

Post Construction Storm Water Management in New Development and Redevelopment Plan to Incorporate Low Impact Development



PROTECT OUR WATER

MĀLAMA I KA WAI

STATE OF HAWAII DEPARTMENT OF TRANSPORTATION

www.stormwaterhawaii.com

Hawaii State Department of Transportation
Highways Division Oahu District
Storm Water Management Program
NPDES Permit No. HI S000001
March 2014

This Page Left Intentionally Blank

TABLE OF CONTENTS

List of Figures and Tables	3
Acronyms	4
1. Introduction	5
2. Unified Criteria for Implementing Low Impact Development	6
3. Quantitative Criteria Development for Design Storm	9
4. Criteria for Waivers from Low Impact Development	10
5. Alternative Options from Low Impact Development	10
Appendix A: Permanent BMP Checklist and Project Record	12
Appendix B: Statewide Rainfall Data Survey of 85 th Percentile Storms at Locations Near State Routes	14

List of Figures and Tables

Figure 1. LID Criteria Compliance Flowchart	8
Table 1. Summary of Statewide 85 th Percentile Storm Averages	9

Acronyms

BMP	Best Management Practice
CCH	City and County of Honolulu
CWA	Clean Water Act
DOH	Department of Health
DOT-HWYS	Hawaii Department of Transportation, Highways Division
EPA	[US] Environmental Protection Agency
LID	Low Impact Development
MEP	Maximum Extent Practicable
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
TMDL	Total Maximum Daily Load
WQDS	Water Quality Design Storm

1. Introduction

On October 28th, 2013, the State of Hawaii Department of Transportation, Highways Division's (DOT-HWYS) revised National Pollutant Discharge Elimination System (NPDES) permit No. HI S000001 became effective. The revised permit includes Low Impact Development (LID) requirements for post-construction storm water management in new development and significant redevelopment. PartD.1.e. of the permit states:

The Permittee shall further develop, implement, and enforce a program to address storm water runoff from all (i.e., both private and public) new development and redevelopment projects that result in a land disturbance of one (1) acre or more and smaller projects that have the potential to discharge pollutants to the DOT-HWYS' MS4. The Permittee's program must ensure that permanent controls are in place to prevent or minimize water quality impacts to the MEP. Review and update as necessary the criteria defining when and the types of permanent post-construction BMPs, including among other thing LID techniques, must be included in a project design to address storm water impacts and pollutants of concern. For State waters on the State CWA Section 303(d) list or State established and EPA approved TMDLs, the pollutants of concern to be targeted shall include the parameters causing impairment. Consideration shall also be provided for trash reduction techniques as to comply with its short and long term plans as required in Section D.1.(f)(1)(v).

and part D.1.e.(1) required DOT-HWYS to submit a plan for requiring LID in DOT-HWYS standards. The plan should include the following elements:

- *Criteria for requiring implementation.*
- *Investigation into the development of quantitative criteria for a specific design storm to be managed by LID techniques. Examples of design storm requirements include: 24-hour, 85% storm through infiltration; on-site management of the first inch of rainfall within a 24-hour period; retention of the 100-year, 2-hour storm; or on-site management of the 24-hour, 95% storm.*
- *Feasibility criteria for circumstances in which a waiver could be granted for the LID requirements.*
- *When a LID waiver is granted, alternatives such as offsite mitigation and/or non-LID treatment control BMPs could be required.*

This plan includes the items listed in the four bullet points above with the intent of establishing a foundation for DOT-HWYS' standards and philosophy for incorporating LID into post-construction storm water management in new development and significant redevelopment areas.

The criteria is intended to assist Design Engineers in preparing drainage designs that are in compliance with permit requirements and DOT-HWYS standards, where applicable. This document is not intended to replace a drainage design manual and/or standards. Drainage design shall be in accordance with the criteria and standards of this document to the maximum extent practicable.

2. Unified Criteria for Implementing LID

Any project (new or redevelopment) that generates one (1) acre or greater of new permanent impervious surface is required to prioritize LID practices for storm water management. Projects that disturb one (1) acre or more of land qualify to be considered under the unified criteria for implementing LID. Furthermore, smaller projects that have the potential to discharge pollutants to the DOT-HWYS' MS4 may be eligible to install LID (see below for qualifiers of such smaller projects).

This criteria applies to:

- Projects within DOT-HWYS' Rights-of-Way:
 - Contract Projects – A construction project designed either by DOT-HWYS personnel or by engineering consultant firms, and constructed by a private contractor;
 - In-House Projects – A construction project that is performed by DOT-HWYS personnel; and
 - Encroachment Projects – A construction project undertaken by a non DOT-HWYS entity (i.e. a third party) within the DOT HWYS' right-of-way and requires issuance by DOT-HWYS of a permit to perform work upon state highways.
- New Projects Requiring a Discharge/Connection to the DOT-HWYS' MS4 permit: Projects outside of DOT-HWYS that produce storm water runoff that drains to DOT-HWYS' MS4 through physical connection
- Specific projects with potential to discharge pollutants to the DOT HWYS' MS4 with at least 10,000 square feet of total impervious surface area which includes but is not limited to:
 - Retail Gasoline Outlets and Carwashes
 - Automotive Repair Shops
 - Restaurants
 - Parking Lots
 - Other projects DOT-HWYS determines has the potential to pollute the MS4

The procedure for implementing the criteria is as follows (see figure 1 for a flowchart version)¹:

A determination will be made of the completed project area. Should it be less than 1 (one) acre total of disturbed area see “Tier 2” below.

Tier 1. New or significant redevelopment projects greater than 1 (one) acre disturbed area steps:

1. Is the amount of new impervious area greater than one acre?
 - a. YES - Proceed to deliberate LID Design and Step 2.
 - b. NO – **Fulfill Requirement** by safely directing runoff to infiltrate
2. Conduct deliberate LID Design with respect to the Quantitative Criteria for the Design Storm Volume (1 (one) inch of water over the area of the project or a more conservative estimate). **Fulfill Requirement** if complete volume is treated.
3. Should the LID design prove unreasonable, seek approval to treat remaining water with alternate BMPs from DOT-HWYS **Fulfill Requirement** if complete volume is treated.
4. Should on-site BMPs prove unreasonable, seek approval for alternative options (see below). **Fulfill Requirement** once any alternative options are completed.

