR Support Staff Requirements

Assuming that all of the recommended O&M and CIP work identified above was contracted out, the only additional staff time would be required for management and oversight of the process. Because it is possible that this responsibility can be handled by the existing staff, this plan does not provide for any additional personnel for that work.

5.5.2 FUNDING FOR DFM

5.5.2.1 Continued Funding of DFM Operating Expenses

In recent years, the CCH administration has funded only a fraction of the amount that DFM has requested. As a result, there is a significant backlog of maintenance work both island-wide and within the planning area.

DFM's records do not provide the data needed to quantify exactly how much is presently spent each year on maintenance work within the TRTD corridor, but an informed estimate is that it is less than \$150,000 per year for the 8-mile long stretch of roadway. Most of the cost is for staff time related to its regular trimming of roadside vegetation and collection of refuse from parking area trash receptacles. However, some of the costs are associated with small roadway patches and pothole repairs that DFM conducts, by request from the public, in response to specific failures and events.

5.5.2.2 Additional Funding of DFM Operating Expenses

5.5.2.2.1 Additional Funding for Ongoing Vegetation Management

The estimated annual cost of the minimum level of ongoing maintenance of the roadside vegetation that originates principally within the CCH's ROW at the level recommended in this report is at least \$600,000 to \$750,000.⁴¹ It is vitally important to note that this amount assumes that the reconstruction of the roadway itself, recommended elsewhere in this report, is conducted in a timely fashion and would largely eliminate the need for pavement patching and other structural repairs that DFM must presently fund because of the deteriorated condition of the roadway. If that fundamental reconstruction is not made, then substantially more maintenance work will be needed for the piecemeal patching and repairs which will be required; in that case, the additional maintenance effort will not maintain an adequate level of service but may slow its further decline.

⁴⁰ If AC is used instead, resurfacing will probably be needed two to four times over the same time span. If the cost of placing an AC overlay on the parking areas is the same as the average cost of an AC overlay on the roadway (which might well be the case if the work is done at the same time/under the same contract), parking area repaving over a 50-year time frame will likely total between \$600,000 and \$1,200,000. The use of AC pavement would reduce the initial CIP amount by approximately \$1.5 million, but up to four additional CIP authorizations of \$300,000 each (i.e., a total of \$1.2 million) would be needed over the following 50 years. Moreover, since the future resurfacing costs are expressed in terms of 2018 dollars, they can be expected to escalate over time, and so the actual expenditures are likely to be higher for the AC option.

⁴¹ This estimate assumes that maintenance can be accomplished with a crew size of 6 to 7 workers and one supervisor and \$100,000 to \$150,000 for equipment and other costs (such as green waste disposal). This is much more manpower and equipment than is currently allocated to the work (which, based on the anecdotal work crew information that is available appears to consist of at most two full-time equivalent workers using mostly handheld equipment).

5.5.2.2.2 *Additional Funding for O&M in Parking Areas and Trailheads*

The planning team has recommended that O&M funding for most work in parking areas and trailheads, particularly pavement and retaining wall-related maintenance, be provided by the State. Funding for vegetation management activities needed to maintain the recreational and aesthetic value of these areas would be provided by the State as discussed in Section 5.5.1.2.2. The cost of the periodic repaving of the parking areas and lookouts that will be needed, if the recommendation to reconstruct them with PCC is not followed, would be a CIP expense.

5.5.2.3 *DFM CIP Expenses*

DFM does not implement capital improvements, and none of the CIP projects recommended in this plan are within its purview. It is possible that it may find that implementing its maintenance responsibilities can be carried out most efficiently using equipment that is not presently in its inventory and that this, in turn, could make it advisable to provide for the acquisition of such equipment in a future operating budget request. However, because of the uncertainty about what such a request might entail and the high likelihood that the use of such capital equipment would not be confined to the planning area, this report does not attempt to account for or recommend funding for maintenance equipment purchases.

5.5.2.4 *DFM Staff Requirements*

Based on the feedback that has been received from DFM, it appears likely that carrying out the increased maintenance that is recommended in this plan will require six to eight full time staff equivalents, which is several times the number presently available to it for work within the TRTD corridor. In past years DFM has proposed increasing its island-wide maintenance staff by approximately 20 full-time equivalents (also known as “FTEs”), but even though the City Council has authorized funds for the increase, the Administration has not authorized the Department to fill the positions. Hence, implementing this appears to require a policy change on the part of the Administration.

Some advisory group members have suggested, as an alternative, that the City create a special fund for the corridor. Such arrangements have been made for a number of places and now appear as line items in the City’s annual budget.⁴² Responsibility for operating the areas could then go to TCA, FOT, or some similar non-profit organization, to enter into a MOU, curatorship agreement, or other appropriate instrument and receive funds to administer a private contract for vegetation maintenance in the TRTD corridor. This possibility is described in greater detail in Section 5.3.4 of this CMP.

5.5.3 FUNDING FOR DEPARTMENT OF DESIGN AND CONSTRUCTION (DDC)

This report recommends a variety of roadway capital improvements. Responsibility for implementing those lies with the DDC. These responsibilities include conducting additional design-level studies, developing construction plans and Requests for Proposals for the needed work, issuing the contracts, and overseeing the construction work itself. The “high” cost estimates for the recommended CIP in Chapter 4 are summarized in Table 5.2. The estimated cost of capital improvements assuming that: (i) the roadway is simply repaved (not reconstructed) and (ii) the cost of all of the projects is at the lower end of what is believed to be the likely range, is shown in Table 5.3.

⁴² Examples include the Waipio Peninsula Soccer Park Fund, the Patsy T. Mink Central O’ahu Regional Park Fund, and the Hanauma Bay Nature Preserve Fund.

Table 5.2 “High” Cost Estimates of Recommended CIP

Overall Roadway Reconstruction (Less Special Areas)	\$30,700,000
Hogsback/Crib Wall Reconstruction	\$4,500,000
4110 Round Top Drive to 4160 Round Top Drive Reconstruction	\$8,200,000
3811 Tantalus Drive to Pu‘u ‘Ōhi‘a Trailhead Reconstruction	\$11,500,000
Embankment: 3811 Tantalus Drive to Pu‘u ‘Ōhi‘a Trailhead	\$3,150,000
Embankment: Forest Ridge Way to Pu‘u ‘Ōhi‘a Trailhead	\$1,125,000
Roadway Signage Refurbishment/Replacement	\$40,000
Rehabilitate Existing Drainage System	\$1,000,000
Make Drainage Improvements	\$3,400,000
Remedial Roadside Vegetation Work	\$360,000
Roadway and Embankment Subtotal	\$63,975,000
R1 and R2 Improvements	\$765,200
R8/Camp Ehrhorn Improvements	\$135,000
R11 Improvements	\$832,600
Reconstruct T1	\$190,100
Reconstruct T2	\$292,600
Reconstruct T3	\$230,400
Reconstruct T4	\$78,400
Reconstruct T6	\$170,000
Reconstruct T9	\$304,600
Reconstruct T11 and T12	\$347,700
Reconstruct T16	\$37,500
Reconstruct T18 and T19	\$607,700
Reconstruct Other Parking Areas	\$1,867,100
Parking Area and Trailhead Subtotal	\$5,858,900
GRAND TOTAL	\$69,833,900
Source: Compiled by Planning Solutions, Inc. (2018)	

Table 5.3 “Low” Cost Estimates of Recommended CIP

Roadway Overlay	\$4,500,000
Hogsback/Crib Wall Reconstruction	\$4,500,000
4110 Round Top Drive to 4160 Round Top Drive Reconstruction	\$3,000,000
3811 Tantalus Drive to Pu‘u ‘Ōhi‘a Trailhead Reconstruction	\$5,000,000
Embankment: 3811 Tantalus Drive to Pu‘u ‘Ōhi‘a Trailhead	\$700,000
Embankment: Forest Ridge Way to Pu‘u ‘Ōhi‘a Trailhead	\$300,000
Roadway Signage Refurbishment/Replacement	\$20,000
Rehabilitate Existing Drainage System	\$1,000,000
Make Drainage Improvements	\$1,300,000
Remedial Roadside Vegetation Work	\$360,000
Roadway Subtotal	\$20,680,000
R1 and R2 Improvements	\$611,000
R8/Camp Ehrhorn Improvements	\$110,000
R11 Improvements	\$502,900
Reconstruct T1	\$133,600
Reconstruct T2	\$220,200
Reconstruct T3	\$169,400
Reconstruct T4	\$51,400
Reconstruct T6	\$111,300
Reconstruct T9	\$232,200
Reconstruct T11 and T12	\$256,800
Reconstruct T16	\$17,900
Reconstruct T18 and T19	\$460,100
Reconstruct Other Parking Areas	\$1,249,000
Parking Area and Trailhead Subtotal	\$4,125,800
GRAND TOTAL	\$24,805,800
Source: Compiled by Planning Solutions, Inc. (2018)	

At nearly \$25 million, even the most optimistic (i.e., lowest) capital cost estimate is very substantial relative to the small amounts that have been spent on the mountain over the past several decades, and at nearly \$70 million, the “high” estimate is much greater. The need for this level of investment is a product of the age of the roadway, large parts of which were laid out over a century ago, and the low level of maintenance that has been carried out there over the past 50 years.

To put these estimated costs into perspective, it is worth comparing them with the CCH’s FY2019 budget totals:

- **FY2019 CIP Budget.** The CCH’s CIP Budget for FY2019 that was approved without the Mayor’s signature on June 22, 2018, totaled \$252,632,014. The remainder of the \$1,009,774,313 budget bill that was enacted was for Revenue Bond Repayment (\$204,250,000), General Obligation Bond repayment (\$516,301,126), and Federal Funds (\$36,591,173). None of the itemized projects are within the TRTD corridor.
- **FY2019 Operating Budget.** A summary of the FY2019 Operating Budget adopted through Ordinance 18-23 is reproduced in Table 5.4. The “Highways and Streets” line item in the budget provides for a total of 505 positions (444 for road maintenance and 61 for administration). A total of \$19,083,512 is allocated for the Department’s salaries, \$20,601,068 for its current expenses, and \$315,000 for its equipment.

Comparing these islandwide budget allocations with the estimated costs for work within the TRTD corridor makes it clear that implementing the recommendations of this report will require a concerted,

multi-year effort that involves a dedication of fiscal and staff resources that is an order of magnitude greater than what has been done in the recent past. If the problems are not confronted now, the cost of maintaining the functionality of the corridor is likely to be even higher. Perhaps of greater significance, a catastrophic failure, such as the one just outside the planning area that closed Round Top Drive for a year and a half in 2006-2007, will be more costly to address than if the work is performed in a timely manner.

Table 5.4 City and County of Honolulu Operating Budget: FY2019

<i>Fund Code</i>	<i>Source of Funds</i>	<i>Amount</i>	<i>Less Interfund Transfer</i>	<i>Net Amount</i>
GN	General Fund	1,828,284,798	339,701,105	1,488,583,693
HW	Highway Fund	290,540,721	156,593,178	133,947,543
SW	Sewer Fund	372,021,828	21,449,884	350,571,944
BT	Bus Transportation Fund	248,190,774	0	248,190,774
LC	Liquor Commission Fund	7,099,500	338,100	6,761,400
BK	Bikeway Fund	946,857	92,200	854,657
HB	Highway Beaut./Aband. Vehicle Disposal Revolving Fund	7,928,814	377,600	7,551,214
SV	Special Events Fund	14,820,931	3,167,400	11,653,531
PD	Honolulu Zoo Fund	15,243,200	4,056,545	11,186,655
GC	Golf Fund	18,321,836	2,744,406	15,577,430
WF	Solid Waste Special Fund	254,349,123	56,375,194	197,973,929
RN	Hanauma Bay Nature Preserve Fund	8,303,565	1,525,849	6,777,716
RA	Rental Assistance Fund	233,000	0	233,000
RD	Housing Development Special Fund	8,007,528	7,807,528	200,000
CF	Clean Water & Natural Lands Fund	164,476	0	164,476
AF	Affordable Housing Fund	250,048	0	250,048
PB	Patsy T. Mink Central O'ahu Reg. Park Fund	220,300	10,500	209,800
PC	Waipi'o Peninsula Soccer Park Fund	117,700	5,600	112,100
TC	Transit Construction Mitigation Fund	750,000	0	750,000
GR	Grants in Aid Fund	9,003,108	0	9,003,108
			<i>SUBTOTAL</i>	<i>2,490,553,018</i>
FEDERAL FUNDS:				
CD	Community Development Fund	1,712,050	0	1,712,050
RL	Hsg. & Comm. Devel. Rehab. Loan Fund	2,500,000	0	2,500,000
SE	Hsg. & Comm. Devel. Sec. 8 Contract Fund	54,191,623	0	54,191,623
FG	Federal Grants Fund	48,277,890	0	48,277,890
			<i>SUBTOTAL</i>	<i>106,681,563</i>
SP	Special Projects Fund	13,353,684	0	13,353,684
			<i>SUBTOTAL</i>	<i>13,353,684</i>
		<i>GRAND TOTAL</i>	<i>\$3,204,833,354</i>	<i>\$594,245,089</i>
				<i>\$2,610,588,265</i>

Source: Compiled by Planning Solutions, Inc. (2018)

5.6 MASTER IMPLEMENTATION TABLE

Table 5.5 below lists all the issues identified in Chapter 3, the recommendations intended to address them provided in Chapter 4, the section in this report where these recommendations are discussed, and the agency or agencies responsible for implementation. It also provides an estimated CIP or annual budget for implementation of each set of recommendations. In addition, in order to facilitate the funding and implementation of the recommendations listed in Table 5.5, the planning team, in consultation with DOFAW and other agencies, has prioritized the projects into one of three phases.

The phase which each recommendation is intended to take place appears in the far-right column of the table.

- Phase I recommendations are targeted for implementation between 2021 and 2024;
- Phase II recommendations are targeted for implementation between 2025 and 2028; and
- Phase III recommendations are targeted for implementation in the years 2029 through 2033.

While the planning team believes that this progression would allow for the logical and efficient implementation of this Plan, the phasing should be considered flexible in the event the agencies find it impossible or inadvisable to sequence the projects in this way, and therefore does not interrupt the progress of the Plan as a whole.

Table 5.5 TRTD-CMP Master Implementation Table

<i>Issue</i>	<i>Recommendation</i>	<i>Section</i>	<i>Jurisdiction</i>	<i>CIP</i>	<i>Annual</i>	<i>Phase</i>
	Reconstruction of Roadway – Design & Engineering	4.1.1	CCH-DDC	\$1,700,000	-	I
	Reconstruction of Roadway – Construction	4.1.1	CCH-DDC	\$29,000,000	-	I & II
Roadway Prism	Hogsback Crib Wall Reconstruction – Total	4.1.2.1	CCH-DDC	\$4,500,000	-	I
	4110-4160 Round Top Dr. Stabilization – Field Investigation	4.1.2.2	CCH-DDC	\$25,000	-	I
	4110-4160 Round Top Dr. Stabilization – Design & Engineering	4.1.2.2	CCH-DDC	\$1,000,000-1,200,000	-	I
	4110-4160 Round Top Dr. Stabilization – Construction	4.1.2.2	CCH-DDC	\$2,000,000-7,000,000	-	II
	Tantalus Dr. to Pu‘u ‘Ōhi‘a Trailhead Stabilization – Field Investigation	4.1.2.3	CCH-DDC	\$50,000	-	I
	Tantalus Dr. to Pu‘u ‘Ōhi‘a Trailhead Stabilization – Design & Engineering	4.1.2.3	CCH-DDC	\$1,000,000-1,500,000	-	II
	Tantalus Dr. to Pu‘u ‘Ōhi‘a Trailhead Stabilization – Construction	4.1.2.3	CCH-DDC	\$4,000,000-10,000,000	-	II
Roadway Embankments	Round Top Dr./Tantalus Dr. Between Forest Ridge Way & Pu‘u ‘Ōhi‘a Trailhead Stabilization – Design & Engineering	4.1.3.1	CCH-DDC	\$100,000-125,000	-	I
	Round Top Dr./Tantalus Dr. Between Forest Ridge Way & Pu‘u ‘Ōhi‘a Trailhead Stabilization – Construction	4.1.3.1	CCH-DDC	\$200,000-1,000,000	-	II
	3811 Tantalus Dr. to Pu‘u ‘Ōhi‘a Trailhead Stabilization – Design & Engineering	4.1.3.2	CCH-DDC	\$150,000-200,000	-	I
	3811 Tantalus Dr. to Pu‘u ‘Ōhi‘a Trailhead Stabilization – Construction	4.1.3.2	CCH-DDC	\$500,000-3,000,000	-	II
	Round Top Lookout Along Mānoa Side of Pu‘u ‘Ualaka‘a – Monitoring Plan	4.1.3.3	State Parks	\$200,000	-	I
Road Signage & Markers	Total Replacement of Roadway Signage on Tantalus Drive and Round Top Drive	4.1.4	CCH-DTS	\$15,000-25,000	-	I
	Pavement Marking Review (internal)	4.1.4.2	CCH-DTS	-	-	I
Drainage	Phase 1 – Drainage Restoration	4.2.1	DOFAW	\$1,000,000	\$20,000	I
	Phase 2 – Advanced Drainage Improvements Study	4.2.2	DOFAW	\$300,000-400,000	-	II
Vegetation Management	Phase 1 – Remedial Vegetation Maintenance	4.3.3.1	DOFAW	\$359,490	-	I
	Phase 2-A – Ongoing Vegetation Maintenance	4.3.3.2.1	CCH-DFM	-	\$349,210	I
	Phase 2-B – Semi-Annual Vegetation Maintenance	4.3.3.2.2	DOFAW	-	\$113,757	I
	Reconstruct R1 and R2 Parking Area (AC or PCC)	4.4.2.1.2	DOFAW	\$461,000-615,000	-	I

IMPLEMENTATION

<i>Issue</i>	<i>Recommendation</i>	<i>Section</i>	<i>Jurisdiction</i>	<i>CIP</i>	<i>Annual</i>	<i>Phase</i>
1 Parking Areas and Trailheads	Reconstruct R1 Parking Area Retaining Wall	4.4.2.1.2	DOFAW	\$150,000	-	I
	R1 Parking Area Centerline Lane Delineators	4.4.2.1.2	DOFAW	\$25,000	-	I
	R1 and R2 Parking Areas Vegetation Management	4.4.2.1.3	DOFAW	\$15,900	-	I
	(OPTIONAL) Vehicle Turnaround at Former Baseyard	4.4.2.1.2	DOFAW	\$250,000	-	I, II, or III
	(OPTIONAL) Vehicle Turnaround at Park Entrance	4.4.2.1.2	DOFAW	\$150,000	-	I, II, or III
	Reconstruct R3 Parking Area (AC or PCC)	4.4.1	DOFAW	\$138,600-190,100	-	III
	Reconstruct R4 Parking Area (AC or PCC)	4.4.1	DOFAW	\$163,600-223,700	-	II
	Reconstruct R5 Parking Area (AC or PCC)	4.4.1	DOFAW	\$46,000-73,100	-	II
	Reconstruct R6 Parking Area (AC or PCC)	4.4.1	DOFAW	\$111,300-170,000	-	II
	Reconstruct R7 Parking Area (AC or PCC)	4.4.1	DOFAW	\$51,400-78,400	-	III
	Reconstruct R8 Parking Area (Gravel)	4.4.2.2	DOFAW	\$100,000	-	I
	Remove R8 Parking Area Cement Planter	4.4.2.2	DOFAW	\$10,000	-	III
	(OPTIONAL) Upgrade Camp Ehrhorn Driveway at R8 Parking Area to PCC	4.4.2.2	DOFAW	\$25,000	-	I
	R8 Parking Area Vegetation Maintenance	4.4.2.2.2	DOFAW	\$8,700	-	II
	Reconstruct R9 Parking Area (AC or PCC)	4.4.1	DOFAW	\$79,300-134,400	-	II
	Reconstruct R10 Parking Area (AC or PCC)	4.4.1	DOFAW	\$51,400-78,400	-	I
	Reconstruct R11 Parking Area (AC or PCC)	4.4.2.3.1	DOFAW	\$192,900-262,600	-	I
	Restore R11 Parking Area Drainages	4.4.2.3.1	DOFAW	\$50,000	-	I
	Enhance R11 Parking Area Retaining Wall	4.4.2.3.1	DOFAW	\$300,000-500,000	-	I
	Enhance R11 Parking Area Access Stairs to Moleka Trail	4.4.1.3.1	DOFAW	\$10,000-20,000	-	I
	R11 Parking Area Vegetation Management	4.4.2.3.2	DOFAW	\$10,100	-	I
	Reconstruct R12 Parking Area (AC or PCC)	4.4.1	DOFAW	\$96,800-148,700	-	III
	Reconstruct T1 Parking Area (AC or PCC)	4.4.2.4.1	DOFAW	\$133,600-190,100	-	I
	Reconstruct T2 Parking Area (AC or PCC)	4.4.2.4.1	DOFAW	\$220,200-292,600	-	I
	Reconstruct T3 Parking Area (AC or PCC)	4.4.2.4.1	DOFAW	\$169,400-230,400	-	I
	Reconstruct T4 Parking Area (AC or PCC)	4.4.2.4.1	DOFAW	\$51,400-78,400	-	I
	T1, T2, T3 and T4 Vegetation Management	4.4.2.4.2	DOFAW	\$21,100	-	I
	Reconstruct T5 Parking Area (AC or PCC)	4.4.1	DOFAW	\$271,200-351,000	-	I
	Reconstruct T6 Parking Area (AC or PCC)	4.4.2.5.1	DOFAW	\$111,300-170,000	-	I
	T6 Parking Area Vegetation Management	4.4.2.5.2	DOFAW	\$4,800	-	I
Reconstruct T7 Parking Area (AC or PCC)	4.4.1	DOFAW	\$27,600-50,100	-	III	
Reconstruct T8 Parking Area (AC or PCC)	4.4.1	DOFAW	\$17,900-37,500	-	III	
Reconstruct T9 Parking Area (AC or PCC)	4.4.2.6.1	DOFAW	\$220,200-292,600	-	I	
Install Moveable Vehicular Barrier at T9 Parking Area	4.4.2.6.1	DOFAW	\$12,000	-	I	

<i>Issue</i>	<i>Recommendation</i>	<i>Section</i>	<i>Jurisdiction</i>	<i>CIP</i>	<i>Annual</i>	<i>Phase</i>
	T9 Parking Area Vegetation Management	4.4.2.6.2	DOFAW	\$8,200	-	I
	Reconstruct T10 Parking Area (AC or PCC)	4.4.1	DOFAW	\$17,900-37,500	-	III
	Reconstruct T11 Parking Area (AC or PCC)	4.4.2.7.1	DOFAW	\$195,500-262,600	-	I
Parking Areas and Trailheads	Reconstruct T12 Parking Area (AC or PCC)	4.4.2.7.1	DOFAW	\$36,300-60,500	-	I
	Resurface T12 Parking Area Mauka Overflow with Gravel	4.4.2.7.1	DOFAW	\$25,000	-	I
	T11 Parking Area Vegetation Management	4.4.2.7.2	DOFAW	\$7,500	-	I
	T12 Parking Area Vegetation Management	4.4.2.7.2	DOFAW	\$2,600	-	I
	Reconstruct T13 Parking Area (AC or PCC)	4.4.1	DOFAW	\$27,600-50,100	-	II
	Reconstruct T14 Parking Area (AC or PCC)	4.4.1	DOFAW	\$94,100-145,000	-	II
	Reconstruct T15 Parking Area (AC or PCC)	4.4.1	DOFAW	\$30,900-54,200	-	I
	Reconstruct T16 Parking Area (AC or PCC)	4.4.2.8.1	DOFAW	\$17,900-37,500	-	I
	T16 Parking Area Vegetation Maintenance	4.4.2.8.2	DOFAW	\$5,600	-	I
	Reconstruct T17 Parking Area (AC or PCC)	4.4.1	DOFAW	\$23,400-44,900	-	I
	Reconstruct T18 Parking Area (AC or PCC)	4.4.2.9.1	DOFAW	\$133,600-195,100	-	I
	Reconstruct T19 Parking Area (AC or PCC)	4.4.2.9.1	DOFAW	\$326,500-412,600	-	I
	T18 Vegetation Management	4.4.2.9.2	DOFAW	\$5,900	-	I
	T19 Vegetation Management	4.4.2.9.2	DOFAW	\$12,500	-	I
	Public Safety	Public Safety Related to Crime	4.5.2.1	DOFAW		\$5,000
Public Safety Related to Driver Behavior		4.5.3	CCH-DTS	-	\$10,000	I, II, III

Source: Planning Solutions, Inc.

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CHAPTER 6 – REFERENCES

- American Association of Highway and Transportation Officials. 2011. *Roadside Design Guide* (4th edition). Publication Code RSDG-4. Author: Washington, D.C.
- Belt Collins Hawaii. December 1999. *Master Guidelines for Landscaping and Maintenance of the Highways in Hawai'i*. State of Hawai'i Department of Transportation Highways Division.
- Carlson, Paul J., Eun Sug Park, and Carl K. Andersen. August 1, 2008. *The Benefits of Pavement Markings: A Renewed Perspective Based on Recent and Ongoing Research*. Paper No. 09-0488 presented at the Transportation Research Board Annual Meeting (January 11-15, 2009).
- Choi, K. Y. and Raymond W. M. Cheung. 2013. "Landslide disaster prevention and mitigation through works in Hong Kong." *Journal of Rock Mechanics and Geotechnical Engineering, Vol. 5 (2013): 354-365*. Accepted for publication on July 18, 2013.
- DDC (2011) *Highway Improvements, Road Repair in the Vicinity of 2798 Tantalus Drive*. Prepared by Kimura International, Honolulu, HI.
- Ellen, Stephen D., Robert K. Mark, Susan H. Cannon, And Donna L. Knifong (1993). *Map of Debris-Flow Hazard in the Honolulu District of Oahu, Hawai'i*. Downloaded File name = of93-213_map
- Federal Highway Administration, Research, Development, and Technology Turner-Fairbank Highway Research Center. April 2007. *Maintaining Traffic Sign Retroreflectivity: Impacts on State and Local Agencies*. Publication No. FHWA-HRT-07-042. U.S. Department of Transportation: McLean, VA 22101-2296.
- Eck, Ronald W. and Hugh W. McGee. May 2007. *Vegetation Control for Safety, A Guide for Local Highway and Street Maintenance Personnel*. Prepared by Vanasse Hangen Brustlin, Inc, Vienna, VA, for the Office of Safety, Federal Highway Administration, U.S. Department of Transportation. Washington, D.C.
- Geotechnical Engineering Office, Civil Engineering and Development Department, The Government of the Hong Kong SAR, Hong Kong, China.
- Hazlett, Alexander, David Shideler, and Hallett H. Hammatt. October 2011. *Historic Preservation Literature Review and Field Inspection for Highway Improvements and Roadway Repair, Vicinity of 3798 Tantalus Drive (Tantalus Crib Wall Repair) Project, Pauoa and Makiki Ahupuaa, Kona District, Oahu Island, TMK: (1) 2-5-012:014 and (1) 2-5-019:005*.
- Hueneke, L. 1990. "Seedling and clonal recruitment of the invasive tree *Psidium cattleianum*: Implications for management of native Hawaiian forests." *Biological Conservation* 53(3): 199-211.
- Julian Ng Inc. October 2011. *Traffic Assessment: Closure of a Portion of Tantalus Drive, Vicinity of 3798 Tantalus Drive, Honolulu, Hawai'i*.
- Liverman, Astrid, Ming-Yi Wong, and Barbara Shideler. May 2009. National Register of Historic Places Nomination Packet for Tantalus-Round Top Road.
- Lowe S., Browne M., Boudjelas S., De Poorter M. 2000. *100 of the World's Worst Invasive Alien Species: A selection from the Global Invasive Species Database*. Published by The Invasive Species Specialist Group (ISSG) a specialist group of the Species Survival Commission (SSC) of the World Conservation Union (IUCN), 12pp. First published as special lift-out in *Aliens* 12, December 2000. Updated and reprinted version: November 2004.

REFERENCES

- Peterson, David M., Stephen D. Ellen, and Donna L. Knifong. 1993. *Distribution of Past Debris Flows and Other Rapid Slope Movements from Natural Hillslopes in the Honolulu District of O'ahu, Hawai'i*. U.S. Department of the Interior, U. S. Geological Survey Open-File Report 93-514. Prepared in cooperation with the City and County of Honolulu, Department of Public Works.
- Shigemura, Lau, Sakanashi, Higuchi & Associates, Inc. July 2005. *Tantalus Crib Wall Rehabilitation Study*. Prepared for the City and County of Honolulu Department of Design and Construction.
- SWCA Environmental Consultants. November 2011. *2012-2022 Statewide Noxious Invasive Pest Program (SNIPP) Strategic Plan*. Hawai'i Department of Transportation Highways Division.
- SWCA Environmental Consultants. December 2014. *Ecological Zones and Native Planting List*. Prepared for the Hawai'i Department of Transportation Highways Division.
- SWCA Environmental Consultants. 2011. *Highway Manual for Sustainable Landscape Maintenance*. Hawai'i Department of Transportation Highways Division.
- Vanasse Hangen Brustlin, Inc. (January 2010). *Maintenance of Signs and Sign Supports: A Guide for Local Highway and Street Maintenance Personnel*. FHWA Report No. FHWA-SA-09-025. Sponsored by the Office of Safety of the Federal Highway Administration, U.S. Department of Transportation. Washington, D.C. 20590.
- Whistler, Dr. W. Arthur. 1995. *Wayside Plants of the Islands*. Isle Botanica, Honolulu, Hawai'i.
- Wilson, R.C., J.D. Torikai, and S.D. Ellen. 1992. *Development of rainfall warning thresholds for debris flows in the Honolulu District, O'ahu*. Open File Report 92-521. United States Dept. of the Interior, U.S. Geological Survey.

CHAPTER 7 – CONSULTATION AND DISTRIBUTION

In the process of identifying and organizing the issues, recommendations, implementation strategies and budgets provided in this TRTD-CMP the planning team engaged in multiple levels of consultation with stakeholder agencies, organizations, and individuals. This chapter summarizes the consultation which has occurred during the preparation of this report and the parties which the Draft TRTD-CMP has been distributed to. In addition, all the comments which were received from the public via the projects dedicated website (<https://tantalus-roundtopcorridor.com>) are reproduced in Appendix C of this report.

7.1 ADVISORY GROUP

The TRTD-CMP Advisory Group was initiated by DOFAW with a September 8, 2017 letter from the O‘ahu Forestry and Wildlife Manager to the Office of the Mayor requesting the collaboration of the CCH for the development of this Plan. On November 22, 2017 the Director of DDC, on behalf of the Mayor, responded expressing support for the planning process and delegating individuals at various CCH departments to collaborate with DOFAW on the development of the TRTD-CMP. Table 1.1 lists the name, title, and agency/organization of the Advisory Group members.

As discussed in greater detail in Section 1.3.1, the first meeting of the Advisory Group was held on January 19, 2018 and meetings and other contacts among the various constituent working groups have continued throughout the development of this Draft TRTD-CMP. All the orientation materials, including the Advisory Group charter, plan vision, and meeting goals are provided in Appendix A of this report.

7.2 DISTRIBUTION OF THE DRAFT TRTD-CMP

Table 7.1 below identifies all the agencies, organizations, and individuals which were provided with an electronic copy of the draft report with a request for review and comment. In addition, all the individuals who provided comments via the project-specific website were emailed a link that allowed them to download, review, and provide comment on the Draft TRTD-CMP; they are not identified in the table to protect their privacy. Finally, DOFAW provided electronic copies of this report to everyone who requested it and made it available for download from its website.

Table 7.1 Distribution of the Draft TRTD-CMP

<i>Federal Agencies</i>	<i>Neighborhood Boards (NB)</i>
U.S. Army Corps of Engineers, Honolulu District	NB No. 7 Mānoa
Natural Resources Conservation Service	NB No. 9 Waikīkī
<i>State Agencies</i>	NB No. 10 Makiki/Lower Punchbowl/Tantalus
Department of Agriculture	NB No. 12 Nu‘uanu Punchbowl
Department of Accounting and General Services	<i>Community Organizations</i>
Department of Business, Economic Development, and Tourism (DBEDT)	Aha Moku O O‘ahu
DBEDT – State Office of Planning	Ala Wai Watershed Association
Department of Defense	Association of Hawaiian Civic Clubs
Department of Education	Bernice Pauahi Bishop Museum
Department of Hawaiian Home Lands	Friends of Tantalus
Department of Health, Environmental Health Admin.	Hālau Kū Māna Public Charter School
Department of Land and Natural Resources (DLNR)	Hawai‘i Bicycling League
DLNR – Office of Conservation and Coastal Lands	Hawai‘i Lodging and Tourism Association
DLNR – State Historic Preservation Division	Hawai‘i Trail and Mountain Club
Hawai‘i Emergency Management Agency	Hawai‘i Ultra Running Team
Hawai‘i Tourism Authority	Historic Hawai‘i Foundation
Office of Hawaiian Affairs	Ko‘olau Mountains Watershed Partnership
<i>CCH Agencies</i>	The Nature Conservancy
Board of Water Supply	O‘ahu Island Parks Conservancy
Department of Design and Construction	The Outdoor Circle
Department of Emergency Management	Papakōlea Community Development Corporation
Department of Environmental Services	Papa Ola Lokahi
Department of Facility Maintenance	Pig Hunter’s Association of O‘ahu
Department of Parks and Recreation	Sierra Club of O‘ahu
Department of Planning and Permitting	Tantalus Community Association
Department of Transportation Services	Waikīkī Business Improvement District Association
Honolulu Fire Department	<i>Utilities</i>
Honolulu Police Department	Hawai‘i Gas
<i>Elected Officials</i>	Hawaiian Electric Company, Inc.
U.S. Senator Brian Schatz	Hawaiian Telcom
U.S. Senator Mazie Hirono	Oceanic Time Warner Cable
U.S. Representative Tulsi Gabbard	<i>Media Agencies</i>
U.S. Representative Ed Case	Hawai‘i News Now
Governor David Ige	Honolulu Civil Beat
State Senator Brian Taniguchi	Honolulu Star Advertiser
State Representative Della Au Belatti	<i>Libraries</i>
Mayor Kirk Caldwell	Hawai‘i State Library Documents Center
Councilmember Carol Fukunaga	University of Hawai‘i Hamilton Library
Source: Compiled by Planning Solutions, Inc. (2019)	

7.3 COMMENTS ON THE DRAFT TRTD-CMP

The parties identified in Table 7.2 provided written comments on the Draft TRTD-CMP. The complete text of their comments is provided in Appendix E of this report. This final report reflects changes made in response to those comments as well as to input received through the website and in public meetings, as discussed in Section 1.3.5 of this report.

Table 7.2 Comments on the Draft TRTD-CMP

<i>No.</i>	<i>Commenter</i>
1	Michael Carney
2	Department of Parks and Recreation
3	Honolulu Fire Department
4	Anonymous
5	Debra Duggan-Takagi
6	Office of Conservation and Coastal Lands
7	Department of Emergency Management
8	Grant Jones
9	Tantalus Botanicals
10	Jason Shon
11	Diana Tusher
12	Army Corps of Engineers
13	Board of Water Supply
14	Honolulu Police Department
15	Alice Lunt
16	Historic Hawai'i Foundation
17	Alan Britten
18	Lynda Sakraida
19	Rosalie and David Wadsworth
20	Barbara Stephan
21	Juli Walters
22	Diana Tusher
23	Department of Facility Maintenance

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APPENDIX A. ADVISORY GROUP ORIENTATION MATERIAL

TANTALUS-ROUND TOP DRIVE CORRIDOR MANAGEMENT PLAN

ADVISORY GROUP CHARTER



January 19, 2018

Vision

Tantalus-Round Top Drive is Hawai'i's only State and National Historic Roadway, and is a unique area in urban Honolulu. The *Tantalus-Round Top Drive Corridor Management Plan* (CMP) is intended to be both a visionary and practical instrument to preserve and enhance this unique, in-town wilderness area so that it will continue to serve the aesthetic, recreational, and practical needs of O'ahu's residents and visitors.

Advisory Group Responsibilities

The primary responsibility of the Advisory Group is to shape and facilitate progress on the Plan by providing members' expertise and institutional momentum to the process. To achieve this, the Advisory Group, and its Working Groups, will:

- Provide a forum that will lead to greater cooperation among management agencies, organizations, and elected officials, working towards consensus among Advisory Group members on the maintenance, repairs, and improvements that will be incorporated into the CMP.
- Advise the Division of Forestry and Wildlife (DOFAW) on key aspects of their organizations' operations, infrastructure, budgets, and priorities for the Plan Area (see attached Plan Area Map).
- Review and provide timely comments on drafts of sub-plans and the CMP as they become available.
- Assist in arriving at consensus on the CMP and assist in seeking funding for its implementation.