Tier 2. Projects less than 1 (one) acre disturbed steps:

1. Is the project a retail gasoline outlet, automotive repair shop, restaurant, or parking lot with at least 10,000 square feet of total impervious surface area?
 - a. YES – Consider applicable LID Site Design Strategies and proceed to step 2
 - b. NO – **Fulfill Requirement** without any necessary storm water controls
2. **Fulfill Requirement** by incorporating applicable source control BMPs

¹ All projects that are not DOT-HWYS maintenance projects will complete a checklist (see Appendix A) that addresses water quality controls to include the possible implementation of LID



Note. Retail gasoline outlets, automotive repair shops, restaurants and parking lots, all with at least 10,000 square feet of total impervious surface area.

3. Quantitative Criteria Development for Design Storm

DOT-HWYS considered different quantitative criteria for the management of LID techniques. These quantitative criteria are essential in designing and sizing BMPs adequate enough to enhance storm water runoff quality through infiltration, evapotranspiration, harvesting/reuse or other activities that treat and release storm water. The City and County of Honolulu (CCH) conducted research and analysis of the 85th percentile values for 24-hour cumulative depths over 0.10 inches for the island of Oahu. The resulting research, presented in the CCH Standards Revision Plan (dated December 2011), demonstrated the 24-hour 85th percentile value of one (1) inch equaling or exceeding the total for 89% of the stations analyzed. Consequently, in 2013 DOT-HWYS conducted independent study to re-verify Oahu data and the rest of the counties in the State of Hawaii with 24-hour 85th percentile values for the purpose of this plan.

DOT-HWYS looked at all rainfall stations within a margin seven (7) miles to the left and right of State routes across all counties. Stations were primarily selected for having 35 years of recent continuous monitoring data. In some cases, stations did not have a complete 35 years of data, but were still useful in providing rainfall information. Through the analysis of these stations, no more than half of the stations in the State exceeded the one (1) inch value with most county averages at or close to the one (1) inch value. This information of averages is presented in table 1. The appendix in the latter part of this plan graphically shows station locations analyzed.

Island Name	No. of Stations Analyzed	Average From All Stations (in.)
Hawaii	107	1.101
Maui	45	1.059
Lanai	3	1.105
Moloka'i	8	0.989
Oahu	62	0.889
Kauai	38	0.939

Table 1. Summary of Statewide 85th Percentile Storm Averages

4. Criteria for Waivers from LID

There may be certain circumstances where a waiver of LID requirements could be granted. The feasibility criteria for issuing waivers would be based on but is not limited to:

- Hydrogeological constraints—e.g., permeability; depth top groundwater; slope stability; structural impacts to buildings/roadbed
- Physical constraints—e.g., space constraints; site slope; lack of right of way; contaminated subsoil
- Operational constraints—e.g., Strength/loading requirements for pavement; no application for water reuse
- Spatial constraints—e.g., no discharge to State Waters; multiple, dispersed project locations

Types of projects that qualify for waivers from LID will be at the discretion for DOT-HWYS and may include, but are not limited to:

- Projects which return the area to pre-development runoff conditions or reduce runoff from the site
- Utilities and Maintenance Projects that do not fall under the redevelopment category that may include:
 - Resurfacing
 - Pipelines
 - Conduits, Lighting, and Signaling
 - Traffic Sign/Signal Projects
 - Safety Projects/Improvements

5. Alternative Options from LID

For Projects that are granted a waiver, off-site mitigation and/or non-LID treatment controls consistent with DOT-HWYS Permanent BMP Criteria could be required.

This Page Left Intentionally Blank

Appendix A: Permanent BMP Checklist and Project Record

PERMANENT BMP CHECKLIST AND PROJECT RECORD

Project Name: _____

Project Number: _____ Project Route/Milepost: _____

Advertise Date: _____

Exemptions (check all that apply)

<input type="checkbox"/>	Projects that do not generate 1 acre or more of new permanent impervious and are not a retail gasoline outlet, auto repair shop, restaurant, parking lot with at least 10,000 square feet of total impervious surface area
<input type="checkbox"/>	Project returns the area to pre-development runoff conditions.
<input type="checkbox"/>	Project is a utility project (check applicable type) <input type="checkbox"/> Pipeline <input type="checkbox"/> Conduit <input type="checkbox"/> Traffic Sign/Signal
<input type="checkbox"/>	Projects that are not continuous or involve several locations which may collectively generate 1 acre or more of new permanent impervious surface.
<input type="checkbox"/>	Projects that do not discharge runoff into any waters of the United States.

If none of the above is checked, the project must provide water quality controls

Water Quality Control:

Water quality volume required: _____ cubic feet

Water quality volume provided by LID: _____ cubic feet

Type of BMP used: _____

*** In the event that water quality volume cannot be treated via LID alone for safety concerns, hydrogeological constraints, physical constraints, or operational constraints alternate approved treatment BMPs will be used**

**** For new gasoline outlets, auto repair shops, restaurants, and parking lots, all with at least 10,000 square feet of total impervious surface area, consider LID and apply Source Control BMPs**

Water Quality Control: (Where applicable)

Existing Site Runoff:

10-year: _____ cubic feet per second
25-year: _____ cubic feet per second
50-year: _____ cubic feet per second
100-year: _____ cubic feet per second

Proposed Site Runoff:

10-year: _____ cubic feet per second
25-year: _____ cubic feet per second
50-year: _____ cubic feet per second
100-year: _____ cubic feet per second