Commitment to Participate

All Advisory Group members agree to participate throughout the planning process, which is currently anticipated to be up to two years.

If an Advisory Group member is unable to participate in a meeting, or is unable to continue as an active member of the Advisory Group, they are asked to delegate one of their staff or other appropriate individual to take their place and fulfill their role.

Advisory Group members or their designated alternate agree to attend all meetings of the Advisory Group, as well as any informal Working Group meetings which they consent to participate in.

All Advisory Group members will respond promptly to communications and other project-related requests of the planning team and fellow Advisory Group members. If it is not possible for a member to respond within a week, that individual will indicate the date by which it will be possible to respond fully and will endeavor to adhere to the schedule that it sets for itself.

Meeting Records

For each Advisory Group meeting that is held, the planning team will keep a written record of meeting attendees, the key issues raised, and the actions recommended or agreed upon at the meeting. It will distribute drafts of this record via email within one week of each meeting, incorporate any clarifications or requested by members, and distribute a final meeting summary, also by email, no later than ten working days following the meeting. Comments from individual members will generally not be attributed, and a verbatim record of the meeting will not be prepared.

The Advisory Group meeting summaries will document the planning process and serve as reference points for Advisory Group meeting agendas, Working Group discussions, and communications.

Decision-Making

While this project is an undertaking of DOFAW, the planning effort is predicated on creating better cooperation among all management agencies active in the area, private organizations that participate, and involved members of the public. In order to do that, it will need to establish clear goals and objectives, and define the pathways to successfully fund and implement projects that will achieve them. Because these activities will cut across multiple jurisdictions, DOFAW is open to allowing the Advisory Group and the organizations or agencies its members represent to have some decision-making ability regarding the terms of the CMP.

Where consensus can be reached, a decision will be considered final and it shall be assumed that all partners are willing to abide by the terms of final CMP.

TANTALUS-ROUND TOP DRIVE CORRIDOR MANAGEMENT PLAN

PLAN AND MEETING GOALS



January 19, 2018

Plan Goals

In order to preserve and enhance the unique qualities of the Tantalus-Round Top Corridor, DOFAW has drafted the following goals for the Corridor Management Plan (CMP):

1. Define the community's common goals for the Plan Area;
2. Agree on the specific responsibilities of the agencies, elected officials, residents, and other parties accept in service of these goals.
3. Identify the specific repairs, maintenance, and capital improvements that are needed to preserve and enhance the Plan Area.
4. Secure commitments from stakeholders to seek the O&M and CIP funding needed to implement the maintenance activities and capital improvement projects agreed to during development of the CMP.

Input on these goals by Advisory Group members are welcome at this time.

Meeting Goals

This first meeting of the TRTD-CMP Advisory Group will be considered a success if:

1. Advisory Group members commit to openly discuss and reach agreement on elements of the CMP and its sub-plans related to their organizations throughout the planning process.
2. Advisory Group members commit to researching their organizations projects and activities in the Plan Area over the past ten years, including any documentation which illustrates the purpose, scope, timeframe, and budget of these activities, and providing this information to the planning team within the next 30 days.
3. Advisory Group members consent to participate in informal Working Groups related to various aspects of the CMP and its sub-plans.

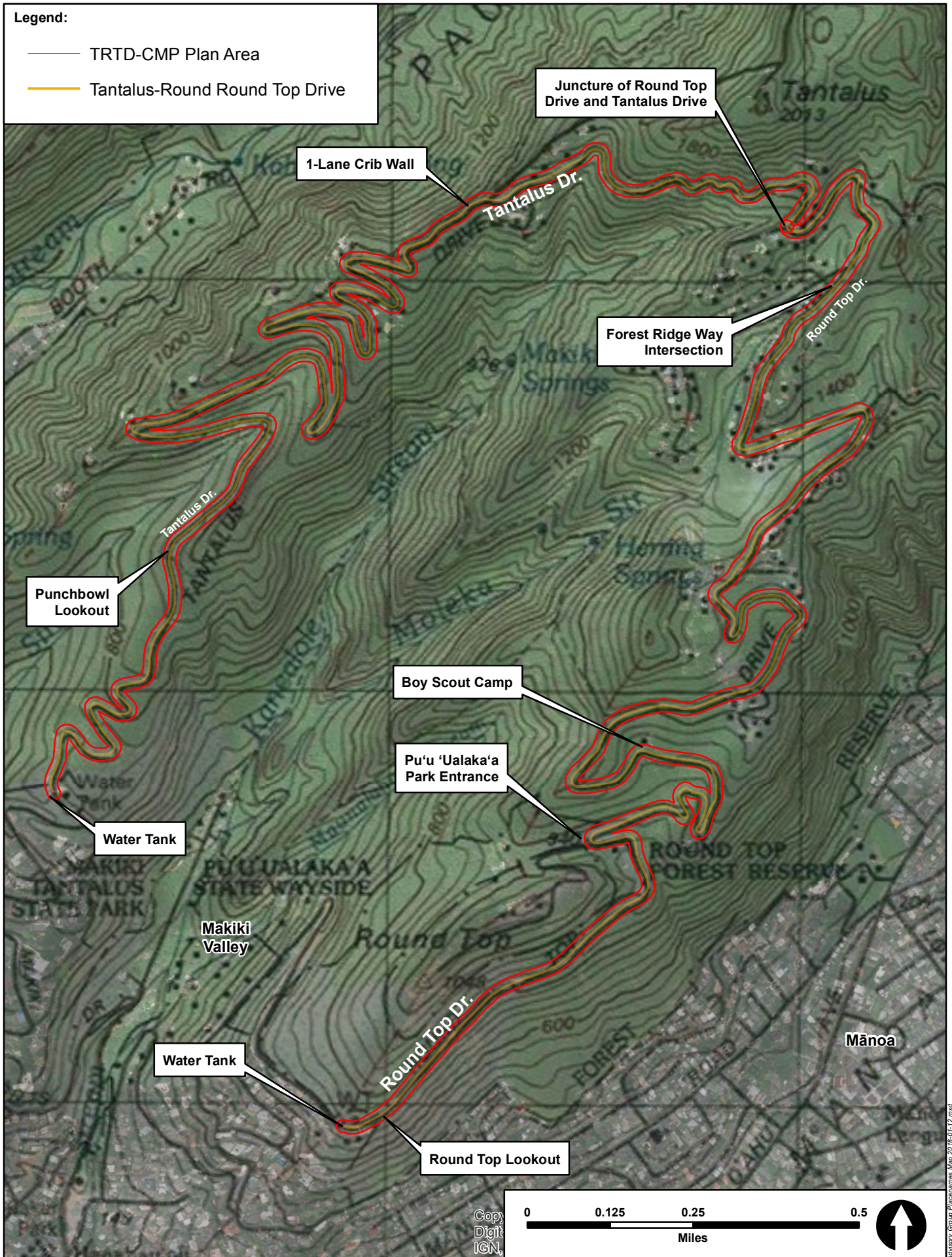
Legend:

- TRTD-CMP Plan Area
- Tantalus-Round Round Top Drive

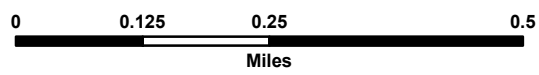


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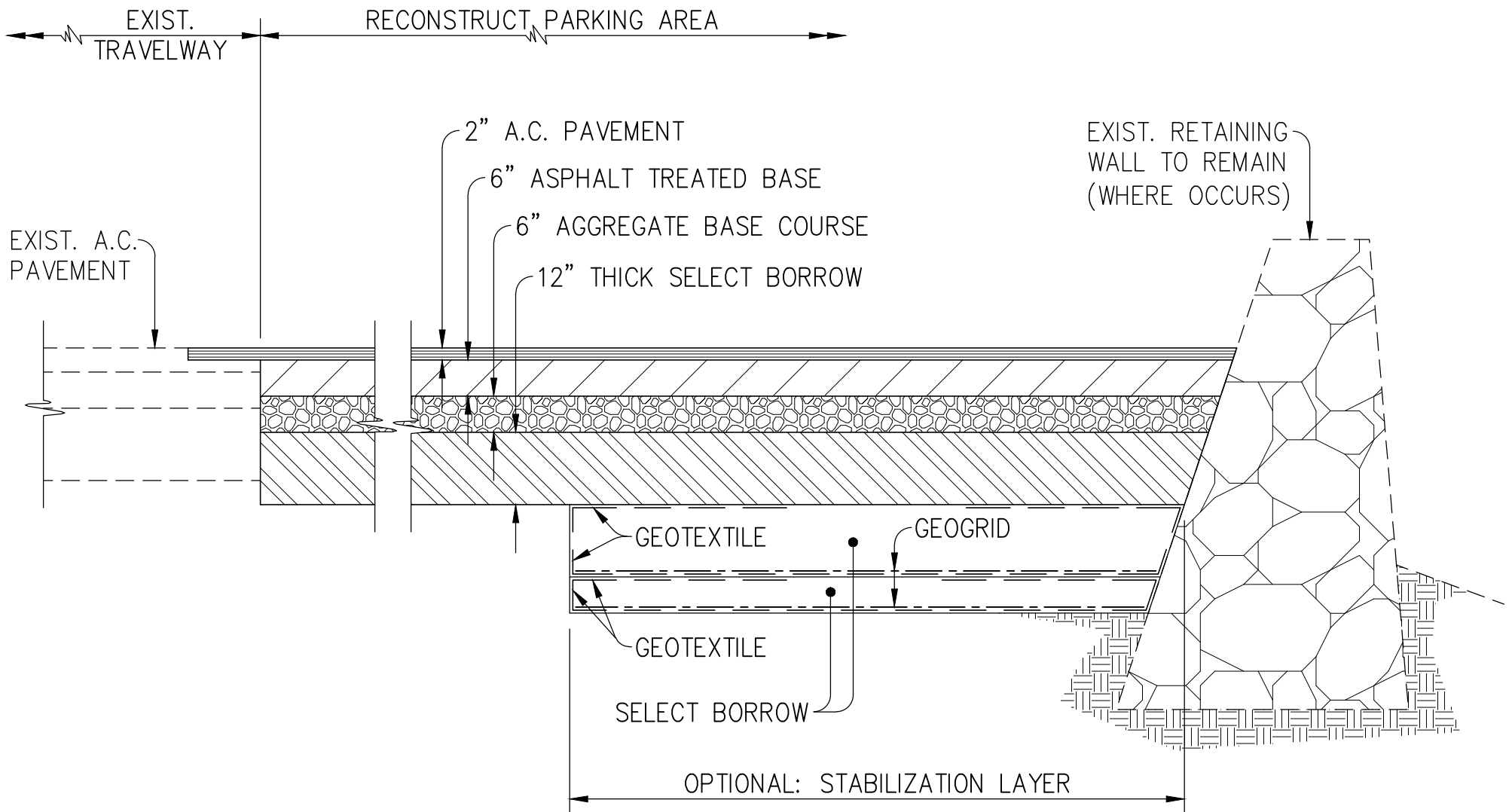
- TRTD-CMP Plan Area
- Tantalus-Round Round Top Drive



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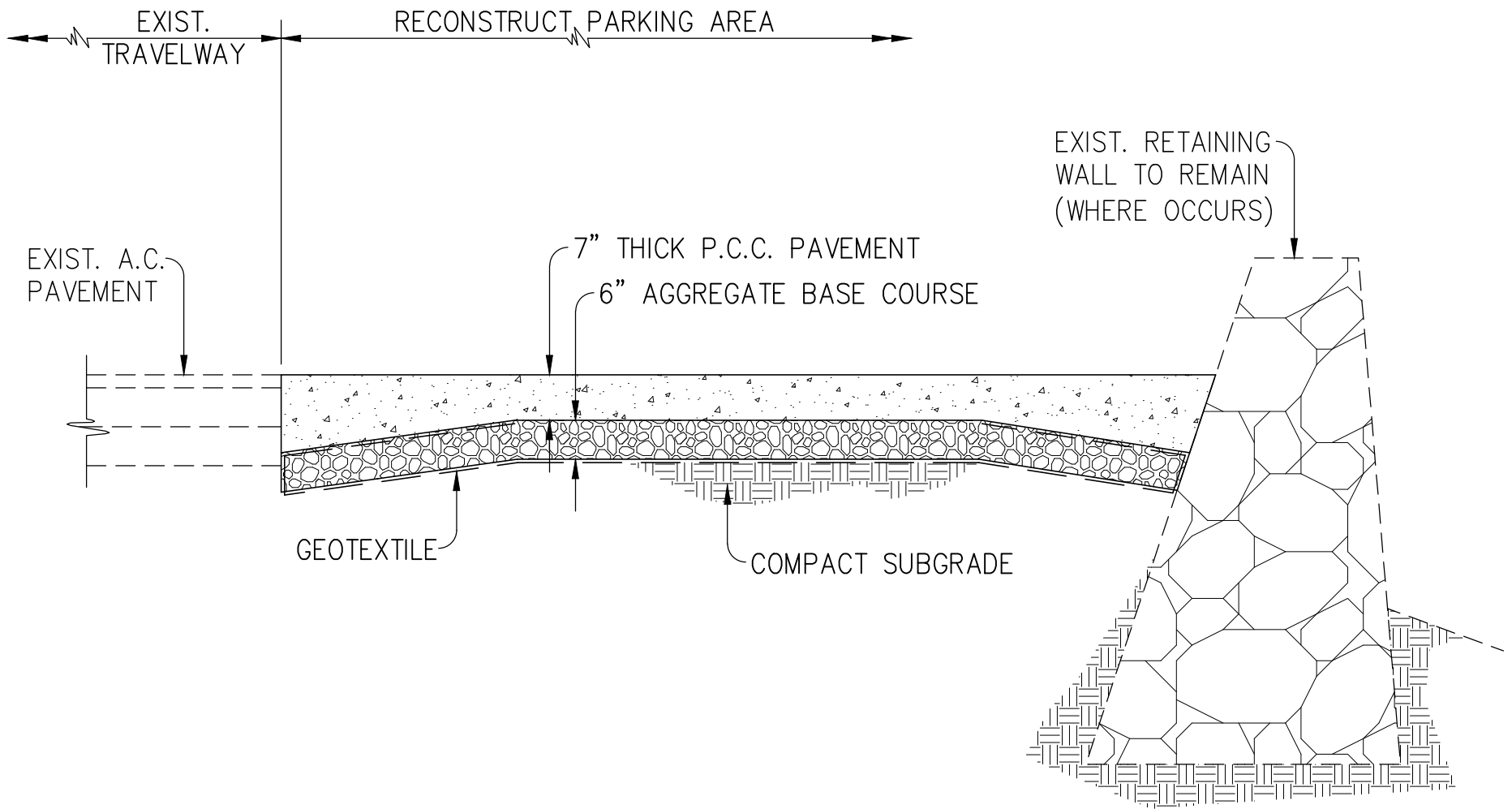


APPENDIX B. ENGINEERING SPECIFICATIONS



TYPICAL SECTION — A.C. PARKING AREA

SCALE: 1/2" = 1'-0"



TYPICAL SECTION — CONC. PARKING AREA

SCALE: 1/2" = 1'-0"

APPENDIX C. WEBSITE COMMENTS

The table below provides all the comments received on the dedicated project website (<https://tantalus-roundtopcorridor.com/>) and considered during preparation of the Draft TRTD-CMP. Some personal information, including the commenters' email address and zip code have been redacted, but all comments are provided in full.

<i>Date</i>	<i>Category</i>	<i>Comment</i>
6/3/2018	Anything Else?	Maybe a couple of signs on both sides reminding cyclists and slower vehicles to pull over and give way. Since it's mostly no-passing on Tantalus you can get really stuck behind slow movers.
6/3/2018	Roadway & Parking	The numerical markers along the road about 18" high installed about ten years ago serve no apparent purpose and get in the way of roadside maintenance equipment and tires. Please remove them or I will!
6/3/2018	Safety	Residents, please drive slowly, and slow way down and give plenty room when passing walkers, dogs, runners, and cyclists. Tantalus drivers are the most dangerous!
6/3/2018	Opportunities & Suggestions	Let's hear it for the fantastic Na Ala Hele trail system on Tantalus. It's a wonderful network of trails, easy and safe, and close to the city. * Better roadside marking of trail names and access points would benefit those not familiar with the trails. * You can report trail maintenance issues such as downed trees - the small trail staff is highly responsive.
6/3/2018	Roadway & Parking	Where private property directly abuts the road, and vegetation growth comes in to the road, residents should be reminded of their responsibility to clear it. Possibly also some enforcement would help.
6/3/2018	Opportunities & Suggestions	Fifty years ago there was a full-time city crew of six just for the Tantalus loop road.
6/3/2018	Problems	We need to be careful about moving this activity to the park. It's such a nice quiet lovely place as is. But worth considering.
6/3/2018	Problems	or put "danger, blind corner, keep right" signs on approach from either direction
5/27/2018	Anything Else?	Mahalo to whoever has done such a nice job over the years keeping this corner mowed. It's lovely and important for safety on this sharp corner.
5/27/2018	Problems	Nice corner turnout parking for trail access. The hau has grown in significantly and crowds the parking and provides a hiding place for overnight car parking.
5/27/2018	Safety	Blind corner when the guinea grass and brush are high. Also the parking on the side of the road just above the corner has eroded away so there is a drop off when cars park. Could use some gravel fill - pretty easy fix for a contractor as part of a larger set of fixes.

5/27/2018	Opportunities & Suggestions	It's probably time to put a permit system in place to limit the number of commercial vans here at a time. It's really crowded and dangerous because the vans are in the road and people are crossing the street including in the dark. Charge for the permits and use the funds to pay for clean up.
5/27/2018	Safety	I should have marked this a safety issue rather than a problem.
5/27/2018	Roadway & Parking	Noting the parking turnout here. This whole stretch has grown in 5-10 feet on both sides. It's actually a pretty good overflow parking area on the mauka side when cleared and mowed.
5/27/2018	Anything Else?	Chronic graffiti issues here on the walls and trash cans on both sides of the road. Nice place to hang out. Thank you to residents who regularly paint out the graffiti. Anyone have ideas for combatting graffiti? There was one paint I saw that said graffiti doesn't stick, for example.
5/27/2018	Anything Else?	Big mahalo to the Park workers and Nutridge tenant for doing such a great job on this corner and the lower one keeping it mowed. They're beautiful. These corners are an important lead-up to the park when mowed and blind when overgrown with guinea grass.
5/27/2018	Opportunities & Suggestions	This whole straight stretch was totally clear and absolutely beautiful in the 1960's and 1970's - an iconic view of Honolulu lined with wiliwili trees and with no koa haole or hau or keawe. This would be a great capital improvement project for joint funding by HTA and tour operators - major brush cutting along the whole length to clear the view and replanting with a long line of some striking ornamental trees.
5/27/2018	Problems	This is a very dangerous blind corner, especially because people often cross the line when they are turning the corner. A mirror or two here might help.
4/24/2018	Opportunities & Suggestions	People have created a parking spot into the vegetation at this turn and have sex and do drugs in their cars. We see it daily. Large rocks or some other barrier should be installed to prevent parking. There is no view and no other reason to park there (other than to possibly read an informational sign about the Ahupua'a).
4/15/2018	Safety	We live just a couple of blocks from where the watershed starts on Tantalus Drive, so we hear those drifters frequently. Seems like a fairly inexpensive and easy solution to discourage them would be to attach (glue? bolt?) lots of little (5 inch diameter? larger?) "bumps" along the centerline of the road, so when they try to drift, it will be all bumpy, uncomfortable, and bad for their cars, so they'll stop doing it there.
4/11/2018	Opportunities & Suggestions	If the road corridor, or even the whole Tantalus area was added to Pu'u 'Ualaka'a State Park, access control and signage issues could be resolved under existing State Park regulations, coordination between the City and the State would be simplified, and there would be a single source for administration. Residential use in the area is already subject to DLNR regulation, so existing rules could probably be continued with little or no change. Funding and political will are the real questions.

4/6/2018	Opportunities & Suggestions	We live next to the Round Top Drive lookout, just below the water tank. We have suggested that the BWS put a fire hydrant 20 to 30 feet below the tank, in case there is a fire, they will not have to drive to Ani Lani St. to fill up. It would not be a full pressure hydrant, but the HFD can pump from the connection. The BWS has given excuses why they don't want to do this. People at the lookout set off fireworks, sky lanterns, and we found a firebomb last week that failed to go off.
3/26/2018	Opportunities & Suggestions	The only way I can envision this happening would be for the Tantalus/Round Top Drive area to become a part of an expanded Pu'u 'Ualaka'a State Park. It could be a linear park, including only the roads and roadsides or it could cover the entire area. There have been several attempts to create such park over the years, but it never got enough support to become reality. Perhaps now it is an idea whose time has come.
2/17/2018	Opportunities & Suggestions	A 30-foot tower erected on the exact spot of Nahuina Triangulation Station would afford the viewer a view that extends from Waipahu to Diamond Head. The incredible view would be completely unobstructed being well above the tree line. On the roof, solar panels that power lights on the stairs, and a water catchment system to collect water, filter the water, and have it available for hikers, runners, and cyclists. A special faucet could control waste. This would help hundreds of people weekly.
3/5/2018	Safety	To stop speeders, private cameras could be placed along the road. You just need 2, but you could have more because the date stamp would show the time to calculate speed (finish time minus start time = miles per hour. Game cameras are at https://www.academy.com/shop/browse/outdoors/hunting/game-cameras--accessories/game-camera (nite pics). Hidden on private property - moved accordingly. Citizen fines thru HPD based on license plate + driver pic, but get them involved so all rules are followed.
3/2/2018	Problems	The motorcycles are worse than the drifting cars, excessive speed and noise. I'm not sure if cameras would deter the cycles as they can flip their license plate up under the seat stopping identification. They really are a large public safety issue.
2/28/2018	Safety	Having lived on Tantalus most of my 53 years, I am saddened by the general mistreatment of such a beautiful mountain. Until about 5 years ago, I enjoyed riding my bike daily on the road, and hiking the trails. Now with the skateboarders, who skid to a stop as they turn onto our street, often nearly missing mine and other neighborhood children out playing, the car "drifting," the crime, dumping, and the drinking/drug element, it's hardly a safe place. PLEASE place guards at Round Top and Tantalus
2/26/2018	Problems	The dangerous motorcycle speeding and excessive noise is much more prevalent than the car drifting.
2/25/2018	Safety	To stop the "bad boys" from drifting up the road and injuring people, I suggest raised BERMS in the middle of the road (on top of double yellow lines) on the curves most drifted upon. This would enable safe drivers minding the speed limit from going over speed bumps and only affect drifters.

2/24/2018	Roadway & Parking	Throughout the loop, until it can be resurfaced, it would be very helpful to at least install the orange reflectors in the middle of the road. It can be very dangerous to drive when it's raining, especially for those of us who have to drive the unfamiliar "other way" because of a downed tree.
2/24/2018	Roadway & Parking	Installation of speed humps, not bumps, on roadway. Maybe on curves where cars usually slow down normally and to deter racing and drifting.
2/22/2018	Anything Else?	<p>As a Civil Engineer...</p> <ol style="list-style-type: none"> 1. Traffic Calming measures <ul style="list-style-type: none"> -Speed tables 2. Signage <ul style="list-style-type: none"> -"Share the Road" Not only to remind drivers but also cyclists. -Informational signs - be aware of cyclist and dog-walkers, no drifting etc. -Indicate chicanes or 2 lane line markings (ambiguous in some places) 3. Lighting <ul style="list-style-type: none"> -Solar street lights in select locations. With motion sensor dimming. There are many good products available. With motion sensor dimming. Common product Here. http://beghelliusa.com/products/luce/lsl-20.php -Flashing amber in areas (solar/motion) -Flashing amber in areas (solar/motion) 4. Mirrors <ul style="list-style-type: none"> -At blind corners, particularly helpful night. 5. Improve shoulders and site distances. <ul style="list-style-type: none"> - Conduct a site distance study, establish a reasonable distance and improve areas accordingly. -Some grassed and vegetated areas to be removed and replaced with matting to discourage growth.
2/22/2018	Anything Else?	Aloha and thank you for your comment. Unfortunately, this system is unable to host longer comments. Please put an abbreviated comment in your place of interest, and email our project leader at makena@psi-hi.com to provide more detailed input.
2/20/2018	Opportunities & Suggestions	Great photo. It would be great to have to on a "Welcome/Info" board.
2/20/2018	Opportunities & Suggestions	I like it, I think this is unrealistic.
2/20/2018	Problems	Blind corner potentially dangerous for cyclists moving slowly up hill, could use a mirror here.
2/19/2018	Safety	This corner, right past Pu'u Ohia trailhead, needs to be examined by a soil engineer to determine its safety. A section of rock, heavily laden with trees and shrubs is separating from the rock beneath it, with the foliage overhanging the road. Whenever I pass this area, I say a little prayer as it appears to be an eminent landslide risk.

2/17/2018	Opportunities & Suggestions	This is the site of the Tantalus Halfway House that served as a resting house and grocery store for hikers and people on horse. The forester David Haughs operated the house and worked in the experimental station just below on the Tantalus Arboretum trail. The foundation of one of these buildings still remains and should be preserved and a historic marker. The house was the turn-around for the very first Tantalus Trail Race in 1919.
2/17/2018	Opportunities & Suggestions	This is Poo Poo Gulch, which is the division between Ahupuaa Kewalao and Kalawahine. An informational sign should be posted to indicate the boundary, along with information on the history of the area.
2/17/2018	Safety	This is where Lectie Altman was hit by a car. The guinea grass is/was ridiculously tall at this spot. We've been cutting it down the last few weeks, but the C&C could really take care of it quickly.
2/17/2018	Opportunities & Suggestions	Erect in unmanned station at the bottom at both ends welcoming people to the Tantalus watershed area. A gate would prevent entry until all could listen to a recorded message telling them that their cars would be photographed upon entry and exit. A sign would be well posted saying everyone welcome and to keep the mountain looking good. This will stop 99% of dumping, much of the speeding, and probably a lot of theft. City and county could be asked to pick up part of the Price tag.
2/17/2018	Opportunities & Suggestions	Re-open the water fountain below the Board of Water Supply. It used to be in the stone arch that is just below the tank. The supply and drainpipes are still there. Runners and cyclists could pick up water up or down. This would be a huge benefit to the community.
2/17/2018	Opportunities & Suggestions	Residents would have a button to push so they could bypass the message and gate. And since no one would be excluded, no one's rights would be infringed upon. Cameras would be hidden in order to prevent vandalism.
2/16/2018	Safety	SEVERE PROBLEM WITH FOLIAGE OVERGROWTH THAT WILL SOON BE THE CAUSE OF A TERRIBLE ACCIDENT UNLESS SOMETHING IS DONE SOON. LACK OF VISIBILITY AND ONE LANE ROAD AT BEST. MY CAR HAS BEEN HIT AND SCRAPPED TRYING TO PASS. NEEDS TO BE TENDED TO REGULARLY. I DON'T THINK A FIRE TRUCK COULD MAKE IT AS IS NOW.
2/7/2018	Safety	This is the start of the racing and drifting areas, from here on up Tantalus, racers go all the way up, drifters just go up a few turnouts and then drift on the way down. Easy to see exactly where it is just by noticing the black skid marks on the road. Many solutions might help stop this problem: a gate guard to monitor license plate numbers, traffic bumps/humps, lights, cameras, more HPD patrolling,
2/15/2018	Safety	No speed bumps please. Thousands of bicyclists enjoy the paved road climb and descent for sport, recreation and fitness. Speed bumps could actually generate more accidents with this user group. But, having HPD patrol more often could help with the car racing. I thought the application of gritty turns helped cut back racers until it wore off.
2/9/2018	Problems	Since the turnout next to Camp Ehrhorn was cleared to allow for parking for hikers (which apparently was on the original design for the area) there have been a lot of problems associated with this spot. personnel associated with the Boy Scouts have reported a substantial increase in break-ins, vandalism, late night partying since the area was cleared of vegetation. There is no fence

		between the area and the Boy Scout Camp allowing easy access for vagrant and ne'er-do-wells. Continued next post.
2/13/2018	Problems	Misplaced. This hazard is about a mile farther up. Sorry.
2/13/2018	Problems	3-foot diameter cut tree trunk four inches from the road. Vegetation will cover it and someone will destroy his car when he tries to use a shoulder that isn't available.
2/13/2018	Problems	I restored the parking area, which was being overtaken by hau, and planted the palm trees. Two suggestions: 1. Close the lot to the public. There's enough street-side parking outside. Put a chain and lock across the entrance to the parking lot and give the key to the people who maintain the camp. 2. Book the camp solid, 24/7/365, except for maintenance. The palms will grow to the point that the trunks alone will not obscure the view.
2/13/2018	Problems	You mean they are supposed to.
2/7/2018	Roadway & Parking	It seems that many of the road safety and road maintenance issues could be addressed by monitoring or controlling access on both sides or the road. Gates and/or cameras and/or human attendants would 1. record who is coming and going and 2. stop access completely from 10pm to 6am. We could catch all of the dumpers, identify the "cruisers" (racers and drifters), the late night scenic pullout partiers and post 2 am and 4 am bar closing impaired drivers.
2/10/2018	Opportunities & Suggestions	would be great if the roadway would look like it did in the 1960's. Will receive a digitized video from Bob Liljestrang showing just that! Will share when completed. Eradication of the guinea grass should be of utmost concern! Need to cut/cut back all the overhanging trees on the roadway.
2/9/2018	Opportunities & Suggestions	If anyone has climbed down the hillside to the bottom, there is about a dozen cars that have been rolled down and is rusting away. I climbed down to look after a C&C road maintenance worker told me about it. There might be more now. I have not gone back. I was there about 20 years ago.
2/9/2018	Problems	The parking lot next to the Boy Scout camp needs to have changes made to it. There needs to concrete road barriers placed under the Hau trees. Cars have parked underneath the trees, cannot tell what the occupants are doing, there have been beer bottles are left behind along with rubbish. The palm trees planted in front of the parking lot hides the view of the lot from the road. There have been abandoned cars, car parts, truckloads of green waste, old building material left behind.
2/9/2018	Opportunities & Suggestions	I should note that this photo is from Bishop Museum and is licensed for personal use. This photo cannot be reproduced or sold.
2/9/2018	Problems	As residents know, this spot has also been used as a dumping ground for derelict vehicles and container loads of trash. it has been very problematic on the evenings that the boy scouts and their troop leaders and chaperones are camping, with drinking, marijuana smoking, breaking glass and general mayhem right next to them
2/9/2018	Problems	How about this?
2/9/2018	Problems	DOES THIS GO INTO COMMENTS CSV?
2/9/2018	Problems	test for repose recording

2/8/2018	Opportunities & Suggestions	The Hogsback should be completely clear of vegetation, restoring it to how it used to be. The vegetation interferes with the view, but also with the drainage of roadway water. At 1,440 feet, it's the highest public lookout from a car. Here it is in 1896.
2/8/2018	Problems	Since the turnout next to Camp Ehrhorn was cleared to allow for parking for hikers (which apparently was in the original design for the area) there have been a lot more problems attributed to this parking area. Derek Fujise, volunteer groundskeeper and boy scout advocate, has reported a substantial increase in break-ins, vandalism, late night partying next to the camp which frightens the scouts and chaperones when they camp out. Also, large amounts of dumping and derelict vehicles. Need space
2/9/2018	Problems	The parking lot next to the parking lot needs to have the palms trees cut down to open up the view from road. right now hard to see inside the lot with the trees blocking view. Would like to see concrete road barriers placed under the Hou trees so cars cannot park underneath.
2/9/2018	Opportunities & Suggestions	Get rid of the trees and bushes blocking the parking lot view from the road and open up the top by cutting the trees above.
2/9/2018	Problems	City and County clears 8 feet from edge of road. Grass and tree branches.
1/24/2018	Opportunities & Suggestions	This is the Punchbowl lookout. A lot of illegal dumping takes place here. Maybe a fence or metal posts should be placed in the parking area to prevent trucks from being able to back up & dump over the edge of the cliff. I have hauled out one too many bags of trash & tires. However, I will continue to do so.
2/7/2018	Safety	If speed bumps or speed humps are not an option in this area, how about trying a DIP in the road? A Dip might be as effective as a bump, but perhaps not as dangerous. Tantalus community could "Adopt a Dip" program to maintain and keep the dips free of debris, branches, etc.
2/8/2018	Opportunities & Suggestions	The Hogsback should be completely clear of vegetation, restoring it to how it used to be. The vegetation interferes with the view, but also with the drainage of roadway water. At 1,440 feet, it's the highest public lookout from a car. Here it is in 1896.
2/8/2018	Roadway & Parking	There are quite a few areas of the road where the downhill edge of the road is not well supported. This makes the road weak and subject to breaking down. These areas need to be reinforced. A great example of this is the "trail" up to the Makapu'u light house where both sides of the road are supported by a barrier wall that is flush with the surface of the road.
2/8/2018	Safety	Because our road is used for such a variety of people (residents, tourists, bikers, hikers, the odd pig or cat....) it is absolutely essential that the sides of the road be maintained to a level which would allow someone to swerve off the road to avoid hitting someone or something. At the very least this would be a strip along the side of the road 4-6 feet wide that is free of large tree stumps and mown frequently enough to have well established grass.
2/8/2018	Anything Else?	Very tight corner. The ditch was finally filled but has started to erode again. There are other examples around the hill. My suggestion is that when the road is finally repaved special attention should be paid to reestablishing the gutter and drain system that was previously in place.

2/8/2018	Anything Else?	<p>When the road was repaved a couple of decades ago they added a layer to the existing road, in many areas this filled the gutters making them totally ineffective. This created many places where the new runoff path caused dangerous erosion along the side of the road. It also means that during heavy rains debris is washed across the roads which is dangerous for bikers and cars.</p> <p>This happened on the corner at 3656 Tantalus Dr. and multiple vehicles being stuck in the ditch that resulted on this</p>
2/8/2018	Opportunities & Suggestions	Perhaps we could have some sort of camera monitoring the parking areas.
2/8/2018	Opportunities & Suggestions	I love the idea of having regular workers whose only job is to maintain our roadside. I think this would be a huge win-win and I imagine it could be done way cheaper than what is being paid out now for erratic maintenance that seems to be done mostly on weekends which I'm assuming means they are getting paid time and a half.
2/8/2018	Roadway & Parking	All the nice telephone pole barriers at the pull outs which the TCA worked so hard to install are deteriorating. I think they should be redone with something a little sturdier and placed so there is less space for parking. The pullouts could be cut in half or more. The side where parking is no longer available could be planted in a nice low maintenance grass. There are barriers out at the view end of Pu'u 'Ualaka'a that seem like they would be a good model.
2/7/2018	Roadway & Parking	All of these corners here have very large parking areas, very inviting for all the racers to meet before racing, for their friends to park and take videos of the racing. Not all of the turnouts are view turnouts. If we could get rid of those turnout areas, it might help! By planting trees, installing posts, etc., we might, perhaps, at least stop the racers from organizing themselves and the "shows" they are putting on. The bigger turnouts also invite more drifting! 2 car spaces is enough.
2/8/2018	Roadway & Parking	I really like the idea of monitoring the flow of cars in and out. I don't think we need to close it as long as we have a record of people in and out. This would be a much easier sell to the general public. If we had a camera near the bottom of each side with a traffic calling device right before it to help slow people for good picture quality that would help. I think just knowing that their presence is being recorded will be a huge deterrent for a lot of the unwanted activity.
2/7/2018	Problems	Trees that fall are not cleared far enough off the road, leaving very dangerous stumps for anyone that needs to swerve slightly off the road to avoid a hazard. There used to be a specific area to be cleared along the road. I think it was 4 feet over from the edge of the road and 14 feet up. I would love to see something like that reinstated.
2/7/2018	Anything Else?	Comment in general: Your comment allowance isn't quite long enough even for somewhat simple descriptions.
2/7/2018	Problems	A tree went down in this area and when CnC came to clear it from the road they left a 20-foot log within 4 inches of the pavement. When they taketh time to come up and clear the road, which we really really appreciate, please do the job so that the road and shoulder is left in a safe condition.
1/24/2018	Opportunities & Suggestions	I also have an idea about the ongoing issue of no roadside maintenance. See my other lightbulb comment thread where I lay it out. It's right next to yours.

1/24/2018	Problems	This section of the roadway suffers from run-off, thus potholes are extremely prevalent here.
1/24/2018	Roadway & Parking	Easier said than done & this would be very expensive. Do you suggest any ways to improve the current upkeep of the roadside?
1/24/2018	Safety	The Manoa Lookout is available for use between 5:00am and 10:00pm as permitted by State law. Unfortunately, the state park closes around 6:45pm (This may have changed). Tourists love to see the city lights at night, thus they can only view them from the Lookout and the Buses create traffic & block the road. The park should close at a later time to allow people to view the city lights from the State Park. However, finding the money & manpower to monitor the park during late hours is required.
1/21/2018	Safety	Significant destruction of sight lines by Guinea Grass combined with skateboarding and motor cycle activity makes this one of the most dangerous sections of the corridor.
1/21/2018	Opportunities & Suggestions	This section of the straight away above the Manoa Lookout has been overtaken by Guinea Grass to the point where the guard rails as well as the view is completely obscured. If we formalize an "adopt a corner" or "adopt a section" of the corridor could we get corporate participation in maintaining the corridor?
1/14/2018	Safety	More mirrors as well as greater enforcement of speed restrictions in the residential areas of the corridor would be helpful. Near the Manoa cliff trail entrance and the residential area where Aina Lani, Mamane, and Puu Alii Pl. branch off Round Top Drive are notorious for having blind curves with higher traffic volumes. There are a few mirrors in this area, but not enough, especially given that there are many buses, tourist drivers who don't know the area, and cyclists/skateboarders, etc.
10/1/2017	Safety	Put your general ideas, suggestions and comments on this wall. Feel free to vote or comment on the ideas of others.
12/2/2017	Opportunities & Suggestions	I would like to know what the city and county budgets for roadside landscaping maintenance along the whole road. Would it be feasible/possible for the community to access these funds and contract a private company to provide 2 regular workers whose only job is to maintain the landscaping along the road. I'm sure we would require additional funds to maintain this year after year but a state grant in aid could make up the difference. There are multiple stake holders who could also pitch in.
12/2/2017	Opportunities & Suggestions	The TCA community could have a supervision team that helps the company and the 2 full time employees take care of the road. The daily presence of workers who are familiar with the road would help tremendously. The community would be thrilled with the road looking great ALL the TIME and no one would have to be embarrassed when visitors see the road in such terrible shape. The C&C would not have to listen to endless complaints. The state would have a jewel they could be proud to promote. Win. Win.
12/2/2017	Opportunities & Suggestions	I need more words. The National Bureau of Labor & Statistics states the average annual salary for landscaper workers in Hawaii is 31K. Adding the cost of employment for the company that is employing the worker a budget of 80K for 2 full time workers seems reasonable. Equipment could be purchased for with grants - especially in light of the historical nature of the road. Equipment could be stored at Nutridge.

12/2/2017	Problems	Roadside maintenance is a constant struggle. The city and county do not have enough resources to take care of the vegetation along the road. They try and every now and then there is a burst of activity but it does not take long for the grass/weeds to grow out of control again. Along with the unsightliness of this there are road safety issues as the road is encroached upon and sight lines are obscured. See my blue lightbulb for a possible solution.
12/2/2017	Problems	The view and experience that the commercial tour companies bring their clients up to see is world class. I imagine they are making a decent profit on these tours. There should be some sort of assessment to them to help take care of the road and park. It does not have to be a big fee, but something would be fair.
11/27/2017	Opportunities & Suggestions	Having the parking areas that service the trails and the trailheads monitored by solar powered security cameras attached to HPD would make users feel more secure and would deter crime.
11/27/2017	Problems	The Manoa Lookout serves the visitor industry as a sunset, city lights tour event. However the Manoa lookout has insufficient parking and parking control to handle the number of tour buses at the busiest times. This creates a traffic and safety hazard while the Pu'u 'Ualaka'a Park has equal views & better infrastructure but remains under used at the same time. Moving the commercial traffic to the Park would relieve the problem and provide some revenue opportunities for the Park.
11/26/2017	Roadway & Parking	In order to keep the roadway safe and accessible to all, both the road itself as well as the shoulders of the road must have regularly scheduled maintenance. This includes regularly scheduled re-paving and pothole repair as well as regularly scheduled trimming of trees, bushes, Guinea Grass and other plants that block the sight lines or grow or fall on the road making it dangerous or unpassable. This involves a coordinated effort of both the State and the C&C of Honolulu.
11/21/2017	Opportunities & Suggestions	Many people access the trail system in the Tantalus area, but many feel unsafe about leaving/parking their cars near the trail heads. Car break-ins are common and deter people from hiking in this area. Is there an opportunity to create safer, more secure, parking areas for the public who wish to recreate in the Tantalus area?
11/19/2017	Problems	I have seen police interaction with the racers, but because they don't necessarily catch them committing a violation, it's hit or miss. Having security cameras connected to HPD that record these and other racers could solve this as well as other issues such as illegal dumping, the other racers and drifters as well providing evidence in burglaries and other criminal activities.
10/3/2017	Roadway & Parking	Does this ideas wall work for you? How can we make it better?
10/3/2017	Roadway & Parking	An example comment.
10/3/2017	Opportunities & Suggestions	Wouldn't it be great if.....
10/4/2017	Problems	Motorcycle racers use this section of road as a racetrack every weekend but the cops don't do anything
10/3/2017	Problems	I'm commenting on the comment

10/3/2017	Problems	This is a test comment.
10/4/2017	Anything Else?	This is the trailhead for the Pu‘u ‘Ōhi‘a trail.
10/5/2017	Anything Else?	Yeah, but there isn't enough parking there for the number of people that want to start hiking here.
Source: Compiled by Planning Solutions, Inc. (2019)		

**APPENDIX D.NOMINATION TO THE NATIONAL
REGISTER OF HISTORIC PLACES**

**United States Department of the Interior
National Park Service**

**NATIONAL REGISTER OF HISTORIC PLACES
REGISTRATION FORM**

This form is for use in nominating or requesting determinations for individual properties and districts. See instructions in How to Complete the National Register of Historic Places Registration Form (National Register Bulletin 16A). Complete each item by marking "x" in the appropriate box or by entering the information requested. If any item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, architectural classification, materials, and areas of significance, enter only categories and subcategories from the instructions. Place additional entries and narrative items on continuation sheets (NPS Form 10-900a). Use a typewriter, word processor, or computer, to complete all items.

1. Name of Property

historic name **TANTALUS – ROUND TOP ROAD**
other names/site number **Tantalus Drive; Round Top Drive**

2. Location

street & number **Tantalus Drive; Round Top Drive** not for publication **N/A**
city or town **Honolulu** vicinity **Makiki**
state **Hawai'i** code **HI** county **Honolulu** code **003** zip code **96822**

3. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act of 1986, as amended, I hereby certify that this ___ nomination ___ request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property ___ meets ___ does not meet the National Register Criteria. I recommend that this property be considered significant ___ nationally ___ statewide x locally. (___ See continuation sheet for additional comments.)

Signature of certifying official Date

State or Federal agency and bureau

In my opinion, the property ___ meets ___ does not meet the National Register criteria. (___ See continuation sheet for additional comments.)

Signature of commenting or other official Date

State or Federal agency and bureau

4. National Park Service Certification

I, hereby certify that this property is:	Signature of Keeper	Date of Action
___ entered in the National Register ___ See continuation sheet.	_____	_____
___ determined eligible for the National Register ___ See continuation sheet.	_____	_____
___ determined not eligible for the National Register	_____	_____
___ removed from the National Register	_____	_____
___ other (explain): _____	_____	_____

5. Classification

Ownership of Property

(Check as many boxes as apply)

- private
- public-local
- public-State
- public-Federal

Category of Property

(Check only one box)

- building(s)
- district
- site
- structure
- object

Name of related multiple property listing

(Enter "N/A" if property is not part of a multiple property listing.)

N/A

Number of Resources within Property

Contributing	Noncontributing	
0	0	buildings
0	0	sites
1	0	structures
0	0	objects
1	0	Total

Number of contributing resources previously listed
in the National Register 0

6. Function or Use

Historic Functions (Enter categories from instructions)

Cat: Transportation

Sub: Road-related (vehicular)

Current Functions (Enter categories from instructions)

Cat: Transportation

Sub: Road-related (vehicular)

7. Description

Architectural Classification

(Enter categories from instructions)

OTHER/ Paved Roadway

Materials

(Enter categories from instructions)

foundation N/A

roof N/A

walls N/A

other concrete; masonry (basalt); asphalt paving

Narrative Description (Describe the historic and current condition of the property on one or more continuation sheets.)

See continuation sheets.

8. Statement of Significance

Applicable National Register Criteria

(Mark "x" in one or more boxes for the criteria qualifying the property for National Register listing)

A Property is associated with events that have made a significant contribution to the broad patterns of our history.

B Property is associated with the lives of persons significant in our past.

C Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or

represents a significant and distinguishable entity whose components lack individual distinction.

D Property has yielded, or is likely to yield information important in prehistory or history.

Criteria Considerations

(Mark "X" in all the boxes that apply.)

Property is:

- A** owned by a religious institution or used for religious purposes.
- B** removed from its original location.
- C** a birthplace or a grave.

- D** a cemetery.
- E** a reconstructed building, object, or structure.
- F** a commemorative property.
- G** less than 50 years of age or achieved significance within the past 50 years.

Areas of Significance (Enter categories from instructions)

ENGINEERING
TRANSPORTATION
SOCIAL HISTORY

Significant Person

(Complete if Criterion B is marked above)

Period of Significance

1892-1954

Cultural Affiliation

N/A

Significant Dates

1891 – 1902 Tantalus Road construction
1913 – 1917 Round Top road construction
1937 – Works Progress Administration paving
ca. 1953-54 - Repaving and roadside drainage
improvements

Architect/Builder

(designer/engineer) county engineers
(builder) county employees; private
contractors; and prison labor (trusties)

Narrative Statement of Significance (Explain the significance of the property on one or more continuation sheets.)

See continuation sheets

9. Major Bibliographical References

Bibliography (Cite the books, articles, and other sources used in preparing this form on one or more continuation sheets.)

See continuation sheets.

Previous documentation on file (NPS)

- preliminary determination of individual listing (36 CFR 67) has been requested.
- previously listed in the National Register
- previously determined eligible by the National Register
- designated a National Historic Landmark
- recorded by Historic American Buildings Survey # _____
- recorded by Historic American Engineering Record # _____

Primary Location of Additional Data

- State Historic Preservation Office
- Other State agency
- Federal agency
- Local government
- University
- Other (Name of repository): Hawai'i State Archives; Hawai'i State Library; Bishop Museum; Hawai'i Nature Center; State Department of Transportation

10. Geographical Data

Acreage of Property 19.7 acres

UTM References

(Place additional UTM references on a continuation sheet)

Zone Easting Northing Zone Easting Northing

1 _____ 3 _____

2 _____ 4 _____

See continuation sheet.

Verbal Boundary Description

The nominated property is a linear resource approximated by the line segments identified by the UTM coordinates listed on the continuation sheet. The nomination includes the roadway and right-of-way proper, but neither the developed private parcels along the route nor landscaping or natural features outside the right-of-way, although they remain important characteristics of the setting. This parcel includes the road, lookouts, culverts, retaining walls and curbs within the public right-of-way, the varying width of which is noted in the narrative description. The boundaries of the nominated district begin at the 1.5 Mile Marker on Tantalus Drive and end at the 8.0 Mile Marker on Round Top Drive.

Boundary Justification

The boundary encompasses, but does not exceed, all of the property that has been historically associated with Tantalus and Round Top Drives. The beginning and end points of this district were determined by the demarcation of the Board of Water Supply system and the Tantalus community's private water catchment system. This section of road holds the greatest historic integrity and character and has been relatively unaltered since the road was completed in 1917. The boundary is further justified by the rural character of this portion of the road in comparison to the lower section closer to urban Honolulu.

11. Form Prepared By

name/title	Astrid Liverman, PhD, Ming-Yi Wong and Barbara Shideler, AIA		
organization	Mason Architects, Inc.	date	5/28/09
street & number	119 Merchant Street, Suite 501	telephone	(808) 536-0556
city or town	Honolulu	state	Hawai'i
		zip code	96813

Additional Documentation

Submit the following items with the completed form:

Continuation Sheets

Maps

- A **USGS map** (7.5 or 15 minute series) indicating the property's location.
- A **sketch map** for historic districts and properties having large acreage or numerous resources.

Photographs

Representative **black and white photographs** of the property.

Additional items

(Check with the SHPO or FPO for any additional items)

Property Owner

(Complete this item at the request of the SHPO or FPO.)

name	City and County of Honolulu, Department of Transportation Services		
street & number	650 South King Street	telephone	(808) 527-6976
city or town	Honolulu	state	HI
		zip code	96813

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Section 7 Page 1 Tantalus – Round Top Road Honolulu, Hawai‘i

Narrative Description

The Tantalus-Round Top road is a 10-mile drive that begins near the entrance to Pūowaina, also known as Punchbowl Crater and home to the “National Memorial Cemetery of the Pacific.” The roadway climbs Tantalus Drive along the Kalāwahine ridge between Pauoa and Makiki Valleys and then descends along Round Top Drive on the ridge linking Pu‘u ‘Ōhi‘a (Mount Tantalus), Pu‘u Kākea (Sugarloaf) and Pu‘u ‘Ualaka‘a (Round Top); then past Maunalaha Valley Road to Makiki Street near the Archie Baker Mini Park. The boundaries for the proposed historic structure begin at the 1.5 Mile Marker on Tantalus Drive near the “Honolulu Watershed Forest Reserve” sign and the Board of Water Supply reservoir that marks the limit of the public water system. The structure ends at the 8.0 Mile Marker on Round Top Drive near the Mānoa Valley Overlook and the Board of Water Supply reservoir on the Pu‘u ‘Ualaka‘a hillside.

The proposed historic structure includes the road, lookouts, culverts, retaining walls and curbs along the shoulder and encompasses the entire public road right of way. The period of significance is from 1890, when residents of Honolulu petitioned the Kingdom of Hawai‘i for a carriage road to the top of Tantalus, until approximately 1954 when the present roadside drainage improvements were completed.

Tantalus-Round Top Drive retains its historic integrity and character in its location, alignment, design, setting and association. Physical construction of the road occurred between 1892 and 1917, and significant aspects of the roadway remain true to their original construction. Despite certain changes in materials and engineering of the surface itself, the curvilinear road dramatically demonstrates contemporary transportation engineering by incorporating rugged topography through the use of switchbacks, hairpins, and ridgeline routes. As such, the road represents not only an effective transportation link, but an aesthetic landscape in harmony with the natural environment. The road arguably took advantage of topography in such a manner as to create a unique recreational resource. Due to subsequent re-surfacing, specific paving is arguably less unique, while culverts, pull-offs, walls, and other features date prior to 1954 and are considered contributing features. No substantial changes have occurred since that date. The roadway varies from 14 feet to 30 feet wide, getting narrower as it reaches the forest reserve surrounding Pu‘u ‘Ōhi‘a (Tantalus peak). The road has been widened and the shoulders improved in short stretches, but it remains winding and narrow along the majority of its length.

Amongst the specific historic engineering features that characterize this roadway are lava-rock guard walls, some dating to the road’s earliest construction and extant in many locations, particularly in the “Hogsback” region near Mile Marker 4.0. Only a few steel w-beam rails have been installed more recently. Concrete and lava-rock (basalt) masonry culverts are contributing elements constructed in the 1950s along portions of the road to allow for storm water drainage. Consistent with its rural character, there are no paved sidewalks or light poles along the roadway. The telephone and electricity lines do not typically follow the route of the road but trace the shortest distance from the bottom of the ridge to the residential area at top. There are few side streets or roads off the main corridor. The majority of the residential and visitor traffic traverses the primary Tantalus-Round Top roadway. The speed limit is 25 miles per hour throughout, with certain sharp turns at 10 miles per hour. Mile and half mile markers are located on the road shoulder.

PHYSICAL DESCRIPTION

Mile Marker 1.5: Tantalus Drive gradually ascends the hillside as it enters the Honolulu Watershed. The vegetation consists mostly of a low mass of introduced grass and bushes with large trees beyond. The asphalt paving ends in a soft edge and concrete lined gutters (swales) are located on the downside of the road curves. There are a number of pipe culverts with masonry rock headwalls, constructed ca.1953-54. This lower road measures approximately 30 feet wide.

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Section 7 Page 2 Tantalus – Round Top Road Honolulu, Hawai‘i

The city of Honolulu is visible as the road travels through the lower forest area over a series of small turns. There are several lookouts along a series of hairpin turns on Tantalus Drive, with views of Diamond Head and the Wai‘anae Range. These lookouts are mostly paved with rolled asphalt curbs, while others have waist-high timber posts or concrete I-shape upright markers defining the edge. At the side of the road in several locations are elongated I-beams, made out of coarse aggregate concrete (roughly 6’-0” long, 7” square), dating from the mid-1950s period. These I-beams are placed crisscross on their ends, two levels high, and held together with metal spikes, often along a full stretch of the road. These I-beams were placed at their current location by the Tantalus Community Association in 2005 to prevent off-roading; they were brought in from a storage site on the Round Top Drive hillside.

Mile Marker 2.0: After the first series of turns, the road narrows to approximately 23 feet, and the character of the vegetation changes. The plantings are denser, with taller trees. The eucalyptus forests begin at this point and there is an earthen embankment on both sides of the road with overhanging branches creating a forest tunnel. The first residence on Tantalus Drive, the historic Castle Estate, appears just before the next series of sharp turns. Often, these large estates are not visible from the road, due to the steepness of the hillside and the size of the property. Long and steep driveways are a particular characteristic of this mountain development. A few of the lowest houses are on city water, however the majority of the homes are on catchment and many have corrugated metal roofs that direct the rainwater into their individual water storage tanks.

Mile Marker 2.5 and 3.0: The next mile and a half of road features sharp hairpin turns. Lava rock walls, holding back the gradual slope, are common in this stretch of the road. The Halfway House, now demolished, is believed to have been just above Mile Marker 3.0. This small wooden shack located halfway up the carriage route provided ice and a few grocery items to visitors and residents. A cabin built for the foresters involved in the early reforestation effort of the mountain was located just below this area. The first of many hiking trails, typically narrow cleared paths into the forest, starts along this section of the road. These trails are identified by a State sign at the trailhead with a pullover for parking nearby.

Mile Marker 3.5: The verdant bamboo forest starts along this portion of the road and non-historic metal guardrails have been installed in stretches. The road measures approximately 20 feet wide.

Mile Marker 4.0: The forest canopy opens up as the road nears the base of Pu‘u ‘Ōhi‘a. A sign warning of one-lane traffic marks a 14-foot wide stretch of road called the ‘Hogsback.’ A contributing historic lava rock wall lines the east (Makiki Valley) side and metal guardrail braces the west (Pauoa Valley) side. The lava rock wall is settling in areas, and the coloring and cut of the stone indicate that it was constructed in two periods. The first course is irregularly cut and may date to the road’s earliest construction in the 1890s; the second course is made of “sugar stone,” a sharply square cut basalt that was most likely added by the Works Progress Administration during its repaving project in 1937. Hogsback is considered the “best vantage point”¹ on this side of the mountain; the extent of Makiki Valley and Round Top Ridge is visible from this point, as well as views of Diamond Head and ‘Ewa. After Hogsback, the first side road, Telephone Road, leads north from Tantalus Drive providing access to one residence and the telephone company installation.

¹ Townsend Griffiss, When you go to Hawai‘i, You will need this Guide to the Islands, (Cambridge: Riverside Press, 1930) 171.

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Section 7 Page 3 Tantalus – Round Top Road Honolulu, Hawai‘i

Mile Marker 4.5, 5.0 and 5.5: Metal guardrails appear with more frequency and residences are more densely situated along this top stretch of road. Telephone poles line the road and reflectors are located at certain turns. Portions of the road are bordered by low basalt rock walls that may date from the 1890s. Another Forestry Cabin is believed to have been situated below the road near Mile Marker 4.5. A side street, Kala‘i‘opua Place, is located south-west of Tantalus Drive and provides access to several residences. Shortly after Kala‘i‘opua Place, Forest Ridge Way drops away from the main road, and leads into Poloke Valley, where many of the mountain residences are located. Forest Ridge historically marks the end of Tantalus Drive and the beginning of Round Top Drive. Today this transition takes place at Kala‘i‘opua Place. The character changes as the road begins its eastern descent. The road narrows and the tree canopy is lower and denser in comparison to Tantalus’ taller forests. There are concrete jersey barriers placed at the side of the road and a few residences are built immediately adjacent to the roadway.

Mile Marker 6.0 and 6.5: Residences are sparsely located in this area. This was the last section of the road to be completed and the final link between Round Top and Tantalus Drives. There is dense foliage on both sides of the road, but overhead, the canopy of trees diminishes. The historic road measures only 18 feet wide. Camp Erhorn, the Boy Scout camp, is located between mile marker 6.5 and 7.0. This was the site of the trustees’ encampment while they were building the road in the early 1900s.

Mile Marker 7.0 and 7.5: There are low concrete walls at the inside of the sharp turns; in between these hairpin turns are grassy landscaped areas. Stretches of stacked concrete I-beams are sited along the curve of the road. Prior to World War II, a garden of day lilies was maintained in this area for use at the Governor’s Residence, “Washington Place” (formerly the private home of Queen Lili‘uokalani).² A tree-lined road leads to Pu‘u ‘Ualaka‘a State Wayside Park where the historic “Nutridge” farm and the Pu‘u ‘Ualaka‘a Lookout are located. The road to the top of Pu‘u ‘Ualaka‘a from Round Top was constructed in the late 1940s³ and the park added in the 1950s. After the park, the road passes by rows of plumeria trees, planted by the Outdoor Circle in the late-1940s. After Mile Marker 7.5, low concrete walls border the edge of the road and the sharp cliff overlooking Mānoa Valley.

Mile Marker 8: The ‘Honolulu Watershed Forest Reserve’ sign marks the south-east end of the proposed linear historic structure.

Designation of Tantalus Round-Top Drive as a Historic Road will help retain its rural nature by preserving its several unique characteristics. The most important of these is the preservation of the historic footprint of the road as determined by the 1936 federal WPA project. This footprint is evidenced in the width and layout of the present roadway.

² Lorin Gill, personal communication, July 10, 2006.

³ Jennie Peterson, “Brief history of Makiki-Tantalus,” Accessed April 25, 2006; available from www.tantalus.ws/tantalus/history.html

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Section 7 Page 4 Tantalus – Round Top Road Honolulu, Hawai‘i

Next in historic importance is the preservation of the hand-laid split-rock retaining walls and culverts that were first constructed in the late-nineteenth and early-twentieth century and are found along the entire length of the road, particularly along the roadway fronting the Castle Estate and in the Hogsback region. Where new walls and culverts are needed, first consideration should be given to replicating this type of wall. Where guardrails are absolutely necessary, nationally approved steel-backed wood guardrails should be used.

A third significant feature of the drive is the limited use of official highway signs and road markings as the modest 25 mph speed limit precludes the need for them.

The fourth unique, and most dramatic, characteristic of Tantalus-Round Top Drive is the long-established paved roadside pull-offs with spectacular panoramic and bird’s-eye views of Honolulu and environs. These include: the Diamond Head Lookout; the Airport View; Punchbowl Lookout on Tantalus Drive between mile markers 1.5 and 3.0; the views from the Hogsback area; and those from the Mānoa Valley Overlook on Round Top Drive. This Historic Road designation will encourage the State Department of Land and Natural Resources to develop a long-term landscape maintenance plan to preserve and enhance these significant view planes.

ENVIRONMENTAL SETTING

Tantalus is located in the Ko‘olau mountain range in the Kona district of the island of O‘ahu. The ridges that carry Tantalus Drive and Round Top Drive surround Makiki Valley. Within this valley, three streams--Kānealole, Moleka, and Maunalaha--eventually drain into Māmala Bay off of the Honolulu Plain. To the south of Makiki Valley lies Pūowaina. Northeast of Makiki is Pauoa Valley and southeast is Mānoa Valley. There are three cinder cones in the Tantalus range: Pu‘u ‘Ōhi‘a (Mount Tantalus, 2013 feet); Pu‘u Kākea (Sugarloaf, 1408 feet); and Pu‘u ‘Ualaka‘a (Round Top, 1052 feet). The mean annual rainfall of Tantalus is 120-130 inches.⁴ By comparison, nearby Waikiki’s annual rainfall is 20 inches.

Early Hawaiians grew taro near the mouth of Makiki Valley where runoff from the three tributaries created ideal agricultural conditions.⁵ Archeologists speculate that by the 1600s the lowland forests had been extensively harvested and that approximately eighty percent of the land below 2,000 feet elevation was altered.⁶ *Mo‘olelo* (Hawaiian stories) indicate that Pu‘u ‘Ualaka‘a was a favored locality for sweet potato cultivation and King Kamehameha I established his personal sweet potato plantation here.⁷ *Pu‘u* translates as “hill” and *‘ualaka‘a* means “rolling sweet potato”, so named for the steepness of the terrain. Within the valley is a quarry where the basalt outcrop was chipped into pieces to make octopus lures. That is believed to be the origin of the word

⁴ Martha Yent and Jason Ota, State of Hawai‘i, Department of Land and Natural Resources, “Archaeological Field Survey of Makiki Valley, the Kanealole Stream and Moleka Stream Systems, Makiki, Kona, O‘ahu” (Honolulu, 1990) 9.

⁵ Peterson.

⁶ Peterson.

⁷ Yent and Ota, 15

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‘*makiki*’ – a type of stone used for weights in octopus lures.⁸ Numerous pre-contact agricultural sites were noted during a 1980 archaeological survey of Makiki Valley, Kānealole Stream and Moleka Stream systems.⁹

Historical attempts at cultivation in the Makiki-Tantalus area included a coffee plantation by J. M. Herring along Moleka Stream in the late 1800s (valley conditions proved too wet for coffee beans to flourish) and Hawai‘i’s first commercial macadamia nut plantation along the west side of Pu‘u ‘Ualaka‘a. Ernest Shelton Van Tassel formed the Hawaiian Nut Company Limited in 1922 (or 1921) on a twenty two-acre parcel leased from the Territory of Hawai‘i. Cultivation started in 1925 and continued until 1967. Rows of macadamia nuts trees from the original orchard remain today.¹⁰ Van Tassel’s house “Nutridge” was designed by noted Honolulu architect, Hart Wood, and is listed on the National Register of Historic Places.

Recreational activities on Tantalus were popular with nineteenth-century Honolulu residents and included hiking Pu‘u ‘Ōhi‘a, collecting endemic land snail shells in the forest and duck hunting in the ponds behind Pu‘u Kākea. The name “Tantalus” originated during a hiking excursion by the Punahou¹¹ student hiking club, the Clan Alpine. The students began their hike at Pu‘u ‘Ualaka‘a. As night approached, they found themselves at the edge of the ridge overlooking Poloke Valley. Unable to continue due to the thick undergrowth, the boys were forced to give up their ascent. Versed in Greek mythology, the students named the mountain “Tantalus.”¹² (The mythological Tantalus was condemned to an afterlife of insatiable hunger and thirst due to unreachable pools of water and overhanging fruit.) “Round Top” and “Sugar Loaf” were also named by early Punahou students; these names appear on an 1873 ‘Map of Makiki Valley’ surveyed by William De Witt Alexander (see Fig. 3).

Due to the close proximity to Honolulu Harbor, the Makiki-Tantalus forest underwent severe deforestation in two periods. In the first period, heavy timber was cut for the sandalwood trade with China from 1815 to 1826. In the second period, 1833 to 1860, wood was primarily harvested as fuel for the whaling trade to render whale blubber into oil. One of the old *lualā‘au*, or wood-pits, dug to hold a horse cart-load of firewood, can still be seen today some two miles up Kalāwahine Trail off Tantalus Drive.¹³ In addition, fires, land clearing for farming, livestock grazing, feral animals, and harvesting for building materials contributed to the loss of the Makiki-Tantalus forest and its replacement by grasses. The spread of introduced plant species have crowded out the remaining native plant species. The dense foliage that now covers the mountain areas was once so open that residents called those areas “meadows.”¹⁴

⁸ Peterson.

⁹ Yent and Ota.

¹⁰ Yent and Carpenter, State of Hawai‘i, Department of Land and Natural Resources, “Archaeological Survey of Proposed State Park Areas in Makiki Valley and Pu‘u ‘Ualaka‘a,” (Honolulu: 1994), 7.

¹¹ Punahou School is a private school created in 1841 for the children of Missionaries. Punahou School is located southwest of the mouth of Makiki Valley.

¹² Griffiss, 170.

¹³ Gill.

¹⁴ Margaret Young, “Tantalus History,” Notes for talk to Tantalus Community Association, Honolulu, March 31, 1990. Available on file with author.

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As early as 1846, the Kingdom of Hawai‘i was facing development pressure from the public regarding the Makiki-Tantalus watershed. The barren hillsides were heavily eroded and the quantity and quality of fresh water in the streams was compromised.¹⁵ That same year, King Kamehameha III passed a law declaring forests to be government property. In 1876, the Kingdom passed the “Act for the Protection and Preservation of Woods and Forests” including watershed preservation. In 1880, further legislation was enacted to protect all watershed areas that contributed domestic water supplies in the Makiki, Tantalus, Round Top and Pauoa area. Despite the establishment of the protected area, 1890s legislation allowed citizens to acquire residential property on Tantalus. The Bureau of Agriculture and Forestry was created by the 1893 Legislature to combat the problem of erosion on the mountain.¹⁶ In 1903, this became the Territorial Board of Agriculture and Forestry. Makiki Valley was designated as a Forest Reserve in 1904 and reforestation began in 1910. Efforts by the first territorial forester, Ralph S. Hosmer, resulted in the intensive growth of non-native species in the valley. Hosmer created Hawai‘i’s first tree nursery with species introduced from Australia, Asia and other parts of the world.¹⁷ Accounts of day trips published during that time mention eucalyptus, guava, lantana, *kukui* and acacia trees, as well as a forester’s cabin along the carriage road on the Tantalus side.¹⁸ A later reforestation program by the Civilian Conservation Corps in the years between 1934 and 1941 planted an average of two million trees per year in Hawai‘i’s forest reserves.¹⁹

The current vegetation of Makiki Valley reflects the reforestation program and private landscaping efforts. Although most of the plants have been introduced, there are still thriving stands of original *koa*, *māmaki*, *kukui* and a few other rare native species. While the native *Kahuli* snails disappeared with the original forest, wild pigs and the ubiquitous rat remain, along with the introduced mongoose. The native owl, *pueo*, now shares the forest with a growing diversity of introduced birds, among them cardinals, Indian mynas, sparrows, *mejiros* and doves, java finch, bulbuls and shama thrushes.²⁰

HISTORICAL DEVELOPMENT OF THE ROAD

In the Great Māhele of 1848, the land was privatized and awarded to individuals by the monarchy. The Māhele claims for Makiki were mostly small parcels of land containing a house lot and relatively few had taro *lo‘i* (wetland agriculture) or *kula* (dryland agriculture) fields. This suggests that the traditional agriculture subsistence economy was being abandoned in the Makiki area more quickly than other areas of Honolulu.²¹ Three Hawaiians

¹⁵ Peterson.

¹⁶ Thomas Cox, “The Birth of Hawaiian Forestry: The Web of Influences,” Presented at the XVII Pacific Science Congress, May 27-June 2, 1991.

¹⁷ Peterson.

¹⁸ “A Trip to Mount Tantalus,” Paradise of the Pacific, June 1897; “An Ascent of Mount Tantalus, O‘ahu,” Paradise of the Pacific, September 1890.

¹⁹ “Some History of Hawai‘i Agriculture,” May 10, 2006, <http://www.Hawai‘iag.org/history.htm>.

²⁰ Irving Jenkins, personal communication, July 6, 2006.

²¹ Yent and Carpenter, 15.

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Tantalus – Round Top Road Honolulu, Hawai‘i

received large land awards.²² John Papa ‘Ī‘ī, high chief and member of the House of Nobles under Kamehameha III, received the largest award of 250 acres at the western edge of upper Makiki valley and two large parcels in lower valley. The effects of the Great Māhele on land ownership overrode any traditional land divisions and use over the years.²³ By 1872, King Kamehameha V had added further land grants to his inherited crown lands, totaling his ownership to roughly 500 acres in Makiki.

Prior to 1890, the only persons living on Tantalus included a Hawaiian man named Alakea and a Hawaiian family living near Pu‘u ‘Ualaka‘a (on the present site of “Nutridge”). Alakea built a *hale* on the Kalāwahine trail after being banished to the mountain for an altercation on the Honolulu waterfront.²⁴ E. B. Scott's book The Saga of the Sandwich Islands features an 1889 picture of two carriages at a grassy turn-around along the Tantalus road and claims "a winding path led further up the singularly bleak mountainside to a scrub covered two-thousand-foot summit, passing a native grass shack and twin-doored privy on the 'ewa shoulder of the mountain."

In April 1891, H.W. Schmidt, a Senator in the Kingdom's legislature, received a Royal Patent (Grant 3535) for land on Tantalus from Queen Lili‘uokalani. He paid \$285 for twenty-one acres located in Poloke, between Pu‘u Kākea and Pu‘u ‘Ōhi‘a, and built the first summer home called “Maluhia.” His deed contained a forty-foot right of way provision for a public road. In July 1901, Schmidt's thirteen-year old son, Paul, wrote an article for the Pacific Commercial Advertiser about his experience living on Tantalus and mentions development of the road. “The building material had to be carried up on the backs of Portuguese (sic), because there was no road, they made their own path up Makiki, then up to the top of the [Tantalus] ridge and through the forest, now in the same place where the path was, is a fine carriage road, made by the government, and connected with Honolulu.”²⁵ Personal interviews with local residents indicate that until 1898 the Tantalus Road ended at the end of Forest Ridge Way.²⁶ Another early horse trail came through Maunalaha Valley, a Hawaiian settlement to the south east, past the Nutridge farm road, and beyond Pu‘u ‘Ualaka‘a on the right and Pu‘u Kākea on the left to reach the Schmidt residence. Lorrin A. Thurston, Minister of Interior under King Kalākaua and a pioneer Tantalus resident, was credited with conceiving and promoting the Tantalus Road project.²⁷ In 1891, Thurston authorized the construction of a carriage road “6’-0” wide with an easy grade of 7%”.

Construction of the Tantalus road began in 1892, in part an effort by the Kingdom of Hawai‘i to provide access to several hundred acres of land for settlement “at an elevation sufficient to enjoy an atmosphere as cool and bracing as is desirable for a summer outing (...) the site [Tantalus] selected is one of the best that can be found in any near vicinity of Honolulu, within easy reach and having the beauteous advantage of overlooking the harbor, city and

²² Martha Yent and Alan Carpenter, 15.

²³ Yent and Carpenter, 10.

²⁴ Lorin Gill, interview by Barbara Shideler, March 17, 2006, Honolulu, Hawai‘i.

²⁵ Paul Schmidt, “A Schoolboy’s Essay on a Forest Home at Tantalus,” Pacific Commercial Advertiser, July 1, 1901, 11.

²⁶ Gill.

²⁷ “Tantalus Drive: Honolulu’s Scenic Wonderland,” Paradise of the Pacific, (December 1926): 115.

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Tantalus – Round Top Road Honolulu, Hawai‘i

surrounding country.”²⁸ Two years prior, sixty prominent citizens petitioned the Legislature for \$17,500 for the construction of a carriage road to the top of Tantalus.²⁹ The petition guaranteed that monies received from the subsequent sale of government lots for residential use would be adequate to repay the Treasury. The residential lots on Tantalus were surveyed and laid out in 1891.³⁰

The Biennial Report of the Minister of the Interior to the Legislative Assembly of 1892 states that the Tantalus carriage road:

(...) from this on to the end of grade in the vicinity of ‘Sugar Loaf’ pond, a distance of say $4\frac{2}{10}$ miles, a wide and good trail has been opened on the road line, but which has yet to be completed as a substantial carriage road.³²

Further accounts specify that the road:

(...) begins at the Punchbowl Road, forming a junction with the same at the rear of the hill, at an elevation of about 285 feet, and follows a 5% grade up the ridge known as the forest ridge, to the narrow ridge, dividing Makiki from Pauoa Valley, at an elevation of about 1450 feet; then around the South Slope of Tantalus and head of the ravines leading into Makiki, to a point by the Pond just above “Sugar Loaf.”³¹

The project suffered a setback in 1892, when the Hawaiian Gazette reported that \$4,500 for the completion of Tantalus road was struck out of a bill by the Minister of Finance. The editors spoke in favor of continuing the work, emphasizing that several lots were already sold but that there were still very desirable government lots higher up that would have access once the road is completed - -“to stop now is to destroy prospect of adequate financial return.”³³ They further stressed that the Tantalus “suburb” was incomparable to any neighborhood in Honolulu as far as climate and scenery is concerned.

The elder Schmidt wrote to James A. King, the Minister of the Interior in 1894, just after construction on the carriage road began, requesting that the “top of Tantalus be retained as a Public reservation and not be sold to private parties. It is one of those landmarks always visited by strangers and residents.”³⁴ The government agreed to reserve sections so that the “characteristic features of this delightful drive will not lose its natural charm.”³⁵ The scenic importance of the roadway was thus early and firmly established.

²⁸ “The Tantalus Road,” Pacific Commercial Advertiser, April 21, 1891.