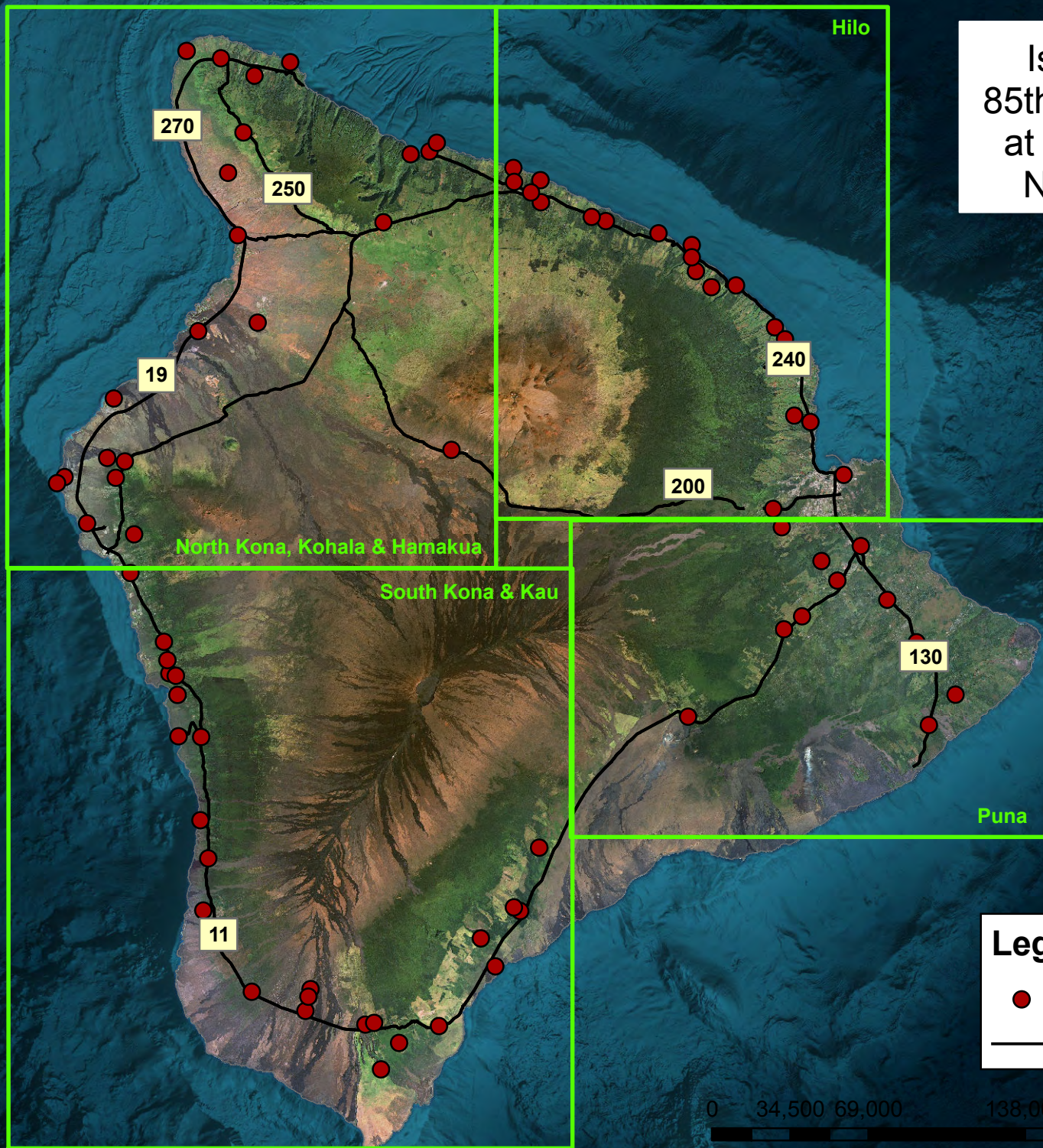
Type of Treatment used: _____

Description: _____

Signatory:

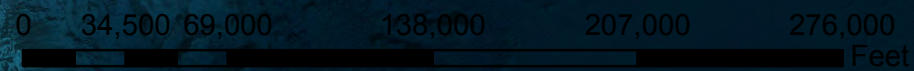
Appendix B: Statewide Rainfall Data Survey of 85th
Percentile Storms at Locations
Near State Routes