²⁹ *Ibid.*

³⁰ Evelyn Frey, “National Register of Historic Places Multiple Property Nomination Form for Tantalus Residences,” April, 1988.

³¹ Doris Moana Rowland of Nā Ala Hele. Letter to Curt Cottrell of Nā Ala Hele. (Honolulu: September 16, 1997).

³² Biennial Report of the Minister of the Interior to the Legislative Assembly of 1892.

³³ “The Tantalus Road,” Hawaiian Gazette, (December 27, 1892).

³⁴ Margaret Young, “Makiki Tantalus State Recreation Area” notes, Honolulu, February 21, 1990. Available on file with author.

³⁵ Thos G. Thrum, pub., “A Handbook of Info on matters relating to the Hawaiian Islands, Original & selected of value to merchants, tourists and others” Hawaiian Almanac & Annual for 1895, (Honolulu: Honolulu Press, 1895), 47.

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Tantalus was earning a reputation as an idyllic and favored locale for the summer residences of prominent Honolulu families.³⁶ In 1897, J.G. Rothwell obtained a land patent (Grant 4425) from Sanford B. Dole, President of the Republic of Hawai‘i, for 1 ½ acres west of the Schmidt holdings. William R. Castle, founder of Castle & Cooke, also obtained title to land on Tantalus, including a large tract in Kewalo and several lots in Poloke. The latter he subsequently subdivided and sold between 1891 and 1902.³⁷ Notable Honolulu families, including the Waterhouses, Castles, Dickeys, Hackfields, Alexanders, Dillinghams, Gills and the Thurstons, began to build summer cottages on Tantalus. These early families planted ironwood trees as windbreaks since the mountain was devoid of mature trees. Newspaper articles noted the significant improvement to the “delightful resort”³⁸ with the well-kept lawns of estates, bungalows, and cottages appearing on the mountainside. And not only did the road provide access to this scenic mountain ridge but the winding road itself, “when looked down on from above, present(s) a most intricate maze which adds to the charm of the place.”³⁹

The continuing development of the carriage road was reported in the June 1898 issue of the Paradise of the Pacific, “Myth of Mountain Tantalus”:

(...) the road leaves the road junction at rear of Punchbowl, rising with many long zigzags for over six miles then skirting along the base of the cone, and for a mile or two further winding on a level, in and out among the hills, to nearly over Mānoa Valley. The middle portion of the road traverses a beautiful new forest of eucalyptus, wattle and other foreign trees. A little higher are wonderful interior views of the deep canyons and ridges. At every turn are new sections of the glorious and ever expanding panorama of ocean and sky; of mountain, town and plain, including large portions of the island. But the richest part of the road above where it cuts through the upper wildwood of *koa* and *kukui*, intermingled with luxuriant fern and wild ginger--all overhanging the deep canyons. One is here in another world – cool, green, moist...it is a long and tedious climb to Tantalus, but once there, the lingering visitor will never regret or forget its romance and the melancholy cadence of its winds.⁴⁰

The road to the foot of Mount Tantalus was completed in 1901-1902 with a six-foot wide bridle path continuing beyond to Pu‘u Kākea.⁴¹ The project cost \$17,705.33. Schmidt extended the main carriage road to his own residence. The road was further extended from the Schmidt’s to the Waterhouse Estate by Samuel T. Alexander as

³⁶ Early landowners were J.G. Rothwell, James Finney, Andrew Brown, Judge W.L. Wilcox, Judge Charles F. Peterson, J.F. Hackfield, C. Duroi & J.F. Humburg, F. Harrison, A.V. Gear, Dr. C.B. Cooper, Judge A. W. Carter, Mary Forster, A.S. Lovekin, L.A. Thurston, Judge (later Governor) W.F. Frear, Charles H. Dickey, Martha and John Waterhouse, and W.M. Giffard. Evelyn Frey, “National Register of Historic Places Multiple Property Nomination Form for Tantalus Residences,” April 1988. Available on file with author.

³⁷ Young, “Tantalus History.”

³⁸ Jas W. Girvin, “Breaking New Trails,” Pacific Commercial Advertiser, September 3, 1906.

³⁹ *Ibid.*

⁴⁰ Janet Jennings, “Myth of Mountain Tantalus,” Paradise of Pacific, June 1898, 83.

⁴¹ A.N. Campbell, “Tantalus Drive: Honolulu Scenic Wonderland,” Paradise of the Pacific, December 1926, 115.

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part of a wedding present for his daughter, Martha Alexander and John Waterhouse. Their home, “Olindita” was built in 1902 and was the first residence on the hill to have a telephone.

Tantalus road is mentioned in the letters and diary entries of Una Hunt Drage, a young girl from the East Coast, during her 1901 trip to Hawai‘i. She described the German Club “built on a knee of Tantalus...with cement tennis court jutting out in front like a prow of a ship.”⁴² Drage noted that “if a ball went ‘out’ it would land in the ocean or in the heart of the city (...) it seems a queer extravagance when the Club House is extremely primitive, for they say it cost a fortune to haul the tons of cement on a donkey’s back over the zigzag trail.”⁴³

In 1906, the Civic Federation of Honolulu brought Charles Mulford Robinson, a well-known civic adviser from Rochester, New York to survey streets, parks and public works in Honolulu. He recommended securing the top of Tantalus for “the one great park for Honolulu that cities now are learning to secure and save for the people, that they may get close to nature, forgetting the fences and survey lines which civilization has thrown like a network of prison walls upon the world.”⁴⁴

By 1911, a Territory of Hawai‘i Survey map (Fig. 4) shows the road continuing beyond the top curve toward the Round Top side and ending at the Waterhouse Estate. The map shows the path of the original Round Top carriage route (by dashed line, labeled “Tantalus Auto Road”) connecting to the terminus of Tantalus Drive. Lorin Gill, who grew up on Tantalus, recalls: “In 1904 my father brought lumber up this trail by pack horses to build the Wilder’s house. It was fairly wide, like a wagon trail.” Drawn in solid lines of narrow width, the new Round Top Drive follows the general contour of the original route but with more turns, perhaps to achieve an easier grade. The map also reveals another (dashed) route at the bottom of the ridge that continues into Maunalaha Valley (this route was eventually discontinued). The map also illustrates the property plots of the early landowners.

Historic photos in the early 1900s from the top of Punchbowl show the development of Makiki-Tantalus. In the lower valley area, large fishponds are visible and there are relatively few buildings.⁴⁵ Upper Tantalus was divided into large residential lots with sizable houses within fenced cleared areas. These residences were located in the Honolulu Watershed Forest Reserve, which was established in 1913 to protect Honolulu’s water supply. This reserve supplies some of the purest water in the world and is considered a “vitaly important source of the city’s artesian water supply.”⁴⁶

In 1907, The Honolulu Advertiser reported: “Bids for the construction of what is to be known as Makiki slopes (now Makiki Heights) road have been received.”⁴⁷ However construction of the Makiki-Round Top road did not began until 1913 during the administration of Territorial Governor Walter Frear (1907-1913). Frear, a Civil

⁴² Drage, 29.

⁴³ *Ibid.*

⁴⁴ Young, “Makiki Tantalus State Recreation Area.”

⁴⁵ Yent and Carpenter, 18.

⁴⁶ A.N. Campbell, “Tantalus Drive: Honolulu Scenic Wonderland,” Paradise of the Pacific, December 1926, 115.

⁴⁷ “History from our Files,” The Honolulu Advertiser, September 12, 1947.

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Engineer by training, had a personal stake in the project since he held property at the top of Tantalus. Round Top Drive was completed in 1917 during Territorial Governor Lucius E. Pinkham’s administration (1913-1918). The Superintendent of Public Works Annual Reports (SPW) from 1913, 1914-1915 and 1915-1916 reveal the progression of “Makiki Slopes” road construction with money initially expended on survey and inspection, plans, specifications, storm drains and wagons. In 1914, portions of the road were opened to automobiles at a cost of some \$4,000 to the City.

Honolulu was fast emerging as a center of transport and commerce and the *Pacific Commercial Advertiser*, stated on April 10, 1914, that “every beauty spot of the islands” should be offered to visitors of Hawai‘i and “it would be an injustice as well as a loss to the advertising of the islands to allow them to depart without experiencing the grandeur of Tantalus.”⁴⁸ The importance of tourism to the Territory’s economy was highlighted by the development of scenic roadways.

The 1915 SPW report went into more depth about the road construction of “Makiki Round Top,” revealing that portable quarters for prisoner-workers were greatly improving the construction speed of the road since the time spent bringing the prisoners back and forth from the prison was eliminated. All work on this road was performed by prison labor – trusties – “a scheme that was proving to be satisfactory because it was of minimal expense by the government as well increasing the value of the government land of which the road passes through.”⁴⁹ The 1916 SPW report noted that the Round Top Road was being constructed “as speedily as possible, such a road [to connect with Tantalus Road] being greatly needed by the residents of the city.”⁵⁰ The road is described as twenty feet wide with a grade of 7% and constructed out of cinder rock of volcanic formation, eight-inches thick, that was widely available on the mountain ridge. The rock, a good substitute for water-bound macadam, “is proving to be cheap as well as satisfactory.”⁵¹ It was reported that the surface would be maintained by Territorial prisoners and constantly resurfaced with black volcanic sand readily available along the road.⁵² The project cost the Territory around \$12,000, a comparatively low cost, with the city contributing the use of some of its road-building machinery.

With the completion of Tantalus and Round Top Drives in 1917, the road was well established as the most beautiful scenic drive in Honolulu and a great tourist attraction. Magazine and newspaper articles touted the escape to Tantalus-Round Top as a place of meditation and “elegant seclusion reached by a picturesque winding road with breathtaking curves but a perfectly safe highway.”⁵³ The summer homes on the mountain ridge were considered among the most desirable residential areas on the island for their proximity to Honolulu, favorable climate and gardens, and panoramic views of the southern shore of O‘ahu. Tantalus quickly became an alluring locale for artists. Madge Tennent, Jules Tavernier, Howard Hitchcock, Alexander Scott, Charles Barlett, Huc Luquiens and Shirley Russell are among the many artists that have depicted scenes of or from Tantalus in their work.⁵⁴

⁴⁸ “Supervisors in favor of opening Tantalus Road,” Pacific Commercial Advertiser, April 10, 1914.

⁴⁹ *Ibid.*

⁵⁰ Superintendent of Public Works, “Makiki Round Top Road” Report for 1916, 9.

⁵¹ *Ibid.*

⁵² Campbell.

⁵³ Francesca Carleton Hawes, “Tantalus,” Paradise of the Pacific, January 1937, 15.

⁵⁴ Artist List. Honolulu Academy of Arts. June 2006.

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For all of the roads' popularity among visitors and residents, the drive was somewhat of an off-road adventure, which added to its allure. Drivers had to leave paved city streets for an unmarked gravel drive with spectacular views and all the potential washouts and potholes that an annual 130 inches of rain can cause. However, paving the eight-mile road with few residents was not economically feasible for the city, no matter how popular a drive and it remained a gravel road for 18 years.

The final step in the full development of Tantalus Round-Top Drive would be macadamized paving to tie in with the rest of the streets of Honolulu. Surprisingly, this expensive undertaking began at the least promising of times, in the midst of a severe economic depression that began in the United States in 1929. To combat the lingering economic downturn, President Franklin Delano Roosevelt established some thirty-five federal agencies to help states recover. The Territory of Hawai‘i was included in that national effort.

The agency that was responsible for paving Tantalus Round-Top Drive was the Works Progress Administration (WPA), which opened an office in Honolulu in 1936. It closed it in 1941 after having sponsored more than \$10,000,000 in projects throughout the islands.

Tantalus Round-Top Drive was among the first projects undertaken by the WPA in Honolulu. Planning for improvements to the road began in 1934, when Honolulu Mayor Fred Wright proposed that work begin on “a continuation of the Tantalus Road up and around Makiki Valley, down Round-Top to Manoa Valley, to connect [sic] with the head of Makiki St.”⁵⁵ The project was to be jointly funded by the City and County of Honolulu and the Federal Emergency Relief Administration, forerunner of the WPA. However, it was not until the establishment of the WPA in Honolulu in 1936 under administrator Fred Locey that plans gathered momentum. In July of that year, The Honolulu Advertiser reported that among the first WPA projects being considered was “widening of portions of the Tantalus-Makiki Round Top Road.”⁵⁶ A month later, in August, the paper reported under the title “LOCEY NAMES WPA PROJECTS”, that the project had expanded to include “widening and general improvement of the Tantalus-Makiki Round-Top Road.”⁵⁷

On September 27, 1936, The Honolulu Star-Bulletin announced that the drive had not only been widened and improved, but paved; “the Tantalus Road improvement project, one of the largest of its kind to be undertaken here in recent years, will be completed in about 10 days. It extends from Papakolea in the Punchbowl district to what is known as Hogsback at the summit. The entire area included in the improvement has been macadamized. Work has already been started in improvement of the highway at the other side, and Mr. Locey (WPA administrator) said today that he hopes eventually to widen and pave the entire remaining section.”⁵⁸

⁵⁵ “A Continuation”, The Honolulu Star-Bulletin, Dec. 28, 1934, p.3.

⁵⁶ “Widening of Portions” The Honolulu Advertiser, July 28, 1936, p.2.

⁵⁷ “Locey Names” The Honolulu Advertiser, 1936, Aug. 14, 1936, p.1

⁵⁸ *Ibid.*

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The cost was the then enormous sum of \$337,000, all of it paid by the federal government. With this final step Tantalus Round-Top Drive became an integral and seamless part of Honolulu’s highway system, turning the eight mile paved road into a beautiful suburban recreational drive instead of an exotic off-road adventure. Tantalus-Round Top Drive had finally arrived, courtesy of the United States Government.

On the morning of December 7, 1941, Japan bombed the United States Naval facilities at Pearl Harbor on O’ahu. Charles Black, a lifelong Tantalus resident, vividly remembered as a six-year-old boy having a panoramic view of the attack from Hogsback Ridge, which looks down on all of Pearl Harbor. Japanese planes returning from bombing and strafing runs seemed to fly straight at them as the Zeros flew in formation “just 100 feet” over Tantalus while anti-aircraft shells burst high overhead.

Governor James B. Poindexter (1934-1943) immediately proclaimed the islands under martial law and requested General Walter D. Short to take over all normal powers of the Governor. Throughout the duration of the Second World War all resources went to the war effort, and as a result improvements and maintenance of the Tantalus-Round Top road came to a complete stand-still. However, even during the war, Tantalus remained a popular drive as the *Honolulu Advertiser* noted: “During the war the Drive was a Mecca for serviceman and towns people alike who had a gallon of gasoline and could, in 20 minutes, look out through silvery kukuis, crescent koa leaves, tree ferns and gnarled hau branches at an astounding panorama from Koko Head to Waianae with the Koolau Range behind them in an island-long sweep.” Gas rationing strengthened the social bond among the small Tantalus community by forcing residents to carpool up and down the mountain, and driving at night under black-out conditions required a detailed memory of the winding road.

During the war years young Charles Black, who had witnessed the attack on Pearl Harbor from Tantalus, ran a "little roadside stand" in front of his home selling candy bars and orange soda to Tantalus visitors driving the road during the war. He remembers early in the war Admiral Chester Nimitz, commander of the Pacific Fleet holding staff meetings walking the 10 mile Tantalus loop, taking advantage of the exercise and privacy afforded by the mountain. Nimitz would always stop and buy refreshments not only for his staff of four or five, but for Charles and his brother as well.

Just a little over a year after Japan surrendered in September 1945, repairs began on the neglected drive. In April 1947, the *Honolulu Advertiser* wrote:

Tantalus Drive, O’ahu’s “skyline boulevard” with its breath-taking panoramic vistas which was devoid of maintenance during the latter years of the war, is now receiving the cooperative attention of the Board of Agriculture and Forestry, the City and County of Honolulu and the Outdoor Circle.

Half of Circle Drive, from Makiki Round Top to the Hogsback, needs complete resurfacing. Bad holes appear after every rain and the crew is now patching the potholes. The City and County Road Department restored a five man maintenance crew to the drive last October and great

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improvement has been noted in clearing brush, widening and intermittent patching. A few months ago they couldn't even look out because neglected roadside growth had shut out all the views.

The [Outdoor] Circle planning committee has developed a plan to increase the natural beauty of the entire drive. The four approaches, through Papakolea, up Mott-Smith Drive past Roosevelt High School, up Makiki Heights Drive, and up Makiki Round Top from the fork at Makiki Reservoir, are to become a mass of plumeria in all its lustrous white and hybrid colors. Above the plumeria on Round Top Drive the Cup of Gold and Night-blooming Cereus plantings will be stressed. Honey Suckle and other low ground coverings of a semi-wild nature will be used in the turn areas.⁵⁹

During the war, the summit of Round Top was used as by the military as a cinder quarry and the Board of Agriculture and Forestry now proposed that the three-acre area be turned into a park: “A low barrier around the edge, a grass surface, some shade trees and windbreak planting, and the residents of and visitors to Honolulu could, in 10 minutes, be nearly a thousand feet above the City in an ideal picnic and recreational spot unequaled on the Leeward side of O‘ahu for its panoramic view of ocean, city, and mountains (...).”⁶⁰ Ten years later, in 1957, this became Pu‘u ‘Ualaka‘a State Park, part of the Makiki –Tantalus Recreation Area.

During the 1950s, with the aid of federal funding, O‘ahu saw an increase in new road construction with the widening, straightening and even elimination of old roads and the building of Hawai‘i’s first freeways and new multi-lane highways. Tantalus-Round Top Drive benefited from benign neglect during this period, very probably due to the few residents living along the drive. The only substantial improvement to the drive was in 1953-54, when low curbside retaining walls and roadside drainage culverts made from quarried basalt were built, where needed, along the length of the road. These were the last substantial additions or alterations to this historic drive.

CURRENT STATUS

Tantalus and Round Top Drives were built on public lands between 1892 and 1917 by the Kingdom, Provisional, Republic and Territorial governments of Hawai‘i. The ownership of the road remained with the Territory of Hawai‘i, and subsequently with the State of Hawai‘i until 1993. The passage of Resolution 93-287 and Act 228 H.B. No. 1055 in 1993 transferred title to the City and County of Honolulu in name and tax map, since a metes and bounds survey does not exist. There was no actual exchange of deeds.

Under Act 234, passed in 1957, the Tantalus–Round Top area was zoned as a Conservation District with conditional residential use in the State’s land use classification system. The zoning regulations were designed to prevent water pollution to the watershed area, thereby restricting further residential, commercial, or agricultural development. The 2,000-acre Makiki State Recreation Area was established in 1957 as part of the State park

⁵⁹ “Tantalus Scenic Drive Improvement Scheduled,” Honolulu Advertiser, April 28, 1947.

⁶⁰ “History from our Files,” Honolulu Advertiser, September 12, 1947.

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system. This recreational area consists of a wayside park along Makiki Heights Drive, an upper valley area from wayside park to Pu‘u ‘Ōhi‘a, and the Pu‘u ‘Ualaka‘a State Park

Tantalus is home to around 900 residents with approximately 200 homes that are not serviced by the municipal wastewater system; there is no long-term plan to extend service to that area.⁶¹ The 2000 Census reports that the neighborhood is an older one with 1957 as the median year for home construction. Most of the homes are higher than 1,300 feet above sea level. Property parcels have been relatively unchanged since they were placed on the market in late 1800s and early 1900s.

The drive provides access to a network of approximately fifteen trails that run throughout Makiki Valley and the Tantalus–Round Top mountain range. These trails, such as the Manoa Cliff Trail, Pu‘u ‘Ōhi‘a Trail, Judd Trail, ‘Aihualama Trail, and Nu‘uanu Trail, offer the hiker respite from nearby urban Honolulu and an opportunity to explore the verdant Tantalus forest, as well as some panoramic views of Diamond Head and the Wai‘anae range. Many of the existing hiking trails are thought to originate with old horse trails from both the deforestation and reforestation days. Of historical note, the lower portion of Maunalaha Trail and a path that runs along the Maunalaha (east) side of Moleka Stream traces the path of the old carriage road built by G.M. Herring that begins at the Forestry Baseyard near the convergence of Kānealole and Moleka Streams.

The road is popular with cyclists, hikers, runners, birdwatchers, and motorcycle clubs (identified on one website as one of the best scenic routes for a motorcycle drive).⁶² The Tantalus Community Association has been very active in the clearing of the invasive and non-native vegetation and engaging in quarterly roadside cleanups and “workdays.” Vehicular speeding is a problem, as the hairpin curves and the length of this mountain road present a challenge irresistible to recreational drivers. Heavy rainfall and strong winds often cause falling trees, forcing road closures. There have been efforts by the City to put up warning signs and re-stripe roads, all toward making the road safe for drivers.

ALTERATIONS

There have been relatively few minor alterations to Tantalus-Round Top Drive outside the period of significance (1890 – 1954). Masonry and concrete swales and rolled asphalt curbs were installed in the mid 1950s on the downside of turns and alongside the edge of lookouts. A few short segments of metal guardrail were installed over the past few decades. Small numbers signs (with displays such as 252+00) were positioned by the City in 2005 to help identify stretches of the road for maintenance crews. Contemporary speed limit signs, reflectors, and traffic signs are found at intervals on the road. The mile and half-mile marker posts were installed by the Tantalus Community Association in 2000. At certain lookouts, short wooden or metal posts are placed to define the limit of the lot – some, particularly the metal poles at the large Pu‘u ‘Ōhi‘a Trailhead parking were installed to deter night-time parking and impede trash dumping.

⁶¹ 4M Inventory Phase Report Executive Summary, Chapter 2.

⁶² www.motorcycleroads.us/roads/hi_rtd.html. Accessed May 11, 2006.

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Tantalus – Round Top Road Honolulu, Hawai‘i

Narrative Statement of Significance

Tantalus-Round Top Drive fulfills Criteria A and C for listing on the National Register of Historic Places. The road represents a significant and distinguishable entity in the historical development of the city of Honolulu. The road retains historic integrity in its original road alignment, narrow lanes, undeveloped shoulders, and spectacular setting above the city. Minimal alterations over the past ninety years have not only preserved the historic character of the road, but have also helped maintain the natural and scenic qualities of the rural Tantalus community.

Criterion A: The development of Tantalus-Round Top Drive spanned the five successive governments of Hawai‘i. The roadway served the sale and development of residential lots along the route, and provided vehicular access for a well-used scenic drive enjoyed by tourists and residents alike.⁶³ In fact, irrespective of associated residential development, the roadway represents an important civic amenity in its function to provide a scenic drive to tourists and residents alike. By providing an overview of the city, construction of the road contributed to the emergence of civic pride in the citizenry of Honolulu during the late-nineteenth and early-twentieth centuries. Its historic use as a recreational destination ensured its continued status as a cherished natural landscape.

At the turn of the eighteenth century, O‘ahu was becoming the new center of commerce and trade in the islands. The discovery of the only navigable harbor in all of the islands on the south shore of O‘ahu in 1793 led to the subsequent growth of Honolulu as an economic, political, and social powerhouse.⁶⁴ From the harvesting of the native forests on Tantalus in the early nineteenth century to the subsequent reforestation initiated by the Kingdom and later the Territory’s Forestry Programs, to the opening of the mountain for recreational and residential use, the development of the mountain road parallels the gradual modernization of Hawai‘i. The development and use of the road extended through the Kingdom of Hawai‘i (1810-1893), the Provincial Government (1893 to 1894), the Republic of Hawai‘i (1894 to 1900), the Territory of Hawai‘i (1900 until 1959), and, finally, the State of Hawai‘i, when the islands were admitted as the Fiftieth State of the United States of America in March 1959. Each government has deemed the mountain road significant enough to dedicate time and money to its maintenance and growth. Tantalus and Round Top Drives represent a pattern of road development that transformed old trails and carriageways into roads that could be easily negotiated by the automobiles introduced to the islands in the early twentieth century.⁶⁵

The macadamized paving of Tantalus Round-Top Drive was one of the earliest projects undertaken by the Work Progress Administration (WPA), one of the agencies established by United States President Franklin Delano Roosevelt to help the nation recover from the severe economic downturn caused by the New York stock exchange collapse in 1929. Between 1936 and 1941, the WPA spent \$10,000,000 in federal funds to aid the Territory of Hawaii. The footprint of the road remains largely as the WPA project left it, and the drive today is a reminder of the United States’ investment in Hawai‘i even prior to statehood in 1959.

The opening of the road in the 1900s allowed Honolulu’s prominent families to purchase residential lots that were in close proximity to town, with a cool comfortable climate and stunning scenic appeal. The first summer homes built in this highly desired resort environment included the Waterhouse’s “Olindita” (1902); Senator C.H. Dickey’s “Kuahiwi” (1906); Mary Alexander’s “Paliuli” (1907); the Wilder home “Mehemanuala,” designed by architect Tom Gill (1908); the

⁶³ “Tantalus Scenic Drive Improvement Scheduled,” April 28, 1947.

⁶⁴ Gavan Daws, *Shoal of Time, A History of the Hawaiian Islands* (Honolulu: University of Hawai‘i Press, 1968), 37.

⁶⁵ Ralph Kuykendall, *The Hawaiian Kingdom, 1854-1874, Vol. 2* (Honolulu: University of Hawai‘i Press, 1953), 23.

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Campbell’s “Kalaukoa” (1917); and David Little Withington’s “The Camp” (1918). The Davies, Judd, Dillingham, Bishop, Castle, and Thurston families also had summer homes on Tantalus. Governor Walter Frear maintained a large estate on the mountain. In 1928, Thomas Gill constructed a home, called ‘Wao’ala’ on Tantalus and became one of the first year-round residents. Many of these historic grand residences are still intact along Tantalus and Round Top Drives and several current residents claim residency back to the Kingdom’s Royal Patents. There are no other mountain ridge residential developments in Honolulu that compare to Tantalus-Round Top’s scenic access by curvilinear road that follows the natural topography. Also notable are the depth to which the road reaches into the valley and the large size of many of the lots. Several homes are currently listed on the State Register of Historic Places as part of the Multiple Property designation for “Tantalus Residences.” “Nutridge” in Pu‘u ‘Ualaka‘a State Park is also individually listed on the National Register as the first macadamia nut farm in Hawai‘i.

Tantalus-Round Top Drive has been since its inception a popular destination for both visitors and residents for its scenic vistas and the experience of driving through a lush forest landscape in close proximity to urban Honolulu. As early as 1820, O‘ahu’s landmarks were already well established; many historical accounts speak of the beaches of Waikīkī and Diamond Head, the flat Honolulu plains, Barber’s Point, and the mountains of Wai‘anae.⁶⁶ The proliferation of literature from the time the road was constructed reveals its significance as an early tourist attraction of Honolulu. Tantalus is described as one of “Hawai‘i’s best cards – miles of the loveliest scenery flanking an excellent driveway that winds through cool forests of *koa*, *kukui* and eucalyptus.” The road provided access to the cool mountains and “makes available this veritable garden spot, with its striking panorama of Honolulu and environs.”⁶⁷ The road was a testament to the civic pride evident in the citizenry of Honolulu at the beginning of the twentieth century: “From Tantalus it is that the Honolulan may really see his city; obtain an indelible impression of its great length sprawled out from Koko Head to Barber’s Point; and of its breadth stretching from the verdure-clothed slopes to the blue ocean, south and west. One must view Honolulu from Tantalus to seriously appreciate its size, its orderliness, its wonderful coloring.”⁶⁸

Additionally, it is important to note that the construction of the road is associated with several prominent Honolulu citizens, among them Lorrin A. Thurston, Henry Hackfield, Governor Walter Frear, and H.W. Schmidt. However, their contribution to the roadway project remains a minor aspect of their careers and accomplishments. As such, the property is not nominated under criterion B.

Lorrin Andrews Thurston (1858-1931), was the grandson of Asa and Lucy Thurston, members of the 1820 pioneer company of missionaries to Hawai‘i. Born in Honolulu, he played an instrumental role in the transformation of Hawai‘i from a sovereign constitutional monarchy into a territory of the United States. As owner and publisher of the *Honolulu Advertiser*, Thurston enthusiastically promoted Hawai‘i as a tourist destination and was a firm proponent of public parks. He was instrumental in the establishment of Hawai‘i Volcanoes National Park on the Island of Hawai‘i and Haleakalā National Park on Maui.⁶⁹ Thurston was the driving force behind government road construction to the volcano on Hawai‘i and to Tantalus on O‘ahu.

⁶⁶ Meyen, viii.

⁶⁷ “Tantalus Drive: Honolulu’s Scenic Wonderland” *Paradise of the Pacific*, December 1928.

⁶⁸ “Tantalus Drive: Honolulu’s Scenic Wonderland” *Paradise of the Pacific*, December 1928.

⁶⁹ A. Grove Day, *History Makers of Hawai‘i*, (Honolulu: Mutual Publishing, 1984) 121.

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Other pioneer Tantalus landowners were Henry Hackfield (1815-1887) of Hackfield and Co., Samuel Northrup Castle (1808-1894) of Castle and Cooke, and Samuel Thomas Alexander (1836-1904) of Alexander and Baldwin. Hackfield, Castle, and Alexander were founding members of three of the five sugarcane corporations known as the “Big Five” that effectively dominated island life economically, politically, and socially throughout the Territorial era and into the early years of Statehood.

Among these leaders, Hackfield in particular promoted Tantalus as a recreational destination by building a retreat for the German Club on his Kala‘i‘opua Place property. The German Club was a large social organization founded in 1854 during the reign of King Kamehameha III and made up of prominent members of the sizable and influential German community in Honolulu. Hackfield’s managing director, H.W. Schmidt, built the first house on Tantalus, “Maluhia,” in 1892. His granddaughter, Margaret Smith Young (1905-1993) was a long-time Tantalus resident and founder of the Hawai‘i Nature Center at the Makiki State Recreation Area.

Many of these early Tantalus residents held various offices in the Hawaiian government. Schmidt was a Senator in the Hawaiian legislature. Hackfield served as consul in Hawai‘i for Germany, Norway, and Sweden and was a charter member of the Honolulu Chamber of Commerce. During the monarchy, Lorrin A. Thurston served in the House of Representatives, House of Nobles, and was appointed Minister of the Interior.

Criterion C: The construction of the road between 1892 and 1916 is a transportation engineering achievement. County engineers, private contractors, and prison trustees improved and modernized the old trail into a carriage road and automobile system despite the challenging terrain. Tantalus-Round Top Drive is a rare extant example of a rural scenic roadway corridor winding through the forest reserve adjacent to Honolulu’s primary urban core. Other examples, such as the Nu‘uanu-Pali Road, have been altered by urban development and the construction of modern highways along the original alignments. Features of the Tantalus-Round Top roadway, such as masonry walls and curbs, are significant for their use of vernacular materials, in this case basalt or “lava rock.”

Tantalus-Round Top Drive is one of the last examples of a heavily forested landscape in the city of Honolulu. The integrity of the road has been sustained over the years. Historic photos, during and after construction, indicate that the rustic character of the road has undergone relatively few and minor changes. Current vegetation reveals layers of the historic use of Makiki Valley –deforestation, reforestation, and patterns of the establishment of native and non-native species. The lava rock walls along certain stretches of both Tantalus and Round Top date from the road’s construction. Basalt rock culverts, concrete-lined gutters and rolled asphalt curbs are examples of typical road treatments in Hawai‘i during the early twentieth century. With the exception of a few stretches of metal guardrail and limited traffic signs, the road’s present-day appearance is physically and visually similar to its original appearance. Today a trip along the Tantalus-Round Top Drive provides an opportunity for a motorist to enjoy what excursionists would have seen in 1917. The road provides spectacular scenery, with views of Honolulu’s natural beauty: verdant mountains and valleys, coastal stretches, and ocean vistas.

United States Department of the Interior
National Park Service

NATIONAL REGISTER OF HISTORIC PLACES
CONTINUATION SHEET

Section 9

Page 1

Tantalus – Round Top Road Honolulu, Hawai‘i

Major Bibliographical References

- Alvarez, Patricia. Historic Bridge Inventory and Evaluation: Island of Hawai‘i. Prepared for the State of Hawai‘i, Department of Transportation, Highways Division in cooperation with the U.S. Department of Transportation, Federal Highways Administration, Honolulu, 1987b.
- Alexander, W.D. Hawaiian Government Survey. “Map of Makiki Valley.” 1873.
- Alexander, W.D. “Map of the State of Kamehameha V in Pawaa, Waikiki.” 1874.
- Black, Charles. Interview by Barbara Shideler of Mason Architects. March 20, 2006.
- Campbell, Marston. Hawai‘i Territory Survey. “Makiki Valley Section.” 1911.
- Cox, Thomas. “The Birth of Hawaiian Forestry: A Web of Influences,” presented at XVII Pacific Science Congress, Honolulu, May 27-June 2, 1991.
- Daws, Gavan. Shoal of Time, A History of the Hawaiian Islands. Honolulu: University of Hawai‘i Press, 1968.
- Day, A. Grove. History Makers of Hawai‘i: a biographical dictionary. Honolulu: Mutual Publishing, 1984.
- Drage, Una Hunt. Hawai‘i Deluxe, compiled from her own diary and letters in 1901. Honolulu: Honolulu Star Bulletin. 1952.
- Frey, Evelyn. A Collection of Tantalus Memories. Unpublished manuscript for the Tantalus Community Association, 1987.
- Gill, Lorin. Interview by Barbara Shideler of Mason Architects. March 17, 2006.
- Griffiss, Townsend . When you go to Hawai‘i, You will need this Guide to the Islands, Cambridge: Riverside Press, 1930.
- Hawai‘i (Territory). Biennial Report of the Minister of the Interior to the Legislative Assembly of 1892. 1892.
- Hawai‘i (Territory). Superintendent of Public Works. Report for 1913, 1914, 1915 and 1916.
- Honolulu Advertiser, various dates.
- Hawaiian Gazette. December 27, 1892.
- Honolulu (City and County). Department of Planning and Permitting. 4M Inventory Phase Report Executive Summary. Honolulu: 2003.
- Honolulu (City and County). Real Property Tax Assessment Office. Property maps for section 2-5.

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National Park Service

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CONTINUATION SHEET

Section 9

Page 2

Tantalus – Round Top Road Honolulu, Hawai‘i

Honolulu Star-Bulletin, various dates.

Jenkins, Irving. Conversations with Barbara Shideler of Mason Architects, various dates.

Kuykendall, Ralph. Hawai‘i: a History from Polynesian Kingdom to American State. Englewood Cliffs: Prentice Hall, 1961.

---. The Hawaiian Kingdom, 1854-1874. Vol. 2. Honolulu: University of Hawai‘i Press, 1953.

Meyen, F.J.F. A Botanist’s Visit to O‘ahu in 1831. Kailua: Press Pacifica, 1981.

Pacific Commercial Advertiser. April 21, 1891; July 1, 1901; September 3, 1906; April 10, 1914.

Paradise of the Pacific. June 1898; December 1926; June 1898; January 1937.

Peterson, Jennie. Interview by Barbara Shideler of Mason Architects. March 22, 2006.

“Brief History of Makiki-Tantalus”; www.tantalus.ws/tantalus/history.html, accessed April 25, 2006.

Pukui, Mary Kawena and S.E. Elbert. Hawaiian Dictionary. Honolulu: University of Hawai‘i Press, 1986.

---. and E.T. Mookini. Place Names of Hawai‘i. Honolulu: University of Hawai‘i Press, 1974.

Thrum, Thos G, pub. “A Handbook of Info on matters relating to the Hawaiian Islands, original and selected of value to merchants, tourists and others” Hawaiian Almanac & Annual 1895. Honolulu: Honolulu Press, 1895.

U.S. United States Geological Survey. Topographic Map of Honolulu, Makiki Valley, Hawai‘i. Washington, D.C.: USGS 1998

Yent, Martha and Alan Carpenter. State of Hawai‘i, Department of Land and Natural Resources. “Archaeological Survey of Proposed State Park Areas in Makiki Valley and Pu‘u ‘Ualaka‘a.” Honolulu: 1994.

---, and Jason Ota. State of Hawai‘i, Department of Land and Natural Resources. “Archaeological Field Survey of Makiki Valley, the Kānealole Stream and Moleka Stream Systems, Makiki, Kona, O‘ahu.” Honolulu: 1990.

Young, Margaret. “Tantalus History,” and “Tantalus State Recreation Area.” Talks given to Tantalus Community Association. Honolulu: March 31, 1990.

United States Department of the Interior
National Park Service

NATIONAL REGISTER OF HISTORIC PLACES
CONTINUATION SHEET

Section 10 Page 1

Tantalus – Round Top Road Honolulu, Hawai‘i

Geographical Data

UTM References The coordinates for Tantalus-Round Top Drive form a linear resource approximated by the following line segments:

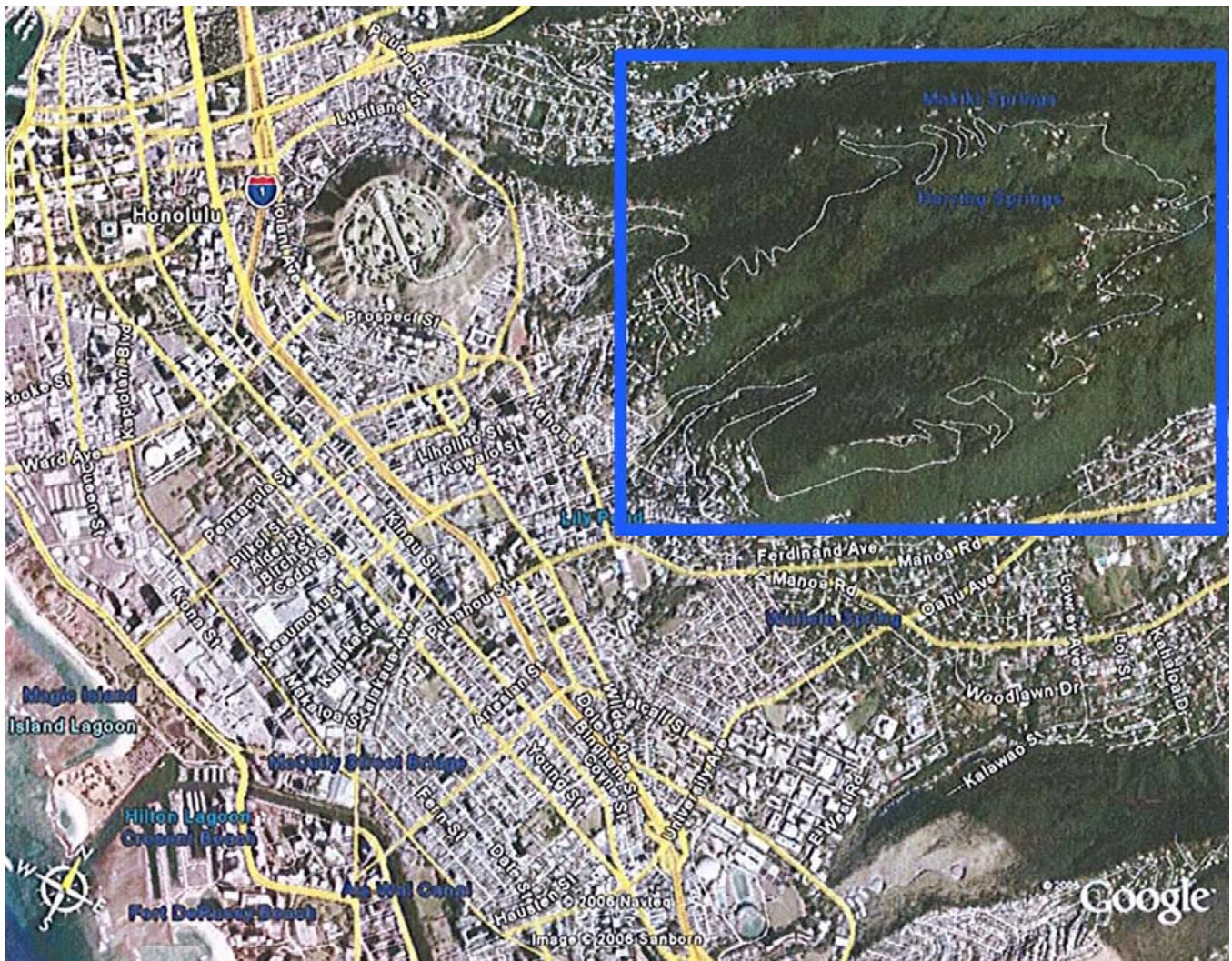
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3. Mile Marker 2.5	04-6216600-235858
4. Mile Marker 3.0	04-6217600-235878
5. Mile Marker 3.5	04-6218500-235890
6. Mile Marker 4.0	04-6220400-235910
7. Mile Marker 4.5	04-6225000-235925
8. Mile Marker 5.0	04-6230800-235920
9. Mile Marker 5.5	04-6230000-235865
10. Mile Marker 6.0	04-6227800-235825
11. Mile Marker 6.5	04-6227400-235795
12. Mile Marker 7.0	04-6227800-235777
13. Mile Marker 7.5	04-6225800-235755
14. Mile Marker 8.0	04-6223200-235730

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**NATIONAL REGISTER OF HISTORIC PLACES
CONTINUATION SHEET**

Section 11 Page 2 Tantalus – Round Top Road
Honolulu, Hawai‘i

Figure 2: Aerial view of Honolulu and Tantalus (*Google Maps, ca. 2005*).

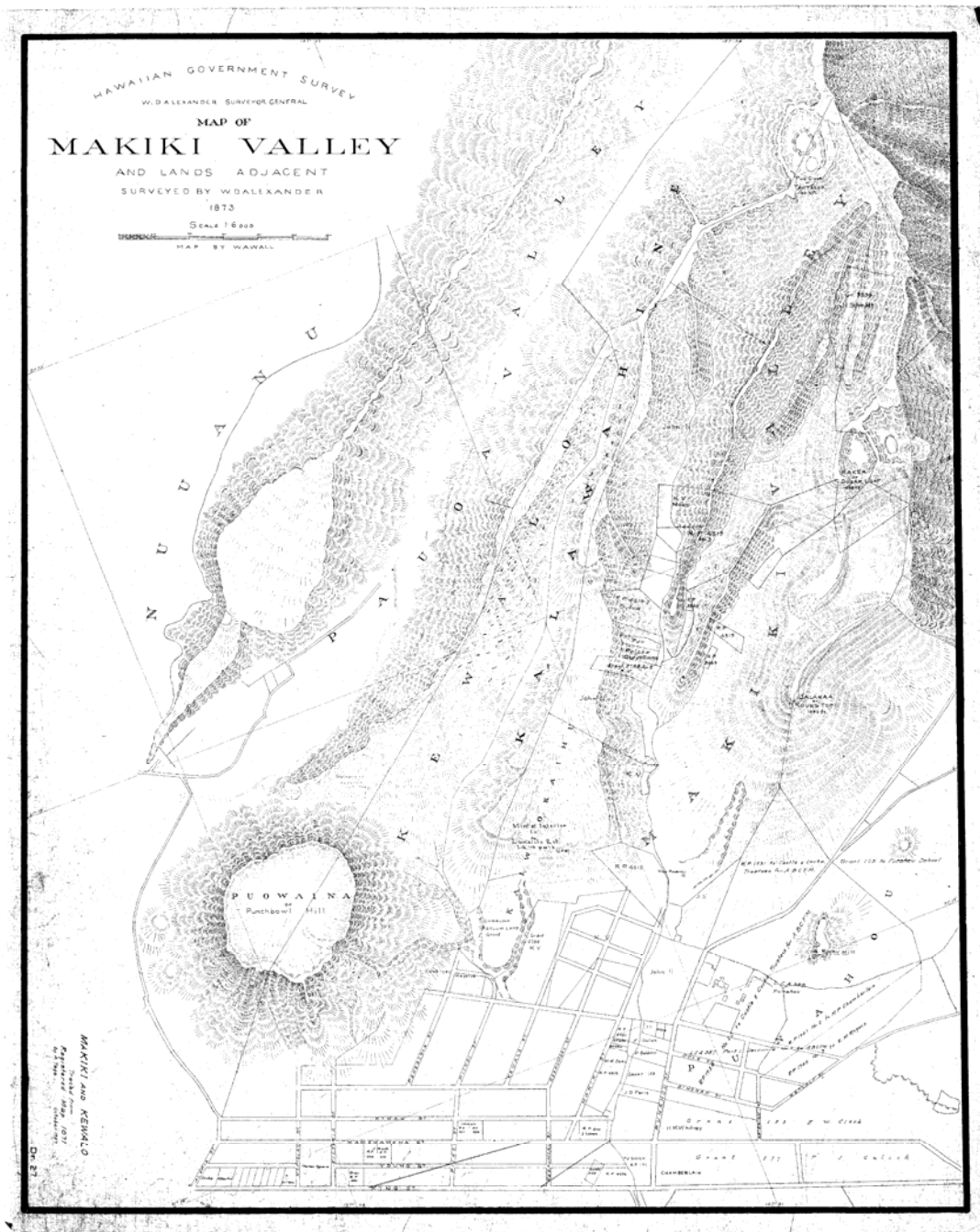


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NATIONAL REGISTER OF HISTORIC PLACES
CONTINUATION SHEET

Section 11 Page 3 Tantalus – Round Top Road
Honolulu, Hawai‘i

Figure 3: 1873 Survey Map of Makiki Valley by W.D. Alexander (full size map attached).

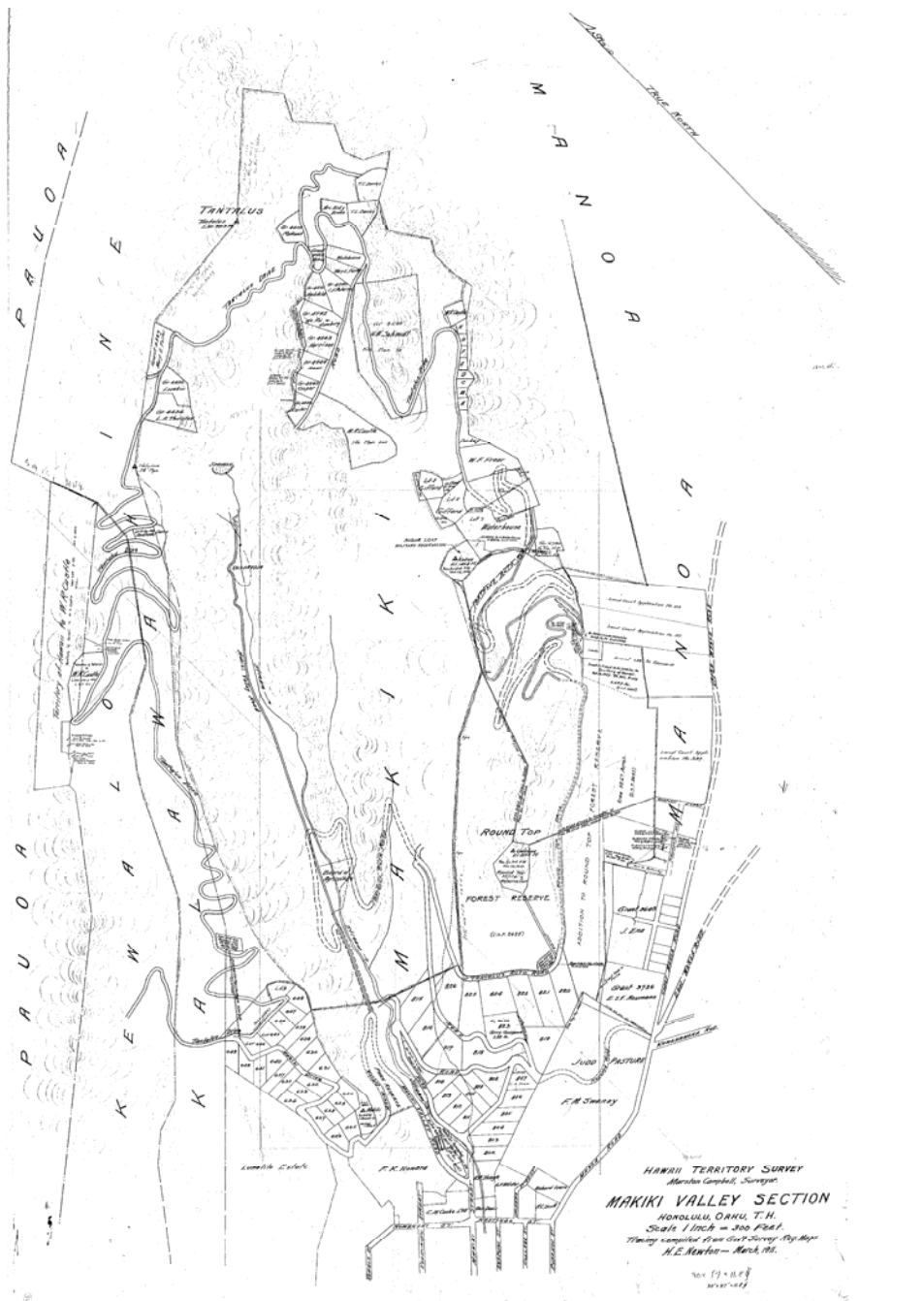


United States Department of the Interior
National Park Service

NATIONAL REGISTER OF HISTORIC PLACES
CONTINUATION SHEET

Section 11 Page 4 Tantalus – Round Top Road
Honolulu, Hawai‘i

Figure 4: 1911 Hawaii Territory Survey Map, Makiki Valley Section (full size map attached).

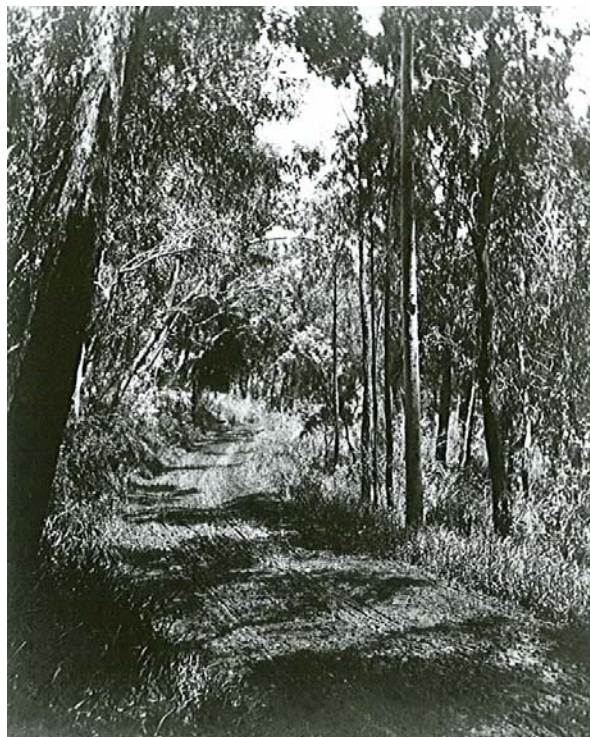


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**NATIONAL REGISTER OF HISTORIC PLACES
CONTINUATION SHEET**

Section 11 Page 5 Tantalus – Round Top Road
Honolulu, Hawai‘i

Figures 5 and 6: Kukui trees along Tantalus Road, 1905 (*Alonzo Gartley, Bernice P. Bishop Museum*)
Tantalus Road, ca. 1907 (*T.S. Wilson, Bernice P. Bishop Museum*)



United States Department of the Interior
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**NATIONAL REGISTER OF HISTORIC PLACES
CONTINUATION SHEET**

Section 11 Page 6 Tantalus – Round Top Road
Honolulu, Hawai‘i

Figures 7 and 8: Diamond Head from Tantalus, ca. 1900-1910 (*Alonzo Gartley, Bernice P. Bishop Museum*)
Diamond Head from Tantalus, 2006 (*Mason Architects, Inc*)

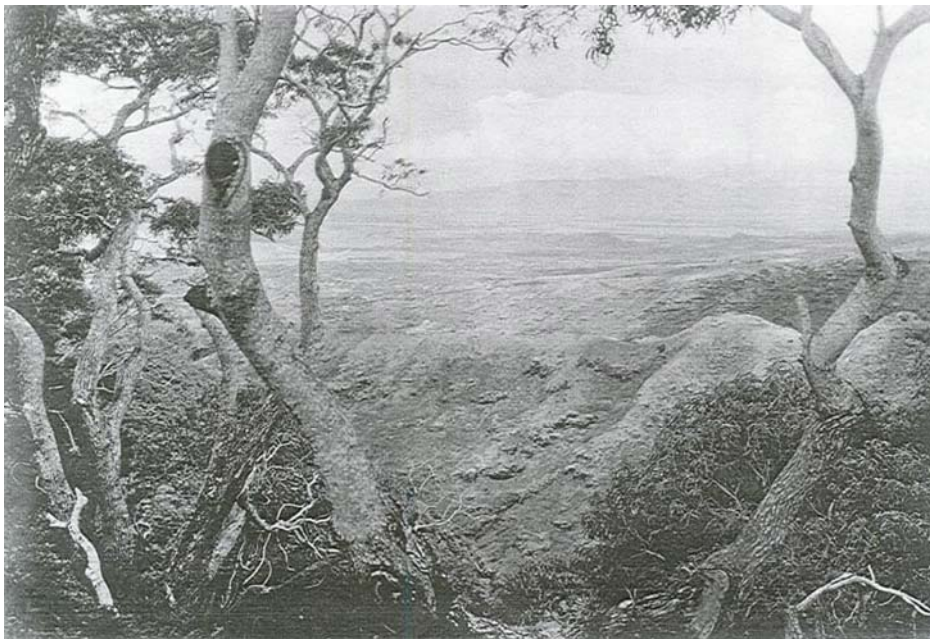


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National Park Service

**NATIONAL REGISTER OF HISTORIC PLACES
CONTINUATION SHEET**

Section 11 Page 7 Tantalus – Round Top Road
Honolulu, Hawai‘i

Figures 9 and 10: Tantalus [view to ‘Ewa], 1926 (*photographer unknown, Bernice P. Bishop Museum*)
Tantalus, view to ‘Ewa, 2006 (*Mason Architects, Inc.*)



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**NATIONAL REGISTER OF HISTORIC PLACES
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Section 11 Page 8 Tantalus – Round Top Road
Honolulu, Hawai‘i

Figures 11 and 12: Paving Round Top Road, ca. 1916 (*Hawaii State Archives*)
Paving Round Top Drive, ca. 1926 (*Williams Studios, Hawaii State Archives*)



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NATIONAL REGISTER OF HISTORIC PLACES
CONTINUATION SHEET

Section 11 Page 9 Tantalus – Round Top Road
Honolulu, Hawai‘i

Figures 13 and 14: Tantalus, 1901 (*Una A. Clark, Private Collection*)
Picnic at Pu‘u Kākea, 1918 (*Hedemann?, Bernice P. Bishop Museum*)



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NATIONAL REGISTER OF HISTORIC PLACES
CONTINUATION SHEET

Section 11 Page 10 Tantalus – Round Top Road
Honolulu, Hawai‘i

Figures 15 and 16: Mile Marker 1.5
Honolulu Watershed Forest Reserve Sign



Figures 17 and 18: “Hogsback”, near Mile Marker 4.0
Basalt (lava rock) retaining wall at Hogsback.



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**NATIONAL REGISTER OF HISTORIC PLACES
CONTINUATION SHEET**

Section 11 Page 11 Tantalus – Round Top Road
Honolulu, Hawai‘i

Figures 19 and 20: Bamboo forest, near original Schmidt Estate, Mile Marker 5.0 – 5.5
Basalt curbing, near Mile Marker 5.0



Figures 21 and 22: Honolulu Watershed Forest Reserve, Mile Marker 8.0
View from Mānoa Valley overlook.



**APPENDIX E. COMMENTS RECEIVED ON THE DRAFT
TRTD-CMP**

DEPARTMENT OF PARKS & RECREATION
CITY AND COUNTY OF HONOLULU

1000 Uluohia Street, Suite 309, Kapiolani, Hawaii 96707
Phone: (808) 768-3003 • Fax: (808) 768-3053
Website: www.honolulu.gov

KIRK CALDWELL
MAYOR



MICHELE K. NEKOTA
DIRECTOR

JEANNE C. ISHIKAWA
DEPUTY DIRECTOR

April 17, 2019

Planning Solutions, Inc
Attn: Mr. Makena White, AICP
711 Kapiolani Boulevard, Suite 950
Honolulu, Hawaii 96813

Dear Mr. White:

SUBJECT: Draft Tantalus-Round Top Drive Corridor Management Plan
Honolulu Ahupuaa
Island of Oahu, Hawaii

The Department of Parks and Recreation has been invited by the Department of Land and Natural Resources to submit comments to you for the Draft Tantalus-Round Top Drive Corridor Management Plan.

The Department of Parks and Recreation has no comment at this time; however, we request being included as a consulted party if and when you proceed to the Environmental Assessment stage.

Should you have any questions, please contact John Reid, Planner at 768-3017.

Sincerely,

A handwritten signature in black ink, appearing to read "Michele K. Nekota".

Michele K. Nekota
Director

MKN:jr
(768814)

HONOLULU FIRE DEPARTMENT
CITY AND COUNTY OF HONOLULU

636 South Street
Honolulu, Hawaii 96813-5007
Phone: 808-723-7139 Fax: 808-723-7111 Internet: www.honolulu.gov/hfd

KIRK CALDWELL
MAYOR



MANUEL P. NEVES
FIRE CHIEF

LIONEL CAMARA JR.
DEPUTY FIRE CHIEF

April 29, 2019

Mr. Makena White, AICP
Planning Solutions, Inc.
711 Kapiolani Boulevard, Suite 950
Honolulu, Hawaii 96813

Dear Mr. White:

Subject: Tantalus-Round Top Drive Corridor Management Plan

In response to a letter from Ms. Marigold Zoll of the State of Hawaii Department of Land and Natural Resources, Division of Forestry and Wildlife, dated April 10, 2019, regarding the abovementioned subject, the Honolulu Fire Department determined that there will be no significant impact to fire department services.

Should you have questions, please contact Battalion Chief Wayne Masuda of our Fire Prevention Bureau at 723-7151 or wmasuda@honolulu.gov.

Sincerely,

SOCRATES D. BRATAKOS
Assistant Chief

SDB/CM:gl

TANTALUS-ROUND TOP DRIVE CORRIDOR MANAGEMENT PLAN

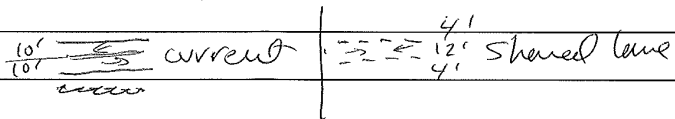
Comment Sheet Instructions:

1. Provide your written comments on this sheet and drop it in the Comment Box; or
2. Submit your written comments to: Planning Solutions, Inc. 711 Kapiolani Boulevard, Suite 950, Honolulu, Hawai'i 96813; or
3. Submit comments electronically to: makena@psi-hi.com

Please consider:

◦ one way motor vehicle flow
(up past a point w/ len results)

◦ an alternative road striping configuration, that reinforces slower + centre driving traffic (except a blind corners). this ~~is~~ would also ~~to~~ give pedestrians (+ uphill cyclists) more space on pavement. This is a common striping layout on narrow (~~low~~ heritage) roadways in Europe + mainland.



From: [Debra Duggan-Takagi](#)
To: [Makena White](#)
Cc: [Carol A Fukunaga](#); rebheltatti@capitol.hawaii.gov
Subject: Tantalus-Round Top Drive Corridor Management Plan Comment
Date: Saturday, May 11, 2019 11:06:23 AM

The two top priorities are:

- #1. 4110-4160 Round Top Drive stabilization, design, engineering and construction.
- #2. Hogs Back reconstruction

Both of these areas are rapidly deteriorating and could result in catastrophic road/slope failure leading to death including residents in adjacent homes and or anyone in cars, tour vans, bicycles, hikers, etc. who happen to be there when it collapses.

We are sadly reminded of the 1999 Sacred Falls rockfalls resulting in eight deaths and numerous horrific injuries. The state paid out \$8.56 million in 2003-approximately \$11,900,000 in 2019 dollars to families affected. This does not include remedial work that may have been subsequently done. This is also not considering that the State of Hawaii and C&C of Hawaii are very much aware of the road issues on Tantalus/RTD.

In addition to all the residents, tourists, various mountain-users from all over, my daughter, son-in-law and two grandchildren live up here and are subject to these dangers navigating the road on a daily basis. My son, his wife and infant daughter visit weekly and likewise are in danger.

PLEASE FUND THESE FIXES ON AN EMERGENCY BASIS before the price tag reaches unfathomable millions!!!

Debra Duggan-Takagi
Homeowner
TCA Security Watch Coordinator

Sent from my iPad

DAVID Y. IGE
GOVERNOR OF
HAWAII



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
ROBERT K. MASUDA
FIRST DEPUTY
M. KALEO MANUEL
DEPUTY DIRECTOR - WATER
AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAPUNIAUWAI SEAL AND RESERVE COMMISSION
LAND
STATE PARKS


Mākena White, AICP
Planning Solutions, Inc.

Correspondence: OA 19-161

Within the Management Plan, Section 3.5.2.1.2 DLNR Fire Buffer Zone Standards quotes Exhibit 5, Fire Buffer Zone Standards of HAR, Chapter 13-5. This section was added during our last round of rule amendments that was completed in 2011. The intent of this section was to decrease permitting for community associations or property owners to better manage vegetation surrounding subdivisions in dry areas. It was never intended to be a 'standard'. The OCCL will be proposing to repeal this section in our next round of rule amendments as no one has utilized this section and proposed activities to decrease fire fodder may be considered under the identified land use land and resource management.

Should you have any questions regarding this correspondence, contact Tiger Mills of our Office at (808) 587-0382.

Sincerely,


✓ Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

REF:OCCL:TM

Correspondence: OA 19-161

MAY 10 2019

Mākena White, AICP
Planning Solutions, Inc.
711 Kapi'olani Blvd., Suite 950
Honolulu, HI 96813

SUBJECT: Draft Tantalus-Round Top Drive Corridor Management Plan, Located at Makiki, O'ahu, Tax Map Section: (1) 2-5

Dear Mr. White:

The Office of Conservation and Coastal Lands (OCCL) has reviewed the subject document and as noted the entire Tantalus-Round Top Drive Corridor Management area appears to lie within the Conservation District, Resource subzone. The OCCL regulates land uses within the Conservation District. The rules and regulations of the Conservation District known as the Hawai'i Administrative Rules (HAR) Chapter 13-5 defines land use as:

- (1) The placement or erection of any solid material on land if that material remains on the land more than thirty days, or which causes a permanent change in the land area on which it occurs;
- (2) The grading, removing, harvesting, dredging, mining, or extraction of any material or natural resource on land;
- (3) The subdivision of land; or
- (4) The construction, reconstruction, demolition, or alteration of any structure, building, or facility on land.

Regarding proposed improvements within the Tantalus-Round Top Road right of way, the OCCL would defer to the City that owns the right of way and the Historic Preservation Division as the Tantalus-Round Top Drive has been added to the State Register of Historic Places.

Other proposed activities noted in the management area such as the removal of invasive species; signs; minor repairs to existing structures/land uses; tree removal; and minor land and resource management actions are identified land uses that could be conducted on Forest Reserve land under DOFAW or could be approved administratively by the OCCL. Major projects and proposed land use outside of Forestry land should be reviewed by the OCCL so that a determination may be made as to what type of authorization may be required.

C: ODLO/DOFAW/HP
City-DPP, DFM

DEPARTMENT OF EMERGENCY MANAGEMENT
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET • HONOLULU, HAWAII 96813
PHONE: (808) 723-8980 • FAX: (808) 524-3439

KIRK CALDWELL
MAYOR



HIROKAZU TOIYA
DIRECTOR

May 7, 2019

Marigold S. Zoll
Oahu Forestry and Wildlife Manager
Department of Land and Natural Resources
Division of Forestry and Wildlife
1151 Punchbowl Street, Room 325
Honolulu, Hawaii 96813

Dear Ms. Zoll:

Upon review of the Draft of Tantalus-Round Top Drive Corridor Management Plan, the draft plan shows great collaboration with all stakeholders which now forms a comprehensive plan. The plan has taken into consideration all the various risks such a drainage, maintenance of roads and vegetation, invasive species control, crime threats, safety signage for various areas such as the hairpin turns, so I can see no negative concerns for their project. Feedback would be that the Department of Emergency Management (DEM) can find no concerns in their plan.

Should you have any questions, please contact Crystal van Beelen at 723-8956.

Sincerely,

Hirokazu Toiya
Director

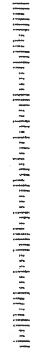
DEPARTMENT OF EMERGENCY MANAGEMENT
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

HONOLULU HI 96813
09 MAY 2019 PM 11



Marigold Zoll
Department of Land and natural Resources
Division of Forstry and Wildlife
1151 Punchbowl Street, Room 325
Honolulu, Hawaii 96813

96813-306575



From: [Grant Jones](#)
To: [Makena White](#)
Cc: [taea.takagi](#)
Subject: Tantalus-Round Top Drive Corridor Management Plan - Community Comments
Date: Thursday, May 16, 2019 3:19:48 PM

Aloha Makena,

Hope all is well. I was glad to hear that you guys were working on this plan given all the great support you have provided to our solar projects over the years. I also hear that you once lived on the mountain. As a homeowner who lives on Forest Ride Way safety and security of the community is our main concern. Given the funding challenges and the need for continued support from multiple agencies over the next decade to see the plan through, it is clear that it will be difficult to fully implement the plan. Knowing that crime, drifting/racing, dumping, drinking/drug use and other activities primarily related to non-residents that occur on a nightly basis, are some of the top concerns of residents, I wanted to throw out the idea of unmanned controlled access after a certain time. As State Land, could access be handled as it is for other state parks between certain hours such as dusk to dawn or another period each night? Minimal cost would be needed to install a gate and key fob's could be issued to residents at a cost so as to help offset the cost of the install. This system could also use license plate or bar code scanning technology in place of key fobs. This would help drastically reduce some of the main issues (outside of road condition) that the community continues to experience year after year. Access could be limited above the park and somewhere down near the s-turns at the bottom of Tantalus. This would not set a new precedent as access to Nutridge Farm via Puu Ualakaa state park is already set up in such a manner (recognizing that Nutridge is owned by the State and not a resident). I'm sure this has been thought of before but I wanted to suggest it. Thanks again for supporting the mountain and putting together the plan.

Mahalo,

Grant Jones & Family

From: [Tantalus Botanicals](#)
To: [Makena White: aaron.lowe@hawaii.gov](mailto:aaron.lowe@hawaii.gov)
Subject: Na Ala Hele Trail Art Project @Tantalus Arboretum Trail
Date: Saturday, May 18, 2019 2:01:42 PM
Attachments: [Screen Shot 2019-05-18 at 1.58.12 PM.png](#)
[Screen Shot 2019-05-18 at 1.57.46 PM.png](#)

Aloha! I am a resident of Tantalus and artistic designer specializing in sustainable concepts and renewable biomaterials. I am very interested in this project at the Arboretum trail and hoped to reach out while it is still in development. I am very committed to Tantalus where I live with my wife in the family home she grew up in. I have worked in many different mediums, but would like to introduce my two most recent projects to familiarize yourself with my artwork, and because they happen to be of particular relevance to Tantalus and its ecosystem.

The first was originally exhibited at the Honolulu Biennial, and has since traveled as far as the Netherlands. I isolated and domesticated a very specific, local species of fungus collected from our property for its ability to create artistic objects through an environmentally beneficial process:

"Sawdust from invasive trees was inoculated with mycelia from a local strain of fungi. The work was then grown out, fusing the sawdust canvas together. Finally, the mushrooms were allowed to form on the surface, independently defining the composition."

The works are optionally preserved in beeswax, creating a completely archival work that has a consistency of wood. You can see more on my [instagram account](#) or [website](#) which includes a cv of previous exhibitions.

The second, is a more recent project I am working on with my wife, Michelle Broder Van Dyke. Michelle is an investigative journalist who grew up in Tantalus, and together we are engaged in a sort of historical narrative of the mountain, its residents and its plants. We are using the property as a departure point, and are currently focused on the period of history from the ~1890-1910. The land was the first spot to be developed by a foreigner who likely won it in a poker game from King Kalakaua. The land is directly tied to events surrounding the overthrow of the Hawaiian Kingdom and the rebellion led by Robert Wilcox, and exhibits a rich botanical collection dating from this time. We have also been uncovering histories pertaining to the Territory of Hawaii's reforestation plan, or various residents farming attempts and the legacy of organisms that remain. We are slowly sharing our findings on our account [Tantalus Botanicals](#)- a design studio we operate that focuses on sustainable, locally grown floral aesthetics, but have yet to present the research in its entirety.

Please consider us for this project, I would love to discuss how we could participate and develop a new proposal specific to the Arboretum trail. We would be honored to represent and uplift the truly unique place that is Tantalus.

Mahalo

- Chris Ritson

From: Jason Shon <jasonmjks@gmail.com>

Subject: Re: Management Plan Comment Period Deadline 6.10.19

Date: May 20, 2019 at 9:56:32 AM HST

To: Tantalus.Oahu@gmail.com

Aloha,

My name is Jason Shon and I live on Forest Ridge Way. I reviewed the plan and have a couple comments:

- Figure 3.24 on page 3-40 shows locations of known driver-behaviors issues. The strip of road just up the road from the pu'u ohia trail head (Gills residence) extending up to Forest Ridge Way is also an area for speeding that creates noise for everyone in the valley. Although I haven't heard or seen people speeding recently (probably because the road conditions are so poor), in the past there have been some weeks when cars or motorcycles speed up that road every night, sometimes several times a night.
- Although the report lists native species that would be appropriate to plant in this climate zone, I don't think the vegetation maintenance recommendations mention the out-planting of native species as a strategy for maintaining the corridor. Even if done slowly in sections over time, eradicating invasive species and planting appropriate, native species along the corridor could reduce the reliance on such frequent trimming (especially of grass) and could even be an opportunity to educate visitors/residents about native species and ecosystems.

Thank you for the opportunity to share my thoughts and mahalo for keeping us informed.

Sincerely,
Jason

From: dTusher
To: Makena White
Subject: TRTD-CMP
Date: Monday, May 20, 2019 10:45:08 AM
Attachments: [dianas Corridor Public Meeting Notes.pdf](#)
[tropiclalo.pdf](#)

Hi,

TCA did eventually tell their mailing list that they would share my bullet list if someone asked them for it.

Copied you with an email to an interested neighbor that did ask for it.

Attached my meeting notes and CTHAR info on Tropic Lalo here, fyi.

Will get to summarizing my observations/questions soon.

Thanks for taking time to talk to me at the Neighborhood Board Meeting. Super that Carol has funding in the budget, assuming the money gets approved and released. She said she would send a template for us to use to send support for this funding. Let me know if you hear about the template or procedures to support funding.

aloha/diana

dTusher
Tusher Architectural Group

From: [Zarbo, Alisa A CIV USARMY CESAJ \(USA\)](#)
To: [Makena White](#)
Subject: Draft Tantalus-Round Top Drive Corridor Management Plan (UNCLASSIFIED)
Date: Friday, May 24, 2019 10:06:39 AM

CLASSIFICATION: UNCLASSIFIED

Hello. Thank you for the opportunity to review the Draft Tantalus-Round Top Drive Corridor Management Plan. The U.S. Army Corps of Engineers (Corps) understands that the plan identifies the management issues in the area and has various recommended actions to manage the valuable resources in the area. The Corps does not require Department of the Army (DA) permits for those land use and policy decisions; however, if any work is proposed in waters of the United States, then a DA permit is required. Here is some basic information to determine if a DA permit is needed:

To determine if waters meet the federal definition of waters of the United States, the applicant would either submit a request for a jurisdictional determination (JD) on the subject property or complete a DA application once those actions are being proposed. Once a JD is completed, the Corps can determine if a permit is needed based on your site plans and designs. Basically, if waters are regulated under Section 404 of the Clean Water Act, then the Corps regulates the fill within waters. If the waters are regulated under Section 10 of the Rivers and Harbors Act, then the Corps regulates structures or work within those waters. If you request a JD or submit an application to our office, we ask that you submit the forms to our email address: CEPOH-RO@usace.army.mil

The Corps appreciates the hard work you have invested to inform the public of the plans envisioned for the Tantalus-Round Top Drive area. Please let me know if you have any questions or if I can help in any way.

Thank you -Alisa

Alisa Zarbo
Acting Chief, Regulatory Branch
Building 252, CEPOH-RO
Fort Shafter, Hawaii 96858-5440
Phone (808) 835-4300
FAX (808) 835-4126
Alisa.A.Zarbo@usace.army.mil

"Forgiveness is the fragrance that the violet sheds on the heel that has crushed it." - Mark Twain

CLASSIFICATION: UNCLASSIFIED

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
830 SOUTH BERETANIA STREET
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May 28, 2019

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Deputy Manager and Chief Engineer *ek*

Mr. Makena White, AICP
Planning Solutions, Inc.
711 Kapiolani Boulevard, Suite 950
Honolulu, Hawaii 96813

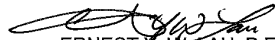
Dear Mr. White:

Subject: Draft Tantalus-Round Top Drive Corridor Management Plan, Honolulu
Ahupuaa, Island of Oahu, Hawaii

Thank you for the opportunity to review the subject documents. We have no comments to offer at this time.

If you have any questions, please call Michael Matsuo of our Land Division at 748-5951.