Island of Hawaii's
85th Percentile Storms
at Various Locations
Near State Routes



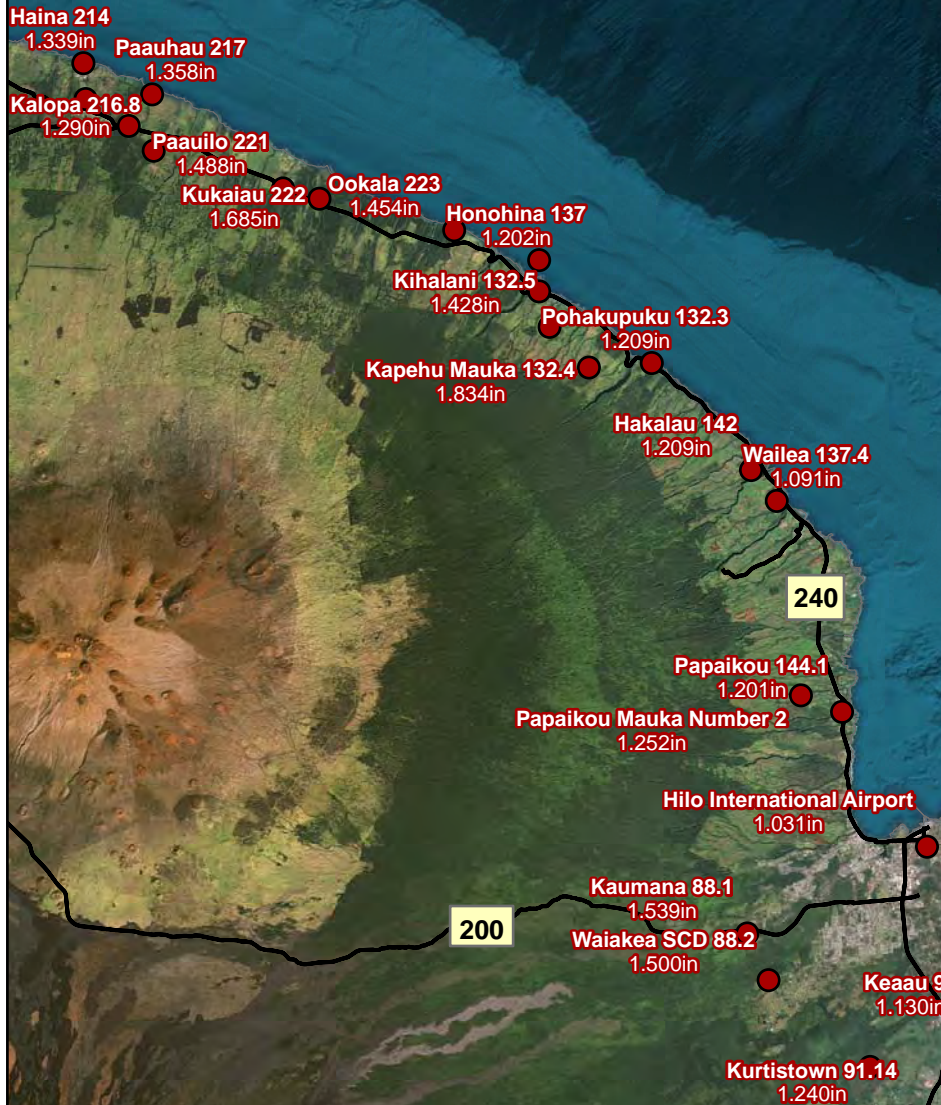
Legend

- NOAA Weather Station
- State Route



Hilo

Island of Hawaii's 85th Percentile Storms at Various Locations Near State Routes



Legend

- NOAA Weather Station
- State Route

0 17,500 35,000 70,000 105,000 140,000 Feet

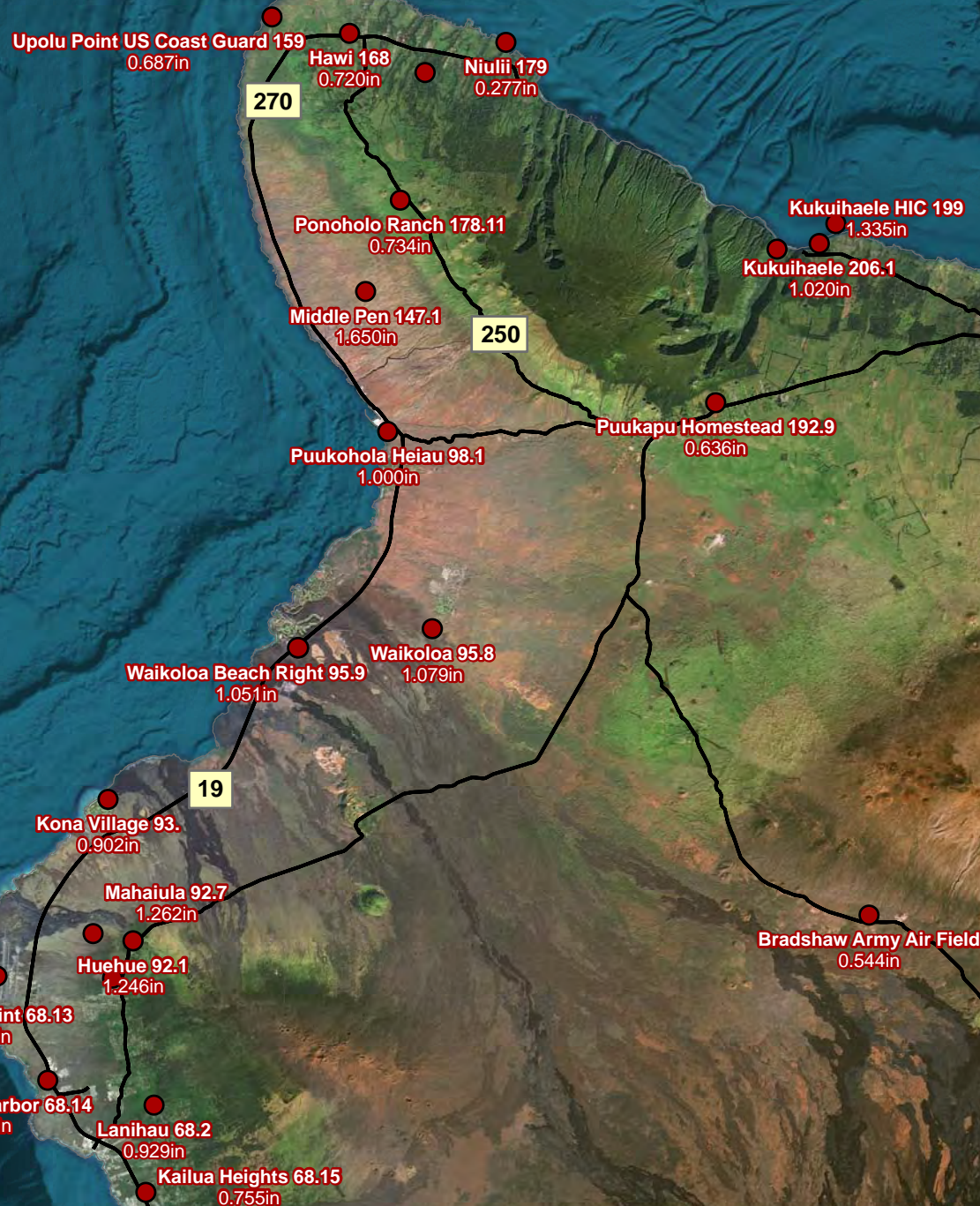
North Kona, Kohala & Hamakua Island of Hawaii's 85th Percentile Storms at Various Locations Near State Routes



Legend

- NOAA Weather Station
- State Route

0 17,500 35,000 70,000 105,000 140,000 Feet



South Kona & Kau Island of Hawaii's 85th Percentile Storms at Various Locations Near State Routes