Very truly yours,


ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

Cc: Marigold S. Zoll, Oahu Forestry and Wildlife Manager
Division of Forestry and Wildlife
1151 Punchbowl Street, Room 325
Honolulu, HI 96813

POLICE DEPARTMENT
CITY AND COUNTY OF HONOLULU

801 SOUTH BERETANIA STREET · HONOLULU, HAWAII 96813
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OUR REFERENCE EO-TS

June 3, 2019

Mr. Makena White, AICP
Planning Solutions, Inc.
711 Kapiolani Boulevard, Suite 950
Honolulu, Hawaii 96813

Dear Mr. White:


This is in response to the Department of Land and Natural Resources' letter of April 10, 2019, requesting comments on the Draft Tantalus-Round Top Drive Corridor Management Plan.

The Honolulu Police Department (HPD) anticipates short-term impacts to pedestrian and vehicular traffic along the entire project, as it is primarily a residential area and a very narrow two-way roadway. The area, in general, is very popular with tourists and residents alike. Thus, the HPD has concerns relating to the safety and security of the area when the project is completed.

If there are any questions, please call Major Ryan Nishibun of District 1 (Central Honolulu) at 723-3327.

Thank you for the opportunity to review this project.

Sincerely,

for 
ALLAN T. NAGATA
Assistant Chief
Support Services Bureau

Serving and Protecting With Aloha

From: Alice Lunt
To: Makena White
Subject: Tantalus Programmic Agreement
Date: Wednesday, June 5, 2019 2:19:47 PM
Attachments: filename-1.pdf

Makena

Attached is the Programmic Agreement from TCA for your reference. We wanted to make sure that you had this information as it pertains to the Master Plan.

These communications are from 2012 so enough time has passed that no one is sure if this document got sent along to the appropriate agency. The person who would know is Pam Burns who has passed away.

So please use this as additional information for the Master Plan as it pertains to the Hogback.

If you have already seen this, let me know when you have a chance.

Aloha

Alice

From: eprintcenter@hp.com <eprintcenter@hp.com>

Sent: Wednesday, June 5, 2019 1:58 PM

To: dsadl@hotmail.com

Subject: Scanned document from HP ePrint user

This email and attachment are sent on behalf of dsadl@hotmail.com.

If you do not want to receive this email in future, you may contact dsadl@hotmail.com directly or you may consult your email application for spam or junk email filtering options.

Regards,
HP Team

Hogsback 3-31-12.

address to?

The Tantalus Community Association and The Friends of Tantalus would like to bring to your attention the more than eight months of meetings between The City, Tantalus Community Association (TCA), Friends of Tantalus (FOT), State Historic Preservation (SHP) and Historic Hawaii (HH) that are still ongoing regarding the proposed Hogsback project on Tantalus Road.

On August 18th following the notice of the proposed project, members of the community met with City staff from Department of Design and Construction (DDC) on the site of the planned project. Concerns regarding the preservation of the historic elements of the road and the length of complete road closure were discussed with The City.

In December a DEA was issued and TCA, FOT and members of the community submitted letters to The City with their continued concerns regarding the historic preservation of the road and the road closure which were not addressed in the DEA.

On February 28, 2012 TCA, FOT and SHP met with City representatives at Makiki District Park to discuss the written concerns submitted to The City in January in response to the DEA. It was noted that this was the first road project to be conducted on the state and nationally designated historic road and was precedent setting for any future road project. As a result, TCA and FOT recommended that an agreement be pursued for this and any future projects to maintain the historic features of the road and to minimize the safety impact to the community regarding road closures. At that meeting participants again raised concerns regarding the preservation of the historic elements of the road and the road closure. The City asked that TCA/FOT develop proposed guidelines and to then meet with them.

On March 23 TCA, FOT, HH met with City representatives at The Fasi Building to review the proposed Programmic Agreement (PA) which is attached. Again, the historic elements of the road and the road closure were presented as significant concerns by TCA, FOT, HH and in writing by SHP. At the conclusion of this meeting, without addressing any of the concerns raised, the Director of DDC announced the City would be sending the contract out to bid "as is".

We have been informed that SHP and The City have scheduled a meeting on _____ concerning the proposed PA.

Tantalus/Round Top Drive is the first Historic Road on Oahu. TCA and FOT believe a PA is important to establish for this and all future historic road projects on Oahu and is critical to this first project as it will be precedent setting.

TCA and FOT has identified and conveyed these issues in a timely and consistent manner. We do not believe that our concerns have been seriously addressed in any way during the last eight months by The City.

Sincerely,

Verne Tagaki
President, Tantalus Community Association
Phone #
?email

Alan Ewell,
President, Friends of Tantalus
Phone #
?email

cc: Mayor Peter Carlisle
Councilmember Tulsi Gabbard
Senator Carol Fukunaga
Representative Della Au Belati
Gary Hooser, ?
? Department of Construction and Design
Angie Westfall, SHP
Kiersten Faulkner, Historic Hawaii

**5th Draft - PROGRAMMIC AGREEMENT between the State
Historic Preservation Division and the City and County of Honolulu
regarding Tantalus/Round Top Drive Historic Roadway Improvements**

Whereas the City and County of Honolulu (C&CH) proposes roadway improvements near 4798 Tantalus Drive in order to stabilize a section of roadway built upon a ridge; and

Whereas, Tantalus/Round Top Drive (T/RTD) was established as a carriage road for the residents of Tantalus during the Hawaiian monarchy in the reign of Queen Liliuokalani; and

Whereas, T/RTD was first macadamized (paved) as a 2-lane road in 1937 as the first WPA Project on Oahu; and

Whereas, in 2007 Tantalus/Round Top Drive received state designation as the first historical road on Oahu and in 2009 the road was placed on the Hawaii Register of Historic Places; and

Whereas, this Historic Road designation requires that the Hawaii Revised Statutes 6E-8 and the Hawaii Administrative Rules (Chapter 13-275) be followed when repairs or upgrades to the road and/or right-of-way are proposed and requires that adverse effects of undertakings be identified through consultation with State Historic Preservation Division, local government agencies, Office of Hawaiian Affairs, and the public; and

Whereas, the C&CH has consulted with the Tantalus Community Association (TCA) representing the residents of the area and TCA has requested to be a consulting party on this agreement; and

Whereas the City and County has consulted with the Friends of Tantalus (FOT), a 501c(3) non-profit organization dedicated to protecting the rain forest environment along this 8 mile historical road, and FOT has requested to be a consulting party on this agreement; and

Whereas occasional maintenance projects are necessary to any infrastructure; and

Whereas a set of guidelines for appropriate repair and construction along T/RTD will ensure its preservation for future generations; and

Now Therefore, the C&CH and SHPD as Signatories and TCA, and FOT as Consulting Parties, agree to abide by the following stipulations for all future projects affecting the T/RTD roadway and/or right-of-way in Honolulu, Hawaii.

I. STIPULATIONS:

The C&CH will ensure the following stipulations are implemented.

- A. As representatives of the community, TCA and FOT shall be notified and included along with SHPD in the project scoping and initial planning stages of any project affecting Tantalus/Round Top Drive.
- B. The CCH shall ensure the historic Tantalus/Round Top Drive resource shall receive thoughtful and well deliberated context-sensitive design and construction executed in accordance with the Secretary of Interior's Standards for the Treatment of Historic Properties.
- C. Road closure during repair and maintenance projects shall be minimized to the extent possible
 1. Project design and construction procedures shall attempt minimize road closures.
 2. Road closure plans shall be presented to TCA and FOT for review and comment.
 3. After consultation, should prolonged closure be deemed unavoidable, it shall be incumbent upon the C&CH to provide means for emergency services to be available to the T/RTD residents.
- D. The following Design Guidelines shall be adopted and followed for all work to the historic T/RTD:
 1. The current footprint of the road shall be preserved
 - a) The roadway shall not be straightened or relocated as a part of any maintenance or construction.
 - b) When road shoulders or roadside planting is disturbed by maintenance or construction, area shall be replanted with low maintenance, low growing plants as appropriate to the area.
 2. The current width of the road shall be preserved
 - a) Given that a primary character defining feature of the roadway is its form, the roadway shall not be widened as a part of any maintenance or construction undertaking.
 3. The macadamized road surface shall be preserved
 - a) Any concrete roadbed required for structural purposes shall be surfaced with asphalt to match the existing roadway or finished in a manner mimicking asphalt.

4. All original hand-laid and faced blue stone basalt rockwork walls and curbs shall be preserved

- a) All new safety barriers and those modified for safety or drainage shall be replaced with hand-laid and hand-faced blue basaltic stone.
 - b) All rebuilt stone walls shall be rebuilt to their historic height
 - c) New stone walls shall have a maximum height of 24-36 inches depending on location, posted speed limits, and safety issues.
 - d) Repaired or rebuilt stone walls shall be repaired in kind to match and reuse original historic materials. When original materials are insufficient in quantity, new stone shall match existing.
 - e) Historic walls shall be repaired or rebuilt by trained masons with experience working with historic stonework.
5. Official road signage shall be minimized and centralized
- a) All informational roadway signage shall be consolidated into a single location when possible at each end of the historic 8 mile drive – this includes parking, speed and other restrictions, distance indicators, maps, and historical markers. Hiking trail head markers, yield signs, and side street identifiers may be located at their reference point.
 - b) Signage required along the historic roadway should be designed to harmonize with the natural surroundings.

II. DISCOVERY

If during the performance of any work along the designated historic T/RTD unidentified historic properties, including human skeletal remains, lava tubes, and lava blisters/bubbles, are discovered or previously unanticipated effects occur to known historic features, the C&CH shall stop all work in the immediate vicinity of the find, the find should be protected from additional disturbance, and notify SHPD.

III. REVIEW AND COMPLIANCE

- A. Any proposed variance from these guidelines will require separate consultation for the project requesting the variance.
- B. Any of the parties to this PA may elect to review activities carried out pursuant to this PA. The C&CH will cooperate with the Party or Parties in carrying out their review.

IV. RESOLVING OBJECTIONS

- A. Should any Signatory or Concurring Party to this PA object in writing to the C&CH regarding how the proposed Undertakings are being carried out or the manner in which the terms of this PA are being carried out, C&CH shall consult with the objecting party and the SHPD to resolve the objection. All other signatories should be notified in writing that one of signatories is objecting to a specific stipulation in this PA. The notification shall include the reasons for the objection and possible solutions.

B. If C&CH and the SHPD determine that the objection cannot be resolved, C&CH shall forward all documentation relevant to the dispute to the Hawaii Historic Places Review Board as prescribed in the Hawaii Administrative Rules – Chapter 13-275.

V. AMENDMENTS

A. Any Signatory or Consulting Party that has signed this PA may propose that this PA be amended, whereupon all Parties will consult to consider such amendment. A written notice must be sent to all Signatories and Consulting parties by the party that wishes to amend the PA. The notice will include the proposed amendments and the reasons for proposing them.

B. No amendment shall take effect until it has been agreed upon by all signatories. The amendment will be effective on the date a copy signed by all of the signatories.

VI. TERMINATION

If any signatory to this PA determines that its terms will not or cannot be carried out, that party shall consult with the other parties to attempt to develop an amendment per Stipulation IV (AMENDMENTS), above. If within 60 days (or another time period agreed to by all signatories) an amendment cannot be reached, any signatory may terminate this PA upon written notification to the other signatories. The written notice must explain in detail the reasons for the proposed termination.

VII. DURATION

A. This PA shall be in effect for a five (5) year period from the date of the last signature. The PA should be reviewed at the end of this five year period and re-signed if all signatories agree and

B. If the five (5) year period passes without a review process, the contract will be automatically renewed.

C. A 90 day notice is required to all signatories and consulting parties should one of the parties like to terminate the agreement at the end of the five year term. Termination notice must be in writing.

HISTORIC HAWAII FOUNDATION

680 Iwilei Road Suite 690, Honolulu HI 96817 • (808) 523-2900 • preservation@historichawaii.org • www.historichawaii.org

June 6, 2019

Marigold S. Zoll
O'ahu Forestry and Wildlife Manager
Department of Land and Natural Resources
Division of Forestry and Wildlife
1151 Punchbowl Street, Room 325
Honolulu, Hawai'i 96813

**RE: Draft Tantalus-Round Top Drive Corridor Management Plan
Honolulu Ahupua'a, Island of O'ahu, Hawai'i**

Dear Ms. Zoll,

Thank you for referring the above-mentioned project to Historic Hawai'i Foundation (HHF). HHF received the letter of April 10, 2019 inviting comments and containing a link to the Draft "Tantalus-Round Top Drive Corridor Management Plan" (Draft TRTD-CMP).

HHF participated in early discussions for the Environmental Assessment of "Highway Improvements, Roadway Repair in the Vicinity of 3798 Tantalus Drive" in 2012 (commonly referred to as the "Hogsback"). The current proposed Plan includes that portion of Tantalus Drive. HHF also participated in discussions about a proposed Programmatic Agreement in 2012.

Interests of Historic Hawai'i Foundation

Historic Hawai'i Foundation is a statewide organization established in 1974 to encourage the preservation of sites, buildings, structures, objects and districts that are significant to the history of Hawai'i. HHF is an organization with a demonstrated interest in the proposed action and a concern for the effects on historic properties.

Background

A. The Tantalus-Round Top Road is a 10-mile drive that is listed on both the Hawai'i and National Registers of Historic Places.

1. The boundaries of the designated historic district begin at the 1.5 Mile Marker on Tantalus Drive and end at the 8.0 Mile Marker on Round Top Drive.¹

¹ National Register of Historic Places Nomination, May 2009, Section 10.

2. The historic property includes "the road, lookouts, culverts, retaining walls and curbs along the shoulder and encompasses the entire public road right of way. The period of significance is from 1890, when residents of Honolulu petitioned the Kingdom of Hawai'i for a carriage road to the top of Tantalus, until approximately 1954 when the present roadside drainage improvements were completed."²
- B. Ownership of the road right-of-way remained with the Territory of Hawai'i (and subsequently with the State of Hawai'i) until the passage of State of Hawai'i Act 228 and Honolulu City Council Resolution 93-287 in 1993 transferred title to the City and County of Honolulu (CCH).
- C. The Honolulu Watershed Forest Reserve (HWFR) through which the Tantalus-Round Top Road corridor passes, is managed by DLNR's Division of Forestry and Wildlife (DLNR-DOFAW). It encompasses approximately 7,242 acres of non-contiguous mauka lands above Honolulu's urban core, and is comprised of several subsections, including all lands owned by the State of Hawai'i in the Makiki-Tantalus area with the exception of the Pu'u 'Ualaka'a State Wayside (State Park).
- D. Because the Tantalus-Round Top Road was constructed many years ago, the ROW over which the CCH has maintenance responsibility does not include as much of the roadside area if the road was built today to modern design standards. As a result, a substantial portion of the cut and fill slopes on which the roadway ultimately depends for its integrity lie on property owned by private individuals or the State of Hawai'i and are, therefore, not the responsibility of the CCH.³ However, designing and implementing solutions to these issues will require cooperation and coordination across all three jurisdictions (i.e. State, County, and private).⁴

Project Vision, Scope and Partners

Vision: "Tantalus-Round Top Drive is Hawai'i's only State and National Historic Roadway and is a unique area in urban Honolulu. The Tantalus-Round Top Drive Corridor Management Plan (CMP) is intended to be both a visionary and practical instrument to preserve and enhance this unique, in-town wilderness area so that it will continue to serve the aesthetic, recreational, and practical needs of O'ahu's residents and visitors."⁵

Scope: "This Tantalus-Round Top Drive Corridor Management Plan (CMP) is an unusual plan, made for a unique place located on O'ahu. It is a plan for a mountain, forest reserve, historic roadway, and a living community. In it, the Division of Forestry and Wildlife (DOFAW) of the State of Hawai'i Department of Land and Natural Resources (DLNR) has taken the lead, marshalling the resources and creativity of the State, the City and County of Honolulu, interested organizations, and determined individuals to plan for the maintenance and enhancement of this special place."⁶

Partners: The collaborative effort included members of the following agencies/organizations

² NR Nomination, Section 7, p.1

³ Draft TRTD-CMP, Section 3.2.2, p 3-5.

⁴ Draft TRTD-CMP, Section 3.2.3, p 3-17

⁵ Draft TRTD-CMP

⁶ Draft TRTD-CMP, Foreword, p. viii.

- Division of Forestry and Wildlife (DOFAW)
- City and County of Honolulu (CCH)
- Tantalus Community Association (TCA)
- Friends of Tantalus (FOI)

Plan Area: The Tantalus-Round Top Road corridor includes the roadway and the State and privately-owned lands on either side of it.⁷

HHF commends the overall effort taken on by DLNR’s Division of Forestry and Wildlife to lay out a framework for a comprehensive and collaborative Management Plan of this unique and valuable historic resource. However, the planning effort did not include any preservation organizations or subject matter experts to ensure preservation issues were addressed.

Management Plan Purpose and Structure

“The purpose of the Tantalus Round Top Drive Corridor Management Plan, also referred to as “the Plan” and the CMP, laid out in this report is to:

- **Articulate the vision** Division of Forestry and Wildlife has adopted for the corridor in consultation and collaboration with the various stakeholders.
- **Describe the short- and long-term goals** for managing the area’s natural, historic, and recreational resources that have been identified during the planning process.
- **Identify the most significant management issues** present in the corridor and the entities that are responsible for addressing them.
- **Detail new and/or modified maintenance protocols**, specific capital improvements, and other actions that will enhance management of the corridor.
- **Document the specific implementation responsibilities** and outline the necessary steps that each agency and community group has agreed to carry out.”⁸

The planning team identified five categories of issues, “plan modules”, to be addressed in the Management Plan:

1. Road Issues
2. Roadside Vegetation Management Issues
3. Drainage Issues
4. Safety Issues
5. Parking Areas and Trailheads

Organization of the Report - Each of the management issues, plan modules, is addressed as follows:

⁷ Draft TRTD-CMP, Section 1.2, p 1-1.

⁸ Draft TRTD-CMP, Section 1.1, p 1-1.

Chapter 3 devotes individual subsections to characterizing in detail issues to be addressed.

Chapter 4 provides a series of recommendations intended to manage or remedy the issues identified in Chapter 3.

Chapter 5 details implementation of the CMP, including jurisdictions and projected costs of ongoing operations and capital improvements.

HHF appreciates the organization of the Plan and finds the subdivision of Plan Modules in Chapters 3 and 4 to be a good management tool. Likewise, the assignment of responsibility among the Partners described in Chapter 5 is clear and useful.

Missing Historic Preservation Component

As a listed historic property, Tantalus-Round Top Road is a “significant historic property” under Hawai’i State Law. As such, the Secretary of the Interior’s Standards for the Treatment of Historic Properties (SOI Standards) provide the standards and guidelines for appropriate design and construction parameters to protect the significant features and historic integrity of the resource.

A key missing element of the Management Plan is a Historic Preservation component. Although the Vision statement refers to the historic nature of the road, the CMP itself fails to elaborate on what that means for future management and does not include specific recommendations to preserve the historic features.

The SOI Standards include the requirement that: “the historic character of a property will be retained and preserved. The removal of distinctive materials or alteration of features, spaces and spatial relationships that characterize a property will be avoided.” (Standard #2).

In order to avoid an adverse effect to character-defining features, spaces or relationships, these elements must be specifically identified within the Corridor Management Plan.

Historic Hawai’i Foundation recommends that a historic preservation component be included that:

- **Identifies the character-defining features of the historic roadway and setting, and**
- **Provides design guidelines that will avoid an adverse effect on identified historic features**

Recognition of Identified Character Defining Features

The National Register form contains the following narrative of features that define the character of the historic road:⁹

“Designation of Tantalus Round-Top Drive as a Historic Road will help retain its rural nature by preserving its several unique characteristics.

- The most important of these is the preservation of the historic footprint of the road as determined by the 1936 federal WPA project. This footprint is evidenced in the width and layout of the present roadway.

⁹ NR Nomination, Section 7, pp 3-4.

- Next in historic importance is the preservation of the hand-laid split-rock retaining walls and culverts that were first constructed in the late-nineteenth and early-twentieth century and are found along the entire length of the road, particularly along the roadway fronting the Castle Estate and in the Hogsback region. Where new walls and culverts are needed, first consideration should be given to replicating this type of wall. Where guardrails are absolutely necessary, nationally approved steel-backed wood guardrails should be used.
- A third significant feature of the drive is the limited use of official highway signs and road markings as the modest 25 mph speed limit precludes the need for them.
- The fourth unique, and most dramatic, characteristic of Tantalus-Round Top Drive is the long-established paved roadside pull-offs with spectacular panoramic and bird's-eye views of Honolulu and environs. These include:
 - The Diamond Head Lookout;
 - the Airport View;
 - Punchbowl Lookout on Tantalus Drive between mile markers 1.5 and 3.0;
 - the views from the Hogsback area; and those from the Mānoa Valley Overlook on Round Top Drive.

This Historic Road designation will encourage the State Department of Land and Natural Resources to develop a long term landscape maintenance plan to preserve and enhance these significant view planes” (emphasis added).

Historic Hawai‘i Foundation recommends that the National Register form become an exhibit to the Corridor Management Plan and included in the appendices for convenient reference.

Prior Directive from Hawai‘i State Historic Preservation Division

In 2012, the Historic Preservation Division of DLNR directed the City and County of Honolulu to prepare a Programmatic Agreement (PA) for roadway improvements, stating that “this PA will need to be in effect prior to SHPD review of any new projects within the Tantalus/Round Top Drive Historic Roadway.”¹⁰

In response to this directive, efforts were conducted to draft the requested PA. However, as far as we can determine, there is no record that the PA was signed and executed. The draft PA contained design guidelines for work within the Tantalus-Round Top Drive historic corridor. These guidelines are still valid and should be included in the Corridor Management Plan. This will act as a guide as the recommendations in Chapter 4 are more closely defined and engineered.

Proposed Design Guidelines

HHF recommends that the CMP (and any subsequent implementation tools, such as the Programmatic Agreement) include the following Design Guidelines for all work affecting the historic Tantalus-Round Top Road:

1. The current/historic footprint of the road shall be preserved

- a) The roadway shall not be straightened or relocated as a part of any maintenance or construction.
- b) When road shoulders or roadside planting is disturbed by maintenance or construction, area shall be replanted with low maintenance, low growing plants to improve sightlines.

2. The current width of the road shall be preserved

- a) The roadway shall not be widened as a part of any maintenance or construction.

3. The macadamized road surface shall be preserved

- a) Any concrete roadbed required for structural purposes shall be surfaced with asphalt to match the existing roadway or finished in a manner mimicking asphalt.
- b) Any maintenance or new construction shall include repavement of roadway shoulders to improve road drainage and control runoff.

4. All original hand-laid and faced bluestone basalt rockwork walls and curbs shall be preserved

- a) All new safety barriers and those modified for safety or drainage shall be replaced with hand-laid and hand-faced blue basaltic stone to match the existing.
- b) All rebuilt stone walls shall be rebuilt to their historic height.
- c) New stone walls shall have a maximum height of 24-36 inches depending on location, posted speed limits, and safety issues.
- d) Repaired or rebuilt stone walls shall be repaired in kind to match and reuse original historic materials. When original materials are insufficient in quantity, new stone shall match existing.
- e) Historic walls shall be repaired or rebuilt by trained masons with experience working with historic stonework.

5. Official road signage shall be minimized and centralized

- a) All informational roadway signage shall be consolidated into a single location at each end of the historic 8 mile drive – this includes parking, speed and other restrictions, distance indicators, maps, and historical markers. Hiking trail head markers, yield signs, and side street identifiers may be located at their reference point.
- b) Signage required along the historic roadway should be designed to harmonize with the natural surroundings.

Determination of Effect

Under Hawai‘i State Law HRS Section 6E-8 and the implementing rules in Chapter 13-275:

- (a) The effects or impacts of a project on significant properties shall be determined by the agency. Effects include direct as well as indirect impacts.

¹⁰ SHPD Letter to CCH Department of Design and Construction, dated June 19, 2012; LOG: 2012.1448, DOC: 1206AW09

- (b) Effects include, but are not limited to, partial or total destruction or alteration of the historic property, detrimental alteration of the properties' surrounding environment, detrimental visual, spatial, noise or atmospheric impingement, increasing access with the chances of resulting damage, and neglect resulting in deterioration or destruction.

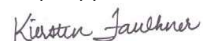
Historic Hawai'i Foundation finds the proposed CMP project has the potential to have an adverse effect on portions of the historic road and associated character-defining features, unless appropriate treatment guidelines are included to direct the recommendations developed in Chapter 4 and the implementation framework in Chapter 5.

For example, the proposed "shotcrete" of the existing crib wall at the "Hogsback" section of Tantalus Road would destroy a significant feature and be adverse. (Chapter 4 – Section 4.1.2.1)

Therefore, HHF recommends that the CMP be revised to include the recommended historic preservation component to identify historic features and guidance for avoiding and minimizing adverse effects on the historic features.

Thank you for the opportunity to comment. We would be pleased to discuss these issues and recommendations further.

Very truly yours,



Kiersten Faulkner, AICP
Executive Director

Copies via email:

SHPD: Susan Lebo, Tanya Gumapac-McGuire; Stephanie Hacker

Planning Solutions
Attention Mākena White, AICP
711 Kapi'olani Boulevard, Suite 950
Honolulu, Hawai'i 96813
makena@psi-hi.com

From: Alan Britten
To: Makena White
Subject: Tantalus Round Top Corridor
Date: Friday, June 7, 2019 7:11:36 AM

Makena,

I have reviewed the document, and I am pleased that at last there has been some thought as to maintenance and repair of the road.

My major concerns are:

Urgency! The road is in deep need of immediate repair. I would like to see City and County and State officials actually experience the road in a normal vehicle, and in parts, on foot. The road is in danger of collapse, which would endanger all of us in our community. While we pay property taxes, we do not have the benefit of water for fire hydrants, street lighting (which I do not want), sidewalks among other normal benefits. Our tax money should go to repair of the only road access to our homes. Drainage issues must be quickly addressed, as the road deteriorates further with every rainfall.

Funding. Hawaii Tourism may be able to help. This corridor is used by many tourist groups, and is advertised as an ecological attraction.

Damage to vehicles. I do know that we can claim support for tire and wheel repairs due to pothole damage. The frequent of payment is nearly zero, however.

I support the overall plan, but it cries of delays. We do not have time for several agencies to argue over who is responsible.

Thank you,
Alan Britten

To: Makena White
Fr: Lynda Sakraida
Re: Comments on Draft Tantalus Round Top Drive Corridor Master Plan
Date: June 10, 2019

1. ROAD RACING

Although I have comments to follow, my only actual criticism of this draft plan to date is the lack of attention spent on the road racing issues. In my memory, the need for SAFER roads up here has been the motivating factor to every plan we've proposed or started....and we've made ZERO progress. When the Whites moved up to Tantalus, racing was restricted to late night hours, primarily on weekends. It now happens 24/7, literally. Any time of the day or night, meaning kids will be racing when the mountain is full of hikers and bikers and walkers. You said at the meeting that there are plans to implement or test various ideas, but we've seen absolutely no movement at all since. I think improving road safety should be included as a priority within this plan.

2. PARKING LOT POSTS

At Turnout #T19, the parking lot across from 4050 Tantalus, there are plans to remove the metal posts, which are no longer used to close the lot at night. PLEASE DO NOT REMOVE THE POSTS. Cars will revert back to their old habits of doing wheelies and spins in that parking area, which is what the posts prevent, even if they are not locked.

3. TURNOUTS

You have designated 31 turnouts to be repaved and maintained in the future. At least half of those turnouts were never intended to be turnouts and were only paved due to lack of direction. After living here 35 years, I will attest that turnouts in general generate major trash dumps, drinking parties and loud noise. Residents should not discourage turnouts with views or near trails that have a recreational benefit, but those turnouts without views or trail access should be blocked from parking.

Unfortunately, I had a difficult time matching up the mapped turnouts with the actual turnouts, and so I'm hesitate to list those turnouts I would prefer reverted back. My suggestion would be to only keep turnouts that have views or trail access...and that's all! I think there are enough of those to still provide plenty of opportunities for cars to pull over to let people pass, check maps, etc.

One small suggestion: I had to invert the colors on your maps in order to still read them once I printed them. It would be easier to read them if you were to print them that way.

From: Rosalie Wadsworth
To: Makena White
Cc: tantalusroundtop@gmail.com
Subject: Tantalus-Round Top Dr. CMP - Comments
Date: Monday, June 10, 2019 1:52:15 PM

Hello,

Fund The Project

Install Toll Booth on both sides of Tantalus ; before Manoa Lookout. R1 and R2 zones. and just after the last home on Tantalus Drive. It can have video cameras that can aid in crime prevention. Less traffic on the roads. Of course, residents of Tantalus will have free access and a residents only lane.

Establish 2-4 person team specifically for maintaining vegetation year round permanent job positions. It rains so much on Tantalus it takes constant pressure to keep the vegetation back.

Add Rumble Tactile Strips to the center lane where drifting occurs and near turnouts.

It is rectangle inverted strip. I notice it after Sandy Beach along the scenic route. And the scenic route after Kahuku on a long straight away near parks.

The Chicken Corner. The swing is maintained by a Kailua Art Community (name ?) who participates in the annual Fourth of July Kailua Parade. They donate free seedling plants instead of candy. They look like young hippies. I have seen there large delivery truck switching out swings.

3.3.2 Falling trees

In emergency situations where a tree obstructs traffic, the aftermath has been large stumps and trunks left on the roadside. There is no clearance to avoid on coming traffic. Eventually, the guinea grass overgrowth hides these stumps. The fallen tree destroys the road. Patching up the road after a fallen tree would avoid future potholes.

4156 Round Top Drive - residents built a parking area. they applied for permits. several attempts to complete it. i noticed they used several people to complete it. the travelway road started slipping over the course of their construction.

Roadside Prism

add PCC concrete edge from the asphalt - Hana Highway does this and it deters the weed overgrowth and easier to identify the drains.

Thank you for your time.

Aloha,
Rosalie and David Wadsworth

Draft Tantalus Round Top Drive Corridor Master Plan--Comments

Barbara Stephan, 4334 Round Top Dr

10 June 2019

PRIORITY IMPROVEMENTS:

ROAD CONDITION AND ROADSIDE MAINTENANCE

We have lived on Tantalus since 1974 and have never seen the road in such bad condition or the roadside maintenance so neglected. 15 years or so ago we were promised the road was to be totally scraped and rebuilt—it never happened. A few years ago we were told that Round Top/Tantalus was again on the list for rebuilding—but somehow the promised maintenance was axed.

We cannot have hopes of a safe recreational area until these two issues are addressed first.

+++++

INDIVIDUAL ISSUES BY TOPIC:

1. HISTORIC ROADWAY status (also relates to Signage)

Why does the plan have no mention of Tantalus-Round Top HISTORIC ROADWAY status? Doesn't that have bearing on the corridor plan?

SIGNAGE: Appropriate signage (similar to the "carved" style used at the State Park and for the roadway markers halfway up the Round Top and Tantalus sides) should be used whenever possible to complement Historic Road status and maintain the special nature of the area.

As for standard metal signs ("Slow" "One-Way" etc.), a number of residents are concerned about proliferation, both because the signs are unsightly and because they are largely ineffective. (We can attest that the 10 mph SLOW sign directly across from our house is routinely ignored by speeders and residents alike.)

+++++

2. "Tantalus Lookout" at Pu'u 'Ualaka'a State Park

Though not covered by the Management Plan, the panoramic view at Pu'u 'Ualaka'a State Park is one of the major draws for visitors to the area. Many miss the park entirely because 1) there is no signage at the entrance to suggest that the tree-lined road leads to anything more than forest, and 2) visitors expect a "lookout" to be located near the top of Tantalus.

We live near the junction of Round Top and Tantalus Drive and are constantly stopped by drivers and hikers seeking directions to the "Tantalus Lookout." Why not some additional signage at the Park? Just the word "Lookout" above the existing sign would be a big plus.

In addition, mileage markers for the park lookout posted near the bottom of Round Top Drive and just above the Makiki Heights-Tantalus Drive intersection would go a long way to alay the confusion of visitors coming up either side. Naturally the signage should be of materials appropriate to the historic road.

+++++

3. Turnout T17 or "Longan turnout"

Note: According to the Turnout map (page 3-42), this looks to be T17. But under Vegetation Management Recommendations D it appears to be part of a series of turnouts along the upper end of **T16** (Figure 4.34).

PLEASE PAY SPECIAL ATTENTION TO THIS TURNOUT

1. This is a small, deep turnout, like a narrow finger of land projecting toward the ocean; the ground drops steeply on all three sides. It accommodates two large vehicles that can park perpendicular to the road.
2. When vehicles pull in forward, windows are largely shielded from the road. The sense of privacy makes this one of the most popular overnight sleeping spots on Tantalus.
3. It is a magnet for trash: the wall that once existed has deteriorated so that trucks and vans can back close to the edge and—hidden from the road—freely dump furniture and large appliances down the 30-foot slope. This steep drop necessitates special equipment for retrieval. (Recent haul: 2 extra-large sofas with scattered cushions, huge broken mirror leaving dangerous shards, assorted pillows and tires.) Because of its size the Punchbowl lookout has more total trash, but this spot beats Punchbowl for difficulty of hauling up dumped items.
4. A decade or more ago residents felt so discouraged by activity at this turnout that they dug up part of the asphalt to make the parking area shallower and planted ginger to hinder access to the edge. The ginger eventually failed, however, and dumping is now worse than ever.

CONSIDERATIONS FOR IMPROVING THIS TURNOUT:

1. The tree that anchors this turnout is a longan (related to lychee). When in fruit, it is a popular picking site.
2. The parking could be eliminated entirely by constructing a low wall close to the roadway. The wall would be consistent with the one already existing on this stretch of road. Fruit pickers would not be inconvenienced because there are parking pullouts on either side of the site.
3. If it is deemed necessary to keep this pullout, consider the following steps:
 - A. Construct a low asphalt or rock wall halfway between the longan tree and the roadway to make the parking area shallower and hinder easy access to the edge. This would still allow at least one vehicle to park parallel to the road.
 - B. Be careful of the longan tree. Trees in this family do NOT like excessive pruning. It would be a shame to eliminate a popular fruit-picking spot when other view spots are nearby.

Notes about a valuable tree in this area

Several years ago Round Top residents Phyllis and Alan Britten noticed interesting blossoms along the roadside just above the longan pullout (T17? or part of T16?). They identified them as *Fitchia speciosa*, a tree that is endemic to Rarotoga but is exceedingly rare elsewhere. This turned out to be a cluster that was rumored to be somewhere on Tantalus, but botanists had long ago lost track of the location.

The Brittens made sure that seedlings they raised were distributed to all local arboretums and U.H. Some time later an overzealous group of workers apparently cut the trees down; it is not clear whether the stand has recovered.

An interesting story of this tree in Hawaii is found at <http://www.sherwincarlquist.com/fitchia-story.html>

POINT: We need to cultivate knowledge about special trees in the area.

+++++

4. ROAD STRIPING

The draft plan covers the importance of road striping, but makes no comment about the safety or consistency of the markings. With every striping, a new "plan" appears. Several stripings ago the passing zones appeared to be designed solely for the safety of cars circling up Round Top and down Tantalus, ignoring the safety of those going in the opposite direction. This created several risky areas, the most glaring of which was along along the Manoa Overlook. Here, in one of the road's few relatively straight stretches, cars traveling downward faced a solid yellow line for the whole length until just before a sharp curve to the right. There the solid line suddenly disappeared, as if to encourage passing just before the corner. The "designer" may have been catering to uphill-traveling motorist slowed by those in front who had spotted the panoramic mountain view, but for downhill drivers the ill-sited passing zone was nothing but a hazard.

The latest striping has taken a totally different approach, eliminating most of the passing zones entirely. For drivers behind 15-mph visitors, this leaves only two choices: tolerate a slow, slow drive, or ignore the solid yellow line and use one's own judgment to pass safely.

Is it possible to request some permanent design that is slightly more flexible than the current one, and stays consistent from year to year?

+++++

COMMENTS

1. The reconstruction work of both Tantalus and Roundtop Drives as recommended in the TRDCMP should be funded, designed and implemented NOW to insure continued access for all users. This work has been neglected or postponed far too long.
2. The Tantalus-Roundtop Drive Corridor requires continual maintenance of the adjacent vegetation to ensure the safety of motorists, pedestrians and bicyclists. The report recommends that a baseyard for regularly used equipment be located at Camp Ehrhorn. This recommendation should be relatively easy to implement and should be done as soon as possible.
3. Despite the constant presence of professional tree trimming trucks along the road, no one seems to be coordinating their work. Overhanging branches continue to be a safety issue, requiring large trucks and delivery vans to swerve into oncoming traffic to avoid damage to their trucks.
4. The repeated landscape recommendation to cut the roadside Guinea grass to a height of 6", not to exceed 30" is not a useful recommendation as it would require a crew to be constantly cutting Guinea grass along some portion of the roadway. A useful recommendation would be one that would require incremental planting of a ground cover which would not require cutting.

Some Comments on the TRT Corridor Management Plan

Applaud the suggestion of a mechanism for allowing private/public cooperation in creating a continuing maintenance plan for the entire corridor and for accessing funds to this.

A main value in this report is the formalization of suggestions that have been made for decades but left in someone's "to do later" file. Important that the report is specific in "next steps", that stakeholders and officials follow up, and there is good communication with stakeholders and community members regarding the follow up process.

Plan should include mechanism for continued research and input about specific material, plant selections and other ideas as the specific projects come into focus.

Interesting that the Historic Roadway status does not play into the report. Does it have any practical real-life effect on the possibilities of the Management Plan?

I'm guessing the CIP portions of this plan will take more than 10 years. If the idea is to look to future use, is there consideration of how folks will get around in the not so distant future and whether recreational use will increase? Residential use is relatively stable and restricted. Is there any flexibility for an increase in the impact of car use if recreational use increases, or will car use be restricted in the future, or will more folks be using uber or needing charging stations?

Parking Areas

View Planes and Tree Cutting

The suggested extreme mass cutting of trees and vegetation in all view planes detracts from the view aesthetics, and is unnecessarily costly and dangerous (and can get boring). Some panoramic views are informative and enjoyable, such as the view from the Mānoa Overlook, Hog's Back, and Pu'u 'Ualaka'a. Otherwise, acknowledge this is an important watershed forest and leave trees to frame the view and make more interesting photographs and memories.

Tree trimming, removal, and vegetation management should focus on road safety and health of the trees first, and then consider trash dumping problems, aesthetics, and continuing maintenance.

I may be misreading some of the report information, but **suggest report edit the clear all vegetation in View Planes approach to be more responsive to the specific area in question.** Some information in the draft report indicates extreme clearing.

Opportunistic Parking

Is opportunistic parking different from informal parking? Why are you so negative about it?

What are formal parking areas? "Recommendations for formal parking areas and to help reduce use of informal parking areas, see Chapter 4" 3.6.1 PARKING AREA ISSUES Could not find info in Chapter 4

Suggest the plan encourage providing more "opportunistic" parking rather than discourage it so absolutely.

Pluses and Minuses. More opportunist (shoulder) parking would be advantages to both residents who do not have guest parking off the road and to visitors, both to residents and for recreational purposes. Some Tantalus residents have maintained shoulder parking while others object to having neighbors or others park near their homes to the point of placing rocks or cones to discourage parking or building fences to prevent use of shoulders for parking or for safety. There are several homes that could not even have guests for dinner, or host a TCA meeting, if you eliminate all guest (opportunistic) parking.

There is at least one home that has no parking other than opportunistic roadside parking, although I understand it might be on private property.

I missed a list of parking areas by purpose. Which ones are (i) general parking; (ii) trailhead parking; (iii) turnouts to allow safe passing; and (iv) parking at scenic lookouts. Do we need all of them? Some are helpful for walkers to get out of the road for a few feet, but I'm had not realized any functioned as or were intended to be turnouts to allow safe passing.

3.6.1 PARKING AREA ISSUES

(i) reduce width of road; **not if totally on the shoulder**

(ii) cause erosion; **not if properly maintained or refurbished with a gravel bed as suggested for T12**

(iii) take mud onto road; **not if grassed and properly maintained (I park at a neighbors opportunistic parking twice a week and do not transfer mud to the road. On the other hand, I can no longer park in the opportunistic parking across from my house because impaired road drainage has compromised the pavement and culvert inlet, and I have mud on my car from simply driving along the dirty road and brushing against vegetation that is not kept cut back in order to stay in my lane.)**

(iv) contribute to property crime; **so, does having street parking in a "regular" neighborhood contribute to property crime to the extent it outweighs other benefits. This is really a stretch.**

and (v) create safety hazards as occupants leave and enter vehicles from the road. **Again, how does entering and leaving parked vehicles along our roads differ so much from do so in along any other roads or streets? The narrow road in some areas can be a consideration, but if hikers, and even residents, are being unsafe and leaving their doors ajar in the traffic lane, occasional stupidity shouldn't preclude all "opportunistic" roadside parking.**

3.6.7 T11 AND T12: NAHUINA AND KALĀWAHINE TRAILHEAD PARKING AREAS

There is occasional opportunistic parking along side of road at both parking areas. Again, there are frequent hiking and trail maintenance volunteer events. E.g. I saw +/-17 vehicles near T12 and 17 more vehicles at T11, 5/12/2019 in the morning.

Plan should consider increasing formal parking areas and/or providing more structured opportunistic shoulder parking, especially for T12 at the Kalāwahine Trailhead. Some improvements could be made in conjunction with renovation of the Hog's Back one lane section of the road. Actually renovation of the hogs back could be an opportunity to provide many improvements.

3.6.8 T19: PU'U 'ŌHI'A TRAILHEAD PARKING AREA

There is occasional overthrust opportunistic parking on mauka road shoulder. Have seen more than 9 cars in the parking area plus 5 along the makai side of the road.

Steel posts and chain were installed to prevent partying and cars doing donuts.

Recommend Plan improve post installation and/or replace with input from community members.

T1-T4

Generally used for views – also used for watching impromptu racing and as a misc meeting spot.

T2 -Have recently seen 4-5 limousines at T2 at +/- 9pm. This pretty much fills the space available. They generally seem to go to T3 to turn around.

Have also seen limousines at T4, but not as many when I saw them.

T2 and T4 are priority tourist areas similar to, but not as well used as R1&2.

T5 - Misc meeting spot. Used to be a major dump site

T7-T10 are just wide shoulder areas. T9 was a major dumpsite before the telephone bollards were put in.

+/- T19-T12 have view potential but need strategic vegetation management, especially for fireworks. Both this area, the Mānoa Lookout area, and some of the lower Tantalus looks are quite crowded for fireworks. Think it's T17 that's a major trash dump site.

TANTALUS ARBORETUM TRAIL PARKING

Should be numbered like the others, even if lightly trafficked. This opportunistic parking area is definitely potentially muddy with no ground cover. Shoulder should be improved similar to T12 to allow for parking.

3.6.2 R1 AND R2: MĀNOA LOOKOUT PARKING AREA -- Mānoa Overlook



Suggest TCA limousine count from 1990's be provided by TCA and a comparable count be done as part of this report. The TCA count was done during a one week 9-9pm period by two TCA residents sitting there each evening. Some limos actually were making two trips an evening. (It might have been only Monday through Friday.) Today, it seems there are more small van/busses and fewer limousines at the Mānoa lookout in the evenings.

Permit system specifically for this lookout could be hard to manage and incurred costs might equal or exceed amount collected. Is it possible to allocate some of existing permit fees for tourist vehicles or some existing fees for tour companies for maintaining major stops on tour routes? Might still be impractical.

Opening Pu'ū 'Ualaka'a at night was nixed in the 90's because of costs, including security, lighting, entry monitoring, other necessary improvements, and the "commercial activity" in the Conservation District question. The commercial activity question seems to be solved with Nutridge becoming a commercial venture. A cost analysis of whether permits for entering the park at night for viewing could pay for providing lighting, necessary security/safety issues and entry monitoring, and other necessary costs would be a reasonable result of this draft report. This should relieve some of the congestion at the Mānoa Overlook. It could be an upscale "special view tour". Unintended negative effect could be increased use of Mānoa Overlook plus use of the park equaling more traffic on lower Round Top.

Concept for informational signage designed in the 1990's but never implemented. Still a good idea.

What about replacing the trees that made such a lovely canopy along the road framing the view until the wiliwili blight killed them. **If one intent of this plan is to improve the aesthetics of the corridor, the plan should consider the strategic planting of trees rather than just cutting them down and trimming them. Or, at least suggest it as a possibility.**

3.6.3 R8: BOY SCOUT CAMP EHRHORN PARKING AREA

There's a lot of talk about getting rid of the palm trees that I understand were planted by a resident. I suspect I'm not alone in having watched these slow growing trees grow over the last several decades. **If they need to be moved, please find a special place for them.**

3.6.4 R11: MOLEKA AND MĀNOA CLIFFS TRAILHEAD PARKING AREA

There is frequent significant overflow parking on weekends and holidays, especially when there is a trail or Mānoa Cliffs Native Forest Restoration Project volunteer workday.
<https://manoacliffreforestation.wordpress.com/the-project/>

Plan should consider increasing the size of the parking area and/or creating better opportunistic shoulder parking. Creating better a shoulder situation would improve road safety in this area also. There have been several incidents when cars have miss-calculated the turn driving uphill and ended up stuck in the mud on the outside of the turn which is noticeably lower than the road.

R5 & 6 Provide roadside parking for Puu Ualakaa Park activities not using Nutridge valet parking. Maybe not necessary?

SWING CORNER, R7 and Vicinity

Since the Swing now must be on many social media sites (even on google maps) given the number of folks stopping by to play on it or have their photos taken, **should it be acknowledged as a place that needs improved opportunistic shoulder parking?** Most of the areas used for parking now are dirt and not at the same elevation as the road.

R9 Trail Head Parking

Frequently has 4-5 cars parked in an unmarked space for maybe 2 that is unpaved and at a distinctly lower elevation than the road. **Should be considered as a place that needs at least improved opportunistic shoulder parking.**

R10 & R12 – purpose? 10 has a potential view but is this a necessary location for a view point? Don't believe 12 has any view potential.

Parking Area Scenic Viewpoint Vegetation Management

In general agree some views would benefit from opening the view plane.

However, the **draft plan is far too extreme** in cutting trees and vegetation in order to create a basically generic 180° view. Trees help to frame and create interesting views, especially in a forest. Cutting young trees too early doesn't allow them to grow tall enough to frame views

Tree trunk and large branch removal should be done minimally and with recommendation of an arborist.

Need to evaluate whether tree is endangered rare or has other intrinsic aesthetic value before trimming. .

Kukuis planted on Mānoa side of Round Top as part of slope stabilization during drainage improvements above Mānoa Valley +/-2006 will eventually grow into view plane and then high enough to frame the view. The draft plan's hard rule of cutting heights would negatively affect growth of these kukui trees. Use of discretion when cutting back vegetation and tree trimming is important. On the other hand, experiences shows that discretion is difficult for DFM folks with no horticultural training.

Also, consider this is an ongoing maintenance project requiring dangerous work on some of the steep slopes.

Parking area reconstruction

If you don't repave road and adjacent areas at the same time the relative heights would change over time. Remember that if the parking areas don't need attention for 50 years, that doesn't mean the road will not be repaved for 50 years. History shows repaving the road would increase the elevation of the road relative to the parking areas.

Mānoa Overlook reconstruction needs further study.

I believe the low asphalt berms you refer to along R2 were installed as part of +/- 2006 drainage improvements Before removing them, reasons for their construction should be researched.

Use of flexible high density plastic lane delineator posts should be discouraged at all locations in the corridor unless there is no alternative; their use is absolutely necessary; and their function and aesthetics are improved from what is seen in Chinatown. As it is, they're more likely to cause problems for vehicles in the roadway than solve them.

Crime at parking areas

Signs to warn of potential criminal activity similar to other tourist locations a good idea.

Surveillance cameras probably the best solution.

Illegal Dumping

In addition to the idea of barriers to make dumping trash over the side of the cliff more difficult, there are additional solutions. E.g. at TCA Dumpsite 1 (T5) TCA extended the culvert under the road about 20' past the makai side of the road and filled the depression with dirt. Dumpers were no longer able to throw trash out of sight in the gulch. and TCA was able to clean up what was dumped more easily. Seemed to work. It's no longer the #1 dumpsite.

Suggest the plan clearly talks about opportunities for future community brainstorming as the plan comes into being.

5.4.2.2 Additional Funding for O&M in Parking Areas and. Trailheads

Having trouble following the funding trail – need a chart.

Road

Can send photos later if you want.

Pavement Height

Applying new asphalt over old has caused the road elevation to rise about 9" over the last two or three decades making it difficult for folks with driveways or parking decks adjacent to the road to get in and out of their property. Cars scrape on the breakpoint between the increased road height and the existing adjacent driveway/deck.

Increasing pavement height has also made many drain inlets ineffective and caused increased erosion along the sides of the road in several places.

Road Shoulders

Increasing areas where the roads can support widening the shoulders will increase safety as well as provide needed roadside parking.

Encourage increasing shoulders wherever possible especially on the inside of blind corners for safety and providing additional roadside parking in residential areas where possible.

Graffiti

Use of graffiti free paint. At one point this was looked into and proposed for a kids' workday project. Was not followed through with because at that time the graffiti free paint was considered hazardous.

Adding Corridor to Pu'u 'Ualaka'a State Park

Still sounds like some real potential advantages. If possible, what are the disadvantages?

Check points at entry on Tantalus and Round Top

As a response to safety concerns, dumping trash, and other dangerous activities, some kind of Check Point system is reasonable to consider.

When considered in the 90's, it was thought this would be considered discriminatory and elitist, but this is not necessarily the case. It was not recommended by TCA, but some folks at DLNR unofficially suggested it as a possibility at that time. There are precedents for private property within a state park in other states.

If this area is considered a valuable resource, and as watershed it is, then it follows protecting it is important. Access can be monitored without being limited. The least expensive way of doing this is by camera. In general, as a matter of privacy rights, I'm not in favor of cameras, but it may be a viable solution. A guard station is an option, but manning a 24 hour guard station would be expensive and a guard station can be a little intimidating.

If the report doesn't already, **suggest report list the option of considering area entry/exit controls above Pu'u 'Ualaka'a and below 3300 Tantalus.** Couldn't find a reference in the draft report.

NOTE: Illegal dumping will only get worse as CCH makes bulk pick up more difficult and/or stops bulk pick up altogether. Dumping increased when CCH limited the amount of trash homeowners can have picked up each week.

Drifting, Speeding, and Racing

Drifting generally happens in specific areas on Tantalus and Round Top around Pu'u 'Ualaka'a where the road is wider and there is room to "play".

Donuts generally could only be done in the Pu'u 'Ōhi'a Trailhead parking area before the steel posts were put in, but I'm sure it's tried elsewhere.

Racing happens all along the corridor, but also happens on the lower wider section of Tantalus.

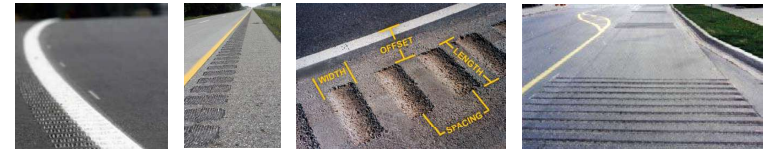
Recommend draft report include a survey or suggest possibility of a survey over a one month or one week period documenting racing, other loud vehicles, etc. heard by residents. Ask residents who are in a position to notice this activity to record time and type of activity at their location. Another option is to record cars and times on a camera, although hard to tell if they're racing.

Road marking options

Inverted/depressed rumble strips can be effective in alerting drivers they're over-the-line. On the down side racers probably won't care, they won't stop drifters, and they would possibly be problematic in areas where there are a lot of leaves on the road to fill the depressions. Advantage, they won't pop off in 3-6 months. Disadvantage = requires stable pavement surface unlike current pavement.

Came across similar road marking in California and found it very affective.

"concerns that often limit the usefulness or application include accommodation of bicyclists, noise for adjacent residences, pavement width and depth, and access that results in significant turning movements or other conflicts" https://safety.fhwa.dot.gov/roadway_dept/pavement/rumble_strips/design-and-construction.cfm



Raised Rumble Strips. Although some residents don't think this is true or important, speed bumps and raised rumble strips have been considered a safety hazard to emergency vehicles by HPD and HFD and to bicycles. Are there solutions that HFD and HPD would agree to that could be put in very limited strategic places and still be useful to discourage racers and drifters and not be dangerous to emergency vehicles?

Speed Tables have the same problems as raised rumble strips and are only effective on straight road segments.

Raised Pavement Reflectors and Botts' Dots

If can figure out a way to keep them attached, serve the purpose of defining the centerline in the dark and increase safety as well as remind drivers they're across the line.

Surveillance Solutions

Cameras with time stamps at various locations along the corridor. Will this produce evidence leading to ticketing or arrest? If so, probably the most cost effective solution.

Police Presence

Not considered practical. Still, it's a good idea to have blue lights common at random times along the corridor to give everyone a feeling of safety and to discourage racing etc. as well as dumping trash and other illegal activities. Speed traps have not proven successful in the past. Interesting that some of the folks who are most in favor of speed traps don't drive the speed limit.

General Road Safety

Signage

"Share the Road" / blind corners / No parking at lookouts / one lane road ahead etc. In the past there has been concern about sign pollution as well as concern that aesthetically designed signs don't meet government standards and are not enforceable.

Is there a way to have a signage program specific to the corridor and historic road character that would meet government standards? It's certainly possible to create a sign program. It could be based on the entering and leaving the watershed signs and mile markers TCA put in place in the 90's. Could include informational sign at the Manoa Overlook and one or two of the parking view areas on Tantalus.

Report should include a cost analysis for a specific RoundTop Tantalus Sign Program design.

Would it be possible to add some of this signage to lower Round Top Drive?

CCH should provide adequate road closed signs at the bottom of the hill when necessary. E.g. "Road closed 3900-4100 blocks". Even with the work at 3707 RT, the signs saying road closed were at the park and an odd location uphill from the work.

Mirrors

What are current opinions about use of mirrors at blind corners? Do they work? We've had mirrors stolen from the road.

Lighting

Ground level road lighting at strategic places could be useful, particularly at major lookouts.

In the past, general lighting has been both nixed by forest environmental concerns and required for subdivision at Pu'u Kakea. Different government agencies at odds.

Restoring vegetation

Restoring to +/- 1900 a bad idea since the lack of vegetation at that time was the result of poor forest management. Should be trying to restore to pre-1800 conditions, as much as possible or feasible.

Managing vegetation /Replanting

There are a number of possible solutions for replanting along the road similar to the Tropical Lalo grass I suggested earlier. <https://www.ctahr.hawaii.edu/oc/freepubs/pdf/CoverCrops/tropiclalo.pdf>

Report should again leave open opportunities for more input at a later date when specific plans are being finalized.

Recommend reworking Table 4.3 – I may be misreading this, but I particularly disagree with "Where the overhanging canopy is too extensive for effective pruning, the tree(s) should be cut back hard to create a tall shrub at the top of the embankment." The goal of retaining erosion control and slope-stabilization by drastically pruning the canopy enough to allow many months or years to elapse before the tree again violates LMZ clearances could well be negated by killing the tree. Remember many of the folks doing maintenance have no experience with trees or plants.

Some grass or future grass areas along the road by parking areas could become picnic spots.

View from corridor into forest

This is a really odd idea. Isn't the reason for parking area view points to get drivers off the road to look at the view? If folks want to see the forest, they can walk on a trail.

Drivers should have their eyes on the road, not be distracted by looking into the forest. **There are enough distractions for drivers as it is.**

Skateboarders and Speeding Bicycles

If the road surface doesn't dissuade them, I'm not sure anything will, except maybe ticketing.

Aside from the recent bicyclist hit by a racing car, the only other critical pedestrian accident I'm aware of in 35 years was the death of a resident walking her dog who was hit by a bicycle.

Multiuse road – everyone is at risk.

Road Spring ?

In front of the gate to Pu'u 'Ualaka'a there appears to be a spring that emits water into the road at near the center of the turn at about 10 o'clock. Just interesting.

4100 block of RT

Think you've said it all. My assessment is that the situation at 4110 is noticeably worse with the panax hedge leaning or not visible and the recent road resurfacing has fallen about 4" on the downhill side of the road. In front of 4160 the broken rock wall looks like it was recently hit by a car and the metal flashing directing water to the drain is bent. Ancient sand bags still in place. Will try to a temporary "fix".

Depending on a lot of unknowns, it seems it could be possible to do this downhill work in sections – maybe 4110 to 4126 and 4134 to Forest Ridge.

Highly recommend you or Mark made personal contact with homeowners who are affected to be sure they're aware of the situation. Could be a USPS post card. There is at least one property that is a rental, and there is at least one property that doesn't have a contact listed on the TCA directory.

DEPARTMENT OF FACILITY MAINTENANCE
CITY AND COUNTY OF HONOLULU

1000 Ulu'ohia Street, Suite 215, Kapolei, Hawaii 96707
Phone: (808) 768-3343 • Fax: (808) 768-3381
Website: www.honolulu.gov

KIRK CALDWELL
MAYOR



May 31, 2019

ROSS S. SASAMURA, P.E.
DIRECTOR AND CHIEF ENGINEER

EDUARDO P. MANGLALLAN
DEPUTY DIRECTOR

IN REPLY REFER TO:
DRM 19-284

Mr. Makena White, AICP
Planning Solutions, Inc.
711 Kapiolani Boulevard, Suite 950
Honolulu, Hawaii 96813

Dear Mr. White:

Subject: Draft Tantalus-Round Top Drive Corridor Management Plan,
Honolulu, Ahupua'a, Island of O'ahu, Hawai'i

Thank you for the opportunity to review and comment on the subject project.

Tantalus Drive and Round Top Drive are considered to be former disputed roads that were accepted by the City Council under Resolution No. 93-287, FD-1 that was adopted on September 29, 1993. However, the title for these former disputed roads were not conveyed and title remains with the State.

The City and County of Honolulu Department of Facility Maintenance (DFM), Division of Road Maintenance (DRM), currently maintains the road infrastructure within the right-of-way of Tantalus Drive and Round Top Drive such as road pavement, bridges, guardrails, signs/stripping.

The responsibility to maintain the sidewalk area that includes the area between the abutting properties and the road pavement edge is described in Chapter 14, Article 20 of the Revised Ordinances of Honolulu ("ROH"), as amended. Pursuant to Article 20, Section 14-20.1, *"Every property owner whose land abuts or adjoins a public street shall continually maintain, and keep clean, passable and free from weeds and noxious growths, the sidewalk and gutter area which abuts or adjoins the property owner's property; provided, however, that this requirement shall not apply where maintenance of an abutting sidewalk and gutter may be hazardous to the owner, or where a sidewalk and gutter, although abutting the owner's residential property, are so situated that there is no reasonable access from the property to the sidewalk and gutter."*

Mr. Makena White, AICP
May 30, 2019
Page 2

DFM does not maintain any lookouts and trails along Tantalus Drive and Round Top Drive. Lookouts are not considered to be a part of the disputed roads that were accepted by the City Council. Under Hawaii Revised Statutes Section 264-1, the trails along Tantalus Drive and Round Top Drive are under the jurisdiction of the Board of Land and Natural Resources.

Please refer to our comments that are tagged on the attached Draft Tantalus-Round Top Drive Corridor Management Plan.

If you have any questions, please call Mr. Kyle Oyasato of the Division of Road Maintenance at 768-3697.

Sincerely,

A handwritten signature in black ink, appearing to read "Ross S. Sasamura".

Ross S. Sasamura, P.E.
Director and Chief Engineer

Attachment

Article 20. Cleaning and Maintaining Sidewalks

Sections:

- 14-20.1 Cleaning of sidewalks.
- 14-20.2 Procedure on owner failing to clean.
- 14-20.3 Notice to property owners.

Sec. 14-20.1 Cleaning of sidewalks.

Every property owner whose land abuts or adjoins a public street shall continually maintain, and keep clean, passable and free from weeds and noxious growths, the sidewalk and gutter area which abuts or adjoins the property owner's property; provided, however, that this requirement shall not apply where maintenance of an abutting sidewalk and gutter may be hazardous to the owner, or where a sidewalk and gutter, although abutting the owner's residential property, are so situated that there is no reasonable access from the property to the sidewalk and gutter. The term "sidewalk" as used herein, shall mean that portion of a street between a curb line or the pavement of a roadway, and the adjacent property line intended for the use of pedestrians, including any setback area acquired by the city for road widening purposes. The term "gutter" as used herein, shall mean that paved portion of a roadway immediately adjacent to the curb or that portion of a roadway in concrete and 12 to 14 inches wide immediately adjacent to the curb. (Sec. 20-4.1, R.O. 1978 (1983 Ed.))

Sec. 14-20.2 Procedure on owner failing to clean.

If any such owner or such owner's agent, which shall include but not be limited to a lessee, tenant, property manager or trustee, after receiving notice from the city, fails, within 20 days after such notice, to clean such sidewalk, or fails and neglects to keep such sidewalk clean and free from weeds and noxious growths, then and thereupon the city may proceed to clean such sidewalk, as may be reasonably required, and the cost thereof shall be charged to and against such property owner and shall be collected from such property owner or the property owner's agent, if not immediately paid, by action in the district court. (Sec. 20-4.2, R.O. 1978 (1983 Ed.))

Sec. 14-20.3 Notice to property owners.

The notice specified in Section 14-20.2 shall be sent to such property owner by mailing it to the property owner's last known address in the State of Hawaii, or to the property owner's agent at the property owner's agent's last known address. (Sec. 20-4.3, R.O. 1978 (1983 Ed.))

Article 21. Construction of Improvements by Certain Property Owners

Sections:

- 14-21.1 Construction of improvements required.
- 14-21.2 Types of improvements.
- 14-21.3 Allocation of costs.
- 14-21.4 Failure to construct improvements.
- 14-21.5 Exceptions.
- 14-21.6 Assessments.
- 14-21.7 Deferment of improvements.
- 14-21.8 Definitions.

Sec. 14-21.1 Construction of improvements required.

(a) The owner of real property abutting any public street who or whose lessee with the approval in writing of the owner, is issued a building permit to construct or reconstruct a building on such property, where such property is situated in an area zoned for any use other than residential or agricultural uses, shall upon the granting of such building permit construct the necessary improvements and dedicate any general plan or development plan street setback area along the street abutting the property, pursuant to the requirements of this article. Such construction of improvements and dedication of any general plan or development plan street setback area shall be substantially completed prior to the issuance of the certificate of occupancy. No temporary certificate of occupancy shall be issued prior to the beginning of such construction of improvements.

In case such building permit should be issued to a lessee, the obligation to construct the improvements shall be on both owner and lessee, but, unless otherwise agreed between owner and lessee, the obligation shall be primarily that of the lessee and, if the lessee should fail to meet the same and the obligation be met by the owner or by enforcement of the lien hereinafter provided against the property, the owner shall be entitled to recover from the lessee such expenses and damages as may be incurred or suffered by such owner in

APPENDIX F. PUBLIC MEETING MATERIALS

DAVID Y. IGE
GOVERNOR OF HAWAII



SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA
FIRST DEPUTY

M. KALEO MANUEL
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
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STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
1151 PUNCHBOWL STREET, ROOM 325
HONOLULU, HAWAII 96813

April 22, 2019

Subject: May 8, 2019 Public Meeting for the Draft Tantalus-Round Top Drive Corridor Management Plan

The Division of Forestry and Wildlife (DOFAW) of the State of Hawai'i Department of Land and Natural Resources has scheduled a public meeting to discuss the recently issued draft of its *Tantalus-Round Top Drive Corridor Management Plan* ("Draft TRTD-CMP"). The Draft TRTD-CMP identifies management issues in the area and recommends actions DOFAW and the community believe should be undertaken to maintain and enhance the corridor's resources. This plan has been prepared in collaboration with other State agencies, the City and County of Honolulu, stakeholder organizations, and many interested individuals. If you have not already done so, you may use the following link to download a copy of the document.

<https://tantalus-roundtopcorridor.com/the-plan>

We have structured the meeting in a way that is intended to allow attendees to interact with agency personnel, consultants, and other interested parties in the most productive way. Accordingly, in addition to a PowerPoint presentation that summarizes the most important aspects of the plan, the meeting space will be arranged so that attendees will be able to speak directly with the individuals responsible for the plan's development and implementation. Attendees will also be able to provide written comments. All written input will be considered prior to finalization of the TRTD-CMP.

The public meeting will be held on Wednesday, May 8, 2019, between 5:30 and 7:30 pm at:

State of Hawai'i Board of Land and Natural Resources
Board Room 132 on the first floor of the Kalanimoku Building
1151 Punchbowl Street
Honolulu, HI

Metered public parking is available in the basement of the building and is accessible from Beretania Street and Punchbowl Street. If you have any questions about the meeting, you may contact Planning Solutions by phone at (808) 550-4538.

Sincerely,

Marigold S. Zoll
O'ahu Forestry and Wildlife Manager

DAVID Y. IGE
GOVERNOR OF HAWAII



SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA
FIRST DEPUTY

M. KALEO MANUEL
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
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STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
1151 PUNCHBOWL STREET, ROOM 325
HONOLULU, HAWAII 96813

April 22, 2019

Councilmember Carol Fukunaga
530 South King Street, Room 202E
Honolulu, Hawai'i 96813

Subject: May 8, 2019 Public Meeting for the Draft Tantalus-Round Top Drive Corridor Management Plan

Aloha Councilmember Fukunaga,

The Division of Forestry and Wildlife (DOFAW) of the State of Hawai'i, Department of Land and Natural Resources deeply appreciates having been able to work with you and your staff as it prepares the *Draft Tantalus Round Top Drive Corridor Management Plan* ("Draft TRTD-CMP"). The Draft TRTD-CMP identifies management issues in the area and recommends actions DOFAW and the community believe should be undertaken to maintain and enhance the corridor's resources.

On April 10, 2019 DOFAW issued the Draft TRTD-CMP and a public notice announcing a 60-day review and comment period. If you have not already done so, you may use the following link to download a copy of the document.

<https://tantalus-roundtopcorridor.com/the-plan>

As part of the review period, DOFAW will hold a public meeting on Wednesday, May 8, 2019, between 5:30 and 7:30 p.m. at:

State of Hawai'i Board of Land and Natural Resources
Board Room 132 on the first floor of the Kalanimoku Building
1151 Punchbowl Street
Honolulu, Hawai'i

Your participation has been instrumental to the development of the Draft TRTD-CMP and your continued support will be critical to its implementation over the coming years. With this letter, DOFAW would like to formally invite you to attend the May 8th meeting. We have structured the meeting in a way that we believe will allow you to interact with agency personnel, consultants, and other interested parties in the most productive way. Accordingly, in addition to a PowerPoint presentation that summarizes the most important aspects of the plan, the meeting space will be arranged so that attendees will be able to speak directly with the individuals responsible for the plan's development and implementation. Attendees will also be able to provide written comments.

Both DOFAW and our consultants at Planning Solutions, Inc. are very grateful for the time, energy, and creativity you have invested in the development of the Draft TRTD-CMP. We look forward to seeing you on May 8th. Metered public parking is available in the basement of the building and is accessible from Beretania Street and Punchbowl Street.

If you have any questions about the meeting or would like to confirm your plan to attend, you may contact Planning Solutions by phone at (808) 550-4538.

Sincerely,

A handwritten signature in blue ink, appearing to read "M Zoll", is positioned above the printed name.

Marigold S. Zoll
O'ahu Forestry and Wildlife Manager

CC: Makena White, Planning Solutions, Inc.
Perry White, Planning Solutions, Inc.

DAVID Y. IGE
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
1151 PUNCHBOWL STREET, ROOM 325
HONOLULU, HAWAII 96813

April 22, 2019

Senator Brian Taniguchi
415 South Beretania Street, Room 219
Honolulu, Hawai'i 96813

Subject: May 8, 2019 Public Meeting for the Draft Tantalus-Round Top Drive Corridor Management Plan

Aloha Senator Taniguchi,

The Division of Forestry and Wildlife (DOFAW) of the State of Hawai'i, Department of Land and Natural Resources deeply appreciates having been able to work with you and your staff as it prepares the *Draft Tantalus Round Top Drive Corridor Management Plan* ("Draft TRTD-CMP"). The Draft TRTD-CMP identifies management issues in the area and recommends actions DOFAW and the community believe should be undertaken to maintain and enhance the corridor's resources.

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SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

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M. KALEO MANUEL
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LAND
STATE PARKS

If you have any questions about the meeting or would like to confirm your plan to attend, you may contact Planning Solutions by phone at (808) 550-4538.

Sincerely,



Marigold S. Zoll
O'ahu Forestry and Wildlife Manager

CC: Makena White, Planning Solutions, Inc.
Perry White, Planning Solutions, Inc.

DAVID Y. IGE
GOVERNOR OF HAWAII



SUZANNE D. CASE
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STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
1151 PUNCHBOWL STREET, ROOM 325
HONOLULU, HAWAII 96813

April 22, 2019

Representative Della Au Belatti
415 South Beretania Street, Room 331
Honolulu, Hawai'i 96813

Subject: May 8, 2019 Public Meeting for the Draft Tantalus-Round Top Drive Corridor Management Plan

Aloha Representative Au Belatti,

The Division of Forestry and Wildlife (DOFAW) of the State of Hawai'i, Department of Land and Natural Resources deeply appreciates having been able to work with you and your staff as it prepares the *Draft Tantalus Round Top Drive Corridor Management Plan* ("Draft TRTD-CMP"). The Draft TRTD-CMP identifies management issues in the area and recommends actions DOFAW and the community believe should be undertaken to maintain and enhance the corridor's resources.

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Sincerely,

A handwritten signature in blue ink, appearing to read "M Zoll".

Marigold S. Zoll
O'ahu Forestry and Wildlife Manager

CC: Makena White, Planning Solutions, Inc.
Perry White, Planning Solutions, Inc.

TANTALUS-ROUND TOP DRIVE CORRIDOR MANAGEMENT PLAN

Public Meeting - Wednesday, May 8, 2019 from 5:30 p.m. — 7:30 p.m.

Kalaheena Baiting and Hazard Conference Room 112
1151 Puuhoani Street Honolulu, Hawaii 96813

Name/Title	Organization	Phone	E-Mail
JULIE WALTERS	TCA	941-2520	JULIEWALTERS@GMAIL.COM
Lynda Sakraida	TCA	947-4062	sakraida@yahoo.com
Alice Lunt	TCA	754-0093	dsadi@kofreil.com
IRY JENKINS	11	216-8400	IRYHAWAII@GMAIL.COM
Debra Duggan-Torrey	TCA	943-8623	Debradt@icloud.com
Steve & Flo Egisdal	TCA	949-5256	fegisdal@gmail.com
Aaron Lowe	DNR / DOPAA		
Makana White	PSI	295-6878	makana@psi-hi.com
Landin Johnson	DNR DOPAA		landin.l.johnson@hawaii.gov
Irene Sprecher	DNR DOPAA		irene.m.sprecher@hawaii.gov
John Fisher	TCA		fusher@att.net
Michael Sowards	Kaality Woods	349-9383	michael@kaalitywoods.com
ALAN FINNELL	FST	382-6548	FINNELL@HAWAII.FR
Tom HEINRICH	Senator Brian Taniguchi	586-6460	t.heinrich@capitol.hawaii.gov
Jon Kawamura	Rep. Bdatti	586-9425	joKawamura@capitol.hawaii.gov
Daniel Alexander	HI Bicycling League	735-5756	daniel@hbl.org
Richard Ogashi	Hawaii Assoc District Council		richard.ogashi@usda.gov
Tony Barnhill		218-0850	tonybarnhill@nrc.com
Tyler Sugihara	CDC Honolulu	768-3600	tsugihara@hawaii.gov

Tantalus-Round Top Corridor Management Plan

Monday, May 6, 2019 HPR Interview Talking Points

1. Introduction

- Marigold S. Zoll, O‘ahu Island Fish and Wildlife Manager
- Division of Forestry and Wildlife (DOFAW) is tasked with management of the Honolulu Watershed Forest Reserve; ~ 8 miles of Tantalus Drive and Round Top Drive pass through the Reserve which is why DOFAW has taken the lead.
- DOFAW has partnered with the City and County of Honolulu (CCH), the Tantalus Community Association (TCA), and Friends of Tantalus (FOT).
- Planning Consultant is Planning Solutions, Inc. (PSI), represented today by Perry and Mākena.

2. Genesis of the Tantalus-Round Top Drive Corridor Management Plan

- The Plan has its origins in the community it is intended to serve.
- In 2007, TCA and FOT partnered to develop the *Round Top-Tantalus Management Plan: 2007-2008 Priority Recommendations*. This report: (i) presented results of a resident survey, (ii) identified concerns, and (iii) provided recommendations.
- TCA and FOT then worked with their elected officials: (i) Councilmember Carol Fukunaga; (ii) Senator Brian Taniguchi; and (iii) Representative Della Au Belatti to obtain funding for a formal planning effort.
- In late 2016 DOFAW selected PSI to help it prepare the *Tantalus-Round Top Drive Corridor Management Plan*.
- PSI assembled advisory group with TCA, FOT, elected officials, and CCH agencies to prepare plan; the draft Plan was issued on April 10, 2019.
- Public meeting in support of the Plan at BLNR conference room, 5:30-7:30 p.m. on May 8, 2019. Comment period for the Plan closes on June 10, 2019.