Legend

- NOAA Weather Station
- State Route

0 15,500 31,000 62,000 93,000 124,000 Feet

Kainaliu 73.2
0.921in

Kealahou 474.8
0.887in

Kaawaloa 29
0.915in

Kealahou 26.2
0.941in

Napoopoo 28
1.161in

Puuhonua O Hona 27.4
0.740in

Honaunau 27
0.858in

Kahoe Makai 24.4
0.854in

Ophihale 24.1
0.799in

Miloli 2.34
0.842in

Kahuku Mauka 2.10
1.071in

Manuka 2
1.00in

South Kona 2.31
0.922in

South Kona 2 2.32
0.859in

Kiolakaa A and F 6
0.670in

Naalehu 14
1.071in

Kamalo Puueo 5.1
0.902in

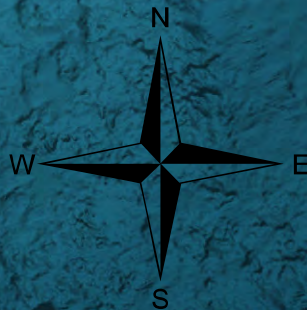
Kapapala Ranch 36
1.144in

Pahala Mauka 21.3
1.299in

Pahala 21
0.912in

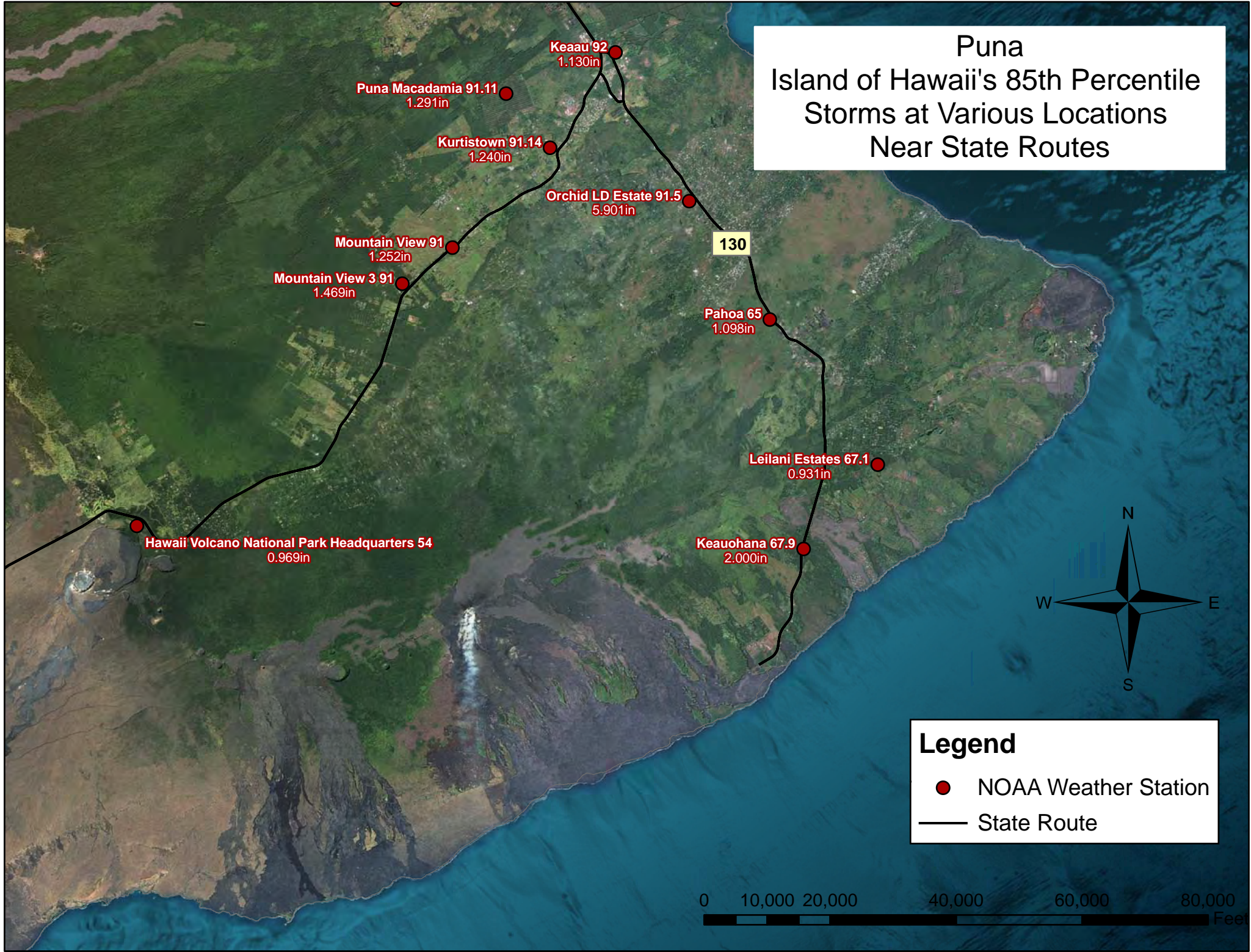
Moaula 18
1.098in

Sea Mountain 12.15
1.272in

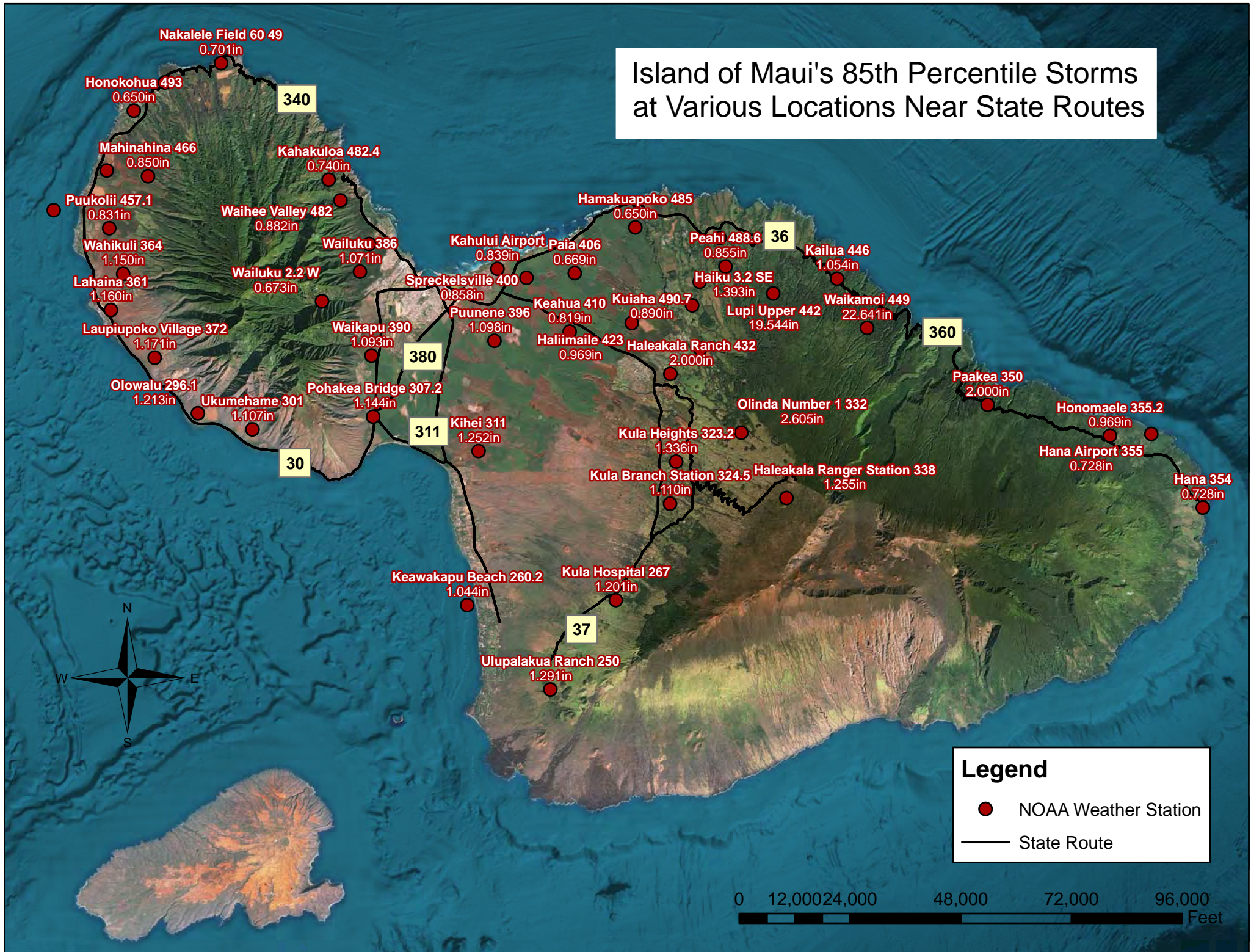


Puna

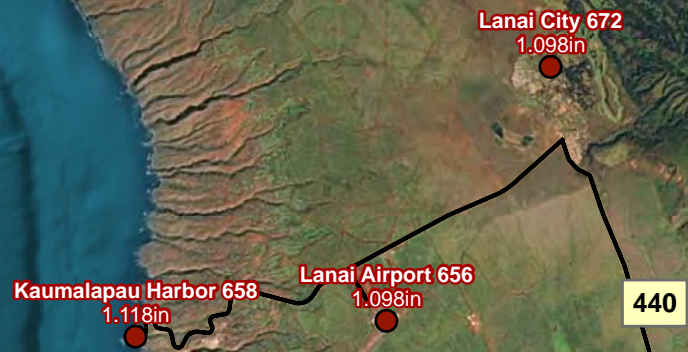
Island of Hawaii's 85th Percentile Storms at Various Locations Near State Routes



Island of Maui's 85th Percentile Storms at Various Locations Near State Routes

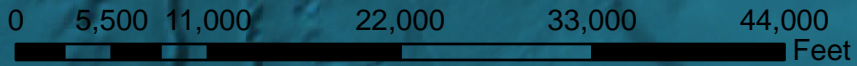


Island of Lanai's 85th Percentile
Storms at Various Locations
Near State Routes

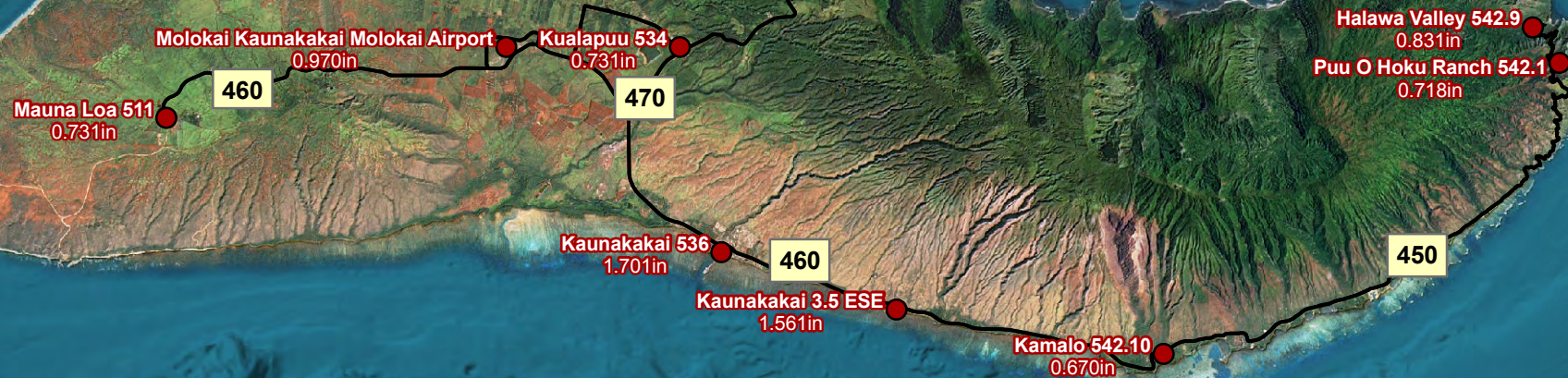
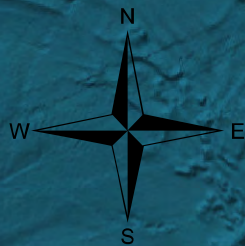


Legend

- NOAA Weather Station
- State Route



Island of Molokai's 85th Percentile Storms at Various Locations Near State Routes