3. Important Points

- The Tantalus-Round Top Corridor is a vital part of the Honolulu Watershed Forest Reserve that safeguards Honolulu’s fresh water supply.
- The road that is at the heart of the corridor provides access to the Pu‘u ‘Ualaka‘a State Wayside, to the Nā Ala Hele Trail System, and is itself an important recreational resource.
- The Plan is a product of State’s long commitment to work with the Tantalus-Round Top community to maintain and improve the area for the benefit of all the people of Hawai‘i.
- DOFAW hopes putting this Plan into action will protect and enhance the area for all the hikers, bikers, walkers, residents, and tourists who enjoy the beauty of this unique urban wilderness.

4. Public Interaction Opportunities (PSI)

- Complete plan may be downloaded at project website: <https://tantalus-roundtopcorridor.com/>
- Attend May 8, 2019 public meeting and talk with planning team.
- Written comments may be submitted via mail to: Planning Solutions, Inc., Attn: Mākena White, 711 Kapi‘olani Boulevard, Suite 950, Honolulu, Hawai‘i 96813 or electronically to makena@psi-hi.com
- Mahalo for inviting us to talk about the Plan!

An aerial photograph of a mountainous region with a green highlighted road corridor. The terrain is rugged with deep valleys and steep slopes. A town is visible in the lower right, and a coastline with turquoise water is at the top. A white box with black text is overlaid on the top left.

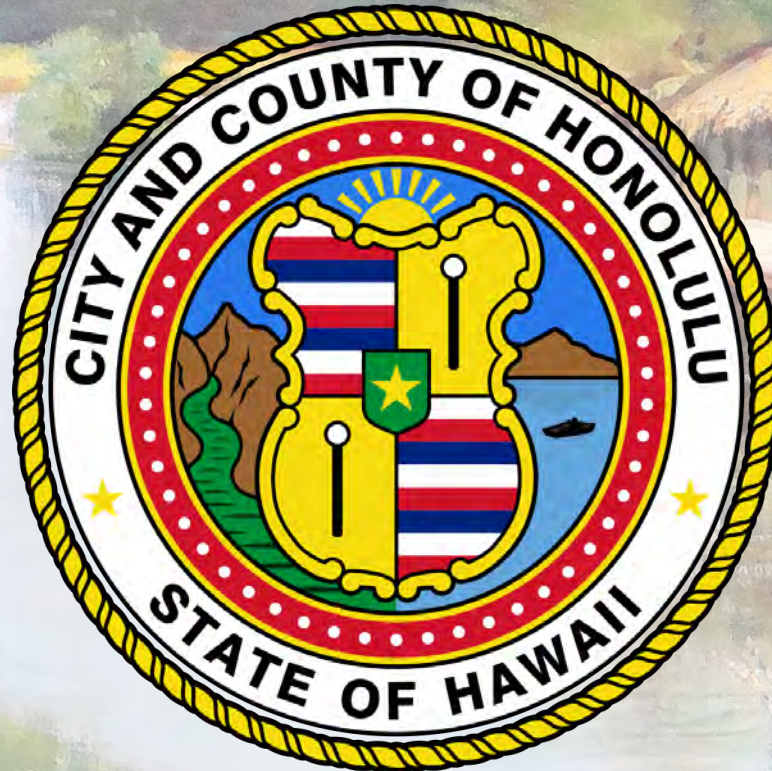
Tantalus-Round Top Drive Corridor Management Plan

May 8, 2019 Public Meeting

TRTD-CMP Partners



**Division of Forestry
and Wildlife**



**City and County of
Honolulu**

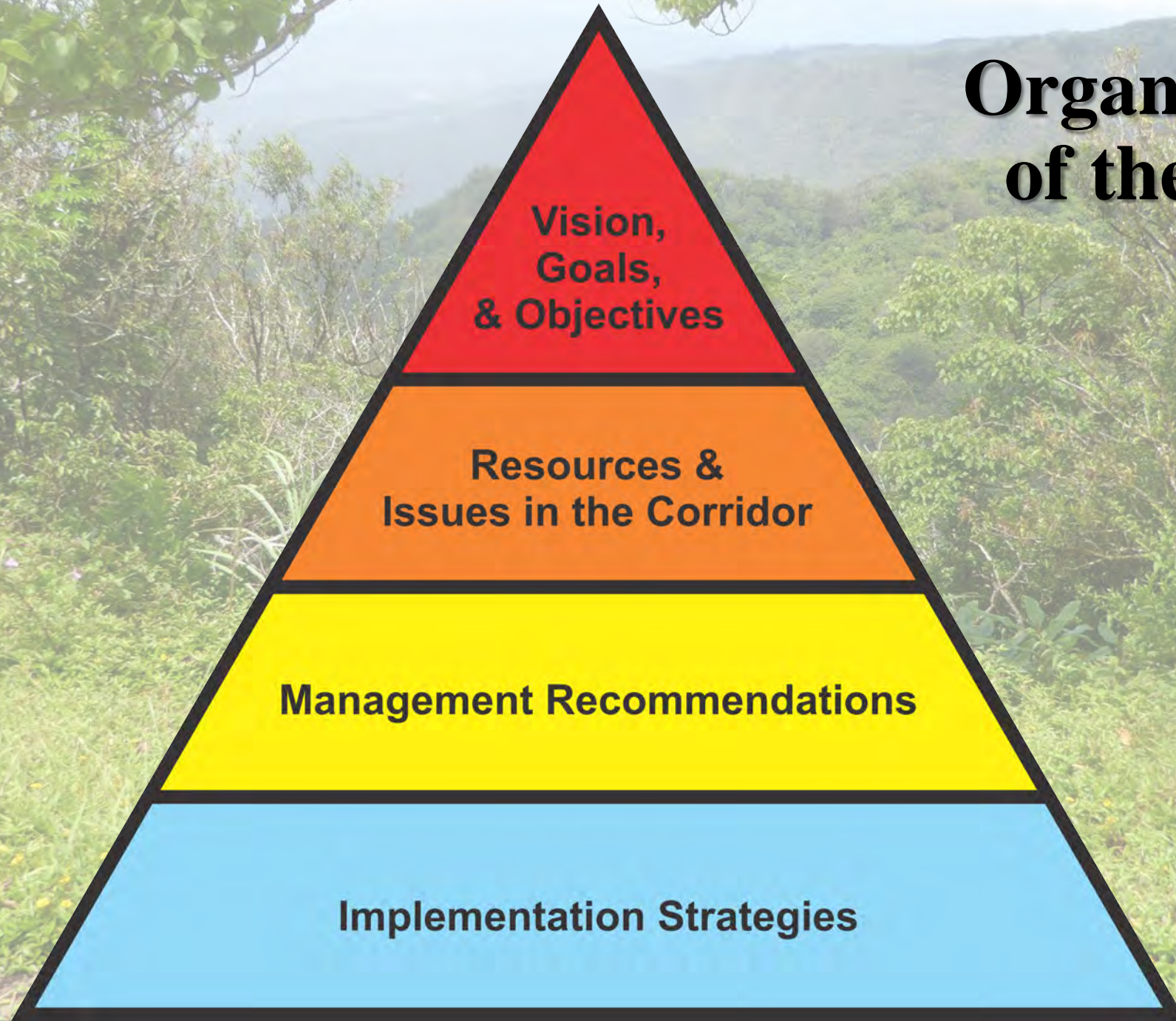


**Tantalus Community
Association & The
Friends of Tantalus**

The TRTD-CMP Planning Process

1. Initiate planning process, reviewing prior reports, assembling Advisory Group (AG), and building website.
2. Conduct initial consultation with management agencies and community.
3. Preparing and organizing the component sections of the Plan.
4. Formal consultation with AG and working groups for each section of Plan.
5. Finalize Draft TRTD-CMP and submit to DOFAW.
- 6. Public reviews and comments on Draft Plan.**
7. DOFAW revises and issues the Final TRTD-CMP.

Organization of the Plan



VISION

Tantalus-Round Top Drive is Hawai'i's only State and National Historic Roadway and is a unique area in urban Honolulu. The Tantalus-Round Top Drive Corridor Management Plan (CMP) is intended to be both a visionary and practical instrument to preserve and enhance this unique, in-town wilderness area so that it will continue to serve the aesthetic, recreational, and practical needs of O'ahu's residents and visitors.

Goal 1: Define the Issues

- **Objective 1.** *Identify the fundamental structural issues.*
- **Objective 2.** *Identify the operations and maintenance activities within the corridor that must be addressed.*
- **Objective 3.** *Identify the critical safety issues that are present within the corridor.*
- **Objective 4.** *Produce maps depicting the identified structural, operations and maintenance, and safety issues within the corridor.*

Goal 2: Recommend Maintenance, Repairs, and Capital Improvements

- **Objective 1.** *Identify the specific operations and maintenance activities, staff, and funding needed to keep existing facilities serviceable over the long term.*
- **Objective 2.** *Obtain preliminary agreement from the State, City and County, and other entities to participate.*
- **Objective 3.** *Identify specific capital improvement projects needed to correct deficiencies or support new activities.*



Goal 3: Agree on Specific Responsibilities

- **Objective 1.** *Agree on the geographic boundaries of each entity's authority.*
- **Objective 2.** *Agree on the kinds of activities each entity will undertake within its jurisdiction.*
- **Objective 3.** *Agree on the regulations and administrative rules that govern uses within each entity's area of responsibility.*
- **Objective 4.** *Produce maps depicting the agreed-upon boundaries.*

Goal 4: Secure Funding Commitments

- **Objective 1.** *Obtain preliminary agreement from agencies and other entities to seek funding for important CIP projects.*
- **Objective 2.** *Draft action plans with sufficient detail to form the basis for budget requests.*

Planning Methodology

- **Dozens of field visits to gather data.**
- **Development of a Geographic Information System (GIS) database for geospatial analysis.**
- **1,000s of photographs documenting conditions.**
- **Interviews with residents, user groups, and agency officials.**
- **Consulting with licensed landscape architect and civil engineer.**
- **Ongoing discussion with Advisory Group.**

The Roadway

- **Much of the roadway was completed by 1917, with the last drainage structures built in the early 1950s.**
- **The roadway is winding and narrow, varying from 14 to 30 feet in width.**
- **Responsibility for the roadway is shared by three departments of the City and County of Honolulu (CCH).**

CCH Agency	Responsibilities
Department of Facility Maintenance (DFM)	Repair and maintenance of existing roadway to the pavement's edge and installation and maintenance of signs at request of DTS.
Department of Design & Construction (DDC)	Designing and implementing capital improvements to the roadway.
Department of Transportation Services (DTS)	Design of signage, striping, reflectors, and traffic calming measures.

Roadway Issues

Road Prism	Roadside Embankments	Signage, Striping, and Reflectors
Systemic breakdown of the road surface.	Upslope cut instability.	Damaged or vandalized signage.
Erosion and subsidence beneath the roadway.	Downslope fill instability.	Weathered and worn striping and reflectors.
Deterioration of retaining walls.	Rockfalls and landslides.	Obscured by overgrowth.

Systematic Breakdown of the Road Surface



Erosion and Subsidence Beneath the Roadway



Deterioration of Retaining Walls



Slope Instability



Signage, Striping, & Reflector Issues



General Roadway Recommendations

The roadway is in very poor shape. At minimum, the roadway should be given a new asphalt overlay, and while more is needed it is can be costly. Because of this, estimates are presented for three different approaches:

1. Complete reconstruction of the roadway; the existing pavement is removed, where necessary the subgrade is reconstructed to current standards, and a new AC pavement is installed. This is different from the simple overlay that has been used in the past. Budget estimated at approximately **\$29 million**.
2. Complete overlay of the roadway; while much lower in cost, this approach: (i) may exacerbate some drainage issues, (ii) will not address issues related to erosion and subsidence of the subgrade, and (iii) would have a higher life-cycle cost. Budget is estimated at approximately **\$4 million**.
3. Milling and filling existing surface with spot reconstruction to address segments with a failed base course or subgrade. Because this approach would require additional investigation, the budget is estimated to range from **\$10-\$20 million**.

Specific Roadway Recommendations

- **The “Hogsback” crib wall should be restored by shotcreting the existing crib wall, adding soil anchors, and other ancillary improvements.**
- **From 4110 Round Top Drive to the intersection with Forest Ridge Way will require engineering analysis and stabilization work.**
- **3811 Tantalus Drive to the Pu‘u ‘Ōhi‘a Trailhead will require engineering analysis and stabilization work.**

Roadway Embankment Recommendations

- **Round Top Drive/Tantalus Drive Between Forest Ridge Way and Pu'u 'Ōhi'a Trailhead: engineering/geotechnical studies followed by embankment improvements.**
- **3811 Tantalus Drive to Pu'u 'Ōhi'a Trailhead: engineering/geotechnical studies followed by improvements to upslope embankments.**
- **Round Top Lookout Along Mānoa Side of Pu'u 'Ualaka'a: Monitoring of slope stability with possible use of debris barriers if determined appropriate.**

Signage, Striping, and Reflector Recommendations

- **Replacement of all signs.**
- **Regular trimming of vegetation to keep signs visible.**
- **Installation of raised reflective centerline markers.**
- **Regular inspection and replacement of markers and striping.**

Vegetation Management Issues

- Most of the vegetation within the Corridor is invasive and aggressive, growing at a rapid pace year round.
- Adequate vegetation management is hampered by unclear lines of responsibility between CCH and State.
- None of the agencies tasked with vegetation management responsibilities have resources adequate for the task.

Inadequate vegetation management can...

- Make the roadway difficult or impossible to use and obscure sight lines and views.
- Lead to blocked roads, power outages, and landslides.
- Left unchecked the problem will only get worse.

Identified Safety Issues Related to Vegetation



**Vegetation
Encroaching on
Roadway**



**Overhanging Vegetation Restricting
Vertical Clearance**



**Vegetation Restricting Sight-Distance
on Turns**

Vegetation Management Recommendations

- **Removal of hazard trees threatening the roadway.**
- **Control of vines on trees immediately adjacent to the roadway.**
- **Regularly trim trees that overhang the roadway and parking areas.**
- **Trim vegetation to restore site lines near sharp turns and lookouts.**
 - **Increase frequency and efficiency of trimming of shoulder vegetation.**
 - **Initiate remedial, bi-annual, and annual cycles of vegetation maintenance.**

Drainage Issues

- The existing drainage structures were built in the early 1950s and were built to the standards of the time.
- They are badly weathered, damaged, and clogged and are not regularly maintained or cleaned due to unclear jurisdiction.
- Because of this, they are not performing their original function in some areas.

Unmaintained drainages can...

- Lead to erosion of the road prism (i.e., the embankments and substrate).
- Cause more rapid deterioration of the road surface.
- Result in ponding in the roadway and adjacent parking areas.

Drainage Issues



Drainage Recommendations

Phase 1: Restoration of Existing Drainage Structures

- Remove the accumulated sediment and debris and maintain them over the long term.
- Repair and restore the damaged inlets, culverts, and outlets.
- Clean and repair the damaged drainage swales to direct water into drain inlets.

Phase II: Drainage Improvements

- Fund a study of existing roadway drainage systems and potential drainage improvements.
- Approximate timeframe for study would be 12 months, with an estimated budget of \$300-\$400k.
- Design and construct drainage improvements in accordance with current CCH rules and standards.
- Give special consideration to the quantity, location, and method of discharge (e.g., dispersion fields) to minimize impacts to downstream areas.

Public Safety Issues

• Road Safety

- Inadequately maintained roadside vegetation.
- Inadequately maintained road surface, barriers, and signage.

• Fire Protection

- Absence of fire hydrants.
- Difficult to provide all desirable fire buffers.
- Highly flammable invasive species.

• Crime Prevention

- Infrequent patrols.
- Extended police response time.
- Car break-in/Vandalism.

• Driver Behavior Safety Issues

- Automobiles and motorcycles racing and drifting.
- Mixed use with trucks, cars, bicycles, skateboards, and pedestrians.
- Use of excessive speed during inclement weather.

Public Safety Recommendations

Road Safety

- Keep vegetation trimmed to maintain adequate sight distances and remove hazard trees.
- Repair pavement surface, striping, and reflectors.
- Replace all signage.
- Consider traffic-calming measures to create safe conditions for drivers, bicyclists, and pedestrians..

Crime and Fire Prevention

- Implement community-based and technology-assisted policing effort in collaboration with Tantalus Community Association.
- Install solar-power cameras and signage warning of property crime at select trailheads and other locations.
- Control vegetation which poses a fire hazard.

Parking Area Issues

- **A total of 31 existing parking areas have been identified and are addressed in the plan.**
- **These paved areas adjacent to the travelway, serve four general purposes: parking, lookouts, turnouts for safe passing, and trailheads.**
- **Because these areas are on State-owned land outside the main roadway they are not usually repaved as part of DFM's periodic road maintenance.**
- **Consequently, the condition of these parking areas are poor and nearly all of them need resurfacing, new signage, and additional and/or refurbished trash receptacles.**

Parking Area Recommendations: General

- Reconstruct with Portland Cement Concrete (PCC) or AC pavement; PCC recommended with lower life-cycle cost.
- Maintain all signage in good order.
- Reinstall signs prohibiting parking between 10:00 p.m. and 5:00 a.m.
- Install and service standardized trash receptacles with replaceable plastic liner.
- Delineate the boundary between each parking area and roadway using a combination of striping, low curbs, and variations in surface material.
- Maintain and repair all walls or other barriers.
- Maintain vegetation in adjacent, unpaved areas in good order and keep view planes open.

Parking Area Recommendations: Specific

Specific physical improvements and vegetation management protocols prescriptions developed for:

- **Mānoa Valley Lookout Parking Area.**
- **Camp Ehrhorn/‘Ualaka‘a Trail Parking Area.**
- **Moleka and Mānoa Cliffs Trail Parking Area**
- **Lower Tantalus Drive Lookout/Parking Areas**
- **Punchbowl Lookout Parking Area**
- **Makiki Valley Trail Parking Area**
- **Nahuina and Kalawāhine Trail Parking Area**
- **T16 Parking Area above Hogsback**
- **Pu‘u ‘Ōhi‘a Trailhead Parking Area**

Implementation

- **Putting the Plan into action will require the cooperation of many agencies, organizations, and the community, and it has been developed in collaboration with them.**
- **Many of the recommendations are costly so the Plan provides, where feasible, several options to address management issues.**
- **The Plan is designed to be implemented incrementally over time.**
- **Proactively implementing the Plan is far more economical than delaying action until an emergency occurs and homes and/or public access are threatened.**



Mahalo nui loa!

Aloha Ahiahi Ia Oukou
**Good Evening and Welcome
to the**

Public Meeting for the Draft Round-Top Tantalus Corridor Management Plan



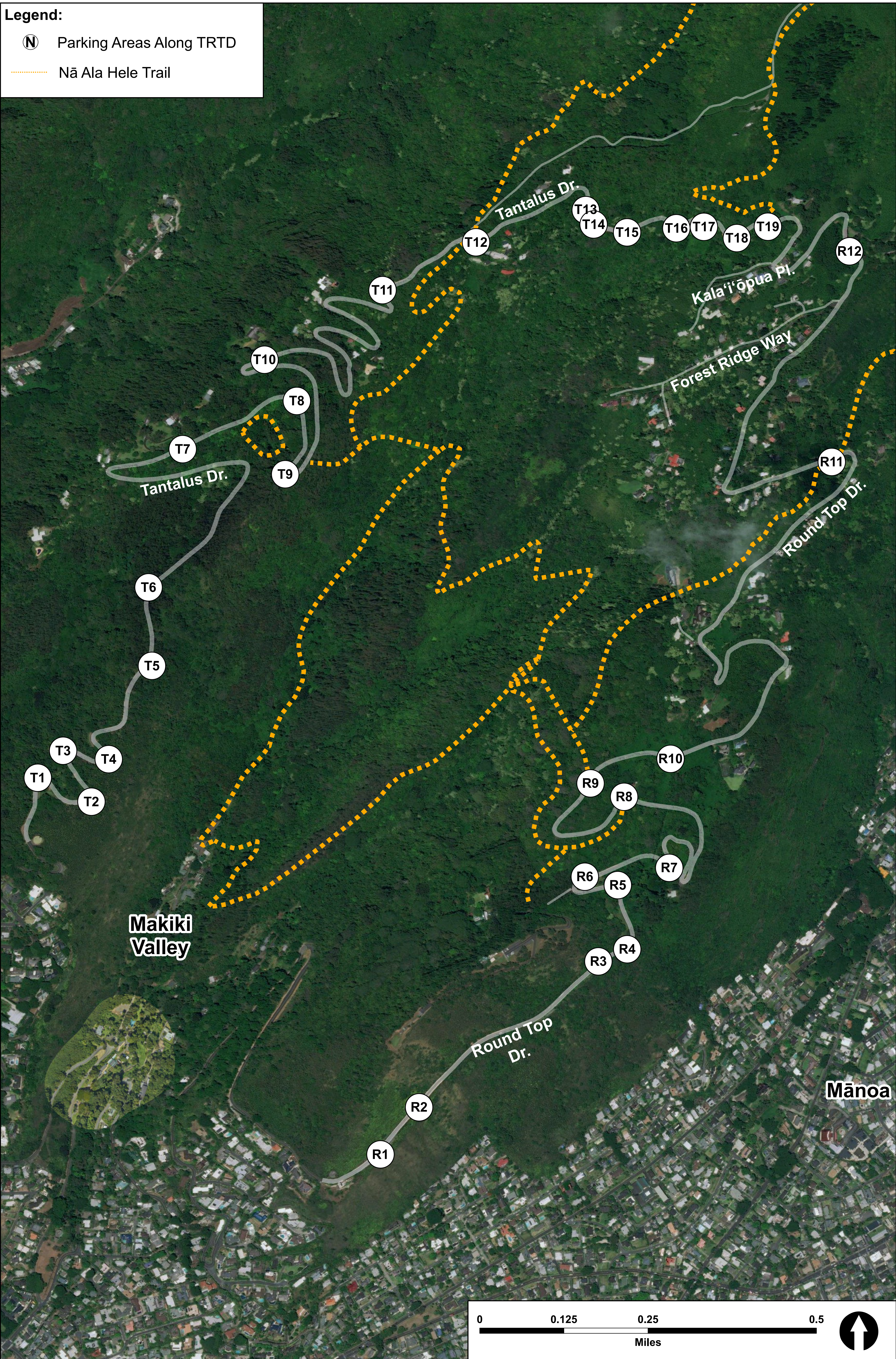
**Wednesday, May 8, 2019
5:30 p.m. to 7:30 p.m.**

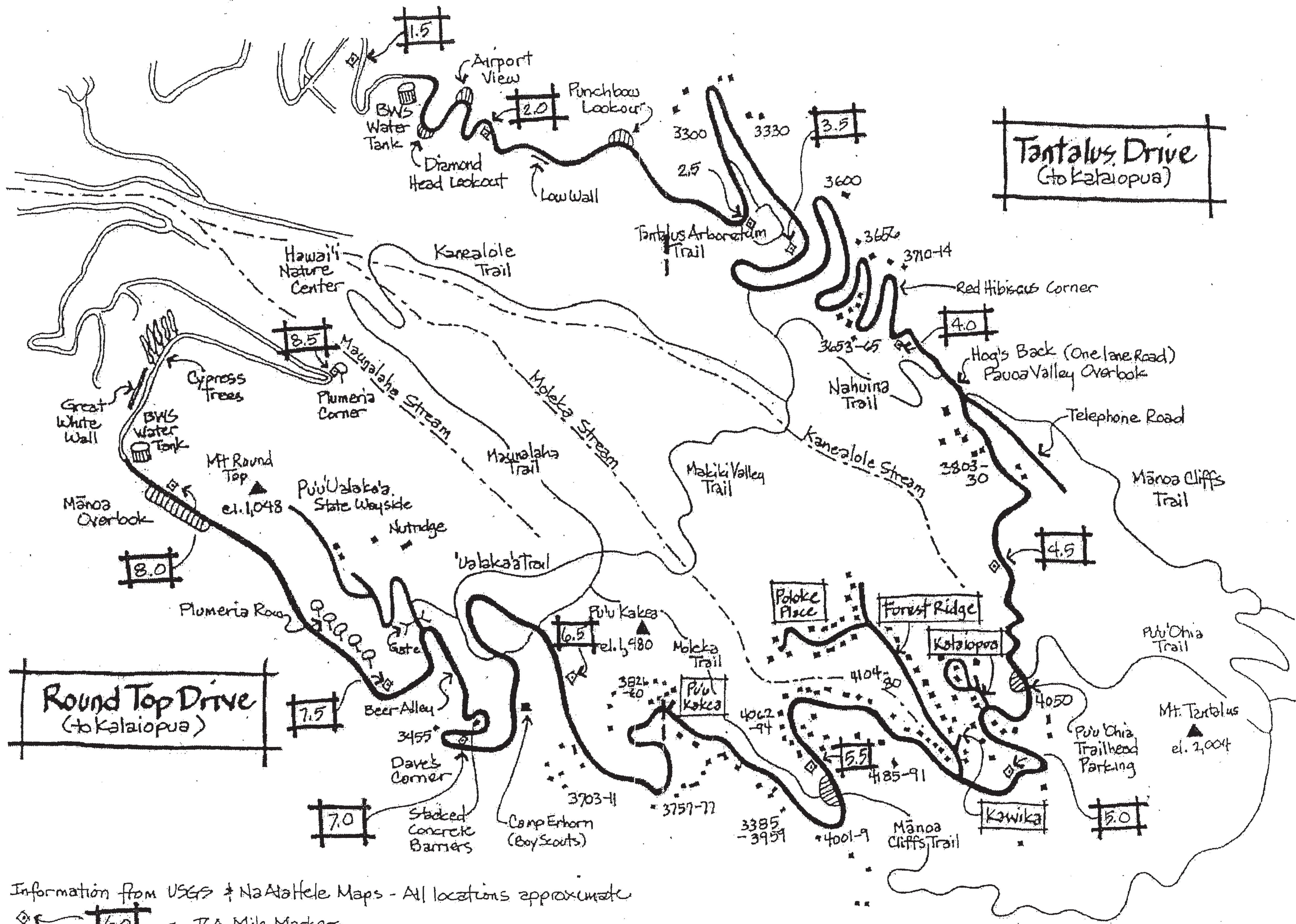
**Department of Land and Natural Resources
Kalanimoku Building, Board Room 132
1151 Punchbowl Street
Honolulu, Hawai'i**

Legend:

 Parking Areas Along TRTD

 Nā Ala Hele Trail





Information from USGS & Na Ahahele Maps - All locations approximate

◊ = TR Mile Markers

Table 5.1 Master Implementation Table from the Draft TRTD-CMP

Issue	Recommendation	Section	Jurisdiction	CIP	Annual
Roadway Pavement	Overlay of Roadway – Design & Engineering	4.1.1	CCH-DDC	\$500,000	-
	Overlay of Roadway – Construction	4.1.1	CCH-DDC	\$4,000,000	-
	Reconstruction of Roadway – Design & Engineering	4.1.1	CCH-DDC	\$1,700,000	-
	Reconstruction of Roadway – Construction	4.1.1	CCH-DDC	\$29,000,000	-
Roadway Prism	Hogsback Crib Wall Reconstruction – Total	4.1.2.1	CCH-DDC	\$4,500,000	-
	4110-4160 Round Top Dr. Stabilization – Field Investigation	4.1.2.2	CCH-DDC	\$25,000	-
	4110-4160 Round Top Dr. Stabilization – Design & Engineering	4.1.2.2	CCH-DDC	\$1,000,000-1,200,000	-
	4110-4160 Round Top Dr. Stabilization – Construction	4.1.2.2	CCH-DDC	\$2,000,000-7,000,000	-
	Tantalus Dr. to Pu'u 'Ōhi'a Trailhead Stabilization – Field Investigation	4.1.2.3	CCH-DDC	\$50,000	-
	Tantalus Dr. to Pu'u 'Ōhi'a Trailhead Stabilization – Design & Engineering	4.1.2.3	CCH-DDC	\$1,000,000-1,500,000	-
	Tantalus Dr. to Pu'u 'Ōhi'a Trailhead Stabilization – Construction	4.1.2.3	CCH-DDC	\$4,000,000-10,000,000	-
Roadway Embankments	Round Top Dr./Tantalus Dr. Between Forest Ridge Way & Pu'u 'Ōhi'a Trailhead Stabilization – Design & Engineering	4.1.3.1	CCH-DDC	\$100,000-125,000	-
	Round Top Dr./Tantalus Dr. Between Forest Ridge Way & Pu'u 'Ōhi'a Trailhead Stabilization – Construction	4.1.3.1	CCH-DDC	\$200,000-1,000,000	-
	3811 Tantalus Dr. to Pu'u 'Ōhi'a Trailhead Stabilization – Design & Engineering	4.1.3.2	CCH-DDC	\$150,000-200,000	-
	3811 Tantalus Dr. to Pu'u 'Ōhi'a Trailhead Stabilization – Construction	4.1.3.2	CCH-DDC	\$500,000-3,000,000	-
	Round Top Lookout Along Manoa Side of Pu'u 'Ualaka'a – Monitoring Plan	4.1.3.3	State Parks	\$200,000	-
Road Signage & Markers	Total Replacement of Roadway Signage on Tantalus Drive and Round Top Drive	4.1.4	CCH-DTS	\$15,000-25,000	-
	Pavement Marking Review and Renewal	4.1.4.2	CCH-DTS	-	-
Drainage	Phase 1 – Drainage Restoration	4.2.1	DOFAW	\$1,000,000	-
	Phase 2 – Advanced Drainage Improvements Study	4.2.2	DOFAW	\$300,000-400,000	-
Vegetation Management	Phase 1 – Remedial Vegetation Maintenance	4.3.3.1	DOFAW	\$359,490	-
	Phase 2-A – Ongoing Vegetation Maintenance	4.3.3.2.1	CCH-DFM	-	\$349,210
	Phase 2-B – Semi-Annual Vegetation Maintenance	4.3.3.2.2	DOFAW	-	\$113,757
Parking Areas and Trailheads	Reconstruct R1 and R2 Parking Area (AC or PCC)	4.4.2.1.2	DOFAW	\$461,000-615,000	-
	Reconstruct R1 Parking Area Retaining Wall	4.4.2.1.2	DOFAW	\$150,000	-
	R1 Parking Area Centerline Lane Delineators	4.4.2.1.2	DOFAW	\$25,000	-
	R1 and R2 Parking Areas Vegetation Management	4.4.2.1.3	DOFAW	\$15,900	-
	(OPTIONAL) Vehicle Turnaround at Former Baseyard	4.4.2.1.2	DOFAW	\$250,000	-
	(OPTIONAL) Vehicle Turnaround at Park Entrance	4.4.2.1.2	DOFAW	\$150,000	-
	Reconstruct R3 Parking Area (AC or PCC)	4.4.1	DOFAW	\$138,600-190,100	-
	Reconstruct R4 Parking Area (AC or PCC)	4.4.1	DOFAW	\$163,600-223,700	-
	Reconstruct R5 Parking Area (AC or PCC)	4.4.1	DOFAW	\$46,000-73,100	-
	Reconstruct R6 Parking Area (AC or PCC)	4.4.1	DOFAW	\$111,300-170,000	-
	Reconstruct R7 Parking Area (AC or PCC)	4.4.1	DOFAW	\$51,400-78,400	-
	Reconstruct R8 Parking Area (Gravel)	4.4.2.2	DOFAW	\$100,000	-
	Remove R8 Parking Area Cement Planter	4.4.2.2	DOFAW	\$10,000	-
	(OPTIONAL) Upgrade Camp Ehrhorn Driveway at R8 Parking Area to PCC	4.4.2.2	DOFAW	\$25,000	-
	R8 Parking Area Vegetation Maintenance	4.4.2.2.2	DOFAW	\$8,700	-
	Reconstruct R9 Parking Area (AC or PCC)	4.4.1	DOFAW	\$79,300-134,400	-
	Reconstruct R10 Parking Area (AC or PCC)	4.4.1	DOFAW	\$51,400-78,400	-
	Reconstruct R11 Parking Area (AC or PCC)	4.4.2.3.1	DOFAW	\$192,900-262,600	-
	Restore R11 Parking Area Drainages	4.4.2.3.1	DOFAW	\$50,000	-
	Enhance R11 Parking Area Retaining Wall	4.4.2.3.1	DOFAW	\$300,000-500,000	-
	Enhance R11 Parking Area Access Stairs to Moleka Trail	4.4.1.3.1	DOFAW	\$10,000-20,000	-
	R11 Parking Area Vegetation Management	4.4.2.3.2	DOFAW	\$10,100	-
	Reconstruct R12 Parking Area (AC or PCC)	4.4.1	DOFAW	\$96,800-148,700	-
	Reconstruct T1 Parking Area (AC or PCC)	4.4.2.4.1	DOFAW	\$133,600-190,100	-
	Reconstruct T2 Parking Area (AC or PCC)	4.4.2.4.1	DOFAW	\$220,200-292,600	-
	Reconstruct T3 Parking Area (AC or PCC)	4.4.2.4.1	DOFAW	\$169,400-230,400	-
	Reconstruct T4 Parking Area (AC or PCC)	4.4.2.4.1	DOFAW	\$51,400-78,400	-
	T1, T2, T3 and T4 Vegetation Management	4.4.2.4.2	DOFAW	\$21,100	-
	Reconstruct T5 Parking Area (AC or PCC)	4.4.1	DOFAW	\$271,200-351,000	-
	Reconstruct T6 Parking Area (AC or PCC)	4.4.2.5.1	DOFAW	\$111,300-170,000	-
	T6 Parking Area Vegetation Management	4.4.2.5.2	DOFAW	\$4,800	-
	Reconstruct T7 Parking Area (AC or PCC)	4.4.1	DOFAW	\$27,600-50,100	-
	Reconstruct T8 Parking Area (AC or PCC)	4.4.1	DOFAW	\$17,900-37,500	-
Reconstruct T9 Parking Area (AC or PCC)	4.4.2.6.1	DOFAW	\$220,200-292,600	-	
Install Moveable Vehicular Barrier at T9 Parking Area	4.4.2.6.1	DOFAW	\$12,000	-	
T9 Parking Area Vegetation Management	4.4.2.6.2	DOFAW	\$8,200	-	
Reconstruct T10 Parking Area (AC or PCC)	4.4.1	DOFAW	\$17,900-37,500	-	
Reconstruct T11 Parking Area (AC or PCC)	4.4.2.7.1	DOFAW	\$195,500-262,600	-	
Reconstruct T12 Parking Area (AC or PCC)	4.4.2.7.1	DOFAW	\$36,300-60,500	-	
Resurface T12 Parking Area Mauka Overflow with Gravel	4.4.2.7.1	DOFAW	\$25,000	-	
T11 Parking Area Vegetation Management	4.4.2.7.2	DOFAW	\$7,500	-	
T12 Parking Area Vegetation Management	4.4.2.7.2	DOFAW	\$2,600	-	
Reconstruct T13 Parking Area (AC or PCC)	4.4.1	DOFAW	\$27,600-50,100	-	
Reconstruct T14 Parking Area (AC or PCC)	4.4.1	DOFAW	\$94,100-145,000	-	
Reconstruct T15 Parking Area (AC or PCC)	4.4.1	DOFAW	\$30,900-54,200	-	
Reconstruct T16 Parking Area (AC or PCC)	4.4.2.8.1	DOFAW	\$17,900-37,500	-	
T16 Parking Area Vegetation Maintenance	4.4.2.8.2	DOFAW	\$5,600	-	
Reconstruct T17 Parking Area (AC or PCC)	4.4.1	DOFAW	\$23,400-44,900	-	
Reconstruct T18 Parking Area (AC or PCC)	4.4.2.9.1	DOFAW	\$133,600-195,100	-	
Reconstruct T19 Parking Area (AC or PCC)	4.4.2.9.1	DOFAW	\$326,500-412,600	-	
T18 Vegetation Management	4.4.2.9.2	DOFAW	\$5,900	-	
T19 Vegetation Management	4.4.2.9.2	DOFAW	\$12,500	-	
Road Safety	Road Safety Related to Vegetation Maintenance	4.5.1.1	DOFAW & CCH-DFM	-	-
	Road Safety Related to Condition of the Roadway	4.5.1.2	CCH-DDC	-	-
Public Safety	Public Safety Related to Crime	4.5.2.1	DOFAW	-	\$5,000
	Public Safety Related to Fire	4.5.2.2	DOFAW	-	-
	Public Safety Related to Falling Trees	4.5.2.3	DOFAW	-	-
	Public Safety Related to Driver Behavior	4.5.3	CCH-DTS	-	\$10,000

Source: Planning Solutions, Inc.

Legend:

- Tantalus-Round Top Drive
- Approx. Corridor

Embankment/Subsidence
3811 Tantalus Dr. to
Pu'u 'Ōhi'a Trailhead

Embankment/Subsidence:
Above Intersection of Round
Top Dr. and Forest Ridge Way

Embankment/Subsidence:
Crib Wall/"Hogsback"

Embankment/Subsidence:
4110 Round Top Drive
to Forest Ridge Way

Embankment: Mānoa Lookout

**Makiki
Valley**

Mānoa