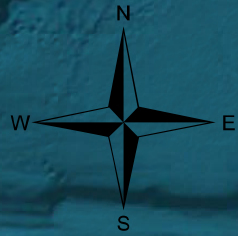
Legend

- NOAA Weather Station
- State Route



North Shore & Central Oahu

Island of Oahu's 85th Percentile Storms at Various Locations Near State Routes



Legend

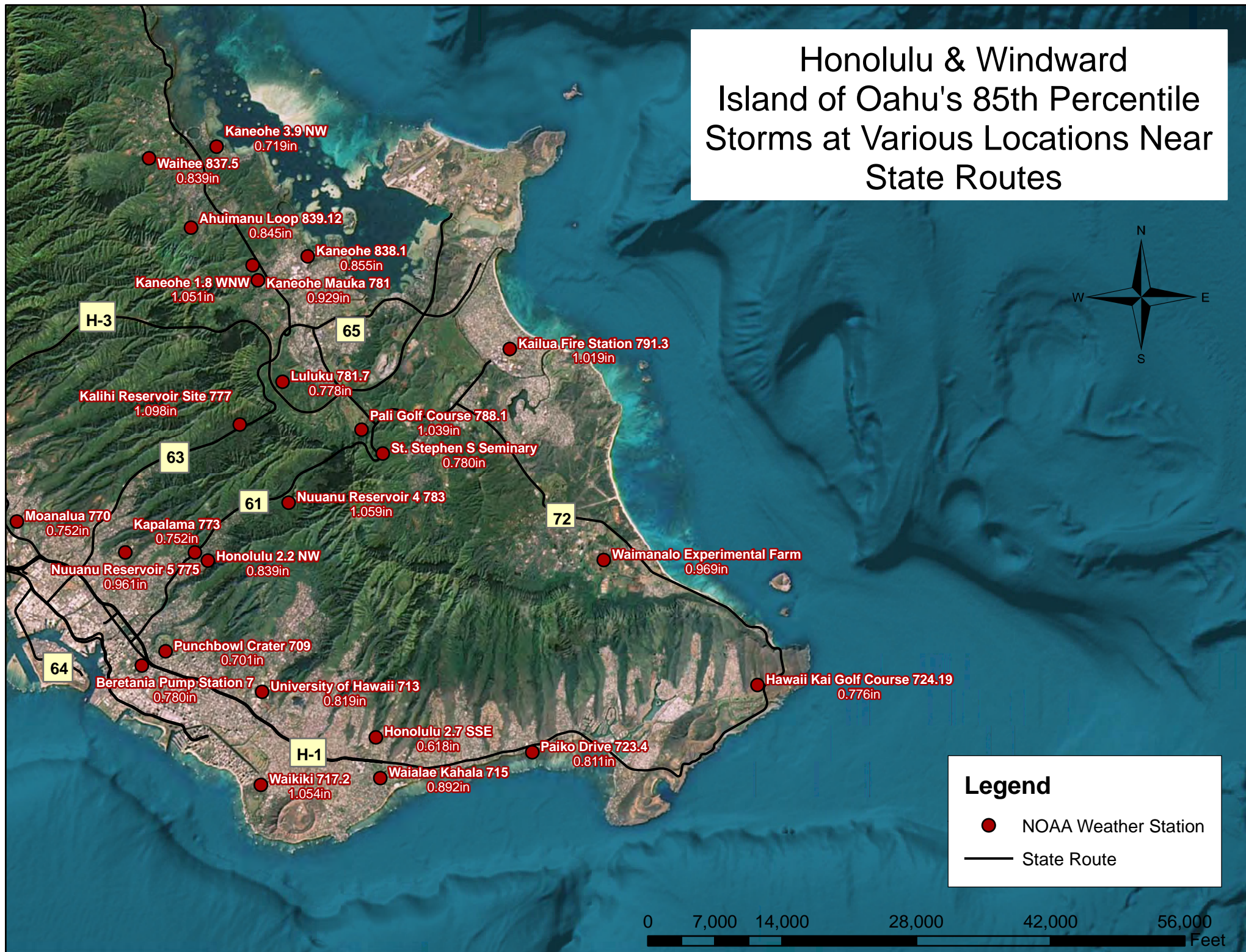
- NOAA Weather Station
- State Route

Leeward

Honolulu & Windward

0 12,500 25,000 50,000 75,000 100,000 Feet

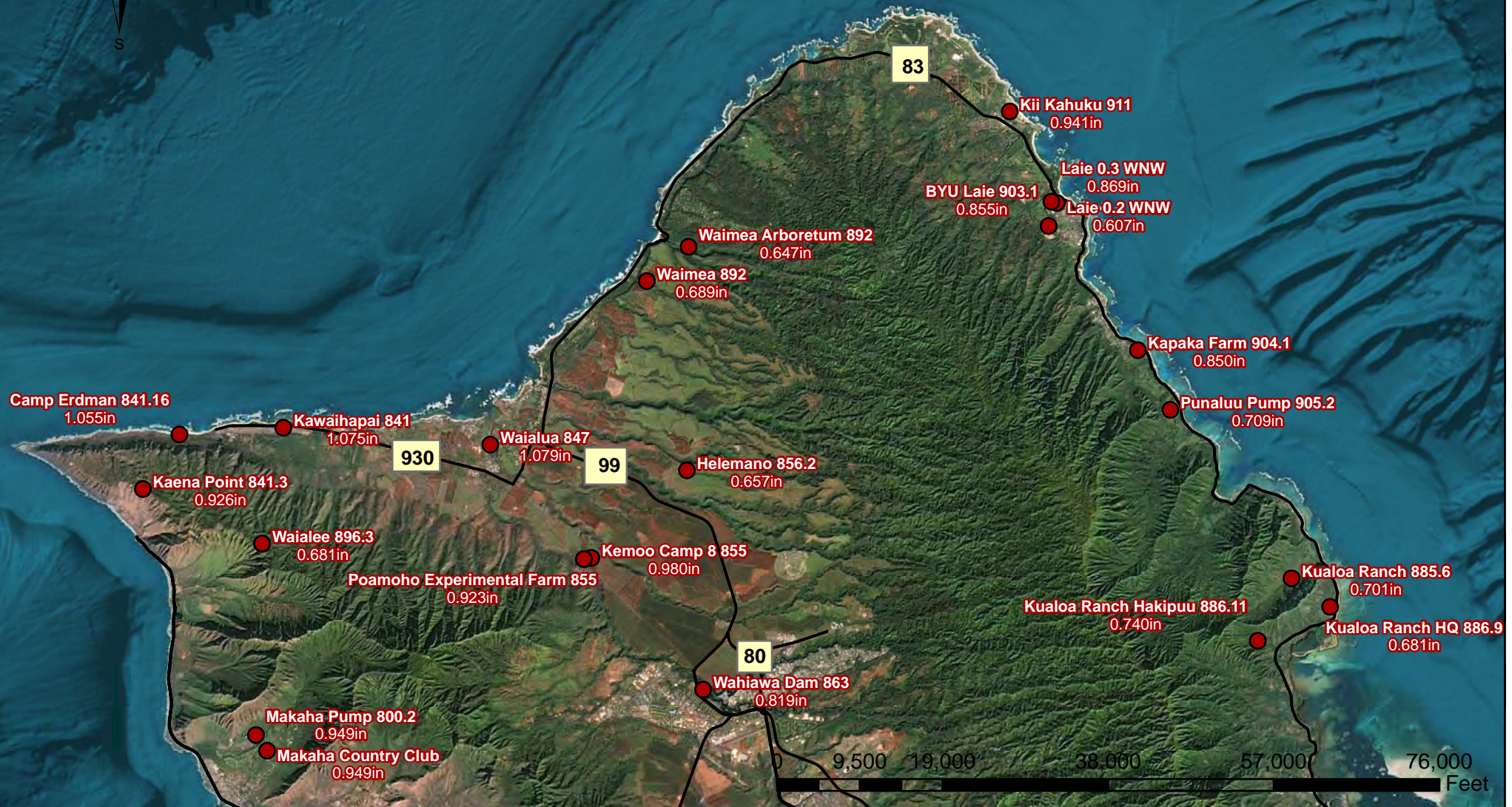
Honolulu & Windward Island of Oahu's 85th Percentile Storms at Various Locations Near State Routes

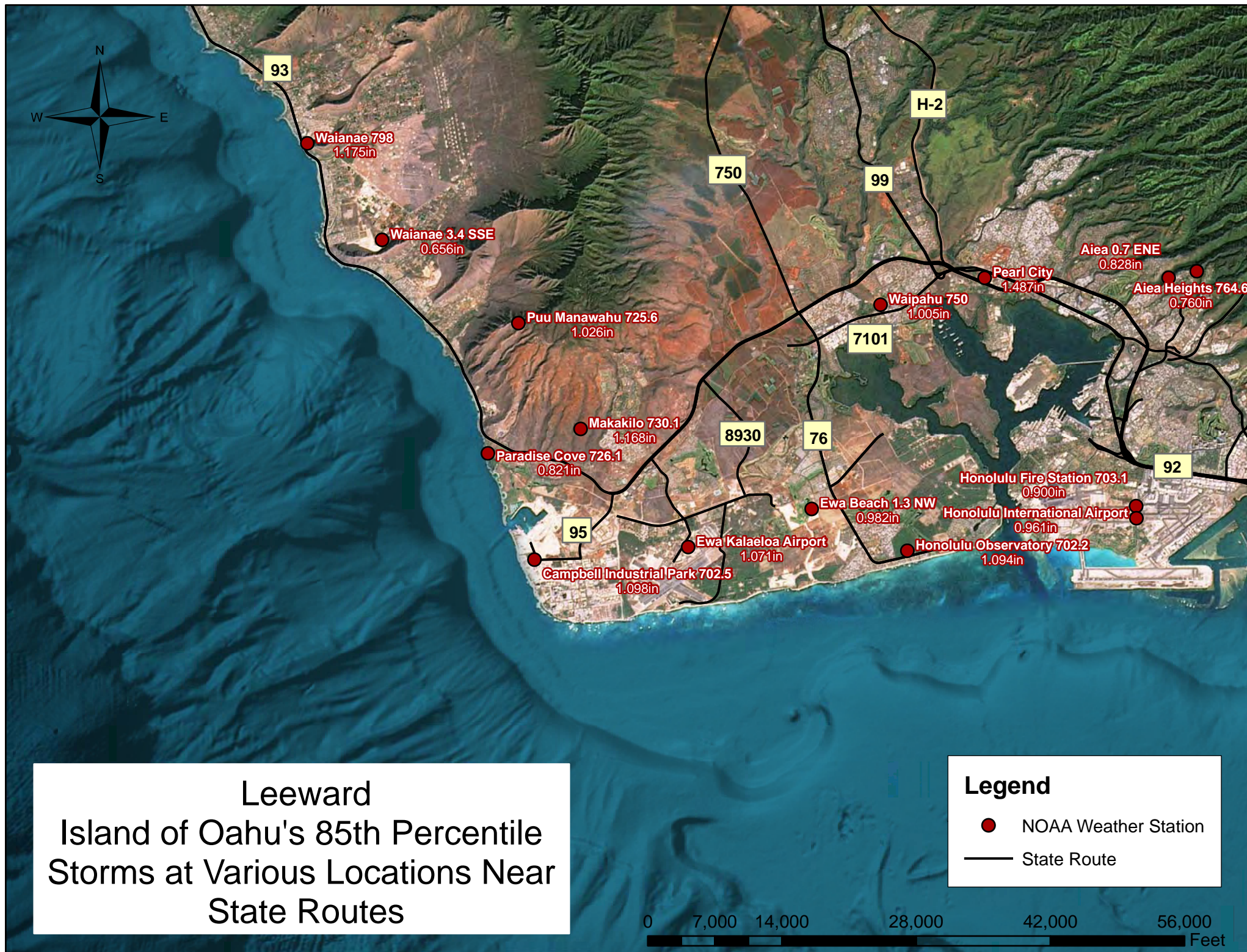


Legend

- NOAA Weather Station
- State Route

North Shore & Central Oahu Island of Oahu's 85th Percentile Storms at Various Locations Near State Routes





Leeward
Island of Oahu's 85th Percentile
Storms at Various Locations Near
State Routes

